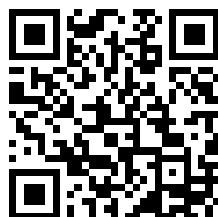

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COLORADO RIVER BASIN PROJECT

HEARINGS
BEFORE THE
SUBCOMMITTEE ON
IRRIGATION AND RECLAMATION
OF THE
COMMITTEE ON
INTERIOR AND INSULAR AFFAIRS
HOUSE OF REPRESENTATIVES
NINETIETH CONGRESS

FIRST SESSION

ON

H.R. 3300 and Similar Bills

TO AUTHORIZE THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE COLORADO RIVER BASIN PROJECT, AND FOR OTHER PURPOSES

S. 20 and Similar Bills

TO PROVIDE FOR A COMPREHENSIVE REVIEW OF NATIONAL WATER RESOURCE PROBLEMS AND PROGRAMS, AND FOR OTHER PURPOSES

MARCH 13, 14, 16, AND 17, 1967

Serial No. 90-5

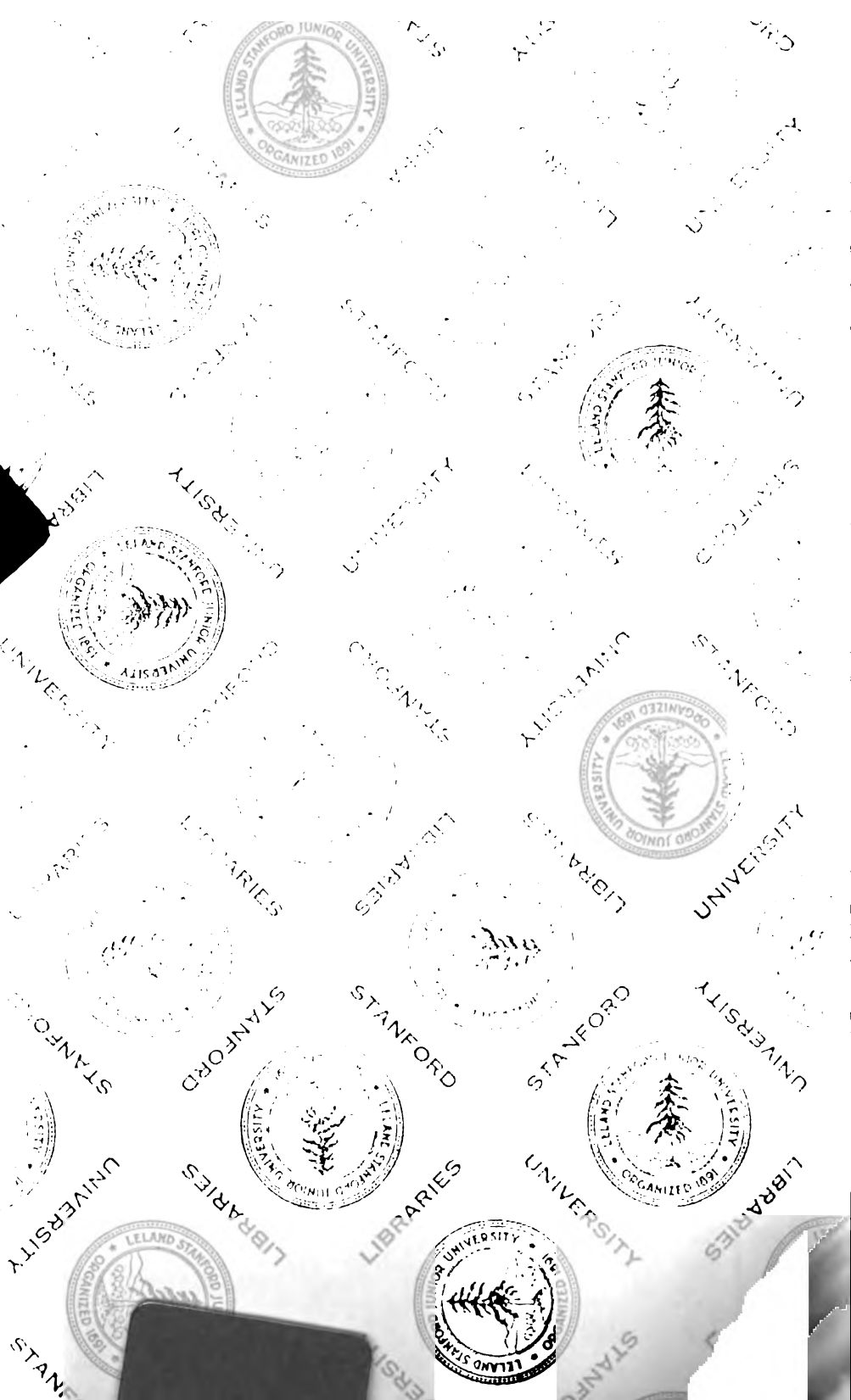
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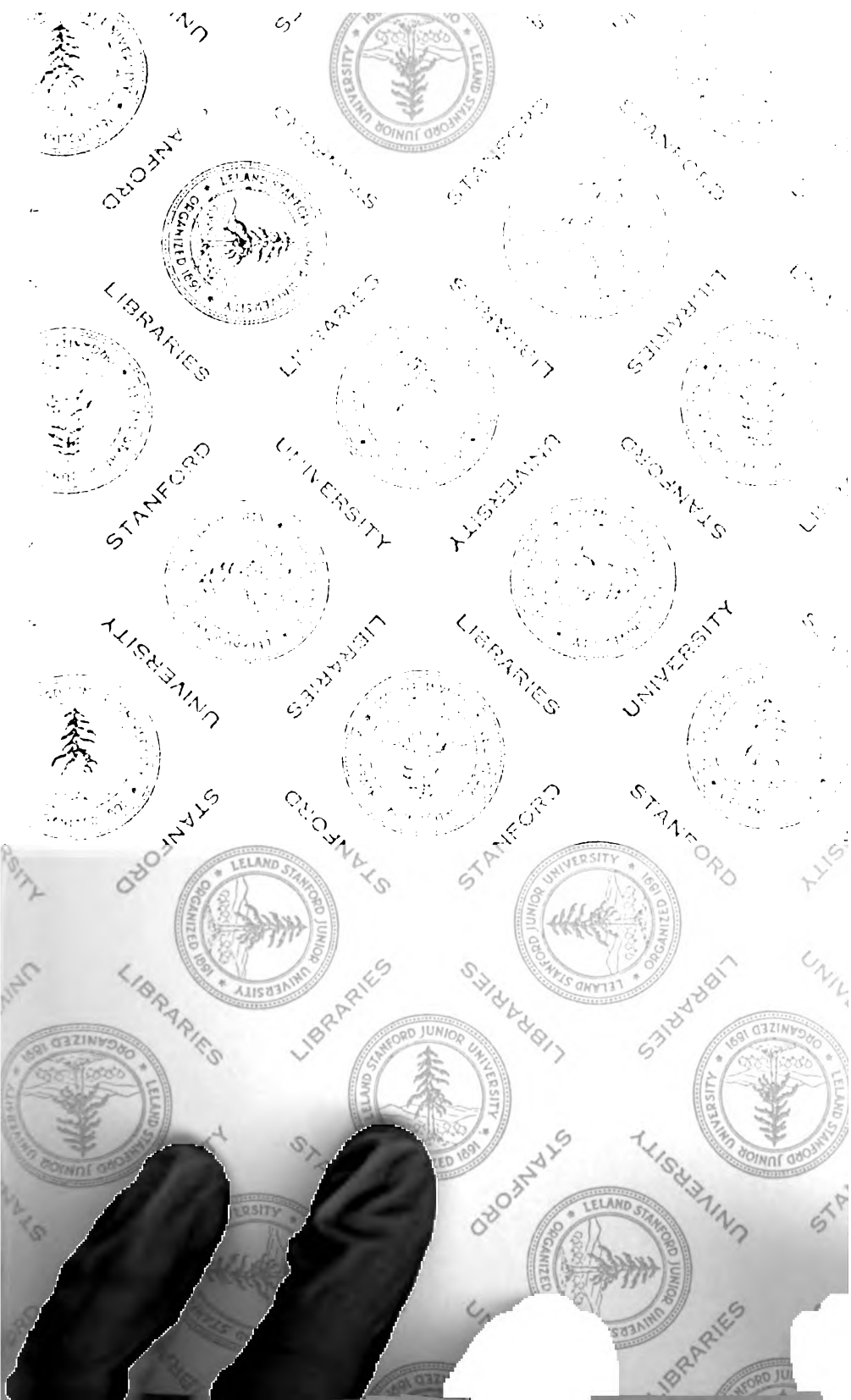


U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 1967













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74-044



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NOTE: The chairman, Hon. Wayne N. Aspinall, and the ranking minority member, Hon. John P. Saylor, are ex officio members of each subcommittee.

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S. 20 AND SIMILAR BILLS TO PROVIDE A COMPREHENSIVE REVIEW OF NATIONAL WATER RESOURCE PROBLEMS AND PROGRAMS, AND FOR OTHER PURPOSES

MONDAY, MARCH 13, 1967

**HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
*Washington, D.C.***

The subcommittee met, pursuant to notice, at 9:50 a.m., in room 1324, Longworth House Office Building, the Honorable Harold T. Johnson (chairman of the subcommittee) presiding.

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation will come to order.

The purpose of meeting today is to take testimony on H.R. 3300, H.R. 9, H.R. 6271, S. 20, and H.R. 1416 to authorize the construction, operation, and maintenance of the Colorado River basin project, and to provide for a comprehensive review of national water resources problems and programs and for other purposes.

Those bills that have been listed will be printed in the record at this point and proper reference will be made to the other bills that have been introduced by various Members of the House.

Mr. HOSMER. I have two bills, but only one is listed. I would like to have both of them before the subcommittee.

Mr. JOHNSON. Without objection, it will be so ordered.

Mr. UDALL. I understand that there are probably 15 or 20 bills on this subject and all will be referred to.

Mr. JOHNSON. Reference will be made to all of them.

Mr. UDALL. But we should have all of the different types of the bills printed in the record.

Mr. HOSMER. I have two bills. I should like both of them before the subcommittee and the committee. I would like both printed in the record.

Mr. SAYLOR. We have got to get this on its way. Let us see to it that all of the bills are printed and are before the subcommittee and the committee, so that nobody will feel hurt and that everybody will see to it that their right of authorship is fully preserved.

Mr. HOSMER. Will you yield?

Mr. SAYLOR. I just want to make sure that all of the bills are printed in the record.

Mr. JOHNSON. The gentleman from California is recognized.

Mr. HOSMER. I want to make it clear that there is no pride of authorship involved on my part. There is a second bill that I have here. I want to make certain that the entire text of both are before the committee.

Mr. JOHNSON. We have a complete listing of the bills, and so that there will be no mistake and no leaving of anyone out, I will introduce all of the numbers of the bills into the record by giving the list to the reporter here for their inclusion.

I will do it in that fashion.

(The list of bills referred to follows:)

COLORADO RIVER BILLS (as of close of sessions March 9, 1967)

H.R. 9 (Udall)	H.R. 6552 (Charles Wilson)
H.R. 30 (Aspinall)	H.R. 6603 (Hanna)
H.R. 722 (Hosmer)	H.R. 6619 (Roybal)
H.R. 744 (Johnson)	H.R. 6620 (Smith of Calif.)
H.R. 1179 (Rhodes, Ariz.)	H.R. 6822 (Reinecke)
H.R. 1271 (Steiger)	H.R. 6848 (Van Deerlin)
H.R. 3300 (Aspinall)	H.R. 6931 (Hawkins)
H.R. 5130 (Bell)	H.R. 7008 (Tunney)
H.R. 5355 (Utt)	H.R. 7084 (Hollfield)
H.R. 5625 (Leggett)	H.R. 7194 (Edmondson)
H.R. 6130 (Bob Wilson)	H.R. 7204 (Saylor)
H.R. 6271 (Hosmer)	H.R. 7558 (King of Calif.)
H.R. 6416 (Smith of Calif.)	H.R. 7562 (Lipscomb)

NATIONAL WATER COMMISSION (as of March 9, 1967)

S. 20	H.R. 3298 (Foley)
H.R. 1416 (Ullman)	H.R. 4124 (May)
H.R. 1458 (Wyatt)	H.R. 5308 (Blatnik)
H.R. 2370 (Rodino)	H.R. 5346 (Reinecke)
H.R. 2546 (Howard)	H.R. 6800 (Helstoski)

(H.R. 3300, together with related bills and the report of the Department of the Interior dated February 15, 1967, follows:)

[H.R. 3300, 90th Cong., first sess.]

A BILL To authorize the construction, operation, and maintenance of the Colorado River Basin project, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—COLORADO RIVER BASIN PROJECT: OBJECTIVES

SEC. 101. That this Act may be cited as the "Colorado River Basin Project Act".

SEC. 102. The Congress recognizes that the present and growing water shortages in the Colorado River Basin constitute urgent problems of national concern, and accordingly authorizes and directs the National Water Commission established in title II of this Act and the Water Resources Council, established by the Water Resources Planning Act (Public Law 89-80), to give highest priority to the preparation of a plan and program for the relief of such shortages, in consultation with the States and Federal entities affected, as provided in this Act. This program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, for municipal, in-

dustrial, and other beneficial purposes; improving water quality; providing for basic public outdoor recreation facilities; improving conditions for fish and wildlife; and the generation and sale of hydroelectric power as an incident of the foregoing purposes.

TITLE II—THE NATIONAL WATER COMMISSION; INVESTIGATIONS AND PLANNING

SEC. 201. (a) There is established the National Water Commission (hereinafter referred to as the "Commission").

(b) The Commission shall be composed of seven members, who shall be appointed by the President and serve at his pleasure. No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.

(c) The President shall designate the Chairman of the Commission (hereinafter referred to as the "Chairman") from among its members.

(d) Members of the Commission may each be compensated at the rate of \$100 for each day such member is engaged in the actual performance of duties vested in the Commission. Each member shall be reimbursed for travel expenses, including per diem in lieu of subsistence, as authorized by law (5 U.S.C. 73b-2) for persons in the Government service employed intermittently.

(e) The Commission shall have an executive director, who shall be appointed by the Chairman with the approval of the President and shall be compensated at the rate provided by law for level IV of the Federal Executive Salary Schedule. The executive director shall have such duties and responsibilities as the Chairman may assign.

SEC. 202. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased useability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to desalting, weather modification and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council established in section 101 of the Water Resources Planning Act (79 Stat. 245) (hereinafter referred to as the "Council"); and (4) conduct such specific investigations as are authorized herein or as hereafter may be authorized by the Congress.

(b) The Commission shall consult with the Council regarding its studies and shall furnish its proposed reports and recommendations to the Council for review and comment. The Commission shall submit to the President such interim and final reports as it deems appropriate, and the Council shall submit to the President its views on the Commission's reports. The President shall transmit the Commission's final report to the Congress together with such comments and recommendations for legislation as he deems appropriate.

(c) The Commission shall terminate not later than six years from the effective date of this Act.

SEC. 203. (a) The Commission may (1) hold such hearings sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) without regard to the civil service laws and regulations and without regard to the Classification Act of 1949, as amended, employ and fix the compensation of such personnel as may be necessary to carry out the functions of the Commission: *Provided*, That of such personnel no more than five persons may receive compensation equivalent to the compensation established for grade 18 under the Classification Act of 1949, as amended; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a), at rates not to exceed \$50 per diem for individuals; (6) purchase, hire, operate, and maintain

passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner; and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

(b) Any member of the Commission is authorized to administer oaths when it is determined by a majority of the Commission that testimony shall be taken or evidence received under oath.

SEC. 204. (a) Subject to general policies adopted by the Commission, the Chairman shall be the chief executive of the Commission and shall exercise its executive and administrative powers as set forth in section 203(a)(2) through section 203(a)(8).

(b) The Chairman may make such provision as he shall deem appropriate authorizing the performance of any of his executive and administrative functions by the executive director or other personnel of the Commission.

SEC. 205. (a) The Commission shall, to the extent practicable, utilize the services of the Federal water resource agencies.

(b) Upon request of the Commission, the head of any Federal department or agency or river basin commission created pursuant to title II of the Water Resources Planning Act is authorized (1) to furnish to the Commission, to the extent permitted by law and within the limits of available funds, including funds transferred for that purpose pursuant to section 203(a)(7) of this Act, such information as may be necessary for carrying out its functions and as may be available to or procurable by such department or agency, and (2) to detail to temporary duty with this Commission on a reimbursable basis such personnel within his administrative jurisdiction as it may need or believe to be useful for carrying out its functions, each such detail to be without loss of seniority, pay, or other employee status.

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C. 48e) shall apply to the collection of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665g) shall apply to appropriations of the Commission: *And provided further*, That the Commission shall not be required to prescribe such regulations.

SEC. 206. (a) The Council, in consultation with the Commission, acting in accordance with the procedure prescribed in section 103 of the Water Resources Planning Act, shall within one hundred and twenty days following the effective date of this Act establish principles, standards, and procedures for the program of investigations and submittal of plans and reports authorized by this section and section 208. The Secretary of the Interior (hereinafter referred to as the "Secretary"), under the direction of the Commission, in conformity with the principles, standards, and procedures so established, and in accordance with the authority granted in section 205, is authorized and directed to—

(1) prepare estimates of the long-range water supply available for consumptive use in the Colorado River Basin, of current water requirements therein, and of the rate of growth of water requirements therein to at least the year 2030;

(2) investigate sources and means of supplying water to meet the current and anticipated water requirements of the Colorado River Basin, including reductions in losses, importations from sources outside the natural drainage basin of the Colorado River system, desalination, weather modification, and other means;

(3) investigate projects within the lower basin of the Colorado River, including projects on tributaries of the Colorado River, where undeveloped water supplies are available or can be made available by replacement or exchange;

(4) undertake investigations, in cooperation with other concerned agencies, of the feasibility of proposed development plans in maintaining an adequate water quality throughout the Colorado River Basin;

(5) investigate means of providing for prudent water conservation practices to permit maximum beneficial utilization of available water supplies in the Colorado River Basin;

(6) investigate and prepare estimates of the long-range water supply in States and areas from which water may be imported into the Colorado River system, together with estimates of the probable ultimate requirements for water within those States and areas of origin, for all purposes, including but not limited to, consumptive use, navigation, river regulation, power, enhancement of fishery resources, pollution control, and disposal of wastes to the ocean, and estimates of the quantities of water, if any, that will be available in excess of such requirements in the States and areas of origin for exportation to the Colorado River system; and

(7) investigate current and anticipated water requirements of areas outside the natural drainage areas of the Colorado River system which feasibly can be served from importation facilities en route to the Colorado River system.

(b) The Secretary is authorized and directed to prepare reconnaissance reports of a staged plan or plans for projects adequate, in its judgment, to meet the requirements reported under subsection (a) of this section, in conformity with section 207.

(c) The plan for the first stage of works to meet the future requirements of the areas of deficiency and surplus as determined from studies performed pursuant to this section shall include, but not be limited to, import works necessary to provide two million five hundred thousand acre-feet annually for use from the main stream of the Colorado River below Lee Ferry, including satisfaction of the obligations of the Mexican Water Treaty and losses of water associated with the performance of that treaty. Plans for import works for the first stage may also include facilities to provide water in the following additional quantities:

(1) Up to two million acre-feet annually in the Colorado River for use in the Lower Colorado River Basin;

(2) Up to two million acre-feet annually in the Colorado River system for use in the Upper Colorado River Basin, directly or by exchange;

(3) Such additional quantities, not to exceed two million acre-feet annually, as the Secretary finds may be required and marketable in areas which can be served by said importation facilities en route to the Colorado River system.

(d) The Congress declares that the satisfaction of the requirements of the Mexican Water Treaty constitutes a national obligation. Accordingly, the States of the upper division (Colorado, New Mexico, Utah, and Wyoming) and States of the lower division (Arizona, California, and Nevada) shall be relieved from all obligations which may have been imposed upon them by article III(c) of the Colorado River Compact when the President issues the proclamation specified in section 305(b) of this Act.

(e) The Secretary shall submit annually to the Commission, the President, and the Congress reports covering progress on the investigations and reports authorized by this section.

SEC. 207. (a) In planning works to import water into the Colorado River system from sources outside the natural drainage areas of the system, the Secretary shall make provision for adequate and equitable protection of the interests of the States and areas of origin, including (in the case of works to import water for use in the lower basin of the Colorado River) assistance from the development fund established by title IV of this Act, to the end that water supplies may be available for use therein adequate to satisfy their ultimate requirements at prices to users not adversely affected by the exportation of water to the Colorado River system.

(b) All requirements, present or future, for water within any State lying wholly or in part within the drainage area of any river basin and from which water is exported by works planned pursuant to this Act shall have a priority of right in perpetuity to the use of the waters of that river basin, for all purposes, as against the uses of the water delivered by means of such exportation works, unless otherwise provided by interstate agreement.

SEC. 208. (a) On or before December 31, 1970, the Secretary shall submit a proposed reconnaissance report on the first stage of the staged plan of development to the Commission and affected States and Federal agencies for their comments and recommendations which shall be submitted within six months after receipt of the report.

(b) After receipt of the comments of the Commission, affected States, and Federal agencies on such reconnaissance report, but not later than January 1, 1972, the Secretary shall transmit the report to the President and, through the President, to the Congress. All comments received by the Secretary under the procedure specified in this section shall be included therein. The letter of transmittal and its attachments shall be printed as a House or Senate document.

SEC. 209. There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this title.

TITLE III—AUTHORIZED UNITS: PROTECTION OF EXISTING USES

SEC. 301. The Secretary shall construct, operate, and maintain the lower basin units of the Colorado River Basin project (herein referred to as the "project"), described in sections 302, 303, 304, 305, and 306.

SEC. 302. The main stream reservoir division shall consist of the Hualapai (formerly known as Bridge Canyon) unit, including a dam, reservoir, powerplant, transmission facilities, and appurtenant works, and the Coconino and Paria River silt-detention reservoirs: *Provided*, That (1) Hualapai Dam shall be constructed so as to impound water at a normal surface elevation of one thousand eight hundred and sixty-six feet above mean sea level, (2) fluctuations in the reservoir level shall be restricted, so far as practicable, to a regimen of ten feet, and (3) this Act shall not be construed to authorize any diversion of water from Hualapai Reservoir except for incidental uses in the immediate vicinity. The Congress hereby declares that the construction of the Hualapai Dam herein authorized is consistent with the Act of February 26, 1919 (40 Stat. 1175).

SEC. 303. (a) As fair and reasonable payment for the permanent use by the United States of not more than twenty-five thousand acres of land designated by the Secretary as necessary for the construction, operation, and maintenance of the Hualapai unit, said land being a part of the tract set aside and reserved by the Executive order of January 4, 1883, for the use and occupancy of the Hualapai Tribe of Arizona (1 Kappler, Indian Laws and Treaties, 804), \$16,398,000 shall be transferred in the Treasury, during construction of the unit, to the credit of the Hualapai Tribe from funds appropriated from the general fund of the Treasury to the Department of the Interior, Bureau of Reclamation, for construction of the project and, when so transferred, shall draw interest at the rate of 4 per centum per annum until expended. The funds so transferred may be expended, invested, or reinvested pursuant to plans, programs, and agreements duly adopted or entered into by the Hualapai Tribe, subject to the approval of the Secretary, in accordance with the tribal constitution and charter.

(b) As part of the construction and operation of the Hualapai unit, the Secretary shall (1) construct a paved road, having a minimum width of twenty-eight feet, from Peach Springs, Arizona, through and along Peach Springs Canyon within the Hualapai Indian Reservation, to provide all-weather access to the Hualapai Reservoir; and (2) make available to the Hualapai Tribe up to twenty-five thousand kilowatts and up to one hundred million kilowatt-hours annually of power from the Hualapai unit at the lowest rate established by the Secretary for the sale of firm power from said unit for the use of preferential customers: *Provided*, That the tribe may resell such power only to users within the Hualapai Reservation: *Provided further*, That the Hualapai Tribal Council shall notify the Secretary in writing of the reasonable power requirements of the tribe up to the maximum herein specified, for each three-year period in advance beginning with the date upon which power from the Hualapai unit becomes available for sale. Power not so reserved may be disposed of by the Secretary for the benefit of the development fund.

(c) Except as to such lands which the Secretary determines are required for the Hualapai Dam and Reservoir site and the construction of the operating campsite and townsite, all minerals of any kind whatsoever, including oil and gas but excluding sand and gravel and other building and construction materials within the areas used by the United States pursuant to this section are hereby

reserved to the Hualapai Tribe: *Provided*, That no permit, license, lease or other document covering the exploration for or the extraction of such minerals shall be granted by the tribe nor shall the tribe conduct such operations for its own account, except under such conditions and with such stipulations as are necessary to protect the interests of the United States in the construction, operation, and maintenance of the Hualapai unit.

(d) The Hualapai Tribe shall have the exclusive right, if requested in writing by the tribe, to develop the recreation potential of, and shall have the exclusive right to control access to, the reservoir shoreline adjacent to the reservation, subject to conditions established by the Secretary for use of the reservoir to protect the operation of the project. Any recreation development established by the tribe shall be consistent with the Secretary's rules and regulations to protect the overall recreation development of the project. The tribe and the members thereof shall have nonexclusive personal rights to hunt and fish on the reservoir without charge, but shall have no right to exclude others from the reservoir except as to those who seek to gain access through the Hualapai Reservation, nor the right to require payments to the tribe except for the use of tribal lands or facilities: *Provided*, That under no circumstances will the Hualapai Tribe make any charge, or extract any compensation, or in any other manner restrict the access or use of the paved road to be constructed within the Hualapai Indian Reservation pursuant to this Act. The use by the public of the water areas of the project shall be pursuant to such rules and regulations as the Secretary may prescribe.

(e) Except as limited by the foregoing, the Hualapai Tribe shall have the right to use and occupy the area of the Hualapai unit within the Hualapai Reservation for all purposes not inconsistent with the construction, operation, and maintenance of the project and townsite, including, but not limited to, the right to lease such lands for farming, grazing, and business purposes to members or nonmembers of the tribe and the power to dispose of all minerals as provided in paragraph (c) hereof.

(f) Upon a determination by the Secretary that all or any part of the lands utilized by the United States pursuant to paragraph (a) of this section is no longer necessary for purposes of the project, such lands shall be restored to the Hualapai Tribe for its full use and occupancy.

(g) No part of any expenditures made by the United States, and no reservation by or restoration to the Hualapai Tribe of the use of land under any of the provisions of this section shall be charged by the United States as an offset or counterclaim against any claim of the Hualapai Tribe against the United States other than claims arising out of the utilization of lands for the project: *Provided, however*, That the payment of moneys and other benefits as set forth herein shall constitute full, fair, and reasonable payment for the permanent use of the lands by the United States.

(h) All funds authorized by this section to be paid or transferred to the Hualapai Tribe, and any per capita distribution derived therefrom, shall be exempt from all forms of State and Federal income taxes.

(i) No payments shall be made or benefits conferred as set forth in this section until the provisions hereof have been accepted by the Hualapai Tribe through a resolution duly adopted by its tribal council. In the event such resolution is not adopted within six months from the effective date of this Act, and litigation thereafter is instituted regarding the use by the United States of lands within the Hualapai Reservation or payment therefor, the amounts of the payments provided herein and the other benefits set out shall not be regarded as evidencing value or as recognizing any right of the tribe to compensation.

SEC. 304. (a) The Central Arizona unit shall consist of the following principal works: (1) a system of main conduits and canals, including a main canal and pumping plants (Granite Reef aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to Orme Dam or suitable alternative, which system shall have a capacity of two thousand five hundred cubic feet per second (A) unless the definite plan report of the Bureau of Reclamation shows that additional capacity (i) will provide an improved benefit-to-cost ratio and (ii) will enhance the ability of the Central Arizona unit to divert water from the main stream to which Arizona is entitled and (B) unless the Secretary finds that the additional cost resulting from such additional capacity can be financed by funds from sources other than the funds credited to the development fund pursuant to section 403 of this Act and without charge, directly or indirectly,

to water users or power customers in the States of California and Nevada; (2) Orme Dam and Reservoir and power-pumping plant or suitable alternative; (3) Buttes Dam and Reservoir, which shall be so operated as to not prejudice the rights of any user in and to the water of the Gila River as those rights are set forth in the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Number 59); (4) Hooker Dam and Reservoir, which shall be constructed to an initial capacity of ninety-eight thousand acre-feet and in such a manner as to permit subsequent enlargement of the structure (to give effect to the provisions of section 304 (c) and (d)); (5) Charleston Dam and Reservoir; (6) Tucson aqueducts and pumping plants; (7) Salt-Gila aqueduct; (8) canals, regulating facilities, powerplants, and electrical transmission facilities; (9) related water distribution and drainage works; and (10) appurtenant works.

(b) Unless and until otherwise provided by Congress, water from the natural drainage area of the Colorado River system diverted from the main stream below Lee Ferry for the Central Arizona unit shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas. It shall be a condition of each contract under which such water is provided under the Central Arizona unit that (1) there be in effect measures, adequate in the judgment of the Secretary, to control expansion of irrigation from aquifers affected by irrigation in the contract service area; (2) the canals and distribution systems through which water is conveyed after its delivery by the United States to the contractors shall be provided and maintained with linings, adequate in his judgment to prevent excessive conveyance losses; (3) neither the contractor nor the Secretary shall pump or permit others to pump ground water from lands located within the exterior boundaries of any Federal reclamation project or irrigation district receiving water from the Central Arizona unit for any use outside such Federal reclamation project or irrigation district, unless the Secretary and the agency or organization operating and maintaining such Federal reclamation project or irrigation district shall agree or shall have previously agreed that a surplus of ground water exists and that drainage is or was required; and (4) all agricultural, municipal and industrial waste water, return flow, seepage, sewage effluent and ground water located in or flowing from contractors service area originating or resulting from (i) waters contracted for from the Central Arizona unit or (ii) water stored or developed by any Federal reclamation project are reserved for the use and benefit of the United States as a source of supply for the service area of the Central Arizona unit or for the service area of the Federal reclamation project as the case may be: *Provided*, That notwithstanding the provisions of clause (3) of this sentence, the agricultural, municipal and industrial waste water, return flow, seepage, sewage effluent and ground water in or from any such Federal reclamation project, may also be pumped or diverted for use and delivery by the United States elsewhere in the service area of the Central Arizona unit, if not needed for use or reuse in such Federal reclamation project.

(c) The Secretary may require as a condition in any contract under which water is provided from the Central Arizona unit that the contractor agree to accept main stream water in exchange for or in replacement of existing supplies from sources other than the main stream. The Secretary shall so require in contracts with such contractors in Arizona who also use water from the Gila River system, to the extent necessary to make available to users of water from the Gila River system in New Mexico additional quantities of water as provided in and under the conditions specified in subsections (e) and (f) of this section: *Provided*, That such exchanges and replacements shall be accomplished without economic injury or cost to such Arizona contractors.

(d) In times of shortage or reduction of main stream water for the Central Arizona unit (if such shortages or reductions should occur), contractors which have yielded water from other sources in exchange for main stream water supplied by that unit shall have a first priority to receive main stream water, as against other contractors supplied by that unit which have not so yielded

water from other sources, but only in quantities adequate to replace the water so yielded.

(e) In the operation of the Central Arizona unit, the Secretary shall offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources, in amounts that will permit consumptive use of water in New Mexico not to exceed an annual average in any period of ten consecutive years of eighteen thousand acre-feet, including reservoir evaporation, over and above the consumptive uses provided for by article IV of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340). Such increased consumptive uses shall not begin until and shall continue only as long as delivery of Colorado River water to downstream Gila River users in Arizona is being accomplished in accordance with this Act, in quantities sufficient to replace any diminution of their supply resulting from such diversions from the Gila River, its tributaries and underground water sources. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

(f) The Secretary shall further offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources in amounts that will permit consumptive uses of water in New Mexico not to exceed an annual average in any period of ten consecutive years of an additional thirty thousand acre-feet, including reservoir evaporation. Such further increases in consumptive use shall not begin until and shall continue only so long as works capable of importing water into the Colorado River system have been completed and water sufficiently in excess of two million eight hundred thousand acre-feet per annum is available from the main stream of the Colorado River for consumptive use in Arizona to provide water for the exchanges herein authorized and provided. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

(g) All additional consumptive uses provided for in subsections (e) and (f) of this section shall be subject to all rights in New Mexico and Arizona as established by the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Number 59) and to all other rights existing on the effective date of this Act in New Mexico and Arizona to water from the Gila River, its tributaries and underground water sources, and shall be junior thereto and shall be made only to the extent possible without economic injury or cost to the holders of such rights.

Sec. 305. (a) Article II(B) (3) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340) shall be so administered that in any year in which, as determined by the Secretary, there is insufficient main stream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the Central Arizona unit shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of main stream water, and by users of the same character in Arizona and Nevada. Water users in the State of Nevada shall not be required to bear shortages in any proportion greater than would have been imposed in the absence of this section 305(a). This section shall not affect the relative priorities, among themselves, of water users in Arizona, Nevada, and California which are senior to diversions for the Central Arizona unit, or amend any provisions of said decree.

(b) The limitation stated in paragraph (a) shall cease whenever the President shall proclaim that works have been completed and are in operation, capable in his judgment of delivering annually not less than two million five hundred thousand acre-feet of water into the main stream of the Colorado River below Lee Ferry from sources outside the natural drainage area of the Colorado River system; and that such sources are adequate, in the President's judgment, to supply such quantities without adverse effect upon the satisfaction of the foreseeable

water requirements of any State from which such water is imported into the Colorado River system. Such imported water shall be made available for use in accordance with subsection (c) of this section.

(c) To the extent that the flow of the main stream of the Colorado River is augmented by such importations in order to make sufficient water available for release, as determined by the Secretary pursuant to article II(B)(1) of the decree of the Supreme Court of the United States in *Arizona against California* (376 U.S. 340), to satisfy annual consumptive use of two million eight hundred thousand acre-feet in Arizona, four million four hundred thousand acre-feet in California, and three hundred thousand acre-feet in Nevada, respectively, the Secretary shall make such additional water available to users of main stream water in those States at the same costs and on the same terms as would be applicable if main stream water were available for release in the quantities required to supply such consumptive use, taking into account, among other things, (1) the nonreimbursable allocation to the replenishment of the deficiencies occasioned by satisfaction of the Mexican Treaty burden provided for in section 401, and (2) such assistance as may be available from the development fund established by title IV of this Act.

(d) Imported water made available for use in the lower basin to supply aggregate annual consumptive uses from the main stream in excess of seven million five hundred thousand acre-feet shall be offered by the Secretary for use in the States of Arizona, California, and Nevada in the proportions provided in article II(B)(2) of said decree. The Secretary shall establish prices therefor while, take into account such assistance as may be available from the development fund established by title IV of this Act in excess of the demands upon that fund occasioned by the requirements stated in subsection (c) of this section. Within each State, opportunity to take such water shall first be offered to persons or entities who are water users as of the effective date of this Act, and in quantities equal to the deficiencies which would result if the total quantity available for consumptive use from the main stream in such State were only the quantity apportioned to that State by article II(B)(1) of said decree.

(e) Imported water made available for use in the upper basin of the Colorado River, directly or by exchange, shall be offered by the Secretary for contract by water users in the States of Colorado, New Mexico, Utah, and Wyoming in the proportions, as among those States, stated in the Upper Colorado River Basin Compact, and at prices which take into account such assistance as may be available from the Upper Colorado River Basin Fund, in excess of the demands upon that fund occasioned by the requirements of the Colorado River Storage Project Act.

(f) Imported water not delivered into the Colorado River system but diverted from the works constructed to import water into that system shall be made available to water users in accordance with the Federal reclamation laws.

Sec. 306. The main stream salvage unit shall include programs for water salvage along and adjacent to the main stream of the Colorado River and for ground water recovery. Such programs shall be consistent with maintenance of a reasonable degree of undisturbed habitat for fish and wildlife in the area, as determined by the Secretary.

Sec. 307. The Secretary shall construct, operate, and maintain such additional works as shall from time to time be authorized by the Congress as units of the project.

Sec. 308. The conservation and development of the fish and wildlife resources and the enhancement of recreation opportunities in connection with the project works authorized pursuant to this title shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213).

Sec. 309. The Secretary shall integrate the Dixie project and Southern Nevada water supply project heretofore authorized into the project herein authorized as units thereof under repayment arrangements and participation in the development fund established by title IV of this Act consistent with the provisions of this Act.

Sec. 310. There is hereby authorized to be appropriated to carry out the purposes of this title the sum of \$1,167,000,000 based on estimated costs as of October, 1963, plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indices applicable to the types of construction involved.

**TITLE IV—LOWER COLORADO RIVER BASIN DEVELOPMENT FUND:
ALLOCATION AND REPAYMENT OF COSTS: CONTRACTS**

Sec. 401. Upon completion of each lower basin unit of the project herein or hereafter authorized, or separate feature thereof, the Secretary shall allocate the total costs of constructing said unit or features to (1) commercial power, (2) irrigation, (3) municipal and industrial water supply, (4) flood control, (5) navigation, (6) water quality control, (7) recreation, (8) fish and wildlife, (9) the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Water Treaty of 1944 with the United Mexican States (treaty series 994), (10) the additional capacity of the system of main conduits and canals of the Central Arizona unit referred to in section 304(a), item (1), in excess of two thousand five hundred cubic feet per second, and (11) any other purposes authorized under the Federal reclamation laws. Costs of construction, operation, and maintenance allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by compliance with the Mexican Water Treaty (including losses in transit, evaporation from regulatory reservoirs, and regulatory losses at the Mexican boundary, incurred in the transportation, storage, and delivery of water in discharge of the obligations of that treaty) shall be nonreimbursable. All funds paid or transferred to Indian tribes pursuant to this Act, including interest on such funds in the Treasury of the United States, and costs of construction of the paved road, authorized in section 303(b) hereof, shall be nonreimbursable. The repayment of costs allocated to recreation and fish and wildlife enhancement shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213). Costs allocated to nonreimbursable purposes shall be nonreturnable under the provisions of this Act. Costs allocated to the additional capacity of the system of main conduits and canals of the Central Arizona unit, referred to in section 304(a), item (1), in excess of two thousand five hundred cubic feet per second shall be recovered as directed in section 304(a).

Sec. 402. The Secretary shall determine the repayment capability of Indian lands within, under, or served by any unit of the project. Construction costs allocated to irrigation of Indian lands (including provision of water for incidental domestic and stock water uses) and within the repayment capability of such lands shall be subject to the Act of July 1, 1932 (47 Stat. 464), and such costs as are beyond repayment capability of such lands shall be nonreimbursable.

Sec. 403. (a) There is hereby established a separate fund in the Treasury of the United States, to be known as the Lower Colorado River Basin development fund (hereinafter called the "development fund"), which shall remain available until expended as hereafter provided for carrying out the provisions of title III.

(b) All appropriations made for the purpose of carrying out the aforesaid provisions of title III of this Act shall be credited to the development fund as advances from the general fund of the Treasury, and shall be available for such purpose.

(c) There shall also be credited to the development fund—

(1) All revenues collected in connection with the operation of facilities herein and hereafter authorized in furtherance of the purposes of this Act (except entrance, admission, and other recreation fees or charges and proceeds received from recreation concessionaires); and

(2) all Federal revenues from the Boulder Canyon and Parker-Davis projects which, after completion of repayment requirements of the said Boulder Canyon and Parker-Davis projects, are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of those projects.

(d) All revenues collected and credited to the development fund pursuant to this Act shall be available, without further appropriation, for—

(1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the project, within such separate limitations as may be included in annual appropriation Acts;

(2) payments, if any, as required by section 502 of this Act;

(3) payments as required by subsection (f) of this section; and

(4) payments to reimburse water users in the State of Arizona for losses sustained as a result of diminution of the production of hydroelectric power

at Coolidge Dam, Arizona, resulting from exchanges of water between users in the States of Arizona and New Mexico as set forth in section 304 of this Act.

(e) Revenues credited to the development fund shall not be available for construction of the works comprised within any unit of the project herein or hereafter authorized except upon appropriation by the Congress.

(f) Revenues in the development fund in excess of the amount necessary to meet the requirements of clauses (1), (2), and (4) of subsection (d) of this section shall be paid annually to the general fund of the Treasury to return—

(1) the costs of each unit of the project or separable feature thereof, authorized pursuant to title III of this Act which are allocated to irrigation, commercial power, or municipal and industrial water supply, pursuant to this Act, within a period not exceeding fifty years from the date of completion of each such unit or separable feature, exclusive of any development period authorized by law;

(2) the costs which are allocated to recreation or fish and wildlife enhancement in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213); and

(3) interest (including interest during construction) on the unamortized balance of the investment in the commercial power and municipal and industrial water supply features of the project at a rate determined by the Secretary of the Treasury in accordance with the provisions of subsection (h) of this section, and interest due shall be a first charge.

(g) To the extent that revenues remain in the development fund after making the payments required by subsections (d) and (f) of this section, they shall be available, upon appropriation by the Congress, to repay the costs incurred in connection with units hereafter authorized in providing (i) for the importation of water into the main stream of the Colorado River for use below Lee Ferry as provided in section 206(c) to the extent that such costs are in excess of the costs allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Mexican Water Treaty as provided in section 401, and (ii) protection of States and areas of origin of such imported water as provided in section 207(a).

(h) The interest rate applicable to those portions of the reimbursable costs of each unit of the project which are properly allocated to commercial power development and municipal and industrial water supply shall be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which the first advance is made for initiating construction of such unit, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations which are neither due nor callable for redemption for fifteen years from the date of issue.

(i) Business-type budgets shall be submitted to the Congress annually for all operations financed by the development fund.

Sec. 404. (a) Irrigation repayment contracts shall provide for repayment of the obligation assumed under any irrigation repayment contract with respect to any project contract unit or irrigation block over a basic period of not more than fifty years exclusive of any development periods authorized by law; contracts authorized by section 9(e) of the Reclamation Project Act of 1939 (53 Stat. 1196; 43 U.S.C. 485h(e)) may provide for delivery of water for a period of fifty years and for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits and from such other points of delivery as the Secretary may designate; and long-term contracts relating to irrigation water supply shall provide that water made available thereunder may be made available by the Secretary for municipal or industrial purposes if and to the extent that such water is not required by the contractor for irrigation purposes.

(b) Contracts relating to municipal and industrial water supply from the project may be made without regard to the limitations of the last sentence of section 9(c) of the Reclamation Project Act of 1939 (53 Stat. 1194); may provide for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits; and may provide for repayment over a period of fifty years if made pursuant to clause (1) of said section and for the delivery of water over a period of fifty years if made pursuant to clause (2) thereof.

SEC. 405. On January 1 of each year the Secretary shall report to the Congress, beginning with the fiscal year ending June 30, 1968, upon the status of the revenues from and the cost of constructing, operating, and maintaining the project and each unit thereof for the preceding fiscal year. The report of the Secretary shall be prepared to reflect accurately the Federal investment allocated at that time to power, to irrigation, and to other purposes, the progress of return and repayment thereon, and the estimated rate of progress, year by year, in accomplishing full repayment.

TITLE V—UPPER COLORADO RIVER BASIN AUTHORIZATIONS AND REIMBURSEMENTS

SEC. 501. (a) In order to provide for the construction, operation, and maintenance of the Animas-La Plata Federal reclamation project, Colorado-New Mexico; the Dolores, Dallas Creek, West Divide, and San Miguel Federal reclamation projects, Colorado, as participating projects under the Colorado River Storage Project Act (70 Stat. 105; 43 U.S.C. 620), and to provide for the completion of planning reports on other participating projects, subsection (2) of section 1 of said Act is hereby further amended by deleting the words "Pine River extension", and inserting in lieu thereof the words "Animas-La Plata, Dolores, Dallas Creek, West Divide, San Miguel". Section 2 of said Act is hereby further amended by deleting the words "Parshall, Troublesome, Rabbit Ear, San Miguel, West Divide, Tomichi Creek, East River, Ohio Creek, Dallas Creek, Dolores, Fruit Growers extension, Animas-La Plata", and inserting after the words "Yellow Jacket" the words "Basalt, Middle Park (including the Troublesome, Rabbit Ear, and Azure units), Upper Gunnison (including the East River, Ohio Creek, and Tomichi Creek units), Lower Yampa (including the Juniper and Great Northern units), Upper Yampa (including the Hayden Mesa, Weasels, and Toponas units)", and by inserting after the word "Sublette" the words "including the Kendall Reservoir on Green River and a diversion of water from the Green River to the North Platte River Basin in Wyoming), Uintah unit and the Ute Indian unit of the Central Utah, San Juan County (Utah), Price River, Grand County (Utah), Ute Indian unit extension of the Central Utah, Gray Canyon, and Juniper (Utah)". The amount which section 12 of said Act authorizes to be appropriated is hereby further increased by the sum of \$360,000,000 plus or minus such amounts, if any, as may be required, by reason of changes in construction costs as indicated by engineering cost indexes applicable to the type of construction involved. This additional sum shall be available solely for the construction of the projects herein authorized.

(b) The Animas-La Plata Federal reclamation project shall be constructed and operated in substantial accordance with the engineering plans set out in the report of the Secretary transmitted to the Congress on May 4, 1966, and printed as House Document 436, Eighty-ninth Congress: *Provided*, That the project construction of the Animas-La Plata Federal reclamation project shall not be undertaken until and unless the States of Colorado and New Mexico shall have ratified the following compact to which the consent of Congress is hereby given:

"ANIMAS-LA PLATA PROJECT COMPACT

"The State of Colorado and the State of New York, in order to implement the operation of the Animas-La Plata Federal Reclamation Project, Colorado-New Mexico, a proposed participating project under the Colorado River Storage Project Act (70 Stat. 105), and being moved by considerations of interstate comity, have resolved to conclude a compact for these purposes and have agreed upon the following articles:

"ARTICLE I

"A. The right to store and divert water in Colorado and New Mexico from the La Plata and Animas River systems including return flow to the La Plata River from Animas River diversions, for uses in New Mexico under the Animas-La Plata Federal Reclamation Project shall be valid and of equal priority with those rights granted by decree of the Colorado state courts for the uses of water in Colorado for the project, providing such uses in New Mexico are within the

allocation of water made to that state by article III and XIV of the Upper Colorado River Basin Compact (63 Stat. 31).

"B. The restrictions of the last sentence of Section (a) of Article IX of the Upper Colorado River Basin Compact shall not be construed to vitiate paragraph A of this article.

"ARTICLE II

"This Compact shall become binding and obligatory when it shall have been ratified by the legislatures of each of the signatory States."

(c) The Secretary shall, for the Animas-La Plata, Dolores, Dallas Creek, San Miguel, West Divide, and Seedskadee participating projects of the Colorado River storage project, establish the nonexcess irrigable acreage for which any single ownership may receive project water at one hundred and sixty acres of class 1 land or the equivalent thereof, as determined by the Secretary, in other land classes.

(d) In the diversion and storage of water for any project or any parts thereof constructed under the authority of this Act or the Colorado River Storage Project Act within and for the benefit of the State of Colorado only, the Secretary is directed to comply with the constitution and statutes of the State of Colorado relating to priority of appropriation; with State and Federal court decrees entered pursuant thereto; and with operating principles, if any, adopted by the Secretary and approved by the State of Colorado.

(e) The words "any western slope appropriations" contained in paragraph (i) of that section of Senate Document Numbered 80, Seventy-fifth Congress, first session, entitled "Manner of Operation of Project Facilities and Auxiliary Features," shall mean and refer to the appropriation heretofore made the storage of water in Green Mountain Reservoir, a unit of the Colorado-Big Thompson Federal reclamation project, Colorado; and the Secretary is directed to act in accordance with such meaning and reference. It is the sense of Congress that this directive defines and observes the purpose of said paragraph (i), and does not in any way affect or alter any rights or obligations arising under said Senate Document Numbered 80 or under the laws of the State of Colorado.

SEC. 502. The Upper Colorado River Basin fund established under section 5 of the Act of April 11, 1956 (70 Stat. 107), shall be reimbursed from the Colorado River development fund established by section 2 of the Boulder Canyon Project Adjustment Act (54 Stat. 755) for all expenditures heretofore or hereafter made from the Upper Colorado River Basin fund to meet deficiencies in generation at Hoover Dam during the filling period of reservoirs of storage units of the Colorado River storage project pursuant to the criteria for the filling of Glen Canyon Reservoir (27 Fed. Reg. 6851, July 19, 1962). For this purpose \$500,000 for each year of operation of Hoover Dam and powerplant, commencing with the enactment of this Act, shall be transferred from the Colorado River development fund to the Upper Colorado River Basin, in lieu of application of said amounts to the purposes stated in section 2(d) of the Boulder Canyon Project Adjustment Act, until such reimbursement is accomplished. To the extent that any deficiency in such reimbursement remain as of June 1, 1967, the amount of the remaining deficiency shall then be transferred to the Upper Colorado River Basin fund from the Lower Colorado River Basin development fund, as provided in paragraph (d) of section 403.

TITLE VI—GENERAL PROVISIONS: DEFINITIONS: CONDITIONS

SEC. 601. (a) Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994), the decree entered by the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), or, except as otherwise provided herein, the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774) or the Colorado River Storage Project Act (70 Stat. 105).

(b) The Secretary is directed to—

(1) administer his responsibilities under this Act in such manner that he, his permittees, licensees, and contractees shall in no way encroach upon, alter, or affect the Colorado River Compact apportionment of waters to the upper and lower basins.

(2) make reports as to the annual consumptive uses and losses of water from the Colorado River system after each successive five-year period, beginning with the five-year period starting on October 1, 1965. Such reports shall be prepared in consultation with the States of the lower basin individually and with the Upper Colorado River Commission, and shall be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River Compact.

(3) condition all contracts for the delivery of water originating in the drainage basin of the Colorado River system upon the availability of water under the Colorado River Compact.

(c) All Federal officers and agencies are directed to comply with the applicable provisions of this Act, and of the laws, treaty, compacts, and decree referred to in subsection (a) of this section, in the storage and release of water from all reservoirs and in the operation and maintenance of all facilities in the Colorado River system under the jurisdiction and supervision of the Secretary, and in the operation and maintenance of all works which may be authorized hereafter for construction for the importation of water into the Colorado River system. In the event of failure of any such officer or agency to so comply, any affected State may maintain an action to enforce the provisions of this section in the Supreme Court of the United States and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.

(d) Nothing in this Act shall be construed to expand or diminish either Federal or State jurisdiction, responsibility of rights in the field of water resources planning, development, or control; nor to displace, supercede, limit or modify any interstate compact or the jurisdiction or responsibility of any legally established joint or common agency of two or more States, or of two or more States and the Federal Government; nor to limit the authority of Congress to authorize and fund projects.

SEC. 602. (a) In order to fully comply with and carry out the provisions of the Colorado River Compact, the Upper Colorado River Basin Compact and the Mexican Water Treaty, the Secretary shall propose criteria for the coordinated long-range operation of the reservoirs constructed and operated under the authority of this Act, the Colorado River Storage Project Act, the Boulder Canyon Project Act and the Boulder Canyon Project Adjustment Act. To effect in part the purposes expressed in this paragraph, the criteria shall make provision for the storage of water in storage units of the Colorado River Storage Project and releases of water from Lake Powell in the following listed order of priority:

(1) Releases to supply one-half the deficiency described in article III(c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the upper division, but in any event such releases, if any, shall terminate when the President issues the proclamation specified in section 305(b) of this Act.

(2) Releases to comply with article III(d) of the Colorado River Compact, less such quantities of water delivered into the Colorado River below Lee Ferry to the credit of the States of the upper division from sources outside the natural drainage area of the Colorado River system.

(3) Storage of water not required for the releases specified in clauses (1) and (2) of this subsection to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three lower division States and taking into consideration all relevant factors (including, but not limited to, historic streamflows, the most critical period of record, and probabilities of water supply), shall find to be reasonably necessary to assure deliveries under clauses (1) and (2) without impairment of annual consumptive uses in the upper basin pursuant to the Colorado River Compact: *Provided*, That water not so required to be stored shall be released from Lake Powell: (i) to the extent it can be reasonably applied in the States of the lower division to the uses specified in article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and (iii) to avoid anticipated spills from Lake Powell.

(b) Not later than July 1, 1968, the criteria proposed in accordance with the foregoing subsection (a) of this section shall be submitted to the governors of the seven Colorado River Basin States and to such other parties and agencies as the Secretary may deem appropriate for their review and comment. After re-

cept of comments on the proposed criteria, but not later than January 1, 1969, the Secretary shall adopt appropriate criteria in accordance with this section and publish the same in the Federal Register. Beginning January 1, 1970, and yearly thereafter, the Secretary shall transmit to the Congress and to the governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected operation for the current year. As a result of actual operating experience or unforeseen circumstances, the Secretary may thereafter modify the criteria to better achieve the purposes specified in subsection (a) of this section, but only after correspondence with the Governors of the seven Colorado River Basin States and appropriate consultation with such state representatives as each governor may designate.

(c) Section 7 of the Colorado River Storage Project Act shall be administered in accordance with the foregoing criteria.

Sec. 603. (a) Rights of the upper basin to the consumptive use of water apportioned to that basin from the Colorado River system by the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin.

(b) Nothing in this Act shall be construed so as to impair, conflict with or otherwise change the duties and powers of the Upper Colorado River Commission.

Sec. 604. Except as otherwise provided in this Act, in constructing, operating, and maintaining the units of the project herein and hereafter authorized, the Secretary shall be governed by the Federal reclamation laws (Act of June 17, 1902; 32 Stat. 388 and Acts amendatory thereof or supplementary thereto) to which laws this Act shall be deemed a supplement.

Sec. 605. (a) All terms used in this Act which are defined in the Colorado River Compact shall have the meanings there defined.

(b) "Main stream" means the main stream of the Colorado River downstream from Lee Ferry within the United States, including the reservoirs thereon.

(c) "User" or "water user" in relation to main stream water in the Lower basin means the United States, or any person or legal entity, entitled under the decree of the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), to use main stream water when available thereunder.

(d) "Active storage" means that amount of water in reservoir storage, exclusive of bank storage, which can be released through the existing reservoir outlet works.

(e) "Colorado River Basin States" means the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming.

[H.R. 9, 90th Cong., first sess.]

A BILL To authorize the construction, operation, and maintenance of the Colorado River Basin project, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—COLORADO RIVER BASIN PROJECT

OBJECTIVES

Sec. 101. That this Act may be cited as the "Colorado River Basin Project Act."

Sec. 102. The Congress recognizes that the present and growing water shortages in the Colorado River Basin constitute urgent problems of national concern, and accordingly authorizes and directs the National Water Commission established in title II of this Act and the Water Resources Council, established by the Water Resources Planning Act (Public Law 89-80), to give highest priority to the preparation of a plan and program for the relief of such shortages, in consultation with the States and Federal entities affected, as provided in this Act. This program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, for municipal, industrial, and other beneficial purposes; improving water quality; provided for basic public outdoor recreation facilities; improving conditions for fish and wildlife; and the generation and sale of hydroelectric power as an incident of the foregoing purposes.

TITLE II—THE NATIONAL WATER COMMISSION
AND COLORADO RIVER BASIN

INVESTIGATIONS AND PLANNING

SEC. 201. (a) There is established the National Water Commission (hereinafter referred to as the "Commission").

(b) The Commission shall be composed of seven members, who shall be appointed by the President and serve at his pleasure. No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.

(c) The President shall designate the Chairman of the Commission (hereinafter referred to as the "Chairman") from among its members.

(d) Members of the Commission may each be compensated at the rate of \$100 for each day such member is engaged in the actual performance of duties vested in the Commission. Each member shall be reimbursed for travel expenses, including per diem in lieu of subsistence, as authorized by law (5 U.S.C. 73b-2) for persons in the Government service employed intermittently.

(e) The Commission shall have an Executive Director who shall be appointed by the Chairman with the approval of the President and shall be compensated at the rate provided by law for level IV of the Federal Executive Salary Schedule. The Executive Director shall have such duties and responsibilities as the Chairman may assign.

SEC. 202. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among those things, to conservation and more efficient use of existing supplies, increased useability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to, desalting, weather modification, and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council established in section 101 of the Water Resources Planning Act (79 Stat. 245) (hereinafter referred to as the "Council"); and (4) conduct such specific investigations as are authorized herein or as hereafter may be authorized by the Congress.

(b) The Commission shall consult with the Council regarding its studies and shall furnish its proposed reports and recommendations to the Council for review and comment. The Commission shall submit to the President such interim and final reports as it deems appropriate, and the Council shall submit to the President its views on the Commission's reports. The President shall transmit the Commission's final report to the Congress together with such comments and recommendations for legislation as he deems appropriate.

(c) The Commission shall terminate not later than six years from the effective date of this Act.

SEC. 203. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) without regard to the civil service laws and regulations and without regard to the Classification Act of 1949, as amended, employ and fix the compensation of such personnel as may be necessary to carry out the functions of the Commission: *Provided*, That of such personnel no more than five persons may receive compensation equivalent to the compensation established for grade 18 under the Classification Act of 1949, as amended; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a) at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission deter-

mines can best be carried out in that manner; and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

(b) Any member of the Commission is authorized to administer oaths when it is determined by a majority of the Commission that testimony shall be taken or evidence received under oath.

SEC. 204. (a) Subject to general policies adopted by the Commission, the Chairman shall be the chief executive of the Commission and shall exercise its executive and administrative powers as set forth in section 203(a)(2) through section 203(a)(8).

(b) The Chairman may make such provision as he shall deem appropriate authorizing the performance of any of his executive and administrative functions by the Executive Director or other personnel of the Commission.

SEC. 205. (a) The Commission shall, to the extent practicable, utilize the services of the Federal water resource agencies.

(b) Upon request of the Commission, the head of any Federal department or agency or river basin commission created pursuant to title II of the Water Resources Planning Act is authorized (1) to furnish to the Commission, to the extent permitted by law and within the limits of available funds, including funds transferred for that purpose pursuant to section 203(a)(7) of this Act, such information as may be necessary for carrying out its functions and as may be available to or procurable by such department or agency, and (2) to detail to temporary duty with this Commission on a reimbursable basis such personnel within his administrative jurisdiction as it may need or believe to be useful for carrying out its functions, each such detail to be without loss of seniority, pay, or other employee status.

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C. 46e) shall apply to the collection of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665g) shall apply to appropriations of the Commission: *And provided further*, That the Commission shall not be required to prescribe such regulations.

SEC. 206. (a) The Council, in consultation with the Commission, acting in accordance with the procedure prescribed in section 103 of the Water Resources Planning Act, shall within one hundred and twenty days following the effective date of this Act establish principles, standards, and procedures for the program of investigations and submittal of plans and reports relating to the Colorado River Basin authorized by this section. The Secretary of the Interior (hereinafter referred to as the "Secretary"), under the direction of the Commission, in conformity with the principles, standards, and procedures so established, and in accordance with the authority granted in section 205, is authorized and directed to—

(1) prepare estimates of the long-range water supply available for consumptive use in the Colorado River Basin and in each of its major constituent parts, of current water requirements therein, and of the rate of growth of water requirements therein, to at least the year 2030;

(2) investigate sources and means of supplying water to meet the current and anticipated water requirements of the Colorado River Basin and of each of its major constituent parts, including reductions in losses, augmentation by desalination, weather modification, and other means;

(3) investigate projects within the lower basin of the Colorado River, including projects on tributaries of the Colorado River where undeveloped water supplies are available or can be made available by replacement or exchange;

(4) undertake investigations, in cooperation with other concerned agencies, of the feasibility of proposed development plans in maintaining an adequate water quality throughout the Colorado River Basin;

(5) investigate means of providing for prudent water conservation practices to permit maximum beneficial utilization of available water supplies in the Colorado River Basin;

(6) investigate means of providing, at the expense of the Federal Government, sufficient water from sources outside the Colorado River Basin, to satisfy obligations for the delivery of water to Mexico under the Mexican Water Treaty, thereby relieving the States of the River Basin, from the burden of said treaty.

Sec. 207. There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this title.

TITLE III—AUTHORIZED UNITS

PROTECTION OF EXISTING USES

Sec. 301. The Secretary shall construct, operate, and maintain the lower basin units of the Colorado River Basin project (herein referred to as the "project"), described in sections 302, 303, 304, 305, and 306.

Sec. 302. The main stream reservoir division shall consist of the Hualapai (formerly known as Bridge Canyon) unit, including a dam, reservoir, power-plant, transmission facilities, and appurtenant works, and the Coconino and Paria River silt-detention reservoirs: *Provided*, That (1) Hualapai Dam shall be constructed so as to impound water at a normal surface elevation of one thousand eight hundred and sixty-six feet above mean sea level; (2) fluctuations in the reservoir level shall be restricted, so far as practicable, to a regimen of ten feet; and (3) this Act shall not be construed to authorize any diversion of water from Hualapai Reservoir except for incidental uses in the immediate vicinity. The Congress hereby declares that the construction of the Hualapai Dam herein authorized is consistent with the Act of February 28, 1919 (40 Stat. 1175).

Sec. 303. (a) From funds appropriated from the General Treasury of the United States to the Department of the Interior, Bureau of Reclamation, for the project, there shall be transferred in the Treasury of the United States to the credit of the Hualapai Tribe of Arizona the sum of \$16,398,000, which shall draw interest on the principal at the rate of 4 per centum per annum until expended, as payment of just compensation for the taking by the United States of such easements, rights-of-way, and other interests in land within the Hualapai Indian Reservation, consisting of not more than twenty-five thousand acres, as the Secretary shall designate are necessary for the construction, operation, and maintenance of the Hualapai unit. The designation by the Secretary shall constitute a taking by the United States of the lands or interests therein so designated. The funds so paid may be expended, invested, or reinvested pursuant to plans, programs, and agreements duly adopted or entered into by the Hualapai Tribe, subject to the approval of the Secretary in accordance with the tribal constitution and charter.

(b) As part of the construction and operation of the Hualapai unit, the Secretary shall (1) construct a paved road, having a minimum width of twenty-eight feet, from Peach Springs, Arizona, through and along Peach Springs Canyon within the Hualapai Indian Reservation, to provide all-weather access to the Hualapai Reservoir; and (2) make available to the Hualapai Tribe up to twenty-five thousand kilowatts and up to one hundred million kilowatt-hours annually of power from the Hualapai unit at the lowest rate established by the Secretary for the sale of firm power from said unit for the use of preferential customers: *Provided*, That the tribe may resell such power only to users within the Hualapai Reservation: *Provided further*, That the Hualapai Tribal Council shall notify the Secretary in writing of the reasonable power requirements of the tribe up to the maximum herein specified, for each three-year period in advance beginning with the date upon which power from the Hualapai unit becomes available for sale. Power not so reserved may be disposed of by the Secretary for the benefit of the development fund.

(c) Except as to such lands which the Secretary determines are required for the Hualapai Dam and Reservoir site and the construction and operating campsite and townsite, all minerals of any kind whatsoever, including oil and gas but excluding sand and gravel and other building and construction materials, within the areas acquired by the United States pursuant to this section are hereby reserved to the Hualapai Tribe: *Provided*, That no permit, license, lease,

or other document covering the exploration for or the extraction of such minerals shall be granted by the tribe nor shall the tribe conduct such operations for its own account, except under such conditions and with such stipulations as are necessary to protect the interests of the United States in the construction, operation, and maintenance of the Hualapai unit.

(d) The Hualapai Tribe shall have the exclusive right, if requested in writing by the tribe, to develop the recreation potential of, and shall have the exclusive right to control access to, the reservoir shoreline adjacent to the reservation, subject to conditions established by the Secretary for use of the reservoir to protect the operation of the project. Any recreation development established by the tribe shall be consistent with the Secretary's rules and regulations to protect the overall recreation development of the project. The tribe and the members thereof shall have nonexclusive personal rights to hunt and fish on the reservoir without charge, but shall have no right to exclude others from the reservoir except as to those who seek to gain access through the Hualapai Reservation, nor the right to require payments to the tribe except for the use of the tribal lands or facilities: *Provided*, That under no circumstances will the Hualapai Tribe make any charge, or extract any compensation, or in any other manner restrict the access or use of the paved road to be constructed within the Hualapai Indian Reservation pursuant to this Act. The use by the public of the water areas of the project shall be pursuant to such rules and regulations as the Secretary may prescribe.

Except as limited by the foregoing, the Hualapai Tribe shall have the right to use and occupy the taking area of the Hualapai unit within the Hualapai Reservation for all purposes not inconsistent with the construction, operation, and maintenance of the project and townsite, including, but not limited to, the right to lease such lands for farming, grazing, and business purposes to members or nonmembers of the tribe and the power to dispose of all minerals as provided in paragraph (c) hereof.

(e) Upon a determination by the Secretary that all or part of the lands acquired by the United States pursuant to paragraph (a) of this section no longer are necessary for purposes of the project, all right, title, and interests in such lands shall thereupon vest in the Hualapai Tribe.

(f) No part of any expenditures made by the United States, and no reservation by or restoration to the Hualapai Tribe of any interests in land, under any of the provisions of this section shall be charged by the United States as an offset or counterclaim against any claim of the Hualapai Tribe against the United States other than claims arising out of the acquisition of land for the project: *Provided, however*, That the payment of moneys and other benefits as set forth herein shall constitute full compensation for the rights transferred.

(g) All funds authorized by this section to be paid or transferred to the Hualapai Tribe, and any per capita distribution derived therefrom, shall be exempt from all forms of State and Federal income taxes.

(h) No payments shall be made or benefits conferred as set forth in this section until the provisions hereof have been accepted by the Hualapai Tribe through resolution duly adopted by its tribal council. In the event such resolution is not adopted within six months from the effective date of this Act, and litigation thereafter is instituted regarding the acquisition of tribal lands for the project or compensation therefor, the amounts of the payments provided herein and the other benefits set out shall not be regarded as evidencing value or as recognizing any right of the tribe to compensation.

SEC. 304. (a) The central Arizona unit shall consist of the following principal works: (1) a system of main conduits and canals, including a main canal and pumping plants (Granite Reef aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to Orme Dam or suitable alternative, which system shall have a capacity of three thousand cubic feet per second (A) unless the definite plan report of the Bureau of Reclamation shows that additional capacity (i) will provide an improved benefit-to-cost ratio and (ii) will enhance the ability of the central Arizona unit to divert water from the main stream to which Arizona is entitled and (B) unless the Secretary finds that the additional cost resulting from such additional capacity can be financed by funds from sources other than the funds credited to the development fund pursuant to section 403 of this Act and without charge, directly or indirectly, to water users or power customers in the States of California and Nevada; (2) Orme Dam and Reservoir and power-pumping plant or suitable alternative; (3) Buttes

Dam and Reservoir, which shall be so operated as to not prejudice the rights of any user in and to the waters of the Gila River as those rights are set forth in the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Numbered 59); (4) Hooker Dam and Reservoir, which shall be constructed to an initial capacity of ninety-eight thousand acre-feet and in such a manner as to permit subsequent enlargement of the structure (to give effect to the provisions of section 304 (c) and (d)); (5) Charleston Dam and Reservoir; (6) Tucson aqueducts and pumping plants; (7) Salt-Gila aqueduct; (8) canals, regulating facilities, powerplants, and electrical transmission facilities; (9) related water distribution and drainage works; and (10) appurtenant works.

(b) Unless and until otherwise provided by Congress, water from the natural drainage area of the Colorado River system diverted from the main stream below Lee Ferry for the central Arizona unit shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas. It shall be a condition of each contract under which such water is provided under the central Arizona unit that (1) there be in effect measures, adequate in the judgment of the Secretary, to control expansion of irrigation from aquifers affected by irrigation in the contract service area; (2) the canals and distribution systems through which water is conveyed after its delivery by the United States to the contractors shall be provided and maintained with linings, adequate in his judgment to prevent excessive conveyance losses; (3) neither the contractor nor the Secretary shall pump or permit others to pump ground water from lands located within the exterior boundaries of any Federal reclamation project or irrigation district receiving water from the central Arizona unit for any use outside such Federal reclamation project or irrigation district, unless the Secretary and the agency or organization operating and maintaining such Federal reclamation project or irrigation district shall agree or shall have previously agreed that a surplus of ground water exists and that drainage is or was required; and (4) all agricultural, municipal, and industrial waste water, return flow, seepage, sewage, effluent, and ground water located in or flowing from contractor's service area originating or resulting from (i) waters contracted for from the central Arizona unit, or (ii) waters stored or developed by any Federal reclamation project are reserved for the use and benefit of the United States as a source of supply for the service area of the central Arizona unit or for the service area of the Federal reclamation project, as the case may be: *Provided*, That, notwithstanding the provisions of item (3) above, the agricultural, municipal, and industrial waste water, return flow, seepage, sewage effluent, and ground water in or from any such Federal reclamation project, may also be pumped or diverted for use and delivery by the United States elsewhere in the service area of the central Arizona unit, if not needed for use or reuse in such Federal reclamation project.

(c) The Secretary may require as a condition in any contract under which water is provided from the central Arizona unit that the contractor agree to accept main stream water in exchange for or in replacement of existing supplies from sources other than the main stream. The Secretary shall so require in contracts with such contractors in Arizona who also use water from the Gila River system, to the extent necessary to make available to users of water from the Gila River system in New Mexico additional quantities of water as provided in and under the conditions specified in subparagraph (d) of this section: *Provided*, That such exchanges and replacements shall be accomplished without economic injury or cost to such Arizona contractors.

In times of shortage or reduction of main stream water for the central Arizona unit (if such shortages or reductions should occur), contractors which have yielded water from other sources in exchange for main stream water supplied by that unit shall have a first priority to receive main stream water, as against other contractors supplied by that unit which have not so yielded water from other sources, but only in quantities adequate to replace the water so yielded.

(d) In the operation of the central Arizona unit, the Secretary should offer to contract with water users in New Mexico for water from the Gila River, its tributaries, and underground water sources, in amounts that will permit consumptive use of water in New Mexico not to exceed an annual average in any

period of ten consecutive years of eighteen thousand acre-feet, including reservoir evaporation, over and above the consumptive uses provided for by article IV of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340). Such increased consumptive uses shall not begin until and shall continue only so long as delivery of Colorado River water to downstream Gila River users in Arizona is being accomplished in accordance with this Act in quantities sufficient to replace any diminution of their supply resulting from such diversions from the Gila River, its tributaries, and underground water sources. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

All additional consumptive uses provided for in this section 304(d) shall be subject to all rights in New Mexico and Arizona as established by the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Numbered 59) and to all other rights existing on the effective date of this Act in New Mexico and Arizona to water from the Gila River, its tributaries, and underground water sources, and shall be junior thereto and shall be made only to the extent possible without economic injury or cost to the holders of such rights.

SEC. 305. Article II(B) (3) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340) shall be so administered that in any year in which, as determined by the Secretary, there is insufficient main stream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the central Arizona unit shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by users in the State of Arizona served under existing contracts with the United States by diversion works heretofore constructed.

SEC. 306. The main stream salvage unit shall include programs for water salvage along and adjacent to the main stream of the Colorado River and for ground water recovery. Such programs shall be consistent with maintenance of a reasonable degree of undisturbed habitat for fish and wildlife in the area, as determined by the Secretary.

SEC. 307. The Secretary shall construct, operate, and maintain such additional works as shall from time to time be authorized by the Congress as units of the project.

SEC. 308. (a) The Secretary shall, in a manner consistent with the other purposes of this Act, (1) investigate, plan, construct, operate, and maintain or otherwise provide for basic public outdoor recreation facilities adjacent to reservoirs, canals, and other similar features of the units, and facilities and measures for the conservation and development of fish and wildlife as the Secretary finds to be appropriate; (2) acquire or otherwise include lands and interests in lands necessary for the aforesaid facilities and necessary for present and future public recreation use of areas adjacent to reservoirs, canals and similar features included in the authorized units; (3) conserve the scenery, the natural, historic, and archeologic objects, and the wildlife on said lands; (4) allocate water and reservoir capacity to recreation and fish and wildlife purposes; and (5) provide for the public use and enjoyment of lands, facilities, and water areas included in the authorized units.

(b) The Secretary may enter into agreements with Federal agencies or State or local public bodies for the operation, maintenance, and additional development of lands or facilities included in units herein and hereafter authorized, or to dispose of such lands or facilities to Federal agencies or State or local public bodies by lease, transfer, conveyance, or exchange, upon such terms and conditions as will best promote the development and operation of such lands or facilities in the public interest for purposes of this subsection. No lands under the jurisdiction of any other Federal agency may be included for or devoted to recreation purposes under the authority of this Act without the consent of the head of such agency; and the head of any such agency is authorized to transfer any such lands to the jurisdiction of the Secretary for the purposes of this subsection.

(c) The Secretary may transfer jurisdiction over lands included in the authorized units within or adjacent to the exterior boundaries of national forests and facilities thereon to the Secretary of Agriculture for recreation and other

national forest system purposes; and such transfer shall be made in each case in which the lands adjacent to a reservoir are located wholly within the exterior boundaries of a national forest unless the Secretaries of Agriculture and the Interior jointly determine otherwise. Where any lands are transferred hereunder to the jurisdiction of the Secretary of Agriculture, the lands involved shall become national forest lands: *Provided*, That the lands and waters within the flow lines of any reservoir or otherwise needed or used for the operation of the authorized units for other purposes shall continue to be administered by the Secretary to the extent he determines to be necessary for such operation.

(d) Nothing in this section shall limit the authority of the Secretary under existing provisions of law relating to recreation and fish and wildlife conservation and development at water resource projects or to disposition of public lands for recreation purposes.

Sec. 309. The Secretary shall integrate the Dixie project and southern Nevada water supply project heretofore authorized into the project herein authorized as units thereof under repayment arrangements and participation in the development fund established by title IV of this Act consistent with the provisions of this Act.

Sec. 310. There is hereby authorized to be appropriated to carry out the purposes of this title the sum of \$1,207,000,000 based on estimated cost as of October 1963, plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indices applicable to the types of construction involved.

TITLE IV—LOWER COLORADO RIVER BASIN

DEVELOPMENT FUND

ALLOCATION AND REPAYMENT OF COSTS—CONTRACTS

Sec. 401. Upon completion of each unit of the project within the lower basin herein or hereafter authorized, or separate feature thereof, the Secretary shall allocate the total costs of constructing said unit or features to (1) commercial power; (2) irrigation; (3) municipal and industrial water supply; (4) flood control; (5) navigation; (6) water quality control; (7) recreation; (8) fish and wildlife; (9) the additional capacity of the system of main conduits and canals of the central Arizona unit referred to in section 304(a), item (1), in excess of three thousand cubic feet per second; and (10) any other purposes authorized under the Federal reclamation laws. Costs of means and measures to prevent loss of and damage to fish and wildlife resources resulting from the construction of the project shall be considered as project costs and allocated as may be appropriate among the project functions. All funds paid or transferred to Indian tribes pursuant to this Act, including interest on such funds in the Treasury of the United States, and costs of construction of the paved road, authorized in section 303(b) hereof, shall be nonreimbursable. Costs allocated to recreation and fish and wildlife enhancement shall be nonreimbursable within appropriate limits determined by the Secretary to be consistent with the provisions of law and policy applicable to other similar Federal projects and programs: *Provided*, That all of the separable and joint costs allocated to recreation and fish and wildlife enhancement at the Dixie project and the main stream reservoir division shall be nonreimbursable. Costs allocated to nonreimbursable purposes shall be nonreturnable under the provisions of this Act. Costs allocated to the additional capacity of the system of main conduits and canals of the central Arizona unit, referred to in section 304(a), item (1), in excess of three thousand cubic feet per second shall be recovered as directed in section 304(a).

Sec. 402. The Secretary shall determine the repayment capability of Indian lands within, under, or served by any unit of the project. Construction costs allocated to irrigation of Indian lands (including provision of water for incidental domestic and stock water uses) and within the repayment capability of such lands shall be subject to the Act of July 1, 1932 (47 Stat. 464), and such costs as are beyond repayment capability of such lands shall be nonreimbursable.

Sec. 403. (a) There is hereby established a separate fund in the Treasury of the United States, to be known as the Lower Colorado River Basin development fund (hereinafter called the development fund), which shall remain available until expended as hereafter provided for carrying out the provisions of title III.

(b) All appropriations made for the purpose of carrying out the aforesaid pro-

visions of title III of this Act shall be credited to the development fund as advances from the general fund of the Treasury and shall be available for such purpose.

(c) There shall also be credited to the development fund—

(1) all revenues collected in connection with the operation of facilities herein and hereafter authorized in furtherance of the purposes of this Act (except entrance, admission, and other recreation fees or charges and proceeds received from recreation concessionaires); and

(2) all Federal revenues from the Boulder Canyon and Parker-Davis projects which, after completion of repayment requirements of the said Boulder Canyon and Parker-Davis projects, are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of those projects: *Provided, however,* That the Secretary is authorized and directed to continue the in lieu of taxes payments to the States of Arizona and Nevada provided for in section 2(c) of the Boulder Canyon Project Adjustment Act so long as revenues accrue from the operation of the Boulder Canyon project.

(d) All revenues collected and credited to the development fund pursuant to this Act shall be available, without further appropriation, for—

(1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the project, within such separate limitations as may be included in annual appropriation Acts;

(2) payments, if any, as required by section 502 of this Act;

(3) payments as required by subsection (e) of this section; and

(4) payments to reimburse water users in the State of Arizona for losses sustained as a result of diminution of the production of hydroelectric power at Coolidge Dam, Arizona, resulting from exchanges of water between users in the States of Arizona and New Mexico as set forth in section 304 (c) and (d) of this Act.

Revenues credited to the development fund shall not be available for construction of the works comprised within any unit of the project herein or hereafter authorized except upon appropriation by the Congress.

(e) Revenues in the development fund in excess of the amount necessary to meet the requirements of clauses (1), (2), and (4) of subsection (d) of this section shall be paid annually to the general fund of the Treasury to return—

(1) the costs of each unit of the project or separable feature thereof, authorized pursuant to title III of this Act which are allocated to irrigation, commercial power, or municipal and industrial water supply, pursuant to this Act, within a period not exceeding fifty years from the date of completion of each such unit or separable feature, exclusive of any development period authorized by law; and

(2) interest (including interest during construction) on the unamortized balance of the investment in the commercial power and municipal and industrial water supply features of the project at a rate determined by the Secretary of the Treasury in accordance with the provisions of subsection (f) of this section, and interest due shall be a first charge.

(f) The interest rate applicable to those portions of the reimbursable costs of each unit of the project which are properly allocated to commercial power development and municipal and industrial water supply shall be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which the first advance is made for initiating construction of such unit, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations which are neither due nor callable for redemption for fifteen years from the date of issue.

(g) Business-type budgets shall be submitted to the Congress annually for all operations financed by the development fund.

Sec. 404. (a) Irrigation repayment contracts shall provide for repayment of the obligation assumed under any irrigation repayment contract with respect to any project contract unit or irrigation block over a basic period of not more than fifty years exclusive of any development periods authorized by law; contracts authorized by section 9(e) of the Reclamation Project Act of 1939 (53 Stat. 1196; 43 U.S.C. 485h(e)) may provide for delivery of water for a period of fifty years and for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits and from such other points of delivery as the Secretary may

designate; and long-term contracts relating to irrigation water supply shall provide that water made available thereunder may be made available by the Secretary for municipal or industrial purposes if and to the extent that such water is not required by the contractor for irrigation purposes.

(b) Contracts relating to municipal and industrial water supply from the project may be made without regard to the limitations of the last sentence of section 9(c) of the Reclamation Project Act of 1939 (53 Stat. 1194); may provide for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits; and may provide for repayment over a period of fifty years if made pursuant to clause (1) of said section and for the delivery of water over a period of fifty years if made pursuant to clause (2) thereof.

SEC. 405. On January 1 of each year the Secretary shall report to the Congress, beginning with the fiscal year ending June 30, 1968, upon the status of the revenues from and the cost of constructing, operating, and maintaining the project and each unit thereof for the preceding fiscal year. The report of the Secretary shall be prepared to reflect accurately the Federal investment allocated at that time to power, to irrigation, and to other purposes, the progress of return and repayment thereon, and the estimated rate of progress, year by year, in accomplishing full repayment.

TITLE V—GENERAL PROVISIONS

DEFINITIONS—CONDITIONS

SEC. 501 (a) Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of the Colorado River Compact (45 Stat. 1067), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994), the decree entered by the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), or, except as otherwise provided herein, the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774), or the Colorado River Storage Project Act (70 Stat. 106).

(b) The Secretary is directed to—

(1) administer his responsibilities under this Act in such manner that he, his permittees, licensees, and contractees shall in no way encroach upon, alter, or affect the Colorado River Compact apportionment of waters to the upper and lower basins;

(2) make reports as to the annual consumptive uses and losses of water from the Colorado River system after each successive five-year period, beginning with the five-year period starting on October 1, 1965. Such reports shall be prepared in consultation with the States of the lower basin individually and with the Upper Colorado River Basin Commission, and shall be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River Compact;

(3) condition all contracts for the delivery of water originating in the drainage basin of the Colorado River system upon the availability of water under the Colorado River Compact.

(c) All Federal officers and agencies are directed to comply with the applicable provisions of this Act, and of the laws, treaty, compacts, and decree referred to in subsection (a) of this section, in the storage and release of water from all reservoirs and in the operation and maintenance of all facilities in the Colorado River system under the jurisdiction and supervision of the Secretary, and in the operation and maintenance of all works which may be authorized hereafter for construction for the importation of water into the Colorado River system. In the event of failure of any such officer or agency to so comply, any affected State may maintain an action to enforce the provisions of this section in the Supreme Court of the United States and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.

(d) Nothing in this Act shall be construed to expand or diminish either Federal or State jurisdiction, responsibility or rights in the field of water resources planning, development, or control; nor to displace, supersede, limit, or modify any interstate compact or the jurisdiction or responsibility of any legally established joint or common agency of two or more States, or of two or more States and the Federal Government; nor to limit the authority of Congress to authorize and fund projects.

SEC. 502. (a) In order to fully comply with and carry out the provisions of the Colorado River Compact, the Upper Colorado River Basin Compact, and the Mexican Water Treaty, the Secretary shall propose criteria for the coordinated long-range operation of the reservoirs constructed and operated under the authority of this Act, the Colorado River Storage Project Act, the Boulder Canyon Project Act, and the Boulder Canyon Project Adjustment Act. To effect in part the purposes expressed in this paragraph, the criteria shall make provisions for the storage of water in storage units of the Colorado River storage project and releases of water from Lake Powell in the following listed order of priority:

(1) Releases to supply one-half the deficiency described in article III(c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the upper division.

(2) Releases to comply with article III(d) of the Colorado River Compact, less such quantities of water, if any, delivered into the Colorado River below Lee Ferry to the credit of the States of the upper division from resources outside the natural drainage area of the Colorado River system.

(3) Storage of water not required for the releases specified in clauses (1) and (2) of this subsection to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three lower division States and taking into consideration all relevant factors (including, but not limited to, historic streamflows, the most critical period of record, and probabilities of water supply), shall find to be reasonably necessary to assure deliveries under clauses (1) and (2) without impairment of annual consumptive uses in the upper basin pursuant to the Colorado River Compact: *Provided*, That water not so required to be stored shall be released from Lake Powell (i) to the extent it can be reasonably applied in the States of the lower division to the uses specified in article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and (iii) to avoid anticipated spills from Lake Powell.

(b) Not later than July 1, 1968, the criteria proposed in accordance with subsection (a) of this section shall be submitted to the Governors of the seven Colorado River Basin States and to such other parties and agencies as the Secretary may deem appropriate for their review and comment. After receipt of comments on the proposed criteria, but not later than January 1, 1969, the Secretary shall adopt appropriate criteria in accordance with this section and publish the same in the Federal Register. Beginning January 1, 1970, and yearly thereafter, the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding Compact water year and the projected operation for the current year. As a result of actual operating experience or unforeseen circumstances, the Secretary may thereafter modify the criteria to better achieve the purposes specified in subsection (a) of this section, but only after correspondence with the Governors of the seven Colorado River Basin States and appropriate consultation with such State representatives as each Governor may designate.

(c) Section 7 of the Colorado River Storage Project Act shall be administered in accordance with the foregoing criteria.

SEC. 503. (a) Rights of the upper basin to the consumptive use of water apportioned to that basin from the Colorado River system by the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin.

(b) Nothing in this Act shall be construed so as to impair, conflict with, or otherwise change the duties and powers of the Upper Colorado River Commission.

SEC. 504. Except as otherwise provided in this Act, in constructing, operating, and maintaining the units of the project herein and hereafter authorized, the Secretary shall be governed by the Federal reclamation laws (Act of June 17, 1902: 32 Stat. 388 and Acts amendatory thereof or supplementary thereto) to which laws this Act shall be deemed a supplement.

SEC. 505. The Congress declares that the satisfaction of the requirements of the Mexican Water Treaty constitutes a national obligation, and that the States of the Colorado River Basin should be relieved of the burden of supplying water thereunder as soon as practicable.

SEC. 506. (a) All terms used in this Act which are defined in the Colorado River Company shall have the meanings there defined.

(b) "Main stream" means the main stream of the Colorado River downstream from Lee Ferry within the United States, including the reservoirs thereon.

(c) "User" or "water user" in relation to main stream water in the lower basin means the United States, or any person or legal entity, entitled under the decree of the Supreme Court of the United States in *Arozina against California and others* (376 U.S. 340), to use main stream water when available thereunder.

(d) "Active storage" means that amount of water in reservoir storage, exclusive of bank storage, which can be released through the existing reservoir outlet works.

(e) "Colorado River Basin States" means the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming.

[H.R. 722, 90th Cong., 1st sess.]

A BILL To authorize the construction, operation, and maintenance of the Lower Colorado River Basin project, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—COLORADO RIVER BASIN PROJECT

OBJECTIVES

SEC. 101. That this Act may be cited as the "Colorado River Basin Project Act".

SEC. 102. The Congress recognizes that the present and growing water shortages in the Colorado River Basin and the Southwest as hereinafter defined constitute urgent problems of national concern, and accordingly authorizes and directs the National Water Commission established in title II of this Act and the Water Resources Council, established by the Water Resources Planning Act (Public Law 89-80), to give highest priority to the preparation of a plan and program for the relief of such shortages, in consultation with the States and Federal entities affected, as provided in this Act. This program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, for municipal, industrial, and other beneficial purposes; improving water quality; providing for basic public outdoor recreation facilities; improving conditions for fish and wildlife; and the generation and sale of hydroelectric power as an incident of the foregoing purposes.

TITLE II—THE NATIONAL WATER COMMISSION AND SOUTHWEST INVESTIGATIONS AND PLANNING

SEC. 201. (a) There is established the National Water Commission (hereinafter referred to as the "Commission").

(b) The Commission shall be composed of seven members, who shall be appointed by the President and serve at his pleasure. No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.

(c) The President shall designate the Chairman of the Commission (hereinafter referred to as the "Chairman") from among its members.

(d) Members of the Commission may each be compensated at the rate of \$100 for each day such member is engaged in the actual performance of duties vested in the Commission. Each member shall be reimbursed for travel expenses, including per diem in lieu of subsistence as authorized by law (5 U.S.C. 73b-2) for persons in the Government service employed intermittently.

(e) The Commission shall have an Executive Director, who shall be appointed by the Chairman with the approval of the President and shall be compensated at the rate provided by law for level IV of the Federal Executive Salary Schedule. The Executive Director shall have such duties and responsibilities as the Chairman may assign.

SEC. 202. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water require-

ments as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to desalting, weather modification and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council established in section 101 of the Water Resources Planning Act (79 Stat. 245) (hereinafter referred to as the "Council"); and (4) conduct such specific investigations as are authorized herein or as hereafter may be authorized by the Congress.

(b) The Commission shall consult with the Council regarding its studies and shall furnish its proposed reports and recommendations to the Council for review and comment. The Commission shall submit to the President such interim and final reports as it deems appropriate, and the Council shall submit to the President its views on the Commission's reports. The President shall transmit the Commission's final report to the Congress together with such comments and recommendations for legislation as he deems appropriate.

(c) The Commission shall terminate not later than six years from the effective date of this Act.

SEC. 203. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) without regard to the civil service laws and regulations and without regard to the Classification Act of 1949 as amended, employ and fix the compensation of such personnel as may be necessary to carry out the functions of the Commission: *Provided*, That of such personnel no more than five persons may receive compensation equivalent to the compensation established for grade 18 under the Classification Act of 1949 as amended; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a) at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner; and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

(b) Any member of the Commission is authorized to administer oaths when it is determined by a majority of the Commission that testimony shall be taken or evidence received under oath.

SEC. 204. (a) Subject to general policies adopted by the Commission, the Chairman shall be the chief executive of the Commission and shall exercise its executive and administrative powers as set forth in section 203(a)(2) through section 203(a)(8).

(b) The Chairman may make such provision as he shall deem appropriate authorizing the performance of any of his executive and administrative functions by the Executive Director or other personnel of the Commission.

SEC. 205. (a) The Commission shall, to the extent practicable, utilize the services of the Federal water resource agencies.

(b) Upon request of the Commission, the head of any Federal department or agency or river basin commission created pursuant to title II of the Water Resources Planning Act is authorized (1) to furnish the Commission, to the extent permitted by law and within the limits of available funds, including funds transferred for that purpose pursuant to section 203(a)(7) of this Act, such information as may be necessary for carrying out its functions and as may be available to or procurable by such department or agency, and (2) to detail to temporary duty with this Commission on a reimbursable basis such personnel within his administrative jurisdiction as it may need or believe to be useful for

carrying out its functions, each such detail to be without loss of seniority, pay, or other employee status.

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C. 46e) shall apply to the collection of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665g) shall apply to appropriations of the Commission: *And provided further*, That the Commission shall not be required to prescribe such regulations.

Sec. 206. (a) The Council, in consultation with the Commission, acting in accordance with the procedure prescribed in section 103 of the Water Resources Planning Act, shall within one hundred and twenty days following the effective date of this Act establish principles, standards, and procedures for the program of investigations and submittal of plans and reports relating to the Southwest authorized by this section and section 208. The Secretary of the Interior (hereinafter referred to as the "Secretary"), under the direction of the Commission, in conformity with the principles, standards, and procedures so established, and in accordance with the authority granted in section 205, is authorized and directed to—

(1) Prepare estimates of the long-range water supply available for consumptive use in the Southwest and in each of its major constituent parts, of current water requirements therein, and of the rate of growth of water requirements therein to at least the year 2030;

(2) Investigate sources and means of supplying water to meet the current and anticipated water requirements of the Southwest and of each of its major constituent parts, including reductions in losses, importations from sources outside the natural drainage basins of the Southwest, desalination, weather modification, and other means;

(3) Investigate projects within the lower basin of the Colorado River, including projects on tributaries of the Colorado River where undeveloped water supplies are available or can be made available by replacement or exchange;

(4) Undertake investigations, in cooperation with other concerned agencies, of the feasibility of proposed development plans in maintaining an adequate water quality throughout the Southwest;

(5) Investigate means of providing for prudent water conservation practices to permit maximum beneficial utilization of available water supplies in the Southwest;

(6) Investigate and prepare estimates of the long-range water supply in States and areas from which water may be imported into the Southwest, together with estimates of the probable ultimate requirements for water within those States and areas of origin, for all purposes, including, but not limited to, consumptive use, navigation, river regulation, power, enhancement of fishery resources, pollution control, and disposal of wastes to the ocean, and estimates of the quantities of water, if any, that will be available in excess of such requirements in the States and areas of origin for exportation to the Southwest; and

(7) Investigate current and anticipated water requirements of areas outside the natural drainage areas of the Southwest which feasibly can be served from importation facilities en route to the Southwest.

(b) The Secretary is authorized and directed to prepare reconnaissance reports of a staged plan or plans for projects adequate, in its judgment, to meet the requirements reported under subsection (a) of this section, in conformity with section 207.

(c) The plan for the first stage of works to meet the future requirements of the areas of deficiency and surplus as determined from studies performed pursuant to this section shall include, but not be limited to, import works necessary to provide two million five hundred thousand acre-feet annually for use from the main stream of the Colorado River below Lee Ferry, including satisfaction

of the obligations of the Mexican Water Treaty and losses of water associated with the performance of that treaty. Plans for import works for the first stage may also include facilities to provide water in the following additional quantities:

- (1) Up to two million acre-feet annually in the Colorado River Basin;
- (2) Up to two million acre-feet annually in the Colorado River system for use in the Upper Colorado River Basin, directly or by exchange;
- (3) Such additional quantities, not to exceed two million acre-feet annually, as the Secretary finds may be required and marketable in areas which can be served by said importation facilities en route to the Colorado River system.

(d) The Congress declares that the satisfaction of the requirements of the Mexican Water Treaty constitutes a national obligation. Accordingly, the States of the upper division (Colorado, New Mexico, Utah, and Wyoming) and States of the lower division (Arizona, California, and Nevada) shall be relieved from all obligations which may have been imposed upon them by article III(c) of the Colorado River compact when the President issues the proclamation specified in section 305(b) of this Act.

(e) The Secretary shall submit annually to the Commission, the President, and the Congress reports covering progress on the investigations and reports authorized by this section.

SEC. 207. (a) In planning works to import water into the Southwest from sources outside the natural drainage areas of the Southwest, the Secretary shall make provision for adequate and equitable protection of the interests of the States and areas of origin, including (in the case of works to import water for use in the lower basin of the Colorado River) assistance from the development fund established by title IV of this Act, to the end that water supplies may be available for use therein adequate to satisfy their ultimate requirements at prices to users not adversely affected by the exportation of water to the Colorado River system.

(b) All requirements, present or future, for water within any State lying wholly or in part within the drainage area of any river basin and from which water is exported by works planned pursuant to this Act shall have a priority of right in perpetuity to the use of the waters of that river basin, for all purposes, as against the uses of the water delivered by means of such exportation works, unless otherwise provided by interstate agreement.

SEC. 208. (a) On or before December 31, 1969, the Secretary shall submit a proposed reconnaissance report on the first stage of the staged plan of development for the Southwest to the Commission and affected States and Federal agencies for their comments and recommendations which shall be submitted within ninety days after receipt of the report. The Secretary shall proceed promptly thereafter with preparation of a feasibility report on the first stage of said plan of development if he finds, on the basis of reconnaissance investigations pursuant to section 206, that a water supply surplus to the needs of the area of origin exists, benefits of the proposed first stage exceed costs, and repayment can be made in accordance with titles III and IV of this Act. Such feasibility report shall be submitted to the Commission and to the affected States and Federal agencies not later than December 31, 1971.

(b) After receipt of the comments of the Commission and affected States and Federal agencies on such feasibility report, but not later than June 30, 1972, the Secretary shall transmit his final report to the President and, through the President, to the Congress. All comments received by the Secretary under the procedure specified in this section shall be included therein. The letter of transmittal and its attachments shall be printed as a House or Senate document.

SEC. 209. There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this title.

TITLE III—AUTHORIZED UNITS

PROTECTION OF EXISTING USES

SEC. 301. The Secretary shall construct, operate, and maintain the lower basin units of the Colorado River Basin project (herein referred to as the "project"), described in sections 302, 303, 304, 305, and 306.

SEC. 302. The main stream reservoir division shall consist of the Hualapai (formerly known as Bridge Canyon) and Marble Canyon units, including dams,

reservoirs, powerplants, transmission facilities, and appurtenant works, and the Coconino and Paria River silt-detention reservoirs: *Provided*, That (1) Hualapai Dam shall be constructed so as to impound water at a normal surface elevation of one thousand eight hundred and sixty-six feet above mean sea level; (2) fluctuations in the reservoir level shall be restricted, so far as practicable, to a regimen of ten feet; (3) Marble Canyon Dam shall be constructed so as to impound water at a normal surface elevation of three thousand one hundred and forty feet above mean sea level; and (4) this Act shall not be construed to authorize any diversion of water from either Hualapai or Marble Canyon Reservoirs except for incidental uses in the immediate vicinity. The Congress hereby declares that the construction of the Hualapai Dam herein authorized is consistent with the Act of February 26, 1919 (40 Stat. 1175).

Sec. 303. (a) From funds appropriated from the General Treasury of the United States to the Department of the Interior, Bureau of Reclamation, for the project, there shall be transferred in the Treasury of the United States to the credit of the Hualapai Tribe of Arizona the sum of \$16,398,000, which shall draw interest on the principal at the rate of 4 per centum per annum until expended, as payment of just compensation for the taking by the United States of such easements, rights-of-way, and other interests in land within the Hualapai Indian Reservation, consisting of not more than twenty-five thousand acres, as the Secretary shall designate are necessary for the construction, operation, and maintenance of the Hualapai unit. The designation by the Secretary shall constitute a taking by the United States of the lands or interests therein so designated. The funds so paid may be expended, invested, or reinvested pursuant to plans, programs, and agreements duly adopted or entered into by the Hualapai Tribe, subject to the approval of the Secretary in accordance with the tribal constitution and charter.

(b) As part of the construction and operation of the Hualapai unit, the Secretary shall (1) construct a paved road, having a minimum width of twenty-eight feet, from Peach Springs, Arizona, through and along Peach Springs Canyon within the Hualapai Indian Reservation, to provide all-weather access to the Hualapai Reservoir; and (2) make available to the Hualapai Tribe up to twenty-five thousand kilowatts and up to one hundred million kilowatt-hours annually of power from the Hualapai unit at the lowest rate established by the Secretary for the sale of firm power from said unit for the use of preferential customers: *Provided*, That the tribe may resell such power only to users within the Hualapai Reservation: *Provided further*, That the Hualapai Tribal Council shall notify the Secretary in writing of the reasonable power requirements of the tribe up to the maximum herein specified, for each three-year period in advance beginning with the date upon which power from the Hualapai unit becomes available for sale. Power not so reserved may be disposed of by the Secretary for the benefit of the development fund.

(c) Except as to such lands which the Secretary determines are required for the Hualapai Dam and Reservoir site and the construction of operating campsite and townsite, all minerals of any kind whatsoever, including oil and gas but excluding sand and gravel and other building and construction materials, within the areas acquired by the United States pursuant to this section are hereby reserved to the Hualapai Tribe: *Provided*, That no permit, license, lease or other document covering the exploration for or the extraction of such minerals shall be granted by the tribe nor shall the tribe conduct such operations for its own account, except under such conditions and with such stipulations as are necessary to protect the interests of the United States in the construction, operation, and maintenance of the Hualapai unit.

(d) The Hualapai Tribe shall have the exclusive right, if requested in writing by the tribe, to develop the recreation potential of, and shall have the exclusive right to control access to the reservoir shoreline adjacent to the reservation, subject to conditions established by the Secretary for use of the reservoir to protect the operation of the project. Any recreation development established by the tribe shall be consistent with the Secretary's rules and regulations to protect the overall recreation development of the project. The tribe and the members thereof shall have nonexclusive personal rights to hunt and fish on the reservoir without charge, but shall have no right to exclude others from the reservoir except as to those who seek to gain access through the Hualapai Reservation, nor the right to require payments to the tribe except for the use of tribal lands or facilities: *Provided*, That under no circumstances will the Hu-

alapai Tribe make any charge, or extract any compensation, or in any other manner restrict the access or use of the paved road to be constructed within the Hualapai Indian reservation pursuant to this Act. The use by the public of the water areas of the project shall be pursuant to such rules and regulations as the Secretary may prescribe.

Except as limited by the foregoing, the Hualapai Tribe shall have the right to use and occupy the taking area of the Hualapai unit within the Hualapai Reservation for all purposes not inconsistent with the construction, operation, and maintenance of the project and townsite, including, but not limited to, the right to lease such lands for farming, grazing, and business purposes to members or nonmembers of the tribe and the power to dispose of all minerals as provided in paragraph (c) hereof.

(e) Upon a determination by the Secretary that all or part of the lands acquired by the United States pursuant to paragraph (a) of this section no longer are necessary for purposes of the project, all right, title, and interests in such lands shall thereupon vest in the Hualapai Tribe.

(f) No part of any expenditures made by the United States, and no reservation by or restoration to the Hualapai Tribe of any interests in land, under any of the provisions of this section shall be charged by the United States as an offset or counterclaim against any claim of the Hualapai Tribe against the United States other than claims arising out of the acquisition of land for the project: *Provided, however*, That the payment of moneys and other benefits as set forth herein shall constitute full compensation for the rights transferred.

(g) All funds authorized by this section to be paid or transferred to the Hualapai Tribe, and any per capita distribution derived therefrom, shall be exempt from all forms of State and Federal income taxes.

(h) No payments shall be made or benefits conferred as set forth in this section until the provisions hereof have been accepted by the Hualapai Tribe through resolution duly adopted by its tribal council. In the event such resolution is not adopted within six months from the effective date of this Act, and litigation thereafter is instituted regarding the acquisition of tribal lands for the project or compensation therefor, the amounts of the payments provided herein and the other benefits set out shall not be regarded as evidencing value or as recognizing any right of the tribe to compensation.

SEC. 304. (a) The central Arizona unit shall consist of the following principal works: (1) a system of main conduits and canals, including a main canal and pumping plants (Granite Reef aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to Orme Dam or suitable alternative, which system shall have a capacity of two thousand five hundred cubic feet per second (A) unless the definite plan report of the Bureau of Reclamation shows that additional capacity (i) will provide an improved benefit-to-cost ratio and (ii) will enhance the ability of the central Arizona unit to divert water from the main stream to which Arizona is entitled and (B) unless the Secretary finds that the additional cost resulting from such additional capacity can be financed by funds from sources other than the funds credited to the development fund pursuant to section 403 of this Act and without charge, directly or indirectly, to water users or power customers in the States of California and Nevada; (2) Orme Dam and Reservoir and power-pumping plant or suitable alternative; (3) Buttes Dam and Reservoir, which shall be so operated as to not prejudice the rights of any user in and to the waters of the Gila River as those rights are set forth in the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Numbered 59); (4) Hooker Dam and Reservoir, which shall be constructed to an initial capacity of ninety-eight thousand acre-feet and in such a manner as to permit subsequent enlargement of the structure (to give effect to the provisions of section 304 (c) and (d)); (5) Charleston Dam and Reservoir; (6) Tucson aqueducts and pumping plants; (7) Salt-Gila aqueduct; (8) canals, regulating facilities, powerplants, and electrical transmission facilities; (9) related water distribution and drainage works; and (10) appurtenant works.

(b) Unless and until otherwise provided by Congress, water from the natural drainage area of the Colorado River system diverted from the main stream below Lee Ferry for the central Arizona unit shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national

wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas. It shall be a condition of each contract under which such water is provided under the central Arizona unit that (1) there be in effect measures, adequate in the judgment of the Secretary, to control expansion of irrigation from aquifers affected by irrigation in the contract service area; (2) the canals and distribution systems through which water is conveyed after its delivery by the United States to the contractors shall be provided and maintained with linings, adequate in his judgment to prevent excessive conveyance losses; (3) neither the contractor nor the Secretary shall pump or permit others to pump ground water from lands located within the exterior boundaries of any Federal reclamation project or irrigation district receiving water from the central Arizona unit for any use outside such Federal reclamation project or irrigation district, unless the Secretary and the agency or organization operating and maintaining such Federal reclamation project or irrigation district shall agree or shall have previously agreed that a surplus of ground water exists and that drainage is or was required; and (4) all agricultural, municipal and industrial waste water, return flow, seepage, sewage effluent and ground water located in or flowing from contractor's service area originating or resulting from (i) waters contracted for from the central Arizona unit or (ii) waters stored or developed by any Federal reclamation project are reserved for the use and benefit of the United States as a source of supply for the service area of the central Arizona unit or for the service area of the Federal reclamation project, as the case may be: *Provided*, That not withstanding the provisions of item (3) above, the agricultural, municipal and industrial waste water, return flow, seepage, sewage effluent, and ground water in or from any such Federal reclamation project, may also be pumped or diverted for use and delivery by the United States elsewhere in the service area of the central Arizona unit, if not needed for use or reuse in such Federal reclamation project.

(c) The Secretary may require as a condition in any contract under which water is provided from the central Arizona unit that the contractor agree to accept main stream water in exchange for or in replacement of existing supplies from sources other than the main stream. The Secretary shall so require in contracts with such contractors in Arizona who also use water from the Gila River system, to the extent necessary to make available to users of water from the Gila River system in New Mexico additional quantities of water as provided in and under the conditions specified in subparagraph (d) of this section: *Provided*, That such exchanges and replacements shall be accomplished without economic injury or cost to such Arizona contractors.

In times of shortage or reduction of main stream water for the central Arizona unit (if such shortages or reductions should occur), contractors which have yielded water from other sources in exchange for main stream water supplied by that unit shall have a first priority to receive main stream water, as against other contractors supplied by that unit which have not so yielded water from other sources, but only in quantities adequate to replace the water so yielded.

(d) In the operation of the central Arizona unit, the Secretary shall offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources, in amounts that will permit consumptive use of water in New Mexico not to exceed an annual average in any period of ten consecutive years of eighteen thousand acre-feet, including reservoir evaporation, over and above the consumptive uses provided for by article IV of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340). Such increased consumptive uses shall not begin until and shall continue only so long as delivery of Colorado River water to downstream Gila River users in Arizona is being accomplished in accordance with this Act in quantities sufficient to replace any diminution of their supply resulting from such diversions from the Gila River, its tributaries and underground water sources. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

The Secretary shall further offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources in amounts that will permit consumptive uses of water in New Mexico not to exceed an annual average in any period of ten consecutive years of an additional thirty thousand acre-feet, including reservoir evaporation. Such further increases in consumptive use shall not begin until and shall continue only so long

as works capable of importing water into the Colorado River system have been completed and water sufficiently in excess of two million eight hundred thousand acre-feet per annum is available from the main stream of the Colorado River for consumptive use in Arizona to provide water for the exchanges herein authorized and provided. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

All additional consumptive uses provided for in this section 304(d) shall be subject to all rights in New Mexico and Arizona as established by the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Numbered 59) and to all other rights existing on the effective date of this Act in New Mexico and Arizona to water from the Gila River, its tributaries and underground water sources, and shall be junior thereto and shall be made only to the extent possible without economic injury or cost to the holders of such rights.

Sec. 305. (a) Article II(B)(3) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340) shall be so administered that in any year in which, as determined by the Secretary, there is insufficient main stream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the central Arizona unit shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of main stream water, and by users of the same character in Arizona and Nevada. Water users in the State of Nevada shall not be required to bear shortages in any proportion greater than would have been imposed in the absence of this section 305(a). This section shall not affect the relative priorities, among themselves, of water users in Arizona, Nevada, and California which are senior to diversions for the central Arizona unit, or amend any provisions of said decree.

(b) The limitation stated in paragraph (a) shall cease whenever the President shall proclaim that works have been completed and are in operation, capable in his judgment of delivering annually not less than two million five hundred thousand acre-feet of water into the main stream of the Colorado River below Lee Ferry from sources outside the natural drainage area of the Colorado River system; and that such sources are adequate, in the President's judgment, to supply such quantities without adverse effect upon the satisfaction of the foreseeable water requirements of any State from which such water is imported into the Colorado River system. Such imported water shall be made available for use in accordance with paragraph (c) of this section.

(c) To the extent that the flow of the main stream of the Colorado River is augmented by such importations in order to make sufficient water available for release, as determined by the Secretary pursuant to article II(B)(1) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340), to satisfy annual consumptive use of two million eight hundred thousand acre-feet in Arizona, four million four hundred thousand acre-feet in California, and three hundred thousand acre-feet in Nevada, respectively, the Secretary shall make such additional water available to users of main stream water in those States at the same costs and on the same terms as would be applicable if main stream water were available for release in the quantities required to supply such consumptive use, taking into account, among other things, (1) the nonreimbursable allocation to the replenishment of the deficiencies occasioned by satisfaction of the Mexican Treaty burden provided for in section 401, and (2) such assistance as may be available from the development fund established by title IV of this Act.

(d) Imported water made available for use in the lower basin to supply aggregate annual consumptive uses from the main stream in excess of seven million five hundred thousand acre-feet shall be offered by the Secretary for use in the States of Arizona, California, and Nevada in the proportions provided in article II(B)(2) of said decree. The Secretary shall establish prices therefor which take into account such assistance as may be available from the develop-

ment fund established by title IV of this Act in excess of the demands upon that fund occasioned by the requirements stated in paragraph (c) of this section. Within each State, opportunity to take such water shall first be offered to persons or entities who are water users as of the effective date of this Act, and in quantities equal to the deficiencies which would result if the total quantity available for consumptive use from the main stream in such State were only the quantity apportioned to that State by article II(B)(1) of said decree.

(e) Imported water made available for use in the upper basin of the Colorado River, directly or by exchange, shall be offered by the Secretary for contract by water users in the States of Colorado, New Mexico, Utah, and Wyoming in the proportions, as among those States, stated in the Upper Colorado River Basin compact, and at prices which take into account such assistance as may be available from the Upper Colorado River Basin fund, in excess of the demands upon that fund occasioned by the requirements of the Colorado River Storage Project Act.

(f) Imported water not delivered into the Colorado River system but diverted from the works constructed to import water into that system shall be made available to water users in accordance with the Federal reclamation laws.

SEC. 306. The main stream salvage unit shall include programs for water salvage along and adjacent to the main stream of the Colorado River and for ground water recovery. Such programs shall be consistent with maintenance of a reasonable degree of undisturbed habitat for fish and wildlife in the area, as determined by the Secretary.

SEC. 307. The Secretary shall construct, operate, and maintain such additional works as shall from time to time be authorized by the Congress as units of the project.

SEC. 308. (a) The Secretary shall, in a manner consistent with the other purposes of this Act, (1) investigate, plan, construct, operate, and maintain or otherwise provide for basic public outdoor recreation facilities adjacent to reservoirs, canals, and other similar features of the units, and facilities and measures for the conservation and development of fish and wildlife as the Secretary finds to be appropriate; (2) acquire or otherwise include lands and interests in lands necessary for the aforesaid facilities and necessary for present and future public recreation use of areas adjacent to reservoirs, canals, and similar features included in the authorized units; (3) conserve the scenery, the natural, historic, and archeologic objects, and the wildlife on said lands; (4) allocate water and reservoir capacity to recreation and fish and wildlife purposes; and (5) provide for the public use and enjoyment of lands, facilities, and water areas included in the authorized units.

(b) The Secretary may enter into agreements with Federal agencies or State or local public bodies for the operation, maintenance, and additional development of lands or facilities included in units herein and hereafter authorized, or to dispose of such lands or facilities to Federal agencies or State or local public bodies by lease, transfer, conveyance, or exchange, upon such terms and conditions as will best promote the development and operation of such lands or facilities in the public interest for purposes of this subsection. No lands under the jurisdiction of any other Federal agency may be included for or devoted to recreation purposes under the authority of this Act without the consent of the head of such agency; and the head of any such agency is authorized to transfer any such lands to the jurisdiction of the Secretary for purposes of this subsection.

(c) The Secretary may transfer jurisdiction over lands included in the authorized units within or adjacent to the exterior boundaries of national forests and facilities thereon to the Secretary of Agriculture for recreation and other national forest system purposes; and such transfer shall be made in each case in which the lands adjacent to a reservoir are located wholly within the exterior boundaries of a national forest unless the Secretaries of Agriculture and the Interior jointly determine otherwise. Where any lands are transferred hereunder to the jurisdiction of the Secretary of Agriculture, the lands involved shall become national forest lands; *Provided*, That the lands and waters within the flow lines of any reservoir or otherwise needed or used for the operation of the authorized units for other purposes shall continue to be administered by the Secretary to the extent he determines to be necessary for such operation.

(d) Nothing in this section shall limit the authority of the Secretary under existing provisions of law relating to recreation and fish and wildlife conserva-

tion and development at water resource projects or to disposition of public lands for recreation purposes.

SEC. 309. The Secretary shall integrate the Dixie project and southern Nevada water supply project heretofore authorized into the project herein authorized as units thereof under repayment arrangements and participation in the development fund established by title IV of this Act consistent with the provisions of this Act.

SEC. 310. There is hereby authorized to be appropriated to carry out the purposes of this title the sum of \$1,395,000,000, based on estimated costs as of October 1963, plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indices applicable to the types of construction involved.

TITLE IV—LOWER COLORADO RIVER BASIN DEVELOPMENT FUND

ALLOCATION AND REPAYMENT OF COSTS—CONTRACTS

SEC. 401. Upon completion of each unit of the project herein or hereafter authorized, or separate feature thereof, the Secretary shall allocate the total costs of constructing said unit or features to (1) commercial power, (2) irrigation, (3) municipal and industrial water supply, (4) flood control, (5) navigation, (6) water quality control, (7) recreation, (8) fish and wildlife, (9) the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Water Treaty of 1944 with the United Mexican States (treaty series 994), (10) the additional capacity of the system of main conduits and canals of the central Arizona unit referred to in section 304(a), item (1), in excess of two thousand five hundred cubic feet per second and (11) any other purposes authorized under the Federal reclamation laws. Costs of means and measures to prevent loss of and damage to fish and wildlife resources resulting from the construction of the project shall be considered as project costs and allocated as may be appropriate among the project functions. Costs of construction, operation, and maintenance allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by compliance with the Mexican Water Treaty (including losses in transit, evaporation from regulatory reservoirs, and regulatory losses at the Mexican boundary, incurred in the transportation, storage, and delivery of water in discharge of the obligations of that treaty) shall be nonreimbursable. All funds paid or transferred to Indian tribes pursuant to this Act, including interest on such funds in the Treasury of the United States, and costs of construction of the paved road, authorized in section 303(b) hereof, shall be nonreimbursable. Costs allocated to recreation and fish and wildlife enhancement shall be nonreimbursable within appropriate limits determined by the Secretary to be consistent with the provisions of law and policy applicable to other similar Federal projects and programs: *Provided*, That all of the separable and joint costs allocated to recreation and fish and wildlife enhancement at the Dixie project and the main stream reservoir division shall be nonreimbursable. Costs allocated to nonreimbursable purposes shall be nonreturnable under the provisions of this Act. Costs allocated to the additional capacity of the system of main conduits and canals of the central Arizona unit, referred to in section 304(a), item (1), in excess of two thousand five hundred cubic feet per second shall be recovered as directed in section 304(a).

SEC. 402. The Secretary shall determine the repayment capability of Indian lands within, under, or served by any unit of the project. Construction costs allocated to irrigation of Indian lands (including provision of water for incidental domestic and stock water uses) and within the repayment capability of such lands shall be subject to the Act of July 1, 1932 (47 Stat. 464), and such costs as are beyond repayment capability of such lands shall be nonreimbursable.

SEC. 403. (a) There is hereby established a separate fund in the Treasury of the United States, to be known as the Lower Colorado River Basin development fund (hereinafter called the "development fund"), which shall remain available until expended as hereafter provided for carrying out the provisions of title III (except section 308).

(b) All appropriations made for the purpose of carrying out the aforesaid provisions of title III of this Act shall be credited to the development fund as advances from the general fund of the Treasury.

(c) There shall also be credited to the development fund—

(1) all revenues collected in connection with the operation of facilities herein and hereafter authorized in furtherance of the purposes of this Act (except entrance, admission, and other recreation fees or charges and proceeds received from recreation concessionaires); and

(2) all Federal revenues from the Boulder Canyon and Parker-Davis projects which, after completion of repayment requirements of the said Boulder Canyon and Parker-Davis projects, are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of those projects: *Provided, however,* That the Secretary is authorized and directed to continue the in-lieu-of-taxes payments to the States of Arizona and Nevada provided for in section 2(c) of the Boulder Canyon Project Adjustment Act so long as revenues accrue from the operation of the Boulder Canyon project.

(d) All revenues collected and credited to the development fund pursuant to this Act shall be available, without further appropriation, for—

(1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the project, within such separate limitations as may be included in annual appropriation Acts;

(2) payments, if any, as required by section 502 of this Act;

(3) payments as required by subsection (e) of this section; and

(4) payments to reimburse water users in the State of Arizona for losses sustained as a result of diminution of the production of hydroelectric power at Coolidge Dam, Arizona, resulting from exchanges of water between users in the States of Arizona and New Mexico as set forth in section 304 (c) and

(d) of this Act.

Revenues credited to the development fund shall not be available for appropriation for construction of the works comprised within any unit of the project herein or hereafter authorized.

(e) Revenues in the development fund in excess of the amount necessary to meet the requirements of clauses (1), (2), and (4) of subsection (d) of this section shall be paid annually to the general fund of the Treasury to return—

(1) the costs of each unit of the project or separate feature thereof, herein authorized, which are allocated to irrigation, commercial power, or municipal and industrial water supply, pursuant to this Act, within a period not exceeding fifty years from the date of completion of each unit or separable feature, exclusive of any development period authorized by law;

(2) interest (including interest during construction) on the unamortized balance of the investment in the commercial power and municipal and industrial water supply features of the project at a rate determined by the Secretary of the Treasury in accordance with the provisions of subsection (f) of this section, and interest due shall be a first charge; and

(3) to the extent that revenues are available in the development fund after making the payments required by clauses (1), (2), and (4) of subsection (d) and subparagraphs (1) and (2) of this subsection, costs incurred in connection with units hereafter authorized in providing (i) for the importation of water into the main stream of the Colorado River for use below Lee Ferry as provided in section 206(c) to the extent that such costs are in excess of the costs allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Mexican Water Treaty as provided in section 401, and (ii) protection of States and areas of origin of such imported water as provided in section 207(a).

(f) The interest rate applicable to those portions of the reimbursable costs of each unit of the project which are properly allocated to commercial power development and municipal and industrial water supply shall be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which the first advance is made for initiating construction of such unit, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations which are neither due nor callable for redemption for fifteen years from the date of issue.

(g) Business-type budgets shall be submitted to the Congress annually for all operations financed by the development fund.

Sec. 404. (a) Irrigation repayment contracts shall provide for repayment of the obligation assumed under any irrigation repayment contract with respect to

any project contract unit or irrigation block over a basic period of not more than fifty years exclusive of any development periods authorized by law; contracts authorized by section 9(e) of the Reclamation Project Act of 1939 (53 Stat. 1196; 43 U.S.C. 485h(e)) may provide for delivery of water for a period of fifty years and for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits and from such other points delivery as the Secretary may designate; and long-term contracts relating to irrigation water supply shall provide that water made available thereunder may be made available by the Secretary for municipal or industrial purposes if and to the extent that such water is not required by the contractor for irrigation purposes.

(b) Contracts relating to municipal and industrial water supply from the project may be made without regard to the limitations of the last sentence of section 9(c) of the Reclamation Project Act of 1939 (53 Stat. 1194); may provide for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits; and may provide for repayment over a period of fifty years if made pursuant to clause (1) of said section and for the delivery of water over a period of fifty years if made pursuant to clause (2) thereof.

SEC. 405. On January 1 of each year the Secretary shall report to the Congress, beginning with the fiscal year ending June 30, 1967, upon the status of the revenues from and the cost of constructing, operating, and maintaining the project and each unit thereof for the preceding fiscal year. The report of the Secretary shall be prepared to reflect accurately the Federal investment allocated at that time to power, to irrigation, and to other purposes, the progress of return and repayment thereon, and the estimated rate of progress, year by year, in accomplishing full repayment.

TITLE V—UPPER COLORADO RIVER BASIN AUTHORIZATIONS AND REIMBURSEMENTS

SEC. 501. (a) In order to provide for the construction, operation, and maintenance of the Animas-La Plata Federal reclamation project, Colorado-New Mexico; the Dolores, Dallas Creek, West Divide, and San Miguel Federal reclamation projects, Colorado, as participating projects under the Colorado River Storage Project Act (70 Stat. 105; 43 U.S.C. 620), and to provide for the completion of planning reports on other participating projects, subsection (2) of section 1 of said Act is hereby further amended by deleting the words "Pine River extension", and inserting in lieu thereof the words "Animas-La Plata, Dolores, Dallas Creek, West Divide, San Miguel". Section 2 of said Act is hereby further amended by deleting the words "Parshall, Troublesome, Rabbit Ear, San Miguel, West Divide, Tomichi Creek, East River, Ohio Creek, Dallas Creek, Dolores, Fruit Growers extension, Animas-La Plata", and inserting after the words "Yellow Jacket" the words "Basalt, Middle Park (including the Troublesome, Rabbit Ear, and Azure units), Upper Gunnison (including the East River, Ohio Creek, and Tomichi Creek units), Lower Yampa (including the Juniper and Great Northern units), Upper Yampa (including the Hayden Mesa, Wessels, and Toponas units)", and by inserting after the word "sublette" the words "(including the Kendall Reservoir on Green River and a diversion of water from the Green River to the North Platte River Basin in Wyoming), Uintah unit and Ute Indian unit of the central Utah, San Juan County (Utah), Price River, Grand County (Utah), Ute Indian unit extension of the central Utah, Gray Canyon, and Juniper (Utah)". The amount which section 12 of said Act authorizes to be appropriated is hereby further increased by the sum of \$360,000,000 plus or minus such amounts, if any, as may be required, by reason of changes in construction costs as indicated by engineering cost indexes applicable to the type of construction involved. This additional sum shall be available solely for the construction of the projects herein authorized.

(b) The Animas-La Plata Federal reclamation project shall be constructed and operated in substantial accordance with the engineering plans set out in the report of the Secretary transmitted to the Congress on May 4, 1966, and printed as House Document Numbered 436, Eighty-ninth Congress: *Provided*, (1) That the project construction shall not be undertaken until each of the Governors of the States of Colorado and New Mexico has certified in a manner acceptable to the Secretary that his State has agreed upon mutually satisfactory

project operating principles and conditions; and (2) that the project shall always be operated by the Secretary.

(c) The Secretary shall, for the Animas-La Plata, Dolores, Dallas Creek, San Miguel, West Divide, and Seedskadee participating projects of the Colorado River storage project, establish the nonexcess irrigable acreage for which any single ownership may receive project water at one hundred and sixty acres of class I land or the equivalent thereof as determined by the Secretary, in other land classes.

(d) In the diversion and storage of water for any project or any parts thereof constructed under the authority of this Act or the Colorado River Storage Project Act within and for the benefit of the State of Colorado only, the Secretary is directed to comply with the constitution and statutes of the State of Colorado relating to priority of appropriation; with State and Federal court decrees entered pursuant thereto; and with operating principles, if any, adopted by the Secretary and approved by the State of Colorado.

(e) The words "any western slope appropriations" contained in paragraph (i) of that section of Senate Document Numbered 80, Seventy-fifth Congress, first session, entitled "Manner of Operation of Project Facilities and Auxiliary Features", shall mean and refer to the appropriation heretofore made for the storage of water in Green Mountain Reservoir, a unit of the Colorado-Big Thompson Federal reclamation project, Colorado; and the Secretary is directed to act in accordance with such meaning and reference. It is the sense of Congress that this directive defines and observes the purpose of said paragraph (i), and does not in any way affect or alter any rights or obligations arising under said Senate Document Numbered 80 or under the laws of the State of Colorado.

Sec. 502. The Upper Colorado River Basin fund established under section 5 of the Act of April 11, 1956 (70 Stat. 107), shall be reimbursed from the Colorado River development fund established by section 2 of the Boulder Canyon Project Adjustment Act (54 Stat. 755), for all expenditures heretofore or hereafter made from the Upper Colorado River Basin fund to meet deficiencies in generation at Hoover Dam during the filling period of reservoirs of storage units of the Colorado River storage project pursuant to the criteria for the filling of Glen Canyon Reservoir (27 Fed. Reg. 6851, July 19, 1962). For this purpose \$500,000 for each year of operation of Hoover Dam and powerplant, commencing with the enactment of this Act, shall be transferred from the Colorado River development fund to the Upper Colorado River Basin fund, in lieu of application of said amounts to the purposes stated in section 2(d) of the Boulder Canyon Project Adjustment Act, until such reimbursement is accomplished. To the extent that any deficiency in such reimbursement remains as of June 1, 1967, the amount of the remaining deficiency shall then be transferred to the Upper Colorado River Basin fund from the Lower Colorado River Basin development fund, as provided in paragraph (d) of section 403.

TITLE VI—GENERAL PROVISIONS

DEFINITIONS—CONDITIONS

Sec. 601. (a) The Secretary shall promulgate equitable criteria for the coordinated long-range operation of the reservoirs constructed under the authority of this Act, the Colorado River Storage Project Act and the Boulder Canyon Project Act, consistent with the provisions of those statutes, the Boulder Canyon Project Adjustment Act, the Colorado River compact, the Upper Colorado River Basin compact and the Mexican Water Treaty. Such criteria shall be prepared and reviewed annually after an exchange of views in writing with the official representatives of each of the seven Colorado River Basin States and the parties to contracts with the United States affected by such criteria.

(b) In the preparation and subsequent execution of the criteria, the following listed order of priorities shall govern the storage of water in storage units of the Colorado River storage project and releases of water from Lake Powell:

(1) Releases to supply one-half the deficiency described in article III(c) of the Colorado River compact, if any such deficiency exists and is chargeable to the States of the upper division, but in any event such releases, if any, shall terminate when the President issues the proclamation specified in section 305(b) of this Act.

(2) Releases to comply with article III(d) of the Colorado River compact, less such quantities of water delivered into the Colorado River below Lee Ferry to the credit of the States of the upper division from sources outside the natural drainage area of the Colorado River system.

(3) Storage of water not required for the releases specified in subparagraphs (1) and (2) to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three lower division States and taking into consideration all relevant factors (including, but not limited to, historic streamflows, the most critical period of record, and probabilities of water supply), shall find to be reasonably necessary to assure deliveries under subparagraphs (1) and (2) without impairment of consumptive uses in the upper basin pursuant to the Colorado River compact: *Provided*, That water not so required to be stored shall be released from Lake Powell (i) to the extent it can be reasonably applied in the States of the lower division to the uses specified in article III(e) of the Colorado River compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and (iii) to avoid anticipated spills from Lake Powell.

(c) Section 7 of the Colorado River Storage Project Act shall be administered in accordance with the foregoing criteria.

SEC. 602. (a) Rights of the upper basin to the consumptive use of water apportioned to that basin from the Colorado River system by the Colorado River compact shall not be reduced or prejudiced by any use thereof in the lower basin.

(b) Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the Upper Colorado River Basin compact provisions (63 Stat. 31 on page 33).

SEC. 603. Except as otherwise provided in this Act, in constructing, operating, and maintaining the units of the project herein and hereafter authorized, the Secretary shall be governed by the Federal reclamation laws (Act of June 17, 1902; 32 Stat. 388 and Acts amendatory thereof or supplementary thereto) to which laws this Act shall be deemed a supplement.

SEC. 604. (a) Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of the Colorado River Basin compact, the Water Treaty of 1944 with the United Mexican States (treaty series 994), the decree entered by the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), or, except as otherwise provided herein, the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774) or the Colorado River Storage Project Act (70 Stat. 105).

(b) The Secretary is authorized and directed to—

(1) make reports as to the annual consumptive uses and losses of water from the Colorado River system after each successive five-year period, beginning with the five-year period starting on October 1, 1965. Such reports shall be prepared in consultation with the State of the lower basin individually and with the Upper Colorado River Commission, and shall be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River compact.

(2) condition all contracts for the delivery of water originating in the drainage basin of the Colorado River system upon the availability of water under the Colorado River compact.

(c) All Federal officers and agencies are directed to comply with the applicable provisions of this Act, and of the laws, treaty, compacts, and decree referred to in subsection (a) of this section, in the storage and release of water from all reservoirs and in the operation and maintenance of all facilities in the Colorado River system under the jurisdiction and supervision of the Secretary, and in the operation and maintenance of all works which may be authorized hereafter for construction for the importation of water into the Colorado River system. In the event of failure of any such officer or agency to so comply, any affected State may maintain an action to enforce the provisions of this section in the Supreme Court of the United States and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.

(d) Nothing in this Act shall be construed so as to impair, conflict with or otherwise change the duties and powers of the Upper Colorado River Commission.

(e) Nothing in this Act shall be construed to expand or diminish either Federal or State jurisdiction, responsibility or rights in the field of water resources planning, development, or control; nor to displace, supersede, limit or modify any interstate compact or the jurisdiction or responsibility of any legally established joint or common agency of two or more States, or of two or more States and the Federal Government; nor to limit the the authority of Congress to authorize and fund projects.

SEC. 605. (a) All terms used in this Act which are defined in the Colorado River compact shall have the meanings there defined.

(b) "Southwest" means the upper basin of the Colorado River, the lower basin of the Colorado River, and that portion of the States of Texas and Kansas situated generally west of the ninety-eighth meridian, and each of these four areas shall be regarded as a major constituent part of the Southwest.

(c) "Main stream" means the main stream of the Colorado River downstream from Lee Ferry within the United States, including the reservoirs thereon.

(d) "User" or "water user" in relation to main stream water in the lower basin means the United States, or any legal entity, entitled under the decree of the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), to use mainstream water when available thereunder.

(e) "Active storage" means that amount of water in reservoir storage, exclusive of bank storage, which can be released through the existing reservoir outlet works.

[H.R. 6271, 90th Cong., first sess.]

A BILL To authorize the construction, operation, and maintenance of the Colorado River Basin project, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—COLORADO RIVER BASIN PROJECT: OBJECTIVES

SEC. 101. That this Act may be cited as the "Colorado River Basin Project Act".

SEC. 102. The Congress recognizes that the present and growing water shortages in the Colorado River Basin constitute urgent problems of national concern, and accordingly authorizes and directs the National Water Commission and the Water Resources Council, established by the Water Resources Planning Act (Public Law 89-80), to give highest priority to the preparation of a plan and program for the relief of such shortages, in consultation with the States and Federal entities affected, as provided in this Act. This program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, for municipal, industrial, and other beneficial purposes; improving water quality; providing for basic public outdoor recreation facilities; improving conditions for fish and wildlife; and the generation and sale of hydroelectric power as an incident of the foregoing purposes.

TITLE II—SOUTHWEST INVESTIGATIONS AND PLANNING

SEC. 201.(a) The Council, in consultation with the Commission, acting in accordance with the procedure prescribed in section 103 of the Water Resources Planning Act, shall within one hundred and twenty days following the effective date of this Act establish principles, standards, and procedures for the program of investigations and submittal of plans and reports authorized by this section and section 203. The Secretary of the Interior (hereinafter referred to as the "Secretary"), under the direction of the Commission, in conformity with the principles, standards, and procedures so established, is authorized and directed to—

(1) Prepare estimates of the long-range water supply available for consumptive use in the Colorado River Basin, of current water requirements therein, and of the rate of growth of water requirements therein to at least the year 2030;

(2) investigate sources and means of supplying water to meet the current and anticipated water requirements of the Colorado River Basin, including reductions in losses, importations from sources outside the natural drainage basin of the Colorado River system, desalination, weather modification, and other means;

(3) investigate projects with the lower basin of the Colorado River, including projects on tributaries of the Colorado River where undeveloped water supplies are available or can be made available by replacement or exchange;

(4) undertake investigations, in cooperation with other concerned agencies, of the feasibility of proposed development plans in maintaining an adequate water quality throughout the Colorado River Basin;

(5) investigate means of providing for prudent water conservation practices to permit maximum beneficial utilization of available water supplies in the Colorado River Basin;

(6) investigate and prepare estimates of the long-range water supply in States and areas from which water may be imported into the Colorado River system, together with estimates of the probable ultimate requirements for water within those States and areas of origin, for all purposes, including, but not limited to, consumptive use, navigation, river regulation, power, enhancement of fishery resources, pollution control, and disposal of wastes to the ocean, and estimates of the quantities of water, if any, that will be available in excess of such requirements in the States and areas of origin for exportation to the Colorado River system; and

(7) investigate current and anticipated water requirements of areas outside the natural drainage areas of the Colorado River system which feasibly can be served from importation facilities en route to the Colorado River system.

(b) The Secretary is authorized and directed to prepare reconnaissance reports of a staged plan or plans for projects adequate, in its judgment, to meet the requirements reported under subsection (a) of this section, in conformity with section 202.

(c) The plan for the first stage of works to meet the future requirements of the areas of deficiency and surplus as determined from studies performed pursuant to this section shall include, but not be limited to, import works necessary to provide two million five hundred thousand acre-feet annually for use from the main stream of the Colorado River below Lee Ferry, including satisfaction of the obligations of the Mexican Water Treaty and losses of water associated with the performance of that treaty. Plans for import works for the first stage may also include facilities to provide water in the following additional quantities:

(1) Up to two million acre-feet annually in the Colorado River for use in the Lower Colorado River Basin;

(2) Up to two million acre-feet annually in the Colorado River system for use in the Upper Colorado River Basin, directly or by exchange;

(3) Such additional quantities, not to exceed two million acre-feet annually, as the Secretary finds may be required and marketable in areas which can be served by said importation facilities en route to the Colorado River system.

(d) The Congress declares that the satisfaction of the requirements of the Mexican Water Treaty constitutes a national obligation. Accordingly, the States of the upper division (Colorado, New Mexico, Utah, and Wyoming) and States of the lower division (Arizona, California, and Nevada) shall be relieved from all obligations which may have been imposed upon them by article III(c) of the Colorado River Compact when the President issues the proclamation specified in section 305(b) of this Act.

(e) The Secretary shall submit annually to the Commission, the President, and the Congress reports covering progress on the investigations and reports authorized by this section.

Sec. 202. (a) In planning works to import water into the Colorado River system from sources outside the natural drainage areas of the system, the Secretary shall make provision for adequate and equitable protection of the interests of the States and areas of origin, including (in the case of works to import water for use in the lower basin of the Colorado River) assistance from the development fund established by title IV of this Act, to the end that water

supplies may be available for use therein adequate to satisfy their ultimate requirements at prices to users not adversely affected by the exportation of water to the Colorado River system.

(b) All requirements, present or future, for water within any State lying wholly or in part within the drainage area of any river basin and from which water is exported by works planned pursuant to this Act shall have a priority of right in perpetuity to the use of the waters of that river basin, for all purposes, as against the uses of the water delivered by means of such exportation works, unless otherwise provided by interstate agreement.

SEC. 203. (a) On or before December 31, 1970, the Secretary shall submit a proposed reconnaissance report on the first stage of the staged plan of development to the Commission and affected States and Federal agencies for their comments and recommendations which shall be submitted within six months after receipt of the report.

(b) After receipt of the comments of the Commission, affected States, and Federal agencies on such reconnaissance report, but not later than January 1, 1972, the Secretary shall transmit the report to the President and, through the President, to the Congress. All comments received by the Secretary under the procedure specified in this section shall be included therein. The letter of transmittal and its attachments shall be printed as a House or Senate document.

(c) The Secretary shall proceed promptly thereafter with preparation of a feasibility report on the first stage of said plan of development if he finds, on the basis of reconnaissance investigations pursuant to section 201, that a water supply surplus to the needs of the area of origin exists, benefits of the proposed first stage exceed costs, and repayment can be made in accordance with titles III and IV of this Act. Such feasibility report shall be submitted to the Commission and to the affected States and Federal agencies not later than January 1, 1973.

(d) After receipt of the comments of the Commission and affected States and Federal agencies on such feasibility report, but not later than June 30, 1973, the Secretary shall transmit his final report to the President and, through the President, to the Congress. All comments received by the Secretary under the procedure specified in this section shall be included therein. The letter of transmittal and its attachments shall be printed as a House or Senate document.

SEC. 204. There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this title.

TITLE III—AUTHORIZED UNITS: PROTECTION OF EXISTING USES

SEC. 301. The Secretary shall construct, operate, and maintain the lower basin units of the Colorado River Basin project (herein referred to as the "project"), described in sections 302, 303, 304, 305, and 306.

SEC. 302. The main stream reservoir division shall consist of the Hualapai (formerly known as Bridge Canyon) unit, including a dam, reservoir, powerplant, transmission facilities, and appurtenant works, and the Coconino and Paria River silt-detention reservoirs: *Provided*, That (1) Hualapai Dam shall be constructed so as to impound water at a normal surface elevation of one thousand eight hundred and sixty-six feet above mean sea level, (2) fluctuations in the reservoir level shall be restricted, so far as practicable, to a regimen of ten feet, and (3) this Act shall not be construed to authorize any diversion of water from Hualapai Reservoir except for incidental uses in the immediate vicinity. The Congress hereby declares that the construction of the Hualapai Dam herein authorized is consistent with the Act of February 26, 1919 (40 Stat. 1175). No licenses or permits shall be issued hereafter under the Federal Power Act for projects on the Colorado River between Glen Canyon Dam and Lake Mead.

SEC. 303. (a) As fair and reasonable payment for the permanent use by the United States of not more than twenty-five thousand acres of land designated by the Secretary as necessary for the construction, operation, and maintenance of the Hualapai unit, said land being a part of the tract set aside and reserved by the Executive order of January 4, 1883, for the use and occupancy of the Hualapai Tribe of Arizona (1 Kappler, Indian Laws and Treaties, 804), \$16,306,000 shall be transferred in the Treasury, during construction of the unit, to the credit of the Hualapai Tribe from funds appropriated from the general fund of the Treasury to the Department of the Interior, Bureau of Reclamation,

for construction of the project and, when so transferred, shall draw interest at the rate of 4 per centum per annum until expended. The funds so transferred may be expended, invested, or reinvested pursuant to plans, programs, and agreements duly adopted or entered into by the Hualapai Tribe, subject to the approval of the Secretary, in accordance with the tribal constitution and charter.

(b) As part of the construction and operation of the Hualapai unit, the Secretary shall (1) construct a paved road, having a minimum width of twenty-eight feet, from Peach Springs, Arizona, through and along Peach Springs Canyon within the Hualapai Indian Reservation, to provide all-weather access to the Hualapai Reservoir; and (2) make available to the Hualapai Tribe up to twenty-five thousand kilowatts and up to one hundred million kilowatt-hours annually of power from the Hualapai unit at the lowest rate established by the Secretary for the sale of firm power from said unit for the use of preferential customers: *Provided*, That the tribe may resell such power only to users within the Hualapai Reservation: *Provided further*, That the Hualapai Tribal Council shall notify the Secretary in writing of the reasonable power requirements of the tribe up to the maximum herein specified, for each three-year period in advance beginning with the date upon which power from the Hualapai unit becomes available for sale. Power not so reserved may be disposed of by the Secretary for the benefit of the development fund.

(c) Except as to such lands which the Secretary determines are required for the Hualapai Dam and Reservoir site and the construction of operating campsite and townsite, all minerals of any kind whatsoever, including oil and gas but excluding sand and gravel and other building and construction materials, within the areas used by the United States pursuant to this section are hereby reserved to the Hualapai Tribe: *Provided*, That no permit, license, lease or other document covering the exploration for or the extraction of such materials shall be granted by the tribe nor shall the tribe conduct such operations for its own account, except under such conditions and with such stipulations as are necessary to protect the interests of the United States in the construction, operation, and maintenance of the Hualapai unit.

(d) The Hualapai Tribe shall have the exclusive right, if requested in writing by the tribe, to develop the recreation potential of, and shall have the exclusive right to control access to, the reservoir shoreline adjacent to the reservation, subject to conditions established by the Secretary for use of the reservoir to protect the operation of the project. Any recreation development established by the tribe shall be consistent with the Secretary's rules and regulations to protect the overall recreation development of the project. The tribe and the members thereof shall have nonexclusive personal rights to hunt and fish on the reservoir without charge, but shall have no right to exclude others from the reservoir except as to those who seek to gain access through the Hualapai Reservation, nor the right to require payments to the tribe except for the use of tribal lands or facilities: *Provided*, That under no circumstances will the Hualapai Tribe make any charge, or extract any compensation, or in any other manner restrict the access or use of the paved road to be constructed within the Hualapai Indian Reservation pursuant to this Act. The use by the public of the water areas of the project shall be pursuant to such rules and regulations as the Secretary may prescribe.

(e) Except as limited by the foregoing, the Hualapai Tribe shall have the right to use and occupy the area of the Hualapai unit within the Hualapai Reservation for all purposes not inconsistent with the construction, operation, and maintenance of the project and townsite, including, but not limited to, the right to lease such lands for farming, grazing, and business purposes to members or nonmembers of the tribe and the power to dispose of all minerals as provided in paragraph (c) hereof.

(f) Upon a determination by the Secretary that all of any part of the lands utilized by the United States pursuant to paragraph (a) of this section is no longer necessary for purposes of the project, such lands shall be restored to the Hualapai Tribe for its full use and occupancy.

(g) No part of any expenditures made by the United States, and no reservation by or restoration to the Hualapai Tribe of the use of land under any of the provisions of this section shall be charged by the United States as an offset or counterclaim against any claim of the Hualapai Tribe against the United States other than claims arising out of the utilization of lands for the project: *Provided*, however, That the payment of moneys and other benefits as set forth herein

shall constitute full, fair, and reasonable payment for the permanent use of the lands by the United States.

(b) All funds authorized by this section to be paid or transferred to the Hualapai Tribe, and any per capita distribution derived therefrom, shall be exempt from all forms of State and Federal income taxes.

(i) No payments shall be made or benefits conferred as set forth in this section until the provisions hereof have been accepted by the Hualapai Tribe through resolution duly adopted by its tribal council. In the event such resolution is not adopted within six months from the effective date of this Act, and litigation thereafter is instituted regarding the use by the United States of lands within the Hualapai Reservation or payment therefor, the amounts the payments provided herein and the other benefits set out shall not be regarded as evidencing value or as recognizing any right of the tribe to compensation.

Sec. 304. (a) The Central Arizona unit shall consist of the following principal works: (1) a system of main conduits and canals, including a main canal and pumping plants (Granite Reef aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to Orme Dam or suitable alternative, which system shall have a capacity of one thousand eight hundred cubic feet per second (A) unless the definite plan report of the Bureau of Reclamation shows that additional capacity (i) will provide an improved benefit-to-cost ratio and (ii) will enhance the ability of the Central Arizona unit to divert water from the main stream to which Arizona is entitled and (B) unless the Secretary finds that the additional cost resulting from such additional capacity can be financed by funds from sources other than the funds credited to the development fund pursuant to section 403 of this Act and without charge, directly or indirectly, to water users or power customers in the States of California and Nevada; (2) Orme Dam and Reservoir and power-pumping plant or suitable alternative; (3) Buttes Dam and Reservoir, which shall be so operated as to not prejudice the rights of any user in and to the waters of the Gila River as those rights are set forth in the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Number 59); (4) Hooker Dam and Reservoir, which shall be constructed to an initial capacity of ninety-eight thousand acre-feet and in such a manner as to permit subsequent enlargement of the structure (to give effect to the provisions of section 304 (c) and (d)); (5) Charleston Dam and Reservoir; (6) Tucson aqueducts and pumping plants; (7) Salt-Gila aqueduct; (8) canals, regulating facilities, powerplants, and electrical transmission facilities; (9) related water distribution and drainage works; and (10) appurtenant works.

(b) Unless and until otherwise provided by Congress, water from the natural drainage area of the Colorado River system diverted from the main stream below Lee Ferry for the Central Arizona unit shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas. It shall be a condition of each contract under which such water is provided under the Central Arizona unit that (1) there be in effect measures, adequate in the judgment of the Secretary, to control expansion of irrigation from aquifers affected by irrigation in the contract service area; (2) the canals and distribution systems through which water is conveyed after its delivery by the United States to the contractors shall be provided and maintained with linings, adequate in his judgment to prevent excessive conveyance losses; (3) neither the contractor nor the Secretary shall pump or permit others to pump ground water from lands located within the exterior boundaries of any Federal reclamation project or irrigation district receiving water from the Central Arizona unit for any use outside such Federal reclamation project or irrigation district, unless the Secretary and the agency or organization operating and maintaining such Federal reclamation project or irrigation district shall agree or shall have previously agreed that a surplus of ground water exists and that drainage is or was required; and (4) all agricultural, municipal, and industrial waste water, return flow, seepage, sewage effluent, and ground water located in or flowing from contractor's service area originating or resulting from (i) waters contracted for from the Central Arizona unit or (ii) water stored or developed by any Federal reclamation project are reserved for the use and benefit of the United States as a source of supply for the service area of the Central Arizona unit or for the

service area of the Federal reclamation project, as the case may be: *Provided*, That notwithstanding the provisions of clause (3) of this sentence, the agricultural, municipal, and industrial waste water, return flow, seepage, sewage effluent, and ground water in or from any such Federal reclamation project, may also be pumped or diverted for use and delivery by the United States elsewhere in the service area of the Central Arizona unit, if not needed for use or reuse in such Federal reclamation project.

(c) The Secretary may require as a condition in any contract under which water is provided from the Central Arizona unit that the contractor agree to accept main stream water in exchange for or in replacement of existing supplies from sources other than the main stream. The Secretary shall so require in contracts with such contractors in Arizona who also use water from the Gila River system, to the extent necessary to make available to users of water from the Gila River system in New Mexico additional quantities of water as provided in and under the conditions specified in subsections (e) and (f) of this section: *Provided*, That such exchanges and replacements shall be accomplished without economic injury or cost to such Arizona contractors.

(d) In times of shortage or reduction of main stream water for the Central Arizona unit (if such shortages or reductions should occur), contractors which have yielded water from other sources in exchange for main stream water supplied by that unit shall have a first priority to receive main stream water, as against other contractors supplied by that unit which have not so yielded water from other sources, but only in quantities adequate to replace the water so yielded.

(e) In the operation of the Central Arizona unit, the Secretary shall offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources, in amounts that will permit consumptive use of water in New Mexico not to exceed an annual average in any period of ten consecutive years of eighteen thousand acre-feet including reservoir evaporation, over and above the consumptive uses provided for by the article IV of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340). Such increased consumptive uses shall not begin until and shall continue only so long as delivery of Colorado River water to downstream Gila River users in Arizona is being accomplished in accordance with this Act, in quantities sufficient to replace any diminution of their supply resulting from such diversions from the Gila River, its tributaries and underground water sources. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved.

(f) The Secretary shall further offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources in amounts that will permit consumptive uses of water in New Mexico not to exceed an annual average in any period of ten consecutive years of an additional thirty thousand acre-feet, including reservoir evaporation. Such further increases in consumptive use shall not begin until and shall continue only so long as works capable of importing water into the Colorado River system have been completed and water sufficiently in excess of two million eight hundred thousand acre-feet per annum is available from the main stream of the Colorado River for consumptive use in Arizona to provide water for the exchanges herein authorized and provided. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the wastes involved.

All additional consumptive uses provided for in subsections (e) and (f) of this section shall be subject to all rights in New Mexico and Arizona as established by the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in the United States against Gila River Irrigation District and others (Globe Equity Number 59) and to all other rights existing on the effective date of this Act in New Mexico and Arizona to water from the Gila River, its tributaries and underground water sources, and shall be junior thereto and shall be made only to the extent possible without economic injury or cost to the holders of such rights.

SEC. 305. (a) Article II(B)(3) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340) shall be so administered that in any year in which, as determined by the Secretary, there is insufficient main stream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the Central Arizona unit shall be so limited as to assure the availability of water in quantities sufficient

to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of main stream water, and by users of the same character in Arizona and Nevada. Water users in the State of Nevada shall not be required to bear shortages in any proportion greater than would have been imposed in the absence of this section 305(a). This section shall not affect the relative priorities, among themselves, of water users in Arizona, Nevada, and California which are senior to diversions for the Central Arizona unit, or amend any provisions of said decree.

(b) The limitation stated in paragraph (a) shall cease whenever the President shall proclaim that works have been completed and are in operation, capable in his judgment of delivering annually not less than two million five hundred thousand acre-feet of water into the main stream of the Colorado River below Lee Ferry from sources outside the natural drainage area of the Colorado River system; and that such sources are adequate, in the President judgment, to supply such quantities without adverse effect upon the satisfaction of the foreseeable water requirements of any State from which such water is imported into the Colorado River system. Such imported water shall be made available for use in accordance with subsection (c) of this section.

(c) To the extent that the flow of the main stream of the Colorado River is augmented by such importations in order to make sufficient water available for release, as determined by the Secretary pursuant to article II(B)(1) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340), to satisfy annual consumptive use of two million eight hundred thousand acre-feet in Arizona, four million four hundred thousand acre-feet in California, and three hundred thousand acre-feet in Nevada, respectively, the Secretary shall make such additional water available to users of main stream water in those States at the same costs and on the same terms as would be applicable if main stream water were available for release in the quantities required to supply such consumptive use, taking into account, among other things, (1) the nonreimbursable allocation to the replenishment of the deficiencies occasioned by satisfaction of the Mexican Treaty burden provided for in section 401, and (2) such assistance as may be available from the development fund established by title IV of this Act.

(d) Imported water made available for use in the lower basin to supply aggregate annual consumptive uses from the main stream in excess of seven million five hundred thousand acre-feet shall be offered by the Secretary for use in the States of Arizona, California, and Nevada in the proportions provided in article II(B)(2) of said decree. The Secretary shall establish prices therefor which take into account such assistance as may be available from the development fund established by title IV of this Act in excess of the demands upon that fund occasioned by the requirements stated in subsection (c) of this section. Within each State, opportunity to take such water shall first be offered to persons or entities who are water users as of the effective date of this Act, and in quantities equal to the deficiencies which would result if the total quantity available for consumptive use from the main stream in such State were only the quantity apportioned to that State by article II(B)(1) of said decree.

(e) Imported water made available for use in the upper basin of the Colorado River, directly or by exchange, shall be offered by the Secretary for contract by water users in the States of Colorado, New Mexico, Utah, and Wyoming in the proportions, as among those States, stated in the Upper Colorado River Basin Compact, and at prices which take into account such assistance as may be available from the Upper Colorado River Basin Fund, in excess of the demands upon that fund occasioned by the requirements of the Colorado River Storage Project Act.

(f) Imported water not delivered into the Colorado River system but diverted from the works constructed to import water into that system shall be made available to water users in accordance with the Federal reclamation laws.

Sec. 306. The main stream salvage unit shall include programs for water salvage along and adjacent to the main stream of the Colorado River and for ground water recovery. Such programs shall be consistent with maintenance of a reasonable degree of undisturbed habitat for fish and wildlife in the area, as determined by the Secretary.

SEC. 307. The Secretary shall construct, operate, and maintain such additional works as shall from time to time be authorized by the Congress as units of the project.

SEC. 308. The conservation and development of the fish and wildlife resources and the enhancement of recreation opportunities in connection with the project works authorized pursuant to this title shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213).

SEC. 309. The Secretary shall integrate the Dixie project and Southern Nevada water supply project heretofore authorized into the project herein authorized as units thereof under repayment arrangements and participation in the development fund established by title IV of this Act consistent with the provisions of this Act.

SEC. 310. There is hereby authorized to be appropriated to carry out the purposes of this title the sum of \$1,167,000,000 based on estimated costs as of October 1963, plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indices applicable to the types of construction involved.

TITLE IV—LOWER COLORADO RIVER BASIN DEVELOPMENT FUND: ALLOCATION AND REPAYMENT OF COSTS: CONTRACTS

SEC. 401. Upon completion of each lower basin unit of the project herein or hereafter authorized, or separate feature thereof, the Secretary shall allocate the total costs of constructing said unit or features to (1) commercial power, (2) irrigation, (3) municipal and industrial water supply, (4) flood control, (5) navigation, (6) water quality control, (7) recreation, (8) fish and wildlife, (9) the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Water Treaty of 1944 with the United Mexican States (treaty series 994), (10) the additional capacity of the system of main conduits and canals of the Central Arizona unit referred to in section 304(a), item (1), in excess of one thousand eight hundred cubic feet per second, and (11) any other purposes authorized under the Federal reclamation laws. Costs of construction, operation, and maintenance allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by compliance with the Mexican Water Treaty (including losses in transit, evaporation from regulatory reservoirs, and regulatory losses at the Mexican boundary, incurred in the transportation, storage, and delivery of water in discharge of the obligations of that treaty) shall be nonreimbursable. All funds paid or transferred to Indian tribes pursuant to this Act, including interest on such funds in the Treasury of the United States, and costs of construction of the paved road, authorized in section 303(b) hereof, shall be nonreimbursable. The repayment of costs allocated to recreation and fish and wildlife enhancement shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213). Costs allocated to nonreimbursable purposes shall be nonreturnable under the provisions of this Act. Costs allocated to the additional capacity of the system of main conduits and canals of the Central Arizona unit, referred to in section 304(a), item (1), in excess of one thousand eight hundred cubic feet per second shall be recovered as directed in section 304(a).

SEC. 402. The Secretary shall determine the repayment capability of Indian lands within, under, or served by any unit of the project. Construction costs allocated to irrigation of Indian lands (including provision of water for incidental domestic and stock uses) and within the repayment capability of such lands shall be subject to the Act of July 1, 1932 (47 Stat. 464), and such costs as are beyond repayment capability of such lands shall be nonreimbursable.

SEC. 403. (a) There is hereby established a separate fund in the Treasury of the United States, to be known as the Lower Colorado River Basin development fund (hereinafter called the "development fund"), which shall remain available until expended as hereafter provided for carrying out the provisions of title III.

(b) All appropriations made for the purpose of carrying out the aforesaid provisions of title III of this Act shall be credited to the development fund as advances from the general fund of the Treasury, and shall be available for such purpose.

(c) There shall also be credited to the development fund—

(1) all revenues collected in connection with the operation of facilities herein and hereafter authorized in furtherance of the purposes of this Act (except entrance, admissions, and other recreation fees or charges and proceeds received from recreation concessionaries); and

(2) all Federal revenues from the Boulder Canyon and Parker-Davis projects which, after completion of repayment requirements of the said Boulder Canyon and Parker-Davis projects, are surplus, as determined by the Secretary, to the operation, maintenance, and replacement requirements of those projects: *Provided, however,* That the Secretary is authorized and directed to continue the in-lieu-of-taxes payments to the States of Arizona and Nevada provided for in section 2(c) of the Boulder Canyon Project Adjustment Act so long as revenues accrue from the operation of the Boulder Canyon project.

(d) All revenues collected and credited to the development fund pursuant to this Act shall be available, without further appropriation, for—

(1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the project, within such separate limitations as may be included in annual appropriation Acts;

(2) payments, if any, as required by section 502 of this Act;

(3) payments as required by subsection (f) of this section; and

(4) payments to reimburse water users in the State of Arizona for losses sustained as a result of diminution of the production of hydroelectric power at Coolidge Dam, Arizona, resulting from exchanges of water between users in the States of Arizona and New Mexico as set forth in section 304 of this Act.

(e) Revenues credited to the development fund shall not be available for construction of the works comprised within any unit of the project herein or hereafter authorized except upon appropriation by the Congress.

(f) Revenues in the development fund in excess of the amount necessary to meet the requirements of clauses (1), (2), and (4) of subsection (d) of this section shall be paid annually to the general fund of the Treasury to return—

(1) the costs of each unit of the project or separable feature thereof, authorized pursuant to title III of this Act which are allocated to irrigation, commercial power, or municipal and industrial water supply, pursuant to this Act, within a period not exceeding fifty years from the date of completion of each such unit or separable feature, exclusive of any development period authorized by law;

(2) the costs which are allocated to recreation or fish and wildlife enhancement in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213); and

(3) interest (including interest during construction) on the unamortized balance of the investment in the commercial power and municipal and industrial water supply features of the project at a rate determined by the Secretary of the Treasury in accordance with the provisions of subsection (f) of this section, and interest due shall be a first charge.

(g) To the extent that revenues remain in the development fund after making the payments required by subsections (d) and (f) of this section, they shall be available, upon appropriation by the Congress, to repay the costs incurred in connection with units hereafter authorized in providing (i) for the importation of water into the main stream of the Colorado River for use below Lee Ferry as provided in section 201(c) to the extent that such costs are in excess of the costs allocated to the replenishment of the depletion of Colorado River flows available for use in the United States occasioned by performance of the Mexican Water Treaty as provided in section 401, and (ii) protection of States and areas of origin of such imported water as provided in section 202(a).

(h) The interest rate applicable to those portions of the reimbursable costs of each unit of the project which are properly allocated to commercial power development and municipal and industrial water supply shall be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which the first advance is made for initiating construction of such unit, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations which are neither due nor callable for redemption for fifteen years from the date of issue.

(i) Business-type budgets shall be submitted to the Congress annually for all operations financed by the development fund.

SEC. 404. (a) Irrigation repayment contracts shall provide for repayment of the obligation assumed under any irrigation repayment contract with respect to any project contract unit or irrigation block over a basic period of not more than fifty years exclusive of any development periods authorized by law: contracts authorized by section 9(e) of the Reclamation Project Act of 1939 (53 Stat. 1196; 43 U.S.C. 485h(e)) may provide for delivery of water for a period of fifty years and for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits and from such other points of delivery as the Secretary may designate; and long-term contracts relating to irrigation water supply shall provide that water made available thereunder may be made available by the Secretary for municipal or industrial purposes if and to the extent that such water is not required by the contractor for irrigation purposes.

(b) Contracts relating to municipal and industrial water supply from the project may be made without regard to the limitations of the last sentence of section 9(c) of the Reclamation Project Act of 1939 (53 Stat. 1194); may provide for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits; and may provide for repayment over a period of fifty years if made pursuant to clause (1) of said section and for the delivery of water over a period of fifty years if made pursuant to clause (2) thereof.

SEC. 405. On January 1 of each year the Secretary shall report to the Congress, beginning with the fiscal year ending June 30, 1968, upon the status of the revenues from and the cost of constructing, operating, and maintaining the project and each unit thereof for the preceding fiscal year. The report of the Secretary shall be prepared to reflect accurately the Federal investment allocated at that time to power, to irrigation, and to other purposes, the progress of return and repayment thereon, and the estimated rate of progress, year by year, in accomplishing full repayment.

TITLE V—UPPER COLORADO RIVER BASIN AUTHORIZATIONS AND REIMBURSEMENTS

SEC. 501. (a) In order to provide for the construction, operation, and maintenance of the Animas-La Plata Federal reclamation project, Colorado-New Mexico: the Dolores, Dallas Creek, West Divide, and San Miguel Federal reclamation projects, Colorado, as participating projects under the Colorado River Storage Project Act (70 Stat. 105; 43 U.S.C. 620), and to provide for the completion of planning reports on other participating projects, subsection (2) of section 1 of said Act is hereby further amended by deleting the words "Pine River extension", and inserting in lieu thereof the words "Animas-La Plata, Dolores, Dallas Creek, West Divide, San Miguel". Section 2 of said Act is hereby further amended by deleting the words "Parshall, Troublesome, Rabbit Ear, San Miguel, West Divide, Tomichi Creek, East River, Ohio Creek, Dallas Creek, Dolores, Fruit Growers extension, Animas-La Plata", and inserting after the words "Yellow Jacket" the words "Basalt, Middle Park (including the Troublesome, Rabbit Ear, and Azure units), Upper Gunnison (including the East River, Ohio Creek and Tomichi Creek units), Lower Yampa (including the Juniper and Great Northern units), Upper Yampa (including the Hayden Mesa, Wessels, and Toponas units)", and by inserting the words "Sublette" the words "(including the Kendall Reservoir on Green River and a diversion of water from the Green River to the North Platte River Basin in Wyoming), Uintah unit and Ute Indian unit of the Central Utah, San Juan County (Utah), Price River, Grand County (Utah), Ute Indian unit extension of the Central Utah, Gray Canyon, and Juniper (Utah)". The amount which section 12 of said Act authorizes to be appropriated is hereby further increased by the sum of \$300,000,000 plus or minus such amounts, if any, as may be required, by reason of changes in construction costs as indicated by engineering cost indexes applicable to the type of construction involved. This additional sum shall be available solely for the construction of the projects herein authorized.

(b) The Animas-La Plata Federal reclamation project shall be constructed and operated in substantial accordance with the engineering plans set out in the report of the Secretary transmitted to the Congress on May 4, 1966, and printed as House Document 436, Eighty-ninth Congress: *Provided*, That the project construction of the Animas-La Plata Federal reclamation project shall not be undertaken until and unless the States of Colorado and New Mexico shall have ratified the following compact to which the consent of Congress is hereby given:

"ANIMAS-LA PLATA PROJECT COMPACT

"The State of Colorado and the State of New Mexico, in order to implement the operation of the Animas-La Plata Federal Reclamation Project, Colorado-New Mexico, a proposed participating project under the Colorado River Storage Project Act (70 Stat. 105), and being moved by considerations of interstate comity, have resolved to conclude a compact for these purposes and have agreed upon the following articles:

"ARTICLE I

"A. The right to store and divert water in Colorado and New Mexico from the La Plata and Animas River systems, including return flow to the La Plata River from Animas River diversions, for uses in New Mexico under the Animas-La Plata Federal Reclamation Project shall be valid and of equal priority with those rights granted by decree of the Colorado state courts for the uses of water in Colorado for that project, providing such uses in New Mexico are within the allocation of water made to that state by articles III and XIV of the Upper Colorado River Basin Compact (63 Stat. 31).

"B. The restrictions of the last sentence of Section (a) of Article IX of the Upper Colorado River Basin Compact shall not be construed to vitiate paragraph A of this article.

"ARTICLE II

"This Compact shall become binding and obligatory when it shall have been ratified by the legislatures of each of the signatory States."

(c) The Secretary shall, for the Animas-La Plata, Dolores, Dallas Creek, San Miguel, West Divide, and Seedskadee participating projects of the Colorado River storage project, establish the nonexcess irrigable acreage for which any single ownership may receive project water at one hundred and sixty acres of class 1 land or the equivalent thereof as determined by the Secretary, in other land classes.

(d) In the diversion and storage of water for any project or any parts thereof constructed under the authority of this Act or the Colorado River Storage Project Act within and for the benefit of the State of Colorado only, the Secretary is directed to comply with the constitution and statutes of the State of Colorado relating to priority of appropriation; with State and Federal court decrees entered pursuant thereto; and with operating principles, if any, adopted by the Secretary and approved by the State of Colorado.

(e) The words "any western slope appropriations" contained in paragraph (i) of that section of Senate Document Numbered 80, Seventy-fifth Congress, first session, entitled "Manner of Operation of Project Facilities and Auxiliary Features," shall mean and refer to the appropriation heretofore made for the storage of water in Green Mountain Reservoir, a unit of the Colorado-Big Thompson Federal reclamation project, Colorado; and the Secretary is directed to act in accordance with such meaning and reference. It is the sense of Congress that this directive defines and observes the purpose of said paragraph (i), and does not in any way affect or alter any rights or obligations arising under said Senate Document Numbered 80 or under the laws of the State of Colorado.

SEC. 502. The Upper Colorado River Basin fund established under section 5 of the Act of April 11, 1958 (70 Stat. 107), shall be reimbursed from the Colorado River development fund established by section 2 of the Boulder Canyon Project Adjustment Act (54 Stat. 755), for all expenditures heretofore or hereafter made from the Upper Colorado River Basin fund to meet deficiencies in generation at Hoover Dam during the filling period of reservoirs of storage units of the Colorado River storage project pursuant to the criteria for the filling of Glen Canyon Reservoir (27 Fed. Reg. 6851, July 19, 1962). For this purpose \$500,000 for each year of operation of Hoover Dam and powerplant, commencing with the enactment of this Act, shall be transferred from the Colorado River development fund to the Upper Colorado River Basin fund, in lieu of application of said amounts to the purposes stated in section 2(d) of the Boulder Canyon Project Adjustment Act, until such reimbursement is accomplished. To the extent that any deficiency in such reimbursement remains as of June 1, 1987, the amount of the remaining deficiency shall then be transferred to the Upper Colorado River Basin fund from the lower Colorado River Basin development fund, as provided in paragraph (d) of section 403.

TITLE VI—GENERAL PROVISIONS: DEFINITIONS: CONDITIONS

SEC. 601. (a) Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994), the decree entered by the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), or, except as otherwise provided herein, the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774) or the Colorado River Storage Project Act (70 Stat. 105).

(b) The Secretary is directed to—

(1) make reports as to the annual consumptive uses and losses of water from the Colorado River system after each successive five-year period, beginning with the five-year period starting on October 1, 1965. Such reports shall be prepared in consultation with the States of the lower basin individually and with the Upper Colorado River Commission, and shall be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River Compact.

(2) condition all contracts for the delivery of water originating in the drainage basin of the Colorado River system upon the availability of water under the Colorado River Compact.

(c) All Federal officer and agencies are directed to comply with the applicable provisions of this Act, and of the laws, treaty, compacts, and decree referred to in subsection (a) of this section, in the storage and release of water from all reservoirs and in the operation and maintenance of all facilities in the Colorado River system under the jurisdiction and supervision of the Secretary, and in the operation and maintenance of all works which may be authorized hereafter for construction for the importation of water into the Colorado River system. In the event of failure of any such officer or agency to so comply, any affected State may maintain an action to enforce the provisions of this section in the Supreme Court of the United States and consent is given to the joinder of the United States as a party in such suit or suits, as a defendant or otherwise.

(d) Nothing in this Act shall be construed to expand or diminish either Federal or State jurisdiction, responsibility or rights in the field of water resources planning, development, or control; nor to displace, supersede, limit or modify any interstate compact or the jurisdiction or responsibility of any legally established joint or common agency of two or more States, or of two or more States and the Federal Government; nor to limit the authority of Congress to authorize and fund projects.

SEC. 602. (a) In order to fully comply with and carry out the provisions of the Colorado River Compact, the Upper Colorado River Basin Compact and the Mexican Water Treaty, the Secretary shall propose criteria for the coordinated long-range operation of the reservoirs constructed and operated under the authority of this Act, the Colorado River Storage Project Act, the Boulder Canyon Project Act and the Boulder Canyon Project Adjustment Act. To effect in part the purposes expressed in this paragraph, the criteria shall make provision for the storage of water in storage units of the Colorado River Storage Project and releases of water from Lake Powell in the following listed order of priority:

(1) Releases to supply one-half the deficiency described in article III(c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the upper division, but in any event such releases, if any, shall terminate when the President issues the proclamation specified in section 305(b) of this Act.

(2) Releases to comply with article III(d) of the Colorado River Compact, less such quantities of water delivered into the Colorado River below Lee Ferry to the credit of the States of the upper division from sources outside the natural drainage area of the Colorado River system.

(3) Storage of water not required for the releases specified in clauses (1) and (2) of this subsection to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three lower division States and taking into consideration all relevant factors (including, but not limited to, historic streamflows, the most critical period of record, and probabilities of water supply), shall find to be reasonably necessary to assure deliveries under clauses (1) and (2) without impairment of annual consumptive uses in the upper basin pursuant to the Colorado River Compact: *Provided*, That water not so required to be stored shall be released from Lake Powell: (1) to the extent it can be reasonably applied in the States of the lower division to the uses speci-

fied in article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and (iii) to avoid anticipated spills from Lake Powell.

(b) Not later than July 1, 1968, the criteria proposed in accordance with the foregoing subsection (a) of this section shall be submitted to the governors of the seven Colorado River Basin States and to such other parties and agencies as the Secretary may deem appropriate for their review and comment. After receipt of comments on the proposed criteria, but not later than January 1, 1969, the Secretary shall adopt appropriate criteria in accordance with this section and publish the same in the Federal Register. Beginning January 1, 1970, and yearly thereafter, the Secretary shall transmit to the Congress and to the governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected operation for the current year. As a result of actual operating experience or unforeseen circumstances, the Secretary may thereafter modify the criteria to better achieve the purposes specified in subsection (a) of this section, but only after correspondence with the Governors of the seven Colorado River Basin States and appropriate consultation with such state representatives as each governor may designate.

(c) Section 7 of the Colorado River Storage Project Act shall be administered in accordance with the foregoing criteria.

Sec. 603. (a) Rights of the upper basin to the consumptive use of water apportioned to that basin from the Colorado River system by the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin.

(b) Nothing in this Act shall be construed so as to impair, conflict with or otherwise change the duties and powers of the Upper Colorado River Commission.

Sec. 604. Except as otherwise provided in this Act, in constructing, operating, and maintaining the units of the project herein and hereafter authorized, the Secretary shall be governed by the Federal reclamation laws (Act of June 17, 1902; 32 Stat. 388 and Acts amendatory thereof or supplementary thereto) to which laws this Act shall be deemed a supplement.

Sec. 605. (a) All terms used in this Act which are defined in the Colorado River Compact shall have the meanings there defined.

(b) "Main stream" means the main stream of the Colorado River downstream from Lees Ferry within the United States, including the reservoirs thereon.

(c) "User" or "water user" in relation to main stream water in the lower basin means the United States, or any person or legal entity, entitled under the decree of the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), to use main stream water when available thereunder.

(d) "Active storage" means that amount of water in reservoir storage, exclusive of bank storage, which can be released through the existing reservoir outlet works.

(e) "Colorado River Basin States" means the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming.

[S. 20, 90th Cong., first sess.]

AN ACT To provide for a comprehensive review of national water resource problems and programs, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Water Commission Act".

THE NATIONAL WATER COMMISSION

Sec. 2. (a) There is established the National Water Commission (hereinafter referred to as the "Commission").

(b) The Commission shall be composed of seven members, who shall be appointed by the President, by and with the advice and consent of the Senate. Members shall serve at the pleasure of the President. No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.

(c) The President shall designate a Chairman of the Commission (hereinafter referred to as the "Chairman") from among its members.

(d) Members of the Commission may each be compensated at the rate of \$100 for each day such member is engaged in the actual performance of duties vested in the Commission. Each member shall be reimbursed for travel expenses, including per diem in lieu of subsistence, as authorized by law (5 U.S.C. 73b-2) for persons in the Government service employed intermittently.

(e) The Commission shall have an Executive Director, who shall be appointed by the Chairman with the approval of the President and shall be compensated at the rate provided by law for level IV of the Federal Executive Salary Schedule. The Executive Director shall have such duties and responsibilities as the Chairman may assign.

DUTIES OF THE COMMISSION

SEC. 3. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to, desalting, weather modification, and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council.

(b) The Commission shall consult with the Water Resources Council regarding its studies and shall furnish its proposed reports and recommendations to the Council for review and comment. The Commission shall submit to the President such interim and final reports as it deems appropriate, and the Council shall submit to the President its views on the Commission's reports. The President shall transmit the Commission's final report to the Congress together with such comments and recommendations for legislation as he deems appropriate.

(c) The Commission shall terminate not later than five years from the effective date of this Act.

POWERS OF THE COMMISSION

SEC. 4. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) without regard to the civil service laws and regulations and without regard to the Classification Act of 1949 as amended, employ and fix the compensation of such personnel as may be necessary to carry out the functions of the Commission: *Provided*, That of such personnel no more than five persons may receive compensation equivalent to the compensation established for grade 18 under the Classification Act of 1949 as amended; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a) at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

(b) Any member of the Commission is authorized to administer oaths when it is determined by a majority of the Commission that testimony shall be taken or evidence received under oath.

POWERS AND DUTIES OF THE CHAIRMAN

SEC. 5. (a) Subject to general policies adopted by the Commission, the Chairman shall be the chief executive of the Commission and shall exercise its executive and administrative powers as set forth in section 4(a)(2) through section 4(a)(8).

(b) The Chairman may make such provision as he shall deem appropriate authorizing the performance of any of his executive and administrative functions by the Executive Director or other personnel of the Commission.

OTHER FEDERAL AGENCIES

SEC. 6. (a) The Commission may, to the extent practicable, utilize the services of the Federal water resource agencies.

(b) Upon request of the Commission, the head of any Federal department or agency or river basin commission created pursuant to title II of the Water Resources Planning Act is authorized (1) to furnish to the Commission, to the extent permitted by law and within the limits of available funds, including funds transferred for that purpose pursuant to section 4(a) (7) of this Act, such information as may be necessary for carrying out its functions and as may be available to or procurable by such department or agency, and (2) to detail to temporary duty with this Commission on a reimbursable basis such personnel within his administrative jurisdiction as it may need or believe to be useful for carrying out its functions, each such detail to be without loss of seniority, pay, or other employee status.

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C. 40e) shall apply to the collection of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665(g)) shall apply to appropriations of the Commission: *And provided further*, That the Commission shall not be required to prescribe such regulations.

APPROPRIATIONS

SEC. 7. There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this Act.

Passed the Senate February 6, 1967.

Attest:

FRANCIS R. VALEO,
Secretary.

[H.R. 1416, 90th Cong., 1st sess.]

A BILL To provide for a comprehensive review of national water resource problems and programs, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Water Commission Act".

THE NATIONAL WATER COMMISSION

SEC. 2. (a) There is established the National Water Commission (hereinafter referred to as the "Commission").

(b) The Commission shall be composed of seven members, who shall be appointed by the President and serve at his pleasure. No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.

(c) The President shall designate the Chairman of the Commission (hereinafter referred to as the "Chairman") from among its members.

(d) Members of the Commission may each be compensated at the rate of \$100 for each day such member is engaged in the actual performance of duties vested in the Commission. Each member shall be reimbursed for travel expenses, including per diem in lieu of subsistence, as authorized by law (5 U.S.C. 73b-2) for persons in the Government service employed intermittently.

(e) The Commission shall have an Executive Director, who shall be appointed by the Chairman with the approval of the President and shall be compensated

at the rate provided by law for level IV of the Federal Executive Salary Schedule. The Executive Director shall have such duties and responsibilities as the Chairman may assign.

DUTIES OF THE COMMISSION

SEC. 3. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to, desalting, weather modification, and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council established in section 101 of the Water Resources Planning Act (79 Stat. 245) (hereinafter referred to as the "Council") and (4) conduct such specific investigations as are authorized herein or as hereafter may be authorized by the Congress.

(b) The Commission shall consult with the Council regarding its studies and shall furnish its proposed reports and recommendations to the Council for review and comment. The Commission shall submit to the President such interim and final reports as it deems appropriate and the Council shall submit to the President its views on the Commission's reports. The President shall transmit the Commission's final report to the Congress together with such comments and recommendations for legislation as he deems appropriate.

(c) The Commission shall terminate not later than six years from the effective date of this Act.

POWERS OF THE COMMISSION

SEC. 4. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) without regard to the civil service laws and regulations and without regard to the Classification Act of 1949 as amended, employ and fix the compensation of such personnel as may be necessary to carry out the functions of the Commission: *Provided*, That of such personnel no more than five persons may receive compensation equivalent to the compensation established for grade 18 under the Classification Act of 1949 as amended; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a) at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

(b) Any member of the Commission is authorized to administer oaths when it is determined by a majority of the Commission that testimony shall be taken or evidence received under oath.

POWERS AND DUTIES OF THE CHAIRMAN

SEC. 5. (a) Subject to general policies adopted by the Commission, the Chairman shall be the chief executive of the Commission and shall exercise its executive and administrative powers as set forth in section 4 (a) (2) through section 4 (a) (8).

(b) The Chairman may make such provision as he shall deem appropriate authorizing the performance of any of his executive and administrative functions by the Executive Director or other personnel of the Commission.

OTHER FEDERAL AGENCIES

SEC. 6. (a) The Commission shall, to the extent practicable, utilize the services of the Federal water resource agencies.

(b) Upon request of the Commission, the head of any Federal department or agency or river basin commission created pursuant to title II of the Water Resources Planning Act is authorized (1) to furnish to the Commission, to the extent permitted by law and within the limits of available funds, including funds transferred for that purpose pursuant to section 4 (a) (7) of this Act, such information as may be necessary for carrying out its functions and as may be available to or procurable by such department or agency, and (2) to detail to temporary duty with this Commission on a reimbursable basis such personnel within his administrative jurisdiction as it may need or believe to be useful for carrying out its functions, each such detail to be without loss of seniority, pay, or other employee status.

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C. 46e) shall apply to the collection of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665 (g)) shall apply to appropriations of the Commission: *And provided further*, That the Commission shall not be required to prescribe such regulations.

APPROPRIATIONS

SEC. 7. There are hereby authorized to be appropriated such sums as are required to carry out the purposes of this Act.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., February 15, 1967.

HON. WAYNE N. ASPINALL,
Chairman, Committee on Interior and Insular Affairs, House of Representatives,
Washington, D.C.

DEAR MR. CHAIRMAN: This responds to your request for a report on H.R. 3300, a bill "To authorize the construction, operation, and maintenance of the Colorado River Basin project, and for other purposes."

With two important exceptions, the bill is patterned after H.R. 4671, 89th Congress, which was extensively considered and, with modifications, favorably reported by your Committee on August 11, 1966 (H. Rept. No. 1849, 89th Cong., 2nd sess.). The two differences are: the Marble Canyon unit is eliminated, and the Secretary of the Interior would be directed to make a reconnaissance grade investigation of projects to augment the flow of the main stream Colorado River below Lee Ferry by a minimum of 2,500,000 acre-feet annually, by imports from sources outside the Colorado River Basin. H.R. 4671, as reported, called for a feasibility report as well. References hereafter to H.R. 4671 are, except as otherwise noted, to that measure as reported.

The basic objectives of the first four titles of H.R. 3300 are two-fold—to authorize the Central Arizona project thereby enabling Arizona to use its entitlement of Colorado River water, and, at the same time, to lay the framework for a sound and lasting solution for the Colorado River Basin's long-range water supply.

With these objectives, the Department and the Administration are in full accord.

The Administration is committed to the authorization of the Central Arizona project. If the State of Arizona is to put to use its entitlement of Colorado River water as adjudicated by the Supreme Court in *Arizona v. California, et al.*, 373 U.S. 546 (1963), this project must be built. The Central Arizona project

should be undertaken now in order to slow the pace at which ground water resources in the Central Arizona area are being exhausted.

Similarly, we are in agreement that studies of the long-range water supply problems of the Colorado River basin should now be initiated in order that proposed solutions may be evolved and considered in a timely fashion.

Over the past four months, in concert with the Bureau of the Budget, we have analyzed a wide variety of possible alternative approaches to the basic objectives encompassed in Titles I-IV of H.R. 3300 and its predecessor, H.R. 4671. These studies have led us to the following recommendations:

1. Authorization of the Central Arizona project (including Hooker Dam in New Mexico) with provision for assistance in meeting repayment requirements in Arizona through (a) a \$10 per acre-foot average canal-side irrigation rate, (b) a \$50 per acre-foot municipal and industrial water rate, (c) a small addition to the municipal and industrial water rate, or an ad valorem tax, or a combination of the two;
2. Provision of low-cost pumping power for the Central Arizona project through prepayment for the requisite capacity and associated transmission facilities in a large, efficient thermal plant to be constructed in the southwest area by a combination of public and private utilities associated with Western Energy Supply and Transmission Associates (WEST);
3. Programs for water salvage and recovery of ground water along and adjacent to the main stream of the lower Colorado River;
4. Expansion of the Grand Canyon National Park to include the Marble Canyon site and the elimination of the latter development from the program;
5. Deferral of action on the Hualapai (Bridge Canyon) project at this time, reserving the question of disposition of the Hualapai site for future consideration by the Congress;
6. Establishment of the National Water Commission to re-examine the nation's critical water supply problems, including the Colorado River Basin, as heretofore recommended by the Administration.

The foregoing program will, we believe, provide the authorization necessary to meet the most immediate water development needs in the lower Colorado River Basin area. At the same time, the studies of the National Water Commission will provide a background of information and advice against which long-range solutions to the region's water supply problems can be effectively evolved.

The segments of the lower Colorado River that would be inundated by the Hualapai and Marble Canyon developments possess major scenic and wilderness values. Whether the benefits to be derived from construction of these projects are of sufficient importance to outweigh the retention of these areas in their present state has been one of the most vexing issues that has emerged in connection with consideration of Colorado River resource problems. After further consideration of all aspects of the matter, we have concluded that the highest and best use of the Marble Canyon site is to retain it in its natural state as an addition to the existing Grand Canyon National Park. Studies regarding the boundaries of the proposed addition to the park will be completed shortly and, as soon as possible, we shall transmit for the Committee's consideration a draft of a bill to carry out this recommendation. Pending action on it, we believe that legislation authorizing the Central Arizona project should also remove the Marble Canyon site, along with the Hualapai site hereafter discussed, from the operation of Part I of the Federal Power Act. If the necessary determinations can be completed in time, there would be no objection to including the park extension in the present legislation.

Whether hydroelectric development of the Hualapai site should also be precluded permanently need not be decided at this time. Deferment of this decision need not affect construction of the Central Arizona project since, under our recommendations, the Central Arizona unit will not depend upon a main stream Colorado River hydroelectric power development as a source of pumping power and financial assistance.

We, therefore, reiterate the recommendation made in our report of May 17, 1965, on H.R. 4671 and by the Bureau of the Budget in its report of May 10, 1965, on S. 75 and S. 1019, that consideration of the Hualapai site be deferred by the Congress pending evaluation of the issue by the National Water Commission.

In order to preserve Congressional freedom of action with respect to Hualapai, Part I of the Federal Power Act should be made inapplicable to it.

We believe that the National Water Commission should be authorized separately as provided by S. 20 which was passed by the Senate on February 6 and is before your Committee. Sections 201-206 of H.R. 3300 would also establish a Commission with similar authority.

We believe the Commission is the appropriate entity to undertake an evaluation of basic issues relative to Colorado River water supply problems. The Commission would be directed by section 3(a) of the Senate-passed bill to:

"(1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to desalting, weather modification and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council."

Advice and guidance on these matters, all relevant to the Colorado Basin's water problems, by a disinterested and objective Commission composed of outstanding citizens should provide background of great assistance in the formulation of specific proposals. The Commission can be expected to give prompt consideration to the problems of the Colorado River Basin. As President Johnson said in his message to the Congress on "Protecting our Natural Heritage" of January 30, 1967, in renewing his recommendation for the establishment of the Commission, "We must thoroughly explore every means for assuring an adequate supply of pure water to arid areas like the Southwest."

Under the previously proposed plan for the Central Arizona project, which envisioned provision of pumping power and financial assistance from main stream hydroelectric power developments, all reimbursable costs would have been returned through financial assistance from power sales and average rates \$10 and \$50 per acre-foot for irrigation and municipal and industrial water, respectively. This \$50 M&I rate included a component for irrigation assistance. Federal financing of a portion of a nonfederally owned thermal plant through prepayment for project power requirements would provide low-cost pumping power and would eliminate the necessity for financial assistance from main stream Colorado River hydroelectric projects.

Using the previously proposed average water rates, our studies estimate that under such a situation, the project cost would be repaid either by increasing the M&I rate to \$56.00 per acre-foot or by assessing the project service area in Arizona with an annual ad valorem tax levy which would come to 0.6 mills per dollar of assessed valuation if Pinal, Maricopa, and Pima Counties are included. The economic benefits of the project should manifest themselves in an increase in the area's wealth which, in turn, would be reflected in a growth of the tax base. All things considered, the increase in taxes would seem to be relatively modest.

Obviously, various combinations of the two alternatives of the municipal and industrial water charge and the ad valorem levy are possible. Decisions on the actual mix should be taken only in closest consultation with the State and local people concerned. The legislation we are suggesting will provide the requisite flexibility. The average \$10 per acre-foot canal-side irrigation water rate, which results in an average rate of \$16 per acre-foot at the farmer's headgate, however, is not capable of substantial adjustment. It represents the average repayment ability of the water users, given other necessary costs, reasonable profit allowances and maintenance of the type of agriculture consistent with the objectives of the Federal reclamation program. Among the factors which restrict an upward thrust of the average irrigation water rate for the Central Arizona project are the restraints proposed upon the expansion of irrigation and the lack of an assurance of a continuing water supply. Consequently, we contemplate retention of the \$10 rate, on the basis of current price levels.

This plan adheres to all present reclamation repayment policies. There are precedents for the use of a small M&I surcharge or ad valorem tax for irrigation repayment assistance. The Central Valley Project in California is an example

of the former. The Colorado River Storage Project and the Fryingpan-Arkansas Project, both upper Colorado River Basin projects, are among the latter, as is the Garrison Diversion Project in North Dakota.

While the prepaid purchase of pumping power from a non-Federal steam-electric plant would be a departure in reclamation history, the provision of pumping power for project use is, itself, customary. There are indications that Bureau of Reclamation cooperation in a non-Federal steamplant would be acceptable to the public and private generating utilities in the WEST organization.

Enclosed as Attachment A is a draft of bill, sections 1-7 of which would give effect to the foregoing recommendations. Additional comments on these sections of this draft are made in Attachment B, entitled "Analysis of Proposed Bill."

H.R. 3300, as did H.R. 4671, would grant California a priority for the consumptive use of 4,400,000 acre-feet of water as against diversions for the Central Arizona project in any year in which there is less than 7,500,000 acre-feet of main stream Colorado River water available for consumptive use in the three lower basin States of Arizona, California, and Nevada. In such event, diversions for the Central Arizona project would also be curtailed in favor of existing users in Arizona and Nevada. This priority would persist until works are in operation capable of augmenting the flow of the main stream of the Colorado River below Lee Ferry by not less than 2,500,000 acre-feet annually. This interstate priority was arrived at by agreement of the States involved. Earlier, the Senate Interior and Insular Affairs Committee, in favorably reporting S. 1658 in the 88th Congress, provided a similar California priority as against the Central Arizona project, but terminating in 25 years.

We believe the questions of whether there should be a statutory priority and of its terms are primarily for resolution by the States involved and the Congress. If agreement can be reached upon an interstate priority, the Administration would offer no objection. The Bureau of Reclamation water supply studies, financial analysis and feasibility determination for the Central Arizona project have been made in the light of a priority of 4,400,000 acre-feet per annum for California uses and for existing rights and uses in Nevada and Arizona.

Payout assistance from a lower Colorado River Basin fund would not be necessary under our proposal. However, if the Congress deems it appropriate to establish such a fund at this time to provide financial assistance for other future water developments for the lower basin, we perceive no objection thereto. Presumably, such a fund would include post-amortization revenues from the existing Hoover and Parker-Davis projects, the Central Arizona project, and such other Federal dams as may be subsequently constructed in the lower basin. The most recent step by the Congress in this direction was the establishment of a Columbia Basin account by section 2 of P.L. 49-448 of June 14, 1966. In the event the Committee concludes that a lower Colorado River Basin development fund should be established at this time, we also transmit such a provision (Attachment C) for the Committee's consideration.

The following table compares the construction cost of the lower Colorado program we recommend be authorized with the cost of the construction authorizations contained in Title III of H.R. 3300:

	Administration recommendation	Title III, H. R. 3300
Hualapai (including Coconino silt retention dam)		\$220,000,000
Paria silt retention dam		11,000,000
Central Arizona project	\$580,000,000	580,000,000
Thermal prepay	92,000,000	92,000,000
Water salvage	42,000,000	42,000,000
Fish and wildlife	5,000,000	5,000,000
Total	719,000,000	1,350,000,000

H.R. 3300 would also authorize five participating projects under the Colorado River Storage Project Act, Animas-La Plata, Colorado-New Mexico and Dolores, Dallas Creek, West Divide and San Miguel in Colorado.

In transmitting the planning reports on these projects to the Congress, the Animas-La Plata and Dolores projects were recommended for immediate authorization. Deferral, pending the establishment and completion of review by the

National Water Commission of related water problems, was proposed for the others. This proposed legislation would seem to be the appropriate vehicle to authorize the Animas-La Plata and Dolores projects. This could be accomplished by inclusion therein of a provision along the lines of Section 501 of H.R. 3300. In that event subsections (a) and (c) would be modified to omit the Dallas Creek, West Divide and San Miguel projects. We would also propose to eliminate what is now subsection (d) of Section 501 of H.R. 3300 (Section 501(d) of H.R. 4671) for the reasons stated last year in Commissioner Dominy's testimony. (See pp. 1343-1344, Serial 89-17 Part II, Hearings on "Lower Colorado River Basin Project.") We would offer no objection to the inclusion of provisions like Sections 501 (b) and (e) of H.R. 3300. Nor would there be objection to applying the "Class 1 equivalency" concept to acreage limitations for the Animas-La Plata, Dolores and Seedskadee projects (Sec. 501(c) H.R. 3300), in view of the high altitude and relatively short growing seasons of the areas involved.

In addition to the foregoing authorization of participating projects under the Colorado River Storage Project Act, H.R. 3300 includes a number of provisions affecting upper and lower Colorado River Basin relationships. These provisions have largely been arrived at in the course of interbasin discussions and Congressional consideration of earlier Colorado River bills. There is no objection to inclusion of the substance of these provisions in this legislation and the attached draft bill so provides, commencing with Section 8. Comments on them are contained in Attachment B.

In addition to H.R. 3300, reports were also requested on H.R. 9, H.R. 722, H.R. 744, H.R. 1179 and H.R. 1271. H.R. 744, except for the omission of Section 502, is identical to H.R. 3300. H.R. 722 is identical to H.R. 4671 as reported by your Committee last year. H.R. 9, H.R. 1179 and H.R. 1271 are identical. These three bills differ from H.R. 3300 principally in that they (a) are less specific regarding the scope and timing of investigations to be undertaken by the Secretary pursuant to Title II, (b) specify a minimum 3,000 cfs capacity for the Granite Reef aqueduct, (c) provide for a Gila River exchange of 18,000 acre-feet annually in favor of New Mexico users, (d) omit the interstate priorities in favor of California (4.4 million acre-feet) and existing Nevada uses, as against diversions for the Central Arizona project in the event of shortage, and (e) omit the provisions dealing with upper Colorado River basin authorizations and reimbursements (Title V of H.R. 3300). The views expressed in this report are applicable to the measures referred to in this paragraph as well as to H.R. 3300.

The Bureau of the Budget advises that there is no objection to the presentation of this report from the standpoint of the Administration's program, and that the enactment of legislation to authorize the Central Arizona project as herein proposed is in accord with the program of the President.

Sincerely yours,

STEWART L. UDALL, *Secretary of the Interior.*

ATTACHMENT A

A BILL TO authorize the construction, operation, and maintenance of the Central Arizona project, Arizona-New Mexico, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

SEC. 1. That this Act may be cited as the "Central Arizona Project Act."

SEC. 2.(a) For the purposes of furnishing irrigation water and municipal water supplies to the water deficient areas of Arizona and western New Mexico through direct diversion or exchange of water, generation of electric power and energy, control of floods, conservation and development of fish and wildlife resources, enhancement of recreation opportunities, and for other purposes, the Secretary of the Interior (hereinafter referred to as the "Secretary") shall construct, operate, and maintain the Central Arizona project, consisting of the following principal works: (1) a system of main conduits and canals, including a main canal and pumping plants (Granite Reef aqueduct and pumping plants), for diverting and carrying water from Lake Havasu to Orme Dam or suitable alternative, which system shall have a capacity of two thousand five hundred cubic feet per second; (2) Orme Dam and Reservoir and power-pumping plant or suitable alternative; (3) Buttes Dam and Reservoir, which shall be so operated as to not prejudice the rights of any user in and to the waters of the Gila

River as those rights are set forth in the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in United States against Gila Valley Irrigation District and others (Globe Equity Number 59); (4) Hooker Dam and Reservoir; (5) Charleston Dam and Reservoir; (6) Tucson aqueducts and pumping plants; (7) Salt-Gila aqueduct; (8) canals, regulating facilities, hydroelectric powerplants, and electrical transmission facilities; (9) related water distribution and drainage works; and (10) appurtenant works.

(b) The Secretary may enter into an agreement with non-Federal interests proposing to construct a thermal generating powerplant whereby the United States shall acquire the right to such portion of the capacity of such plant, including delivery of power and energy over appurtenant transmission facilities to mutually agreed upon delivery points, as he determines is required in connection with the Central Arizona project. Power and energy acquired thereunder may be disposed of intermittently by the Secretary when not required in connection with the Central Arizona project. The agreement shall provide, among other things, that—

(1) The United States shall pay not more than that portion of the total construction cost, exclusive of interest during construction, of the powerplant, and of any switchyards and transmission facilities serving the United States, as is represented by the ratios of the respective capacities to be provided for the United States therein to the total capacities of such facilities. The Secretary shall make the Federal portion of such costs available to the non-Federal interests during the construction period, including the period of preparation of designs and specifications, in such installments as will facilitate a timely construction schedule;

(2) Annual operation and maintenance costs, including provision for depreciation (except as to depreciation on the pro-rata share of construction cost borne by the United States in accordance with the foregoing subdivision (1)) shall be apportioned between the United States and the non-Federal interests on an equitable basis taking into account the ratios determined in accordance with the foregoing subdivision (1);

(3) Costs to be borne by the United States under subdivisions (1) and (2) shall not include (a) interest and interest during construction, (b) financing charges, (c) taxes (except for Social Security and other payroll taxes) including but not limited to real or personal property taxes, gross or net income taxes, and sales, use, and transaction privilege taxes, (d) franchise fees, and (e) such other costs as shall be specified in the agreement;

(4) The United States shall be given appropriate credit for any interests in Federal lands administered by the Department of the Interior that are made available for the powerplant and appurtenances.

(c) Unless and until otherwise provided by Congress, water from the Central Arizona project shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas.

(d) (1) Irrigation and municipal and industrial water supply under the Central Arizona project within the State of Arizona may, in the event the Secretary determines that it is necessary to effect repayment, be pursuant to master contracts with organizations which have power to levy assessments against all taxable real property within their boundaries. The terms and conditions of contracts or other arrangements whereby each said organization makes water from the Central Arizona project available to uses within its boundaries shall be subject to the Secretary's approval and the United States shall, if the Secretary determines such action is desirable to facilitate carrying out the provisions of this Act, have the right to require that it be a party to such contracts or that contracts subsidiary to the master contracts be entered into between the United States and any user. The provisions of this subparagraph (1) shall not apply to the supplying of water to an Indian tribe for use within the boundaries of an Indian reservation.

(2) Any obligation assumed pursuant to section 9(d) of the Reclamation Project Act of 1939 (43 U.S.C. 485h(d)) with respect to any project contract unit or irrigation block shall be repaid over a basic period of not more than fifty years; any water service provided pursuant to section 9(e) of the Reclamation Project Act of 1939 (43 U.S.C. 485h(e)) may be on the basis of delivery

of water for a period of fifty years and for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits and from such other points of delivery as the Secretary may designate; and long-term contracts relating to irrigation water supply shall provide that water made available thereunder may be made available by the Secretary for municipal or industrial purposes if and to the extent that such water is not required by the contractor for irrigation purposes. Notwithstanding any other provisions of law no contract relating to an irrigation water supply under the Central Arizona project from the main stream of the Colorado River shall commit the United States to deliver such supply for a basic period of more than fifty years for each project contract unit or irrigation block, nor shall such a contract carry renewal or conversion rights or entitle the contractor to water beyond expiration of the delivery periods specified therein. In negotiating new contracts for delivery of such main stream water, the Secretary shall consult with representatives of the State of Arizona and the Secretary shall take into consideration the overall water supply and needs of the Central Arizona project.

(3) Contracts relating to municipal and industrial water supply under the Central Arizona project may be made without regard to the limitations of the last sentence of section 9(c) of the Reclamation Project Act of 1939 (43 U.S.C. 485h(c)); may provide for the delivery of such water at an identical price per acre-foot for water of the same class at the several points of delivery from the main canals and conduits; and may provide for repayment over a period of fifty years if made pursuant to clause (1) of said section and for the delivery of water over a period of fifty years if made pursuant to clause (2) thereof.

(e) Each contract under which water is provided under the Central Arizona project shall require that (1) there be in effect measures, adequate in the judgment of the Secretary, to control expansion of irrigation from aquifers affected by irrigation in the contract service area; (2) the canals and distribution systems through which water is conveyed after its delivery by the United States to the contractors shall be provided and maintained with linings, adequate in his judgment to prevent excessive conveyance losses; (3) neither the contractor nor the Secretary shall pump or permit others to pump ground water from lands located within the exterior boundaries of any Federal reclamation project or irrigation district receiving water from the Central Arizona project for any use outside such Federal reclamation project or irrigation district, unless the Secretary and the agency or organization operating and maintaining such Federal reclamation project or irrigation district shall agree or shall have previously agreed that a surplus of ground water exists and that drainage is or was required; and (4) all agricultural, municipal and industrial waste water, return flow, seepage, sewage effluent and ground water located in or flowing from contractor's service area originating or resulting from (i) waters contracted for from the Central Arizona project or (ii) waters stored or developed by any Federal reclamation project are reserved for the use and benefit of the United States as a source of supply for the service area of the Central Arizona project or for the service area of the Federal reclamation project, as the case may be: *Provided*, That notwithstanding the provisions of clause (3) of this subsection, the agricultural, municipal and industrial waste water, return flow, seepage, sewage effluent and ground water in or from any such Federal reclamation project, may also be pumped or diverted for use and delivery by the United States elsewhere in the service area of the Central Arizona project, if not needed for use or reuse in such Federal reclamation project.

(f) The Secretary may require in any contract under which water is provided from the Central Arizona project that the contractor agree to accept main stream water in exchange for or in replacement of existing supplies from sources other than the main stream. The Secretary shall so require in the case of users in Arizona who also use water from the Gila River system, to the extent necessary to make available to users of water from the Gila River system in New Mexico additional quantities of water as provided in and under the conditions specified in subsection (h) of this section: *Provided*, That such exchanges and replacements shall be accomplished without economic injury or cost to such Arizona contractors.

(g) In times of shortage or reduction of main stream Colorado River water for the Central Arizona project, as determined by the Secretary, users which have yielded water from other sources in exchange for main stream water sup-

plied by that project shall have a first priority to receive main stream water, as against other users supplied by that unit which have not so yielded water from other sources, but only in quantities adequate to replace the water so yielded.

(h) In the operation of the Central Arizona project, the Secretary shall offer to contract with water users in New Mexico for water from the Gila River, its tributaries and underground water sources, in amounts that will permit consumptive use of water in New Mexico not to exceed an annual average in any period of ten consecutive years of eighteen thousand acre-feet, including reservoir evaporation, over and above the consumptive uses provided for by article IV of the decree of the Supreme Court of the United States in *Arizona against California* (378 U.S. 340). Such increased consumptive uses shall not begin until and shall continue only so long as delivery of Colorado River water to downstream Gila River users in Arizona is being accomplished in accordance with this Act, in quantities sufficient to replace any diminution of their supply resulting from such diversions from the Gila River, its tributaries and underground water sources. In determining the amount required for this purpose full consideration shall be given to any differences in the quality of the waters involved. All additional consumptive uses provided for in this subsection shall be subject to all rights in New Mexico and Arizona as established by the decree entered by the United States District Court for the District of Arizona on June 29, 1935, in *United States against Gila Valley Irrigation District and others* (Globe Equity Number 59) and to all other rights existing on the effective date of this Act in New Mexico and Arizona to water from the Gila River, its tributaries and underground water sources, and shall be junior thereto and shall be made only to the extent possible without economic injury or cost to the holders of such rights.

SEC. 3. The conservation and development of the fish and wildlife resources and the enhancement of recreation opportunities in connection with the Central Arizona project works authorized pursuant to this Act shall be in accordance with the provisions of the Federal Water Project Recreation Act (79 Stat. 213).

SEC. 4. The Secretary shall determine the repayment capability of Indian lands within, under, or served by the Central Arizona project. Construction costs allocated to irrigation of Indian lands (including provision of water for incidental domestic and stock water uses) and within the repayment capability of such lands shall be subject to the Act of July 1, 1932 (47 Stat. 464), and such costs as are beyond repayment capability of such lands shall be nonreimbursable.

SEC. 5. The interest rate applicable to those portions of the reimbursable costs of the Central Arizona project which are properly allocated to commercial power development and municipal and industrial water supply shall be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which the first advance is made for initiating construction of such project, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations which are neither due nor callable for redemption for fifteen years from the date of issue.

SEC. 6. The Secretary may undertake programs for water salvage along and adjacent to the main stream of the Colorado River and for ground water recovery in the Yuma area. Such programs shall be consistent with maintenance of a reasonable degree of undisturbed habitat for fish and wildlife in the area, as determined by the Secretary. No groundwater recovery program hereby authorized shall be undertaken until the Secretary of State has reported to the President on consultation which he may have had with the Government of Mexico pursuant to the Water Treaty of 1944 (Treaty Series 994) and the President has approved a definite plan report thereon.

SEC. 7. Part I of the Federal Power Act (16 U.S.C. 791a-823) shall not be applicable to the reach of the Colorado River between Lake Mead and Glen Canyon Dam until and unless otherwise provided by Congress.

SEC. 8. The Upper Colorado River Basin fund established under section 5 of the Act of April 11, 1956 (70 Stat. 107), shall be reimbursed from the Colorado River development fund established by section 2 of the Boulder Canyon Project Adjustment Act (54 Stat. 755), for all expenditures heretofore or hereafter made from the Upper Colorado River Basin fund to meet deficiencies in generation at Hoover Dam during the filling period of reservoirs of storage units of the Colorado River storage project pursuant to the criteria for the filling of Glen Canyon Reservoir (27 Fed. Reg. 6851, July 19, 1962). For this purpose \$500,000 for each year of operation of Hoover Dam and powerplant, commencing

with the enactment of this Act, shall be transferred from the Colorado River development fund to the Upper Colorado River Basin fund, in lieu of application of said amounts to the purposes stated in section 2(d) of the Boulder Canyon Project Adjustment Act, until such reimbursement is accomplished. To the extent that any deficiency in such reimbursement remains as of June 1, 1987, the amount of the remaining deficiency shall then be transferred to the Upper Colorado River Basin fund from net revenues derived from the sale of electric energy generated at Hoover Dam.

Sec. 9(a). Nothing in this Act shall be construed to alter, amend, repeal, modify, or be in conflict with the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994), the decree entered by the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), or, except as otherwise provided herein, the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774) or the Colorado River Storage Project Act (70 Stat. 1065).

(b) The Secretary is directed to—

(1) make reports as to the annual consumptive uses and losses of water from the Colorado River system after each successive five-year period, beginning with the five-year period starting on October 1, 1965. Such reports shall be prepared in consultation with the States of the lower basin individually and with the Upper Colorado River Commission, and shall be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River Compact.

(2) condition all contracts for the delivery of water originating in the drainage basin of the Colorado River system upon the availability of water under the Colorado River Compact.

Sec. 10. (a) The Secretary shall propose criteria for the coordinated long-range operation of the reservoirs constructed and operated under the authority of the Colorado River Storage Project Act and the Boulder Canyon Project Act, consistent with the provisions of those statutes, the Boulder Canyon Project Adjustment Act, the Colorado River Compact, the Upper Colorado River Compact and the Mexican Water Treaty. To effect in part the purposes expressed in this paragraph, the criteria shall make provision for the storage of water in storage units of the Colorado River Storage Project and releases of water from Lake Powell in the following listed order of priority:

(1) Releases to supply one-half the deficiency described in article III(c) of the Colorado River Compact, if any such deficiency exists and is chargeable to the States of the upper division.

(2) Releases to comply with article III(d) of the Colorado River Compact.

(3) Storage of water not required for the releases specified in clauses (1) and (2) of this subsection to the extent that the Secretary, after consultation with the Upper Colorado River Commission and representatives of the three lower division States and taking into consideration all relevant factors (including, but not limited to, historic streamflows, the most critical period of record, and probabilities of water supply), shall find to be reasonably necessary to assure deliveries under clauses (1) and (2) without impairment of annual consumptive uses in the upper basin pursuant to the Colorado River Compact: *Provided*, That water not so required to be stored shall be released from Lake Powell: (i) to the extent it can be reasonably applied in the States of the lower division to the uses specified in article III(e) of the Colorado River Compact, but no such releases shall be made when the active storage in Lake Powell is less than the active storage in Lake Mead, (ii) to maintain, as nearly as practicable, active storage in Lake Mead equal to the active storage in Lake Powell, and (iii) to avoid anticipated spills from Lake Powell.

(b) Not later than July 1, 1968, the criteria proposed in accordance with the foregoing subsection (a) of this section shall be submitted to the governors of the seven Colorado River Basin States and to such other parties and agencies as the Secretary may deem appropriate for their review and comment. After receipt of comments on the proposed criteria, but not later than January 1, 1969, the Secretary shall adopt appropriate criteria in accordance with this section and publish the same in the Federal Register. Beginning January 1, 1970, and yearly thereafter, the Secretary shall transmit to the Congress and

to the governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected operation for the current year. As a result of actual operating experience or unforeseen circumstances, the Secretary may thereafter modify the criteria to better achieve the purposes specified in subsection (a) of this section, but only after correspondence with the governors of the seven Colorado River Basin States and appropriate consultation with such State representatives as each governor may designate.

(c) Section 7 of the Colorado River Storage Project Act shall be administered in accordance with the foregoing criteria.

SEC. 11. (a) Rights of the upper basin to the consumptive use of water apportioned to that basin from the Colorado River system by the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin.

(b) Nothing in this Act shall be construed so as to impair, conflict with or otherwise change the duties and powers of the Upper Colorado River Commission.

SEC. 12. Except as otherwise provided in this Act, in constructing, operating, and maintaining the Central Arizona project, the Secretary shall be governed by the Federal reclamation laws (Act of June 17, 1902; 32 Stat. 388 and Acts amendatory thereof or supplementary thereto) to which laws this Act shall be deemed a supplement.

SEC. 13. (a) All terms used in this Act which are defined in the Colorado River Compact shall have the meanings there defined.

(b) "Main stream" means the main stream of the Colorado River downstream from Lee Ferry within the United States, including the reservoirs thereon.

(c) "User" or "water user" in relation to main stream water in the lower basin means the United States, or any person or legal entity, entitled under the decree of the Supreme Court of the United States in Arizona against California, and others (376 U.S. 340), to use main stream water when available thereunder.

(d) "Active storage" means that amount of water in reservoir storage, exclusive of bank storage, which can be released through the existing reservoir outlet works.

(e) "Colorado River Basin States" means the States of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming.

ATTACHMENT B

ANALYSIS OF PROPOSED BILL "TO AUTHORIZE THE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE CENTRAL ARIZONA PROJECT, ARIZONA-NEW MEXICO, AND FOR OTHER PURPOSES"

The description of the Central Arizona project (Sec. 2(a)) differs from that as set out in Section 304(a) of H.R. 3300, in that (1) Granite Reef aqueduct capacity is fixed at 2,500 cfs and (2) specific reference to capacity and possible enlargement of Hooker dam is omitted.

Section 2(b) is new. It encompasses the authorization for acquisition of thermal power for purposes of the Central Arizona project (with commercial sale of power when intermittently not required in connection with the project). Preliminary studies of the Bureau of Reclamation indicate that approximately 400 megawatts of thermal power would be required for pumping purposes with the 2,500 cfs Granite Reef aqueduct we propose. However, we have not specified that figure in the authorization—instead we make reference to such portion of the output as is required—in order to allow for flexibility in negotiations and possible modification resulting from final, detailed planning.

Section 2(c) is adapted from the first sentence of Section 304(b) of H.R. 3300.

Section 2(d)(1) is new. It provides for ad valorem taxing authority to assist in repayment of the costs of the Central Arizona project.

Except for the last two sentences, Section 2(d)(2) is substantially identical with Section 404(a) of H.R. 3300. The last two sentences are similar to a provision first included as Section 107(e) of the draft bill transmitted with our report of April 9, 1964, to the Senate Committee on Interior and Insular Affairs

on S. 1658 in the 88th Congress. Our report of May 17, 1965, to your Committee on H.R. 4671 also proposed its inclusion. We reiterate here what was said in that letter:

"Until such time as sufficient water is available to meet all demands, it is important that legislation authorizing new projects using lower basin Colorado River water include the mechanisms whereby the availability of water as between irrigation and municipal and industrial uses can be further considered from time to time. Irrigation water contracts should be of a definite term—long enough to justify investments and development to put the water to use, but nevertheless with a finite time limit—to provide the opportunity for reappraisal of the water situation at the end of the contract period looking to the dedication of water to its highest use at that time. We recognize that this is a departure from the permanent service requirement of the Boulder Canyon Project Act and the provisions of the act of July 2, 1956 (70 Stat. 415) providing for renewal of irrigation water delivery contracts. It is, however, in our view justified by the conditions now prevailing in the Southwest."

Section 2(d) (3) incorporates the provisions of Section 404(b) of H.R. 3300. Section 2(e) incorporates all of Section 304(b) of H.R. 3300 except for the first sentence which, as above noted, appears as Section 2(c) of the attached draft. Clauses 3 and 4 of Section 2(e) (clauses 3 and 4 of Sec. 304(b) of H.R. 3300) did not appear in the version of H.R. 4671 to which our May 17, 1965, report was directed. However, we have no objection to them as explained at page 58 of the Committee's report (House Rep. 1849, 89th Cong., 2nd sess.).

Sections 2(f) and (g) incorporate Sections 304(c) and (d) of H.R. 3300. They deal with exchange of main stream Colorado River water for existing local supplies in connection with the Central Arizona project. Except for the references to Gila River system exchange, somewhat similar provisions were included in the version of H.R. 4671 upon which we reported. We have no objection thereto.

Section 2(h) incorporates provisions of Section 304(e) and (g) of H.R. 3300. It would require an exchange of 18,000 acre-feet of water per annum from the Gila River system in Arizona for main stream Colorado River water made available in Arizona in order that Gila River system water users in New Mexico might increase their use by the same amount. The section is explained at pages 58-59 of your Committee's report on H.R. 4671. It represents an agreement arrived at between Arizona and New Mexico during consideration of H.R. 4671. We have no objection to it. We have not included that portion of the H.R. 3300, (Sec. 304(f)) which provides, on a contingent basis, for an exchange of an additional 30,000 acre-feet of water.

Section 3, dealing with fish and wildlife and recreation, appears as Section 306 of H.R. 3300. It specifically makes applicable the provisions of the Federal Water Project Recreation Act (79 Stat. 213).

Section 4 relating the reimbursability of costs of the Central Arizona project allocable to Indian lands, is Section 402 of H.R. 3300. It is a standard provision.

Section 5 (Sec. 403(h) of H.R. 3300) is the usual provision establishing the interest rates applicable to reimbursable costs allocable to commercial power and municipal and industrial water. It is standard.

Section 6, dealing with water salvage programs in the lower Colorado River area, is essentially in the form in which it appeared in Section 305 of the version of H.R. 4671 upon which we reported.

Section 8 is similar to Section 502 of H.R. 3300 (Section 502 of H.R. 4671). It represents an agreement between upper and lower Colorado River basin interests relative to the ultimate assumption of the costs entailed in meeting deficiencies in generation at Hoover Dam occasioned by filling operations at the Colorado River storage project reservoirs. We offer no objection to it.

Section 502, like the provisions of Title VI of H.R. 3300, involves matters of concern to the lower Colorado River basin as well as to the upper basin. For that reason, we have included it as Section 8 of the proposed draft bill, along with the others to which we offer no objection.

Section 9(a) is identical to Section 601(a) of H.R. 3300.

Section 601(b) (1) of H.R. 3300 is not reflected in the draft bill because of the possibility that it may not be entirely consistent with the provisions of Section 602 of H.R. 3300 which appear, in substance, as Section 10 of the draft. The latter provision is also one which has been worked out between the upper and lower basin interests with participation on the technical level by representatives

of this Department. As Secretary Holum said in testifying before your Committee last year, "we endorse the objective of this section and find the guidelines to be reasonable and workable." (See Serial No. 89-17 Part II, "Hearings on H.R. 4671 and similar bills," p. 1339).

Section 601(c) of H.R. 3300 (Sec. 604(c) of H.R. 4671) is patterned after similar provisions in the Colorado River Storage Project Act (70 Stat. 105); the Navajo Indian Irrigation Project and San Juan-Chama Project Act (76 Stat. 96) and the Fryingpan-Arkansas Project Act (76 Stat. 389). It appears to us to be unnecessary and is, therefore, omitted from the attached draft bill.

Section 601(d) of H.R. 3300 (Sec. 604(e) of H.R. 4671) appears to us to be unnecessary. We do not read the bill as having the effects referred to.

The other provisions of the draft bill are self-explanatory.

ATTACHMENT C

DRAFT PROVISION FOR "LOWER COLORADO RIVER BASIN DEVELOPMENT FUND"

SEC.—All Federal revenues from the Boulder Canyon, Parker-Davis, Central Arizona and any other Federal reclamation projects hereafter constructed in the lower Colorado River Basin, which, after completion of the respective repayment requirements thereof, are surplus, as determined by the Secretary, to their respective operation, maintenance, and replacement requirements shall be kept in a separate fund in the Treasury of the United States, to be known as the Lower Colorado River Basin development fund, to be expended or applied in connection with water conservation and development for the Lower Colorado River Basin as may hereafter be prescribed by the Congress.

**UNITED STATES DEPARTMENT OF THE INTERIOR
STEWART L. UDALL, SECRETARY**

SUMMARY REPORT

**CENTRAL ARIZONA PROJECT WITH
FEDERAL PREPAYMENT POWER
ARRANGEMENTS**

FEBRUARY 1967



**BUREAU OF RECLAMATION
FLOYD E. DOMINY, COMMISSIONER**

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**UNITED STATES DEPARTMENT OF THE INTERIOR
STEWART L. UDALL, SECRETARY**

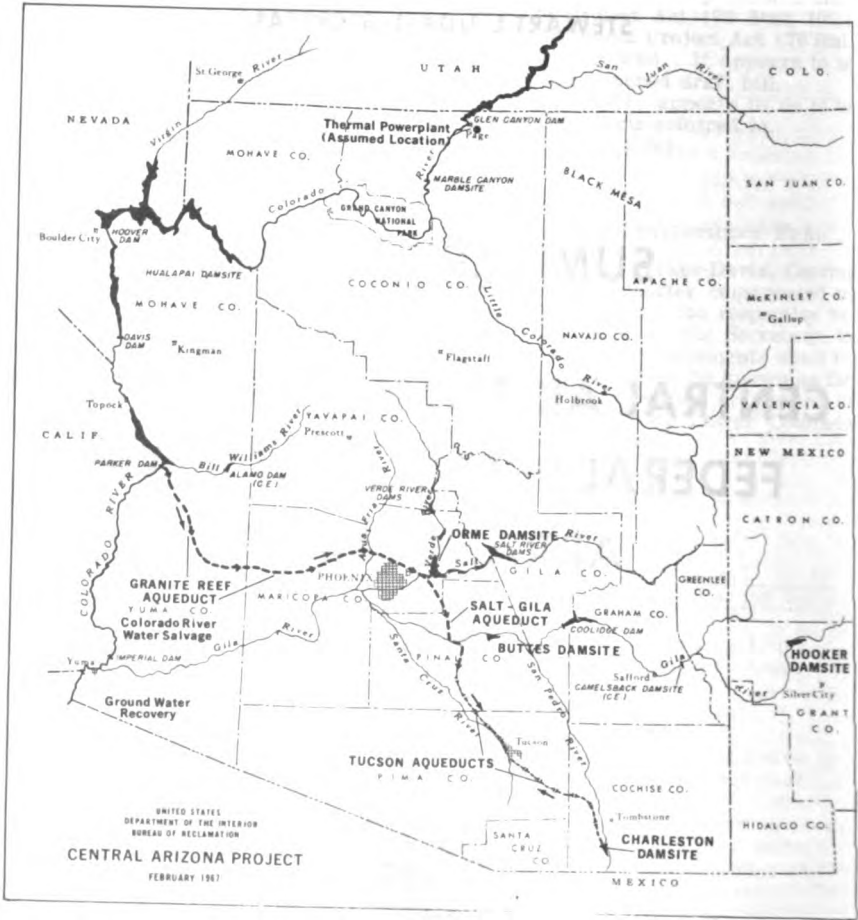
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SUMMARY SHEETS

COSTSProject Costs

Granite Reef Aqueduct	\$ 336,430,000
Salt-Gila Aqueduct	38,400,000
Tucson Aqueduct	42,030,000
Orme Dam & Reservoir	38,419,000
Buttes Dam & Reservoir	31,974,000
Charleston Dam & Reservoir	33,048,000
Hooker Dam & Reservoir	28,797,000
Drainage System	10,500,000
Power Generation and Transmission Arrangements	<u>91,950,000</u> ^{1/}
Subtotal	\$ 651,547,000
Indian Distribution System	19,970,000
Water Salvage and Recovery	42,450,000
Fish Hatcheries & Wildlife Refuge	<u>5,250,000</u>
Total Project Costs	\$ 719,217,000

Annual Operation, Maintenance,
and Replacement Costs

Aqueduct System	\$ 3,203,000 ^{2/}
Power Generation and Transmission Arrangements	<u>6,566,000</u> ^{2/}
Subtotal	\$ 9,769,000
Water Salvage Projects	1,000,000
Fish Hatcheries & Wildlife Refuge	<u>490,000</u>
Total	\$ 11,259,000

^{1/} Includes \$27,650,000 for federally constructed transmission system to project pumps.

^{2/} Pumping power costs are associated with powerplant and transmission system rather than aqueduct system.

BENEFIT-COST ANALYSISBenefits

<u>Function</u>	<u>Direct</u>	<u>Indirect</u>	<u>Total</u>
Irrigation	31,558,000	33,926,000	65,484,000
M&I	16,853,000		16,853,000
Commercial Power	3,725,000		3,725,000
Fish & Wildlife	1,635,000		1,635,000
Recreation	583,000		583,000
Flood Control	780,000		780,000
Area Redevelopment	267,000		267,000
Total	55,401,000	33,926,000	89,327,000

Costs

Total Project Costs	719,217,000
Interest During Construction	<u>46,993,000</u>
Subtotal	766,210,000
Less: Investigation Costs	5,794,000
Indian Distribution System	<u>19,970,000</u>
	<u>25,764,000</u>
Net Federal Investment	740,446,000
Annual Equivalent of Investment Costs (100 years - 3-1/8% interest)	24,257,000
Average Annual OM&R	<u>11,259,000</u>
Total Annual Costs	35,516,000

Benefit-Cost Ratios

Total benefits 100-years	2.5 to 1.0
Direct benefits only 100-years	1.5 to 1.0
Total benefits 50-years	2.5 to 1.0 ^{1/}
Direct benefits only 50-years	1.5 to 1.0 ^{1/}

^{1/} Because of declining water supplies, annual irrigation benefits are less in later years. Therefore, the average annual benefits are greater over the first 50 years than over 100 years. This effect offsets the higher annual costs over 50 years.

COST ALLOCATION (100-year period - 3-1/8% interest)

Purpose	Project Cost	Interest During Construction	Total Federal Investment	Average Annual OM&R
Irrigation	\$322,301,000	\$ 23,957,000	\$346,258,000	\$ 2,378,000 ^{1/}
Municipal and industrial	194,029,000	12,924,000	206,953,000	445,000 ^{1/}
Power	91,950,000	5,087,000	97,037,000	5,566,000 ^{1/}
Irrigation	(48,366,000)	(2,676,000)	(51,042,000)	(3,454,000)
M&I	(16,459,000)	(910,000)	(17,369,000)	(1,175,000)
Commercial	(27,125,000)	(1,501,000)	(28,626,000)	(1,937,000)
Recreation	6,343,000	926,000	7,269,000	278,000
Flood control	11,164,000	812,000	11,976,000	34,000
Fish and wildlife	24,129,000	1,843,000	25,972,000	68,000
Prepaid investi- gation	<u>1,631,000 ^{2/}</u>	<u>--</u>	<u>1,631,000 ^{2/}</u>	<u>--</u>
Subtotal	\$651,547,000	\$ 45,549,000	\$697,096,000	\$ 9,769,000
Indian distribution system	19,970,000 ^{3/}	--	--	--
Water salvage and recovery	42,450,000	1,444,000	43,894,000	1,000,000
Fish hatcheries and wildlife refuge	<u>5,250,000</u>	<u>--</u>	<u>5,250,000</u>	<u>470,000</u>
Total	\$719,217,000	\$ 46,993,000	\$746,240,000	\$11,259,000

^{1/} Pumping power costs shown under power allocation.

^{2/} Prepaid from Colorado River Development Fund. Remainder of investigation costs are allocated among project purposes.

^{3/} Included for authorization purposes but not considered in economic and financial analyses. Repayment would be deferred under the provisions of the Leavitt Act.

REPAYMENT ANALYSISSummary of Reimbursable and Nonreimbursable Costs

	<u>Project Cost</u>	<u>Interest During Construction @ 3.225%</u>	<u>Total for Repayment</u>
<u>Reimbursable</u>			
Irrigation	\$322,301,000	\$ --	\$322,301,000
Municipal and industrial	194,020,000	14,784,000	208,804,000
Power	91,350,000	2,489,000	93,839,000
Irrigation	(48,366,000)	(--)	(48,366,000)
M&I	(16,459,000)	(940,000)	(17,399,000)
Commercial	(27,125,000)	(1,549,000)	(28,674,000)
Recreation	1,525,000	217,000	1,742,000
Fish and wildlife	294,000	40,000	334,000
Total	\$610,099,000	\$17,530,000	\$627,629,000
<u>Nonreimbursable</u>			
Flood control	\$ 11,164,000	--	\$ 11,164,000
Recreation	4,813,000	--	4,813,000
Fish and wildlife	23,835,000	--	23,835,000
Indian distribution system ^{1/}	19,970,000	--	19,970,000
Water salvage and recovery	42,450,000	--	42,450,000
Fish hatcheries and wildlife refuge	5,250,000	--	5,250,000
Total	\$107,487,000	--	\$107,487,000
Prepaid investigation costs ^{2/}	1,631,000		
Total Project Cost	\$719,217,000		

^{1/} Repayment deferred under Leavitt Act provisions.^{2/} Prepaid from Colorado River Development Fund.

REPAYMENT OF REIMBURSABLE COSTS

	<u>Reimbursable Costs</u>	<u>Net Revenues Available for Repayment</u>	<u>Surplus or Deficit</u>
<u>Repayment with Ad Valorem Tax</u>			
Irrigation	\$322,301,000	\$ 95,846,000	\$-226,455,000
Municipal and Industrial	208,813,000	217,095,000	8,282,000
Power, Total	94,439,000	166,776,000	72,337,000
Fish and Wildlife	334,000	334,000	--
Recreation	<u>1,742,000</u>	<u>1,742,000</u>	<u>--</u>
Subtotal	\$627,629,000	\$481,793,000	\$-145,836,000
Ad Valorem Tax		<u>145,836,000</u>	<u>145,836,000</u>
Total	\$627,629,000	\$627,629,000	--

Repayment without
Ad Valorem Tax

Irrigation	\$322,301,000	\$ 95,846,000	\$-226,455,000
Municipal and Industrial	208,813,000	363,906,000	155,093,000
Power, Total	94,439,000	166,776,000	72,337,000
Fish and Wildlife	334,000	334,000	--
Recreation	<u>1,742,000</u>	<u>1,742,000</u>	<u>--</u>
Total	\$627,629,000	\$628,604,000	\$ 975,000

INTRODUCTION

The Central Arizona Project initially was recommended to the Congress for construction by the Secretary of the Interior in 1948. The conceptual framework and principal objectives of the project have remained substantially unchanged since that time; however, details of the project plan, repayment, and specific features have been changed to reflect the negotiations, legal decisions, and additional studies which subsequently have taken place.

The Pacific Southwest Water Plan, which was approved by the Secretary of the Interior in January of 1964, incorporated the Central Arizona Project, as a unit, into a plan for regional water resource development designed to meet the immediate and long-range water needs of the Pacific Southwest. The Hualapai (Bridge Canyon) Dam, which had previously been a feature of the Central Arizona Project, was included in the Pacific Southwest Water Plan, but as a separate unit. The report on the Pacific Southwest Water Plan was reviewed by the States of the Colorado River Basin and the interested Federal agencies, and aspects of the plan became the basis for proposed legislation to authorize construction of the Colorado River Basin Project which was considered in the 89th Congress.

The action of the House of Representatives Committee on Interior and Insular Affairs, which, in turn, reflects a great deal of interstate negotiation and compromise, introduced further

changes in the legislative proposals culminating in a bill to authorize the Colorado River Basin Project (H.R. 4671 of the 89th Congress) which was favorably reported by the Committee on August 11, 1966. The bill was not acted upon further by the Congress.

After the adjournment of the 99th Congress, the Bureau of Reclamation undertook a series of analyses of a wide variety of alternative plans which would accomplish in varying degree the objectives of the previous proposals for the Lower Colorado River Basin portion of the Colorado River Basin Project. The results of these studies were utilized by the Secretary of the Interior and the Administration in formulating a revised development program for the Lower Colorado River and the Central Arizona Project. The revised program was announced by the Secretary of the Interior on February 1, 1967, and was transmitted to the Congress with a recommended draft of a bill on February 15, 1967.

Current Proposal

This summary report describes the portion of the Administration's currently proposed development program pertaining to the Central Arizona Project. It represents a modification of that portion of the Pacific Southwest Water Plan which was described in detail in the Supplemental Information Report on Central Arizona Project and includes the previously proposed Water Salvage Program and fish hatcheries and wildlife refuge included in the Pacific Southwest Water Plan.

The Central Arizona Project has been revised in two major aspects:

(1) The Central Arizona Project, including the Water Salvage Program and other fish and wildlife measures, is proposed as an independent development without financial assistance from the Lower Colorado Basin Development Fund which was included in the Pacific Southwest Water Plan and the legislation reported on in the 89th Congress. This revised proposal provides that the Federal Government prepay a portion of the capital costs of a large, thermal powerplant and of a related transmission system which would be constructed by non-Federal interests. The prepayment would be a project cost and would be repaid as such under Reclamation law and policy. Federal participation in the construction costs would enable the project to obtain low-cost pumping power from the thermal powerplant. In years when water supplies are low, a portion of the power associated with the capacity of the prepaid portion of the plant would be excess to pumping needs. The revenues from sales of this power would be used in part to amortize the prepayment investment and in part to assist in the repayment of project costs allocated to irrigation.

The remaining irrigation repayment assistance required by the project would be obtained by increasing the municipal and industrial water rate over that contemplated in earlier proposals, or by

levying an ad valorem tax on the project area, or by a combination of the two.

(2) The capacity of the main aqueduct has been increased from 1,800 to 2,500 c.f.s. This change is consistent with the action of the House Committee on Interior and Insular Affairs on H.R. 4671. On the basis of hydrologic predictions and without augmentation of the flows of the Colorado River, the 2,500 c.f.s. aqueduct will be necessary for Arizona to divert an average of almost 1.2 million acre-feet annually over the repayment period of the project. The 1,800-c.f.s. aqueduct contemplated in the Pacific Southwest Water Plan would have accomplished this objective only in conjunction with the augmentation of Colorado River flows. Adoption of the 4.4 million acre-foot priority for California would reduce the total water supply available for diversion by the Central Arizona Project in years of low flow. The 2,500-c.f.s. canal would be of greater importance under such conditions as it would permit larger diversions in years of high flow and help to maintain overall diversions which would approach full use of Arizona's entitlement to Colorado River water within the State.

Other Aspects of the Revised Lower Colorado River Plan

This summary report includes only that portion of the revised development program for the Lower Colorado River which pertains to the authorization of the Central Arizona Project. The plan must be considered, however, in view of the associated recommendations which

are included in the proposal. The points, other than the immediate authorization of the development described herein, are as follows:

(1) Place Marble Canyon in an enlarged Grand Canyon National Park; reserve final decision on the Hualapai Dam for future congressional action.

(2) Leave the issue of a 4.4 million acre-foot annual priority of Colorado River water for California to the States involved and to the Congress.

(3) Authorize a National Water Commission as in the Bill S. 20 passed by the Senate on February 6, 1967. The Commission would be expected to give early attention to the Colorado River Basin and study all problems of water supply, shortages, and potential solutions.

(4) Leave for determination by the Congress the establishment of a development fund which would receive revenues, after completion of existing repayment schedules, from the federally constructed Hoover, Parker, and Davis Dams on the Lower Colorado. Revenues from the Central Arizona Project after payout also could be covered into the development fund as could post-amortization revenues from other Federal dams hereafter constructed in the Lower Colorado River Basin.

PLAN OF DEVELOPMENT

Purposes

As originally set forth in the 1947 report, the Central Arizona Project plan of development would make Colorado River water available to the project area through a pumping and aqueduct system which would raise and convey the water from Lake Havasu, on the Colorado River, into the Central Service Zone which is essentially comprised of the Phoenix-Tucson area. Through exchange, water could be made available in the areas of Arizona and New Mexico outside of the Central Service Zone.

The present plan of development remains the same in all major aspects with the exception of the source of pumping energy required for project pumping needs. Project facilities would coordinate the use of imported Colorado River water and the local water resources of the Gila River Basin. The project is designed to provide water for irrigation and municipal and industrial purposes. Additional purposes include flood control, recreation, fish and wildlife conservation, sediment retention, salinity control, power generation, and area redevelopment.

Project Facilities

The backbone facilities of the Central Arizona Project would be the Granite Reef, Salt-Gila, and Tucson Aqueducts, which would convey pumped Colorado River water to the Central Service Zone. Minor changes in the 1947 aqueduct location have been made due to urbanization. This is particularly true on the north side of the Phoenix metropolitan area.

Major project features include:

Granite Reef Aqueduct and Pumping Plants

Salt-Gila Aqueduct and Pumping Plant

Orme Dam and Reservoir (designated as McDowell Dam and Reservoir in the 1947 report) or suitable alternative

Tucson Aqueduct and Pumping Plants (Colorado River source)

Buttes Dam and Reservoir

Hooker Dam and Reservoir (New Mexico)

Charleston Dam and Reservoir

Tucson Aqueduct (San Pedro River source)

Aqueduct System

Granite Reef Aqueduct--The Granite Reef Aqueduct would transport water diverted from Lake Havasu by the Havasu Pumping Plant about 200 miles to Orme Dam located a few miles northeast of Phoenix. The designed capacity of the concrete-lined aqueduct is 2,500 c.f.s. The Granite Reef Aqueduct, in addition to the initial pumping plant at Lake Havasu, would require a series of lower lift pumping plants, short tunnels, and siphon crossings at major drainages.

Orme Dam and Reservoir--Located on the Salt River just downstream from its junction with the Verde River, the Orme Dam would be integrated with the present Salt River Project storage system as well as the import water supply from the Colorado River. Sediment-laden storm-flows, originating on tributaries below Bartlett and Stewart Mountain Dams, would be regulated and controlled. Coordinated with operation

of the Granite Reef Aqueduct, it would provide regulatory storage as needed for both Salt-Verde flows and Granite Reef Aqueduct deliveries. In its multiple-purpose role it would serve as an afterbay, reregulate releases from upstream reservoirs, improve the Salt River Project operating conditions by removing sediment, create a recreational area with fish and wildlife conservation uses, and in combination and coordination with the upstream reservoirs and downstream channelization, provide storage to meet the flood control requirements of the Salt River through the Phoenix area.

Salt-Gila Aqueduct and Pumping Plant--The 1,400-c.f.s.-capacity Salt-Gila Aqueduct would receive water either directly from the Granite Reef Aqueduct or by releases from Orme Reservoir. A relatively low-head pumping plant is required to lift the water into the aqueduct from either source.

Buttes Dam and Reservoir--Although investigated and reported previously as a separate facility, Buttes Dam and Reservoir was included as an integral part of the Central Arizona Project in the 1947 report and in the 1964 supplemental report. An earthfill structure, the Buttes Dam would form a reservoir of 366,000-acre-foot capacity. Conservation storage capacity would be 100,000 acre-feet, and 266,000 acre-feet of capacity would be used for sediment and flood control purposes.

Tucson Aqueduct (Colorado source)--An aqueduct to deliver 100,000 feet annually to the Tucson metropolitan area would originate

at the terminus of the Salt-Gila Aqueduct. This municipal and industrial water supply would be conveyed through a 150-c.f.s.-capacity pipeline and would be lifted 920 feet by a series of pumping plants.

Charleston Dam and Reservoir--On the San Pedro River between Tombstone and Fort Huachuca, a concrete gravity structure rising 158 feet above streambed, with earthen wing dams, would create a 238,000-acre-foot-capacity reservoir. Water conservation would be provided through exchanges. Recreation, fish and wildlife uses, sediment detention, and flood control benefits would also accrue.

Tucson Aqueduct (San Pedro source)--This conduit would convey about 12,000 acre-feet annually from the Charleston Reservoir to Tucson and vicinity.

Hooker Dam and Reservoir--Hooker Dam on the Upper Gila River in New Mexico would create a reservoir having an initial capacity of 98,000 acre-feet. The dam would be a concrete gravity structure rising 222 feet above streambed and would be so designed as to permit subsequent enlargement. The reservoir would provide water conservation, fish and wildlife uses, recreation, sediment detention, and flood control.

Distribution systems--In all areas an improvement in conveyance and distribution system efficiencies is essential to obtain optimum water development and use. Widely varying capabilities and conditions exist among the various organized districts and unorganized areas.

Lining of presently unlined and future conveyance and distribution systems would be provided by, and would be the responsibility of, existing or to-be-formed districts.

The existing facilities of the Salt River and San Carlos Projects, the Maricopa County Municipal Water Conservation District, and several other districts are based on integrated surface and ground-water supplies. Rehabilitation and lining of conveyance and distribution works in progress by these districts to improve their system efficiencies would be completed under project conditions.

Construction of new irrigation systems and rehabilitation and lining of existing systems are included for the seven Indian reservations within the project area.

Additional works--Growing and potential water needs of the area require facilities in addition to those included in the project works. Existing facilities of other agencies which could be integrated operationally into the Central Arizona Project include dams, reservoirs, and irrigation works serving proposed contracting agencies in the project area.

The proposed channel improvements of the middle Gila River and the construction of Camelsback Reservoir by the Corps of Engineers and the continuing soil and moisture conservation programs of the Bureau of Land Management and Soil Conservation Service would be integrated or coordinated with the project. Natural channels used for water transport are basically canals and, when used as part of a

system, their efficiency should be commensurate with their use. The lining of presently unlined conveyance and distribution systems is also essential for maximum utilization of the water supplies of the area.

Drainage and reuse facilities--The control, use, and disposal of the return and effluent flows to be made available in the project area will require additional study to properly evaluate the benefits accruing from reuse and the attendant costs of physical facilities. The cost of such facilities would not affect economic and financial aspects of the project as presented in this report because these units would have to be justified by benefits over and above those considered herein.

Drainage facilities contemplated as part of the project works are open drains and drainage wells upstream from Gillespie Dam. Costs of these facilities are included in the project cost.

Power Generation and Transmission Arrangements

No thermal electric power generating facilities will be constructed as project features. This plan proposes a cooperative approach with the utility industry somewhat comparable to that currently being employed by private and public utility companies.

The Secretary of the Interior would be authorized to make arrangements with non-Federal interests to acquire the right to a portion of the capacity and associated energy from the output of a large thermal generating powerplant as necessary to serve project

purposes. The right would also include delivery of the power on jointly shared transmission facilities. Current studies indicate that 400,000 kilowatts of capacity would be required in connection with the Central Arizona Project as proposed with the Granite Reef Aqueduct sized at 2,500 c.f.s. In this way, the project would obtain power for pumping at a low cost reflecting the economy of large thermal electric powerplants; shared economical, high-capacity, extra-high-voltage transmission facilities; and the benefits of Federal financing.

Payment for the capacity entitlement would be made to the plant owners from time to time during the construction period by advancing a portion of construction costs in a ratio not to exceed the ratio of the capacity entitlement acquired to the total plant capacity. Transmission of power and energy to points of project use would be provided both by Federal construction of transmission lines and by acquiring capacity in lines jointly used by plant owners and the Government through the Government advancing a portion of the construction costs of such dual-use lines in a ratio not to exceed the ratio of the capacity requirement of the Government to the total of capacity of such facilities.

In addition to the payments associated with construction, the Government would also pay to the owners of plant and transmission lines a commensurate portion of the annual operation and maintenance cost and of the replacement costs as they occur.

The United States would not participate in any of the owners' costs associated with interest, financing charges, taxes (except payroll taxes), or other similar items. The Federal financing costs would become project costs, and as such would be subject to repayment by the project beneficiaries under applicable provisions of Reclamation law and policy.

In the analyses for this report, it was assumed that a power banking arrangement with utilities in the area would be established. Surplus power and energy when available would be put into the bank to be withdrawn later to accommodate fluctuating project pumping requirements. The ratio between amounts of deposit and withdrawal would be adjusted for losses between the banking utilities' systems and the Central Arizona Project pumping plants as well as providing a small incentive to the utilities.

The power and energy available for commercial sale each year was assumed to be the Government's entitlement to total generation less the Central Arizona Project pumping requirement, transmission losses, and reserve for the capacity sold commercially, and it was adjusted for the power banking service described above. Based on water supply projections, practically the entire Federal share of the thermal plant output will be required for project pumping purposes through the year 1990. A small increment of commercial power sales would be anticipated during this period because of the smaller amount of reserve capacity that would be maintained in the

early years. Following 1990, it is expected that commercial power sales would increase gradually as project water supply and associated project pumping power requirements decrease. By the year 2030 it is estimated that commercial sales would average 179,000 kilowatts.

For purposes of deriving power prepayment cost estimates, it was assumed that a large, coal-fired powerplant would be located near Page, Arizona, adjacent to Lake Powell. Such a plant would burn coal obtained from the Black Mesa fields in northeastern Arizona. Sufficient transmission costs were included in the estimates to provide for proper connection of the plant to the integrated system.

Even though the central Arizona area would be the large commercial load area closest to the powerplant, the commercial power production of the plant would not necessarily serve this area alone. The power output of the thermal plant could be integrated with the power production of Reclamation's interconnected hydroelectric power system which extends generally throughout the West. Such coordination could enhance and broaden the usability of the power produced by both the thermal plant and the hydroplants. The coordinated output of these plants could be available to serve loads from Reclamation's interconnected transmission system.

Water Salvage Measures

Included in this plan are water salvage measures consisting of ground-water recovery in the Yuma area and phreatophyte clearing along the Lower Colorado River. These undertakings would yield

320,000 acre-feet of water annually for use in the Lower Colorado River Basin which, particularly in years of low water supply, would be necessary to realize the projected diversion of water to the Central Arizona Project.

Fish Hatcheries and Wildlife Refuge

Fish and wildlife measures not reflected in the costs of multipurpose project structures include national fish hatcheries for both warm water fish and trout, the Cibola National Wildlife Refuge, the New Mexico State Fish Hatchery, and a rough fish eradication program.

PROJECT OPERATION

Water Rights

The water legally available for diversion from the Colorado River by the Central Arizona Project is defined by a succession of legal determinations. The Colorado River Compact was signed in 1922; consented to by the Congress in the Boulder Canyon Project Act, without Arizona's ratification, in 1928; and was ultimately ratified by Arizona in 1944. The Compact divides the Colorado River Basin into the Upper and Lower Divisions with the division point being at Lee Ferry, and enjoins the States of the Upper Division not to cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75 million acre-feet for any period of 10 consecutive years.

The Boulder Canyon Project Act required that California limit its consumptive use of Colorado River water to 4.4 million acre-feet annually of the waters apportioned to the Lower Basin States by Article III(a) of the Colorado River Compact plus not more than one-half of any surplus waters unapportioned by the Compact.

The Compact recognized the possibility of a treaty with Mexico whereby the latter might share in Colorado River water. A treaty was consummated in 1944 which guarantees Mexico 1.5 million acre-feet of water annually with provisions for increase when surpluses are available and reductions in times of extreme drought.

In 1952 Arizona brought suit in the Supreme Court against California to establish the States' respective entitlements of water from the Colorado River. The Supreme Court Decree of March 9, 1964, among other items, provides that the first 7.5 million acre-feet of mainstream water below Lee Ferry available for release for consumptive use in the United States shall be apportioned 2.8 million to Arizona, 4.4 million to California, and 0.3 million to Nevada.

The Supreme Court Decree provides that if less than 7.5 million acre-feet are available for release to the Lower Basin for consumptive use, the first call on such water shall be for satisfaction of present perfected rights and any remainder shall be apportioned "in such manner as is consistent with the Boulder Canyon Project Act."

A number of the recent proposals for the Colorado River basin legislation have included a provision for what is termed herein the 4.4 priority. This provision, if enacted, would require that in years when there is insufficient mainstream water for release to satisfy annual consumptive use of 7.5 million acre-feet from the Colorado River below Lee Ferry, the available water would be apportioned according to the following priorities:

- (1) Present perfected rights.
- (2) Other users in the State of California served under existing contracts with the United States by diversion works heretofore

constructed and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of main-stream water, and by users of the same character in Arizona and Nevada. Water users in the State of Nevada would not be required to bear shortages in any proportion greater than would have been imposed in the absence of the 4.4 priority.

In other words, California would have a priority over the Central Arizona Project, up to 4.4 million acre-feet annually, in the event shortages must be apportioned.

The 4.4 priority has been assumed to be in effect in the hydrologic studies associated with the plan presented herein.

As a planning assumption, the priority is conservative in that of the various probable methods of apportioning shortages it reflects the economic and financial conditions most adverse to the Central Arizona Project. If the priority were omitted from the assumptions, the benefit-cost analysis and repayment of the project would be improved.

Water Supply

Within the framework of the legal limitations described above, the Central Arizona Project water supply will be determined by the physical availability of water. Two general factors apply in the consideration of water availability. The first is the wide fluctuation in the natural flow of the Colorado River. Computed annual virgin flows at Lee Ferry since 1896 vary from about 5.6 to 24.0

million acre-feet. Superimposed upon this natural variation is an increasing depletion due to increasing consumptive uses in the Upper Basin as that basin develops uses for its remaining share of Colorado River water as determined by the Colorado River Compact.

The assumption of average available flows upon which the Colorado River Compact was predicated has not been borne out in recent decades of record. Primarily because of this, the Central Arizona Project has had to be planned to accommodate a fluctuating and decreasing diversion over time.

The studies underlying the analyses in this report are based upon a method of operation of the existing storage reservoirs on the Colorado River designed to maximize the average annual yield over the entire study period. To account for the probable fluctuation of natural flows of the river, the actual recorded flows for the period 1906 through 1965 are used. These flows are corrected for existing and projected consumptive uses and modified for reservoir operation to provide a basis for project water supply studies. The studies also assumed that the 4.4 priority for California would be in effect.

In addition to the water supplies provided from the Colorado River, the Central Arizona Project would develop additional water by regulation of Gila River System flows. Operation of the Butte Reservoir would contribute 38,000 acre-feet and Charleston Reservoir would contribute 12,000 acre-feet annually.

Additional water would be made available for use in the area by reuse of percolation, waste, and effluent flows originating from project supplies. This secondary utilization of project water, however, is not provided for in the physical plan or considered in the economic or financial analyses.

The tabulation which follows presents a summary of the project water supply studies for the representative years of 1975, 1990, 2000, and 2030. Year 1975 is assumed to be the initial year of full project operation, while year 2030 is the point at which the water supply available to the Lower Basin would become stabilized under the assumptions and projections adopted relative to Upper Basin depletions.

The coordination of conservation and control facilities involving surface-water supplies would be essential to realization of the optimum benefits from the introduction of an import supply from the Colorado River. The construction of the Orme, Buttes, Charleston, and Hooker Reservoirs would provide operational and regulatory control of surface water to make exchanges possible. The additional regulation obtained would make possible higher utilization efficiencies in the conveyance and distribution systems. Control of stormflows and improvement of irrigation practices could provide an additional usable water supply.

Through this hydrologic coordination, comprehensive water conservation would be achieved by a combination of water salvage, river

Summary of
Bureau of Reclamation reservoir operation and water supply studies
(Averages for 60-year period 1906-65, inclusive, in thousands of a.f.)

Item	Year 1975	Year 1990	Year 2000	Year 2030
Virgin flow--Lee Ferry	15,063	15,063	15,063	15,063
Upper basin depletion	4,220	5,100	5,430	5,800
Upper basin end-of-year storage:				
Maximum	36,125	34,476	33,329	30,386
Minimum	15,769	14,280	9,186	6,888
Net storage change	0	0	0	0
Lee Ferry regulated delivery	9,570	8,770	8,600	8,250
Upper basin spills	1,273	1,193	1,033	1,013
Net gain, Lee Ferry to Hoover	772	753	732	704
Lake Mead:				
Inflow	11,615	10,716	10,365	9,967
Evaporation	898	872	835	853
Spills	653	269	148	158
Regulated release	10,064	9,575	9,382	8,956
Maximum end-of-year storage	25,900	25,900	25,900	24,900
Minimum end-of-year storage	13,370	13,000	11,800	11,090
Net storage change	0	0	0	0
Bill Williams River	50	50	50	50
Net losses, Hoover to Mexico (after salvage)	590	590	590	590
Delivery to Mexico	1,500	1,500	1,500	1,500
Available for use in U. S.	8,024	7,535	7,342	6,916
California ^{1/}	4,762	4,687	4,654	4,564
Nevada	100	150	200	300(-)
Arizona ^{1/}	3,162	2,698	2,488	2,052
Other than Central Arizona Project	1,020	1,160	1,230	1,230
Central Arizona Project:				
Available	2,142	1,538	1,258	822
Limited by 2500-c.f.s. aqueduct	1,650	1,255	1,026	676
System losses ^{2/}	165	126	103	69
Supplied from Colorado River	1,485	1,129	923	608
Supplied from Gila River	50	50	50	50
Project deliveries	1,535	1,179	973	658 ^{3/}
M&I	82	232	312	312
Irrigation	1,453	947	661	346

^{1/} Figures represent California and Arizona entitlements under the decree in Arizona versus California (including surplus in excess of 7.5 million when available) and 4.4 priority for California. California could use more, however, due to Arizona's inability, through physical limitations, to use its full share.

^{2/} System losses assumed to be 10 percent throughout. Refinement of this estimate, particularly in years of less than full capacity aqueduct operation, will be considered in more detailed studies.

^{3/} Although the average yield under year 2030 condition would be 658,000 acre-feet, the assured yield would be about one-half of this figure and would be devoted to M&I use.

channel improvement, river regulation, and watershed soil and moisture programs. For maximum project benefit, direct use of the imported Colorado River water as a base supply would be necessary, requiring seasonal variation in ground-water pumping and storage reservoir draft.

Proposed legislation introduced in the 89th and 90th Congresses has included provisions for exchanges between New Mexico users on the upper Gila River System and users in Arizona who can be physically supplied with Colorado River water from the Central Arizona Project aqueduct system. These provisions would have the effect of transferring to New Mexico a portion of Arizona's entitlement of Colorado River water based upon agreement between the States. The exchange would be accommodated by operation of Hooker Reservoir.

The Secretary could require users of Central Arizona Project water in Arizona to agree to additional exchanges to provide water supplies to other areas in the State of Arizona. These possibilities are under study. Their accomplishment would require authorization of additional facilities.

ECONOMIC AND FINANCIAL ANALYSIS

The project is economically justified. The benefit-cost ratio is 2.5 to 1.0. The comparison of benefits and costs was made on the basis of average annual equivalent values at 3-1/8 percent interest over a 100-year period of analysis. Financial feasibility is established in the repayment analysis which shows that all reimbursable costs can be returned within 50 years after completion of facilities.

Project Benefits

Total benefits for the multiple-purpose project are estimated to be \$99,327,000 annually.

Irrigation--Total irrigation benefits are estimated to be \$65,434,000 annually, of which \$31,558,000 are direct benefits representing increased net farm income based on farm budget analyses, and \$33,926,000 are indirect effects reflecting the movement of farm products through the channels of trade and industry. These benefits are associated with water delivered at canalside.

Municipal and Industrial--Benefits for canalside delivery of M&I water to the metropolitan water users of Central Arizona are estimated to be \$16,853,000 annually. These benefits are based on the estimated cost of obtaining a comparable supply of water from the most likely single-purpose alternative.

Commercial Power--The generation of power is primarily for the purpose of providing energy for project pumping. The value of power

used for pumping is reflected in the benefits for irrigation and M&I water supply. Due to the variability of river flows and the projected reduction in future supplies, some power is available for commercial sales on an increasing basis as average pumping requirements decline. The evaluation of benefits from commercial power sales of \$3,725,000 annually is based upon Federal Power Commission procedures representing average costs of large efficient coal-fired thermal plants in the Southwest, associated transmission to load centers, and a weighting of both private and public financing.

Flood Control--While the overall picture in the Gila River Basin is one of water shortage, periodical and destructive floods occur in the area. Annual flood control benefits which will accrue to the project have been estimated by the Corps of Engineers to be \$780,000.

Recreation--The Central Arizona Project and its reservoirs will create considerable recreation potential. The Fort McDowell and Salt River Indian Reservations should gain significant economic stimulation from the recreational aspects of Orme Dam and Reservoir. The estimated annual benefits were evaluated by the Bureau of Outdoor Recreation at \$583,000.

Area Redevelopment--Central Arizona Project facilities will provide employment opportunities during construction and operation of the project to areas which have been designated as redevelopment areas. Employment benefits in these areas are estimated to be equivalent to an annual average of \$267,000.

Summary of Project Benefits

<u>Function</u>	<u>Annual Benefit</u>
Irrigation	\$ 65,484,000
Municipal and industrial	16,853,000
Power	3,725,000
Fish and wildlife	1,635,000
Flood control	780,000
Recreation	533,000
Area redevelopment	267,000
Total	\$ 89,327,000

Project Costs

The total estimated project cost of this plan for the Central Arizona Project is \$719,217,000. Cost estimates are based upon October 1963 price levels with the exception of power generation and transmission arrangements which are based upon October 1966 price levels.

Interest during construction amounts to \$46,993,000 calculated at 3-1/8 percent, making the total Federal investment \$766,210,000.

Annual operation, maintenance, and replacement costs are estimated at \$11,259,000.

Summary of Costs

<u>Project Costs</u>	
Granite Reef Aqueduct	\$ 336,430,000
Salt-Gila Aqueduct	38,400,000
Tucson Aqueduct	42,030,000
Orme Dam and Reservoir	38,418,000
Buttes Dam and Reservoir	31,974,000
Charleston Dam and Reservoir	33,048,000
Hooker Dam and Reservoir	28,797,000
Drainage system	10,530,000
Power generation and transmission arrangements	91,950,000
Subtotal	\$ 651,547,000
Indian distribution system	19,970,000
Water salvage and recovery	42,450,000
Fish hatcheries and wildlife refuge	5,250,000
Total Project Costs	\$ 719,217,000
Annual equivalent cost (100 years, 3/1-8 percent interest)	\$ 22,718,000 <u>1/</u>

Interest During Construction (3-1/8 percent)

Aqueduct system	\$ 40,462,000
Power generation and transmission arrangements	5,087,000
Water salvage and recovery	1,444,000
Total	\$ 46,993,000

Annual equivalent cost
(100 years, 3-1/8 percent interest) \$ 1,539,000

Annual Operation, Maintenance, and Replacement

Aqueduct system	\$ 3,203,000 <u>2/</u>
Power generation and transmission arrangements	6,566,000 <u>2/</u>
Water salvage and recovery	1,000,000
Fish hatcheries and wildlife refuge	490,000
Total	\$ 11,259,000

1/ Excludes \$5,794,000 investigation costs and \$19,970,000 Indian distribution system costs. Benefits for distribution works excluded from project benefits which reflect values at canal side.

2/ Pumping power costs are associated with powerplant and transmission system rather than aqueduct system.

Benefit-Cost Ratio

The benefit-cost ratio, based upon total benefits over a 100-year period of analysis, is 2.5 to 1.0.

Benefit-Cost Ratios

100 years--total benefits	2.5 to 1.0
100 years--direct benefits only	1.5 to 1.0
50 years--total benefits	2.5 to 1.0 <u>3/</u>
50 years--direct benefits only	1.5 to 1.0 <u>3/</u>

3/ Because of declining water supplies, annual irrigation benefits are less in later years. Therefore, the average annual benefits are greater over the first 50 years than over 100 years. This effect offsets the higher annual costs over 50 years.

Cost Allocation

Costs of the water salvage and recovery program, Indian distribution systems, and fish hatcheries and wildlife refuge were directly assigned to these purposes. The remaining project costs were allocated

among the various purposes using the separable costs-remaining benefits method and using a 100-year period of analysis and an interest rate of 3-1/8 percent. A suballocation of the costs allocated to power was made among irrigation pumping, M&I pumping and commercial power sales based on relative uses of power.

Summary of Cost Allocation

<u>Purpose</u>	<u>Project Cost</u>	<u>Interest During Construction</u>	<u>Total Federal Investment</u>	<u>Annual O&M^{1/2}</u>
Irrigation	\$322,301,000	\$ 23,957,000	\$346,258,000	\$ 2,378,000 ^{1/}
Municipal and industrial	194,029,000	12,924,000	206,953,000	445,000 ^{1/}
Power	91,950,000	5,087,000	97,037,000	6,566,000 ^{1/}
Irrigation	(48,366,000)	(2,676,000)	(51,042,000)	(3,454,000)
M&I	(16,474,000)	(910,000)	(17,384,000)	(1,175,000)
Commercial	(27,110,000)	(1,501,000)	(28,611,000)	(1,937,000)
Recreation	6,343,000	926,000	7,269,000	278,000
Flood control	11,164,000	812,000	11,976,000	34,000
Fish and wildlife	24,129,000	1,843,000	25,972,000	68,000
Prepaid investi- gation ^{2/}	1,631,000	---	1,631,000	---
Subtotal	\$651,547,000	\$ 45,549,000	\$697,096,000	\$ 9,769,000
Indian distribution system	19,970,000 ^{3/}	---	---	---
Water salvage and recovery	42,450,000	1,444,000	43,894,000	1,000,000
Fish hatcheries and wildlife refuge	<u>5,250,000</u>	<u>---</u>	<u>5,250,000</u>	<u>490,000</u>
Total	\$719,217,000	\$ 46,993,000	\$746,240,000	\$11,259,000

^{1/} Pumping power costs shown under power allocation.

^{2/} Prepaid from Colorado River Development Fund. Remainder of investment costs are allocated among project purposes.

^{3/} Included for authorization purposes but not considered in economic and financial analyses. Repayment would be deferred under the provisions of the Leavitt Act.

Repayment Analysis

Two repayment analyses were made of approaches to accomplish payout of reimbursable costs within 50 years after completion of facilities. Irrigation assistance requirement in the first analysis is met by combination of surplus power revenues, surplus M&I revenues, and ad valorem taxes. In the second analysis, irrigation assistance is provided only from surplus power revenues and surplus M&I revenues from an increase in M&I water charges.

Allocations to commercial power and M&I are returned within 50 years at the current interest rate of 3.225. Irrigation costs are repaid within 50 years without interest. Fish and wildlife and recreation costs are repaid in conformance with the provisions of the Federal Water Project Recreation Act of 1965 (P.L. 89-72). Flood control and costs of the water salvage program are considered nonreimbursable. Repayment of costs for the Indian distribution system is deferred under Leavitt Act provisions. A summary of reimbursable and nonreimbursable costs is presented in the next table.

Summary of Reimbursable and Nonreimbursable Costs

	<u>Project Cost</u>	<u>Interest During Construction @ 3.225%</u>	<u>Total for Repayment</u>
<u>Reimbursable</u>			
Irrigation	\$322,301,000	\$ --	\$322,301,000
Municipal and industrial	194,029,000	14,784,000	208,813,000
Power	91,950,000	2,489,000	94,439,000
Irrigation	(48,366,000)	(--)	(48,366,000)
M&I	(16,459,000)	(940,000)	(17,399,000)
Commercial	(27,125,000)	(1,549,000)	(28,674,000)
Recreation	1,525,000	217,000	1,742,000
Fish and wildlife	294,000	40,000	334,000
Total	\$610,099,000	\$ 17,530,000	\$627,629,000
<u>Nonreimbursable</u>			
Flood control	\$ 11,164,000	--	\$ 11,164,000
Recreation	4,818,000	--	4,818,000
Fish and wildlife	23,835,000	--	23,835,000
Indian distribution system ^{1/}	19,970,000	--	19,970,000
Water salvage and recovery	42,450,000	--	42,450,000
Fish hatcheries and wildlife refuge	5,250,000	--	5,250,000
Total	\$107,487,000	--	\$107,487,000
Prepaid Investigation costs ^{2/}	1,631,000		
Total Project Cost	\$719,217,000		

^{1/} Repayment deferred under Leavitt Act provisions.^{2/} Prepaid from Colorado River Development Fund.

Operation, Maintenance, Replacement (OM&R) Costs

Annual operation, maintenance, and replacement (OM&R) costs for flood control, water salvage and recovery, fish hatcheries (with the exception of the New Mexico Hatchery which will be operated by non-Federal interests), and wildlife refuge are nonreimbursable. Fish and wildlife and recreation costs of joint facilities are also non-reimbursable under the provisions of P.L. 89-72 as are separable OM&R costs of facilities administered by Federal agencies. Other separable OM&R costs of recreation and fish and wildlife will be assumed by appropriate local entities.

OM&R costs assignable to irrigation include a charge of 3 mills per kilowatt-hour for pumping power; M&I includes a pumping power charge of 5 mills. All OM&R costs assigned to the irrigation and M&I purposes are recovered from water users.

The OM&R costs of the powerplant and transmission facilities will be repaid from charges to irrigation and M&I pumping and from commercial power sales.

Estimated annual operating costs for irrigation, M&I, and commercial power vary in accordance with available water supplies.

Summary of Annual Operating Expenses for Repayment ^{1/}

Irrigation	
(including power at 3 mills)	\$ 5,833,000
Municipal and industrial water	
(including power at 5 mills)	3,341,000
Commercial power	1,941,900
Fish and wildlife	
(fish hatchery, New Mexico)	90,000
Recreation	134,000

^{1/} Average annual costs over the payout period.
 Total OM&R cost of powerplant and transmission
 facilities for all power is \$6,579,000.

Repayment with Ad Valorem Tax

This analysis proposes that irrigation water be sold at an average of \$10 per acre-foot at canalside and that municipal and industrial water be sold at an average of \$50 per acre-foot as in previous Central Arizona proposals. Pumping power rates would be 3 mills per kilowatt-hour for irrigation and 5 mills for M&I. Surplus power would be sold commercially at an average return of 5 mills per kilowatt-hour. An ad valorem tax of 0.6 mills per dollar of assessed valuation would be levied against the taxable real properties of Maricopa, Pinal, and Pima Counties, Arizona, and applied to the irrigation obligation. The tax yield is based on a projected increase in the assessed valuation estimated at 3 percent annually. Repayment would be accomplished in 50 years after completion of facilities.

Irrigation--Of the reimbursable irrigation costs, excluding power facilities, of \$322,301,000, the irrigators would repay \$95,346,000 directly from water revenues. The remaining \$226,455,000 would be repaid by assistance from revenues from M&I water sales

(\$8,282,000), power sales (\$72,337,000), and ad valorem tax revenues (\$145,836,000).

Municipal & Industrial Water--M&I water users return all reimbursable costs with interest within 50 years. In addition, M&I water revenues provide repayment assistance to irrigation.

Power--All costs of powerplant and transmission facilities are returned from irrigation and M&I pumping charges and revenues from commercial sales with appropriate interest. Surplus power revenues assist in the repayment of irrigation.

Fish and Wildlife and Recreation--The costs associated with these functions which are reimbursable under the provisions of the Federal Water Project Recreation Act (P.L. 89-72) will be repaid under cost-sharing agreements with local entities.

Summary of Repayment Analysis with Ad Valorem Tax

<u>Purpose</u>	<u>Reimbursable Costs</u>	<u>Net Revenues Available for Repayment</u>	<u>Surplus or Deficit</u>
Irrigation	\$322,301,000	\$ 95,846,000	- \$226,455,000
Municipal and Industrial	208,813,000	217,095,000	8,282,000
Power, Total	94,439,000	166,776,000	72,337,000
Fish and wildlife	334,000	334,000	--
Recreation	1,742,000	1,742,000	--
Subtotal	\$627,629,000	\$481,793,000	-\$145,836,000
Ad Valorem tax	--	145,836,000	145,836,000
Total	\$627,629,000	\$627,629,000	--

Repayment without Ad Valorem Tax

This analysis proposes that irrigation water be sold at an average of \$10 per acre-foot at canalside as in previous Central Arizona proposals. Municipal and industrial water would be sold at an average of \$56 per acre-foot, an increase of \$6 over the \$50 rate in previous proposals. The increased revenues accruing from the M&I sales would provide sufficient repayment assistance to achieve total project repayment without an ad valorem tax. Pumping power rates would be 3 mills per kilowatt-hour for irrigation and 5 mills per kilowatt-hour for M&I. Surplus power would be sold commercially to yield an average return of 5 mills per kilowatt-hour. The power rates are the same in both repayment analyses presented herein. Repayment will be accomplished within 50 years after completion of facilities.

Summary of Repayment Analysis without Ad Valorem Tax

<u>Purpose</u>	<u>Reimbursable Costs</u>	<u>Net Revenues Available for Repayment</u>	<u>Surplus or Deficit</u>
Irrigation	\$322,301,000	\$ 95,846,000	-\$226,455,000
Municipal and Industrial	208,813,000	363,906,000	155,093,000
Power, Total	94,439,000	166,776,000	72,337,000
Fish and wildlife	334,000	334,000	--
Recreation	<u>1,742,000</u>	<u>1,742,000</u>	<u>--</u>
Total	\$627,629,000	\$628,604,000	\$ 975,000

Combination of Repayment Approaches

Under the basic estimates and assumptions of this report as to costs, interest rates, water supply, power marketing, and other factors, two approaches to the repayment of the project are presented. Insofar

as costs to the project beneficiaries are concerned, both assume an average return of \$10 per acre-foot for irrigation water at canalside. The first repayment study includes a \$50-per-acre-foot M&I charge plus the levying of an ad valorem tax while the second study relies entirely on an increase in the M&I rate to \$56 per acre-foot. Combinations of lower ad valorem taxes with lesser increases in the M&I rate could also be used to demonstrate repayment. Any variations in final plans from the basic underlying assumptions would, of course, affect the projected costs to the project beneficiaries. It is not expected, however, that the estimated costs to the beneficiaries would vary significantly.

Consolidated Repayment Schedules

Individual payout studies for irrigation, M&I, and power were prepared, showing year-by-year financial transactions. These studies are interrelated in that the pumping power charges in the irrigation and M&I schedules are included as revenue inputs in the power payout. Summaries of the significant payout components by purposes are presented in the following consolidated payout schedules for each of the repayment proposals described.

Mr. JOHNSON. I want to ask the permission of the subcommittee have my statement appear in the record at this point.

Is there any objection?

Hearing none, it will be so ordered.

(The prepared statement of Hon. Harold T. Johnson follows:)

STATEMENT OF HON. HAROLD T. (BIZZ) JOHNSON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Members of the Committee, I would like to take this opportunity to express my views concerning H.R. 3300, a bill to authorize the construction, operation and maintenance of the Colorado River Basin project which has been introduced by the Chairman of the Full Committee, the gentleman from Colorado, Mr. Aspinall. At the outset I want to make clear my complete support of this legislation and I have joined the Chairman as co-author of this bill.

The people of California have an immense stake in the Colorado River. About ten million people, half of the state's population, live in the area served by Colorado River water. More than \$20 billion of assessed valuation, more than half that of the whole state, is located in this same Colorado River service area. It is conservatively estimated that by the year 2000 nine million people will be living in this oasis, this semi-desert country of Southern California.

Southern California's agriculture to the extent of nearly six hundred thousand acres, producing approximately \$300,000,000 yearly in crops, is wholly dependent on the Colorado. This is the source of a large share of the Nation's winter vegetables and table grapes.

Colorado River water is brought to our people by three projects. In historical order, these are the Palo Verde Valley project, the All-American Canal, and the Metropolitan Water District's Colorado River Aqueduct. All of these had their inception before the passage of the Boulder Canyon Project Act of 1928. They have been constructed at a total cost in excess of \$600,000,000.

Their history, in a few words, is this:

(1) Palo Verde Valley, an area of about 100,000 acres, was first cultivated in the 1870's. It has the oldest water rights on the river, with the exception of one or two Indian reservations. It has what the Supreme Court has called "present perfected rights," that is, rights to Colorado River water that exist before Hoover Dam was built, and that are not dependent on stored water. In the 1960's, the government built a new diversion weir for the Palo Verde Irrigation District, because the clear water released from Hoover Dam had silted out the river channel to a depth which made it difficult to continue to draw water. Otherwise, all of the District's works have been built at the expense of the local people, or with money which they sold bonds to borrow.

(2) The All-American Canal serves the Imperial and Coachella Valleys by gravity. Both lie below sea level. The canal, and its diversion structure, the Imperial Dam were authorized by the Boulder Canyon Project Act. The canal replaces one that the farmers had built at their own expense to serve the Imperial Valley along an old route of the river that looped into Mexico and back into the Valley, which served them from 1901. The All-American Canal replaced the Mexican canal, which was subject to international difficulties and to constant danger of recurrence of the 1905 flood, when the river broke into the Valley through this old channel. The Imperial Irrigation District, too, has present perfected rights. The Coachella Valley County Water District serves the Coachella American Canal water to that rich valley. These two districts underwrote repayment to the United States of the cost of the All-American Canal. They are not aided by Hoover power revenues.

(3) California's third Colorado River project in point of time is the Colorado River Aqueduct of the Metropolitan Water District of Southern California. It is 242 miles long, and carries water from Parker Dam over and through the mountains to the Coastal Plain. Most of the coastal area from the Mexican border north, almost to Ventura, is served by the Metropolitan Water District. The aqueduct, with its distribution works, cost approximately one-half billion dollars. Preliminary work was commenced on it in the 1920's by the City of Los Angeles. Metropolitan underwrote 36% of the cost of Hoover Dam to obtain power to pump its water, courageously sold bonds in the depression, and

IRIGATION		
Plant in Service	Irriga- tion Assist- ance Required	Allo- cated Funds
23,151		
269,888		
300,482		
322,301		

		32
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this great project, on which Southern California's economy is so largely dependent. It went into service in 1941.

The newest of California's projects has thus been in existence more than 25 years.

But because water rights on the Colorado are, or were, determined by the century-old doctrine of priority of appropriation, the Secretary of the Interior's contracts with these California projects stipulate that the oldest, Palo Verde and the All-American Canal, shall have priority, so that shortages fall first on the Metropolitan Water District.

The result is this: These three California projects have put to use about 5.1 million acre-feet annually, out of an existing constructed capacity of about 5.4 million. The senior rights of Palo Verde and the All-American Canal amount to 3.85 million. Consequently, whenever California must reduce her uses to 4.4 million, the quantity which would be recognized and protected by the bill reported out by this Committee last year, and by the bills which Chairman Aspinall, Congressman Hosmer, and I have introduced this year, Metropolitan Water District must sacrifice about 700,000 acre-feet of its existing uses. It must replace that water at great cost from other sources. It will retain only 550,000 acre-feet from the Colorado. But this is the consequence of the agreement that California's legislature made with Congress in 1928, limiting us to 4.4 million acre-feet plus half of any surplus available. We were required to agree to this only if the Project Act was to become effective in the absence of Arizona's ratification of the Colorado River Compact. We remain bound by that agreement even though Arizona, 22 years later, did ratify the Compact which she had opposed.

Our bills spell out the other half of this shortage formula. As I have indicated, the 1928 Project Act in effect required California to bear the first burden of shortages if the supply for the three States of Arizona, California, and Nevada drops as low as 7.5 million acre-feet, as it will. But the 1928 agreement between Congress and California, in turn, recognizes our right to appropriate up to 4.4 million. The bills which we have introduced therefore protect the existing projects in California up to this quantity, and no more, although we protect the existing projects in Arizona and Nevada without restriction. We bear the first loss when the supply falls to 7.5 million; Arizona bears the next shortage, if the supply falls still lower, but only until imported water arrives to end any risk that there will be any such further reduction. It is possible, therefore, that, if importations are delayed several decades, Arizona may then have a half-full Central Arizona aqueduct, just as California will be reduced to a half-full aqueduct—except that ours will be reduced to half a supply for the MWD aqueduct much sooner, indeed whenever the Central Arizona project is built and begins to take water out of the river.

Here we are legislating in the field that the Supreme Court refused to decide, the allocation of shortages, and which it remitted to Congress. We propose to solve that problem by resort to the century-old law of the West: the protection of existing uses under senior appropriations against new uses, but all in strict accordance with the agreement that California's legislature made with Congress forty years ago. We have relied on that agreement in building the half-billion dollars of projects on which ten million people and most of Southern California's agriculture are now dependent, and we are confident that Congress will keep its side of that same bargain in authorizing the new Central Arizona project.

In this way both States are made aware of their common necessity to bring about the importation of water into the Colorado—a necessity shared by all seven States, for that matter.

With our existing projects protected to the extent that I have described, California can and does support the inclusion of the Central Arizona project in the regional plan of development proposed in our bills.

Gentlemen, in conclusion I want to express my appreciation for your consideration of my comments here today. I know that testimony we will hear during the balance of this week will justify fully the merits of this legislation. Thank you.

Mr. JOHNSON. As we start these hearings on the Colorado River legislation and the National Water Commission bills, I should like to restate the ground rules that we have tried to publicize in announcing these hearings and replying to requests to be heard.

The committee spent 29 days on legislation similar to this in the last Congress, and the complete record of those hearings is available to all members.

Copies were furnished to all new members of the committee some time ago for their information prior to the hearings.

When these hearings were announced, the chairman of the full committee and I made it quite clear that the committee expected to receive testimony setting forth new information or testimony directed to new provisions in the bills. I hope that all witnesses will cooperate with the committee in this respect. In accordance with the rules of the committee, public witnesses will be expected to summarize their testimony in 10 minutes or less. We will not impose this limitation of Federal and State representatives, but it is hoped that they, too, will cooperate with the committee by summarizing the important points of their testimony so far as possible.

Mr. SAYLOR. Mr. Chairman?

Mr. JOHNSON. The gentleman from Pennsylvania is recognized.

Mr. SAYLOR. I would like to go on record as opposing the manner in which these hearings are to be conducted, as has been announced by the chairman of the full committee and by the chairman of the subcommittee.

The House of Representatives is not a continuing body. The House of Representatives is a new session every time we meet. This has been thrashed out over the years.

On the committee at this time, there are eight members who have absolutely no knowledge or a limited knowledge of what has been considered by this subcommittee and the full committee last year, and this comes, so far as I am concerned, with poor grace to start out a hearing and notifying the witnesses that only new testimony will be heard. This is an entirely new ball game. This is an entirely new set of bills and is an entirely new approach being used by the Department downtown, by the representatives of the various interests who are here.

This committee is limiting themselves in a manner which I feel is absolutely uncalled for by the procedure which has been announced by the chairman and the chairman of the subcommittee.

And I might further say, Mr. Chairman, that in the hearings last year before the subcommittee several witnesses who appeared against this bill were abused unnecessarily, and the rules and the regulations with regard to new testimony in that hearing was applied to the opponents of the bill but it was not applied to the proponents of the bill.

I just want to be on the record right now in saying that this set of rules that you have set down as being the ground rules under which these hearings are to be conducted, as to any witness who appears before this committee from the Department or otherwise who repeats anything that was said last year, that I will object to it under the rules that you have set forth.

Mr. JOHNSON. Is there any further discussion on the matter before the subcommittee?

You have all heard the reading of the request of the chairman of the full committee and the chairman of the subcommittee. What is your pleasure in connection with it?

Mr. UDALL. I move that the ground rules as outlined by the chairman be adopted in full detail.

Mr. SAYLOR. I object to any vote being taken on the ground that a quorum is not present.

Mr. UDALL. I withdraw my motion.

Mr. JOHNSON. I ask unanimous consent to have a statement on ground rules for the hearings put into the record as being the order of the day.

Do I hear any objection?

Mr. SAYLOR. I will object.

Mr. JOHNSON. The objection is heard.

Mr. HOSMER. I move that the rules set forth by the chairman pertaining to the hearings—

Mr. SAYLOR. I make a point of order.

(Discussion was had outside the record.)

Mr. JOHNSON. The committee will be in order.

We will continue to proceed under the rules of the committee.

Mr. JOHNSON. The chairman recognizes the gentleman from Pennsylvania, the ranking minority member. Do you have a statement which you would like to present?

STATEMENT OF HON. JOHN P. SAYLOR, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. SAYLOR. Mr. Chairman, I would like to say that I have a short statement for the record at this time.

I would like to say that as we start on these hearings, the planning of a water supply for the future requires some forecasts or foreknowledge of future situations on water supply needs.

There have been some people who have appeared before this committee who advocated that we should look ahead 100 years.

I want to say to the members of this committee that in the tempo of the last one-half of the 20th century in which we are living, it is not possible to foresee what the situation will be in the year 2067. It is more important to do the planning and the development, I believe, in shorter terms and in such a way that it will leave the maximum flexibility for the future.

And I hope that it is not too much to expect that our descendants will have a greater ability than we do to cope with this problem. Ideal planning will enable us to bequeath to the next generation of people a world at least as good as the one that we entered. Planning should not be such as that future generations would be subject to our own shortcomings.

Water planning requires decisions, and these decisions are necessarily political because their purposes are political purposes of states and nations, and for that reason no perfect planning solution for water problems will be found at anytime. We are so try and meet the demands of society, and society's demands change to meet ever-changing situations. Planners and managers of these programs have to make endless decisions and actions to meet new situations as human events go beyond any former situation. It is for this reason that I say that we cannot today solve these problems in themselves. They can only be solved, these problems, as they come in their time.

Witnesses can tell us—those who are going to appear before this committee—what their views are, and that is about all.

And I can only tell you that one of the things that disturbs me—and I think it is disturbing more and more people in America—is that there are too many people placing their faith in science and technology in attempting to arrive at a solution, which, in itself, is an arrogance toward the landscaping of this great country of ours.

I can only feel, and tell you, that there is nothing that is going to be presented to this committee that I think will enable us to solve some of the problems of the Great Southwest. Dams and canals, irrigation, and navigation are not new. They have been known for thousands of years. Tunnels are not new; they have, also, been known and have been dealt with thousands of years ago. The Romans erected an aqueduct for the delivery of water.

Flood control has been raging in this country for several hundred years.

I hope, as we look at this bill that the witnesses who will appear before us will try and attempt to solve some of these problems. I hope that the Bureau of Reclamation and its witnesses will, at least, have some new ideas. It is probably too much to expect that. They have not had any for a long time. All they have done is to rehash their old ones. They want to build bigger and bigger dams, more and more projects of larger magnitude, as monuments to somebody in a bureau downtown, and not for the purpose of improving the land in which we live.

I might say that, so far as I am concerned, their arrogance toward the landscape in which we live and the manner in which they are trying to change it reminds me very, very much of some things that took place when some of our predecessors in recorded history built the pyramids. They demonstrated an engineering feat that has never been accomplished by the Bureau of Reclamation, nor by the Corps of Army Engineers. They are tremendous monuments to bigness; that is about the only thing that they solved, and the people refused to worship the Pharaohs and mummified bodies that were entombed therein. We now have them as monuments to a bygone era and a bygone age.

I am hoping that we might have some new attitudes and new concepts of water rights presented to this committee during these hearings on these bills.

Mr. JOHNSON. The next witness will be the Honorable Morris K. Udall, who will be accompanied by the Honorable John J. Rhodes, and the Honorable Sam Steiger.

Will you three gentlemen take the witness stand there and give us your testimony?

STATEMENT OF HON. MORRIS K. UDALL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ARIZONA; ACCOMPANIED BY HON. JOHN J. RHODES AND HON. SAM STEIGER, REPRESENTATIVES FROM THE STATE OF ARIZONA

Mr. UDALL. Thank you, Mr. Chairman. We have a joint statement which has been rather carefully prepared and consists of 17 pages and is before the subcommittee. It is important that this be in the record as though read in full, but it is not so important that it actually be

read. And so we will ask the usual courtesy of having it extended in the record as though read in full, and then I shall endeavor on behalf of myself and my colleagues, to summarize it in reading only parts of it.

Mr. JOHNSON. Without objection, the joint statement will be placed in the record at the end of your remarks. Is there objection?

Mr. SAYLOR. Reserving the right to object—and I will not object—I just want to commend my colleagues for having complied with the rules of the committee in having filed the statement in time. They did better than the department did.

Mr. JOHNSON. You may proceed, Mr. Udall.

Mr. UDALL. My distinguished friend, John Rhodes, and I have had experience in testifying on this bill, which is the fourth time in 4 years; however, this is a new experience for Congressman Steiger, the third member of the Arizona delegation.

In northern Arizona where I grew up, the Mormons in one little community built a dam six times and every year it was flooded out. Finally, the Corps of Engineers sent someone down from Denver to help them build the dam, and the Mormons ran them out of town indignantly and stated: "We know how to build it exactly; we do not need any help; we have done it six times."

[Laughter.]

Mr. UDALL. I do not think Congressman Rhodes needs any particular help in testifying, but we do need help in getting action on this project at long last.

This is Arizona's presentation, Mr. Chairman. There will be no other official witness from the State of Arizona or from the various governmental agencies of the State.

I would ask that our Governor, Mr. Williams, be permitted to file a statement with the committee, and we will have this available shortly.

Mr. JOHNSON. The statement of the Governor will follow the joint statement of you gentlemen.

Do I hear any objection to that?

If not, the statement will be incorporated into the record as though presented by the Governor.

Mr. UDALL. We will follow the ground rules as suggested by the chairman of the subcommittee and outline for the committee the basic provisions of H.R. 9, which is my bill, and the two identical companion bills, H.R. 1179 and H.R. 1271, of my two colleagues.

We will focus on the new issues that they refer to and referring to past matters only where we are required to put the present in focus.

I am going to page 2, at the bottom of my statement.

The 1966 committee report on H.R. 4671 made three major points. The first was that the economy of Arizona is threatened with disaster unless supplemental water is brought in from the Colorado River.

The second is that Arizona's water uses at present greatly exceed the water supply. The central Arizona area alone now uses roughly 4.5 million acre-feet of water per year. Rivers and surface sources provide 1 million acre-feet. In this area, about 3.5 million acre-feet of water is pumped from underground. The annual recharge to the underground source amounts to about 1.3 million acre-feet.

This leaves an annual deficit of about 2.2 million acre-feet. Thus, the underground water bank which has accumulated over a period of thousands of years is being "mined" at a most dangerous rate to meet this deficit.

Third, this legislation, as it pertains to the central Arizona unit, is strictly a "rescue" operation which will help to save a portion of the lands now being irrigated in central Arizona. No new lands will be brought into production or cultivation. In fact, a substantial portion of the water is required for growing municipal and industrial needs.

And I emphasize to the new members of the committee that this bill would not bring new lands into production but simply save some of the old lands that are already in production.

Let me outline the major features of our bill this year, in H.R. 9. It has six major features.

First, is the construction of the main canal, the Granite-Reef aqueduct of 3,000 cubic feet per second capacity from Lake Havasu to central Arizona; Orme Dam and Reservoir; Buttes Dam and Reservoir; Charleston Dam and Reservoir; Tucson aqueducts, and the Salt-Gila aqueduct.

The second is construction of the Hualapai Dam and Reservoir on the same terms and conditions as provided in last year's bill.

Third would be the establishment of the National Water Commission with authority and a specific directive to study, investigate and report on water needs, water supplies, water quality standards and water conservation practices in the Colorado River Basin.

Fourth is a directive to the Secretary of the Interior to investigate means of providing water to satisfy the Mexican Treaty burden.

Fifth is a water salvage and ground water recovery program on the same terms and conditions as provided in last year's bill.

And sixth is the establishment of the lower Colorado River Basin development fund for future authorized development of the Lower Colorado River Basin.

The features authorized by the bill would cost \$1,207 million. The project authorized by this legislation would have a favorable benefit-cost ratio of approximately 2.5 to 1.

This, then, is the substance of our modest proposal—the essence of our "rescue operation."

Mr. JOHNSON. Will you yield to the gentleman from Pennsylvania at this point?

Mr. UDALL. Yes.

Mr. SAYLOR. Mr. Chairman, this is an excellent statement, but if we comply with the rules of the committee and the rules which the Chair laid down at the beginning, I am perfectly in order to object to Mr. Udall's presentation because this was rehashed last year. It is old hat. It is just what we ended up with last year. He is the first witness coming before the committee. The rules which the Chair has laid down indicate that anybody who is opposed to the bill or anybody who is in favor of it who wants to comply with the rules which we have been asked to adopt, can object to Mr. Udall proceeding any further. This shows how foolish the rules are which were attempted to be adopted by the committee. The rules of the committee are excellent. Under the rules of the full committee, the gentleman

from Arizona, with his colleagues, are in proper form, and I believe would make an excellent presentation.

I want them to go ahead, because as last year and so this year, I am in favor of the central Arizona project with some modifications.

Please proceed.

Mr. JOHNSON. Just a moment.

The Chairman would like to say that any Member of Congress, especially any Member who is an author of a bill, has a perfect right to testify in behalf of that legislation. He is not restricted in any way, shape or form by the suggestions of the chairman of the full committee and the chairman of the subcommittee. They do not apply to Members of Congress nor do they apply to authors of legislation.

I would say to the member from Arizona and his two members from Arizona that they have a perfect right to proceed, in support of H.R. 9, in any way that they see fit. It will be so ordered.

Proceed.

Mr. UDALL. I will get into this act only to say that we have no new information—we have no new factual matters to develop. We simply want to explain why our bill this year is different from the bill last year. And in order to do that, I would have to say why we advocate the particular features of this new bill, and we may put the matter in focus by referring to what happened last year.

Mr. JOHNSON. The Chair has no objection to what you have said and what is included in your testimony.

Please proceed.

Mr. UDALL. Last year Arizona and its neighbor States asked for much more. We worked toward a regional water resource development plan which would have solved many of the present and future water supply problems of the entire Southwest. Together, we undertook to solve all of our common water problems and succeeded in reaching agreement on a sound, workable regional plan.

That plan, as considered so meticulously by this Committee last year, was a good plan, a farsighted plan, a blueprint for the essential future development of an entire segment of the country. But it was large, it was expensive, and it was ambitious. And, we regret to say, it was highly controversial. It included some elements which continue to be controversial—elements flatly unacceptable to some Members of the Congress and unacceptable to some segments of the public. As we know, that great plan, which looked not just to the present but 50 years into the future, was approved by this committee, but its controversies bore heavily upon it, and it failed to clear the Rules Committee in the closing days of the 89th Congress and was never considered by the entire Congress.

After careful soul searching, after a thorough and painful analysis of the legislative situation, and after another hard look at our rapidly deteriorating water situation, the Arizona congressional delegation is now convinced that Arizona cannot wait to solve all the water supply problems of the Southwest.

Let us make it perfectly clear that we support regional water planning and action. Our bill is a regional bill; it does contain the essential foundation and skeleton on which future regional and inter-regional development may be built.

A journey of a thousand miles must begin with one step, and our bill is that step and much more. But we cannot again agree to let the central Arizona project be used as the vehicle to carry all the problems of all other Western States through the Congress. We cannot afford the luxury of unrelated and time-consuming studies and analyses suggested in connection with a regular or interregional water plan of the magnitude presented and considered last year. Arizona must be rescued before it is too late, and the Congress can start by taking the first step now. Accordingly, we have eliminated the following major provisions which were contained in last year's bill:

1. Authorization of Marble Canyon Dam and Reservoir.
2. Authorization of specific water importation studies looking to augmentation of the Colorado River from sources outside the basin States.
3. Provision for a 4.4 million acre-foot priority to the State of California during periods of water shortage.

We have eliminated the five Colorado projects which were in our bill last year, although I must make it clear that we support the authorization of those projects in any appropriate legislative vehicle.

We have eliminated these features only after considerable forethought and in recognition of the fact that works simply must be authorized now which will meet a current water emergency—authorized in such a way that these works may be integrated and coordinated into future regional and interregional development plans and facilities. The plan presented and proposed in H.R. 9 and the companion bills will accomplish these objectives.

We hope we can look at our experiences of last year as “an arch to build upon”—not as an obstacle; not as an end to regional cooperation. We learned some hard lessons in last year's efforts and we intend to capitalize on that experience and avoid making similar mistakes in this session.

For example, last year's bill, H.R. 4671, contained a provision for immediate and specific Bureau of Reclamation studies of the costs and feasibility of the importation of water from the Pacific Northwest, and other areas. This provision created genuine concern and bitter resistance from the people of the Northwest. It was widely charged that we, in the Southwest, were attempting to “pirate” their future water supply. We had no such intention. But mere assurances by us were not enough.

In our judgment, the inclusion of water importation study language of the type contained in last year's bill should not be tacked onto legislation intended to authorize the central Arizona project. We believe studies must and should be made, but we are unwilling to demand again that they be included in our bills in a form which is sure to arouse opposition in the entire Northwest.

We hope that our friends from the other basin States will join with us in thus assuring the Pacific Northwest that, notwithstanding our imperative need for supplementing the water supply of the Colorado River, we are willing to approach the problem in an orderly step-by-step approach, with full safeguards to the rights and future needs of the people of the Northwest. With this understanding as to the future, we again earnestly solicit the support of the Northwest States in resolving today's immediate problem in the Southwest.

On the rest of page 7 we discuss the dam and reservoir of last year, and since it substantially repeats our position of last year, I will not take the committee's time to read it again.

Going now to page 8, we talk about what is, I think, the most important problem facing Arizona and California, and that is the 4.4 priority.

H.R. 9 and its companion bills do not contain last year's 4.4 m.a.f. priority for the State of California during times of shortages. In this regard, Mr. Chairman, I am sure that my California colleagues will agree with me that the California priority is the most troublesome issue which our two States must face—and which our two States must finally resolve.

Our unwillingness to again agree to this priority is not an arbitrary, stubborn, emotional position based on anger and bitterness as some people would have you believe. This problem of water for our State—and water for the entire Colorado River Basin is too big and too vital to be decided by matters of emotion or "face."

We should like to take a few moments here to discuss this problem in some detail, to point out why we believe too much has been made of the 4.4 priority and to make it clear that H.R. 9 is not just an Arizona bill. It is indeed a "California" bill from which that State will benefit immensely, and which in its own interests it should support.

Let us consider first the history-making agreement which we reached last year in cooperation with representatives of all of the Colorado River Basin States. As between Arizona and California there were four major elements to that proposal:

1. The authorization and construction of the central Arizona project.
2. The study of means to augment water supplies in the Colorado River to make the river whole including meaningful studies of the possibility of water importation.
3. The establishment of a basin fund with revenues from the hydro-electric dams to assist in financing any future water augmentation program.
4. The establishment of a 4.4 million acre-foot priority to California at such time as shortages develop and must be allocated on the river.

Of these four points, the fourth, the California priority, was really the least important. The allocation of shortages, if it ever comes, will not come for 20 or 25 years. And if we can achieve the first three objectives of last year's bill, the question of allocating shortages will never be reached.

Despite some considerable dissent in Arizona, and despite our view that the form of the California priority was somewhat inequitable, we agreed to its inclusion (and Representative Rhodes and the rest of the delegation last year agreed to the inclusion) as the price for California's support on a program of immediate action. As part of an ambitious regional bill which provided the money and the machinery to insure that the shortages of 1995 would not occur, that provision contained modest risks we could afford to take.

But the single most important lesson of 1966 was that H.R. 4671 was probably too large and controversial to pass without serious danger of amendment.

I might add that the people from California took the view last August and September that there was danger of amendment.

In our judgment, a less ambitious bill such as H.R. 9 can pass this year, but without specific importation studies, without Marble Canyon Dam, without the other detailed elements of H.R. 4671, the risks for Arizona in last year's 4.4 priority language are simply too high.

The main effect of such a 4.4 priority would be to place on Arizona the whole incentive and burden of augmenting the river before the "crunch" of the 1990's. We could accept that burden when the machinery for augmentation was part of the bill. But, since we cannot include this machinery for the practical reasons set forth above, we cannot accept and assume this burden. And, in our judgment, it is patently unfair to place this burden on Arizona when California has at least three sources of potential augmentation: the Colorado River, the rivers of northern California and the entire Pacific Ocean, while we have only the Colorado—not to mention California's numerical strength in the House of Representatives with 38 Members to our 3.

Putting aside, of course, the questions of quality and the like of the delegation.

And I will now skip to the last paragraph on that page.

In this regard, we are told by some of our friends in California that authorization and construction of Arizona's project, the most urgently needed in the region, cannot go forward piecemeal. Apparently, however, the same principle does not apply as widely on the west bank of the river. For at present, California Representatives are seeking approval and authorization of additional Federal reclamation projects and other programs to augment water supplies both in southern and northern California.

Just a week or 2 ago, this very month, California proponents of a bill to authorize the huge desalting plant in the Los Angeles area were before this committee asking for a Federal contribution of some \$70 million, all of which is nonreimbursable. This desalinization project, we are told, will produce some 150 million gallons of fresh water each day—enough water to supply the needs of cities the size of Phoenix or San Francisco, or two cities the size of Tucson—which is my home town—for use and consumption in southern California.

I pointed out during the hearing on that bill that, while we support these plans for water augmentation and believe that the desalinization technology and other water resource development programs must go forward, we will not stand idly by while these projects receive priority and funding and let our own long-overdue project, which is entirely reimbursable, self-sustaining and so badly needed, be ignored.

We hope that our California neighbors will not make the mistake of concentrating so hard on a 4.4 million acre-foot priority that they lose sight of the fact that the bill which Arizona brings before this committee has important, direct and far-reaching benefits to California. California has a right to ask: "What is in your bill for us; what is in it for us?" And we say, "In this bill we offer our friends in California the hand of partnership."

We ask that California ponder hard and long whether that State will really be better off:

(a) If it works to defeat this legislation because it does not contain these magic words, words which relate only to shortages and to events

in the distant times—eventualities which need never occur if we work together; or,

(b) If this bill (H.R. 9) passes with not-so-magic language, but produces results which benefit California in the following direct ways—now, I want to list what is really in this bill for California:

(1) The passage of this bill will end the fight between Arizona and California and will begin a partnership—a partnership not just with Arizona, but a partnership involving all of the basin States. It will revive and renew the cooperative spirit we achieved last year.

(2) The passage of this bill will end the stalemate on the Colorado River. It will clear the decks so that we can all go forward together. There are important reclamation projects needed in California right now, and I would like to go forward with them. The passage of this bill will remove any reason or incentive for Arizona, or other basin States, to oppose or delay the authorization or funding of these projects.

(3) The passage of this bill will immediately establish a basin fund, the key bank account needed to finance the many important things which simply must be done if our region of the country is to survive.

(4) The passage of this bill will mean that we can begin meaningful preliminary steps and studies which are an essential prerequisite to the desperately needed augmentation of the river. The river simply will not be augmented until meaningful, far-reaching studies are made. We would have preferred that the augmentation and import studies be made under the terms and conditions provided for in last year's bill rather than by the National Water Commission as provided in title II of H.R. 9. But the plain political and legislative facts for the foreseeable future are such that we will either have a National Water Commission study of possibilities for augmentation of the Colorado River by transbasin diversions, or we will have no study at all. Faced with these, as realistically alternatives, we favor the National Water Commission study and believe it represents a meaningful step toward resolving the long-range problems of the area.

(5) In addition to the crucial studies for augmentation from outside the basin, the bill last year provided for other equally important studies within the basin. H.R. 9 retains from last year's bill:

(a) Studies of the export of water from northern California to the Colorado River and southern California.

(b) Studies of the possibilities of augmenting Colorado River water supplies through the improvement of desalinization technology and the construction of large-scale desalting plants.

(c) Studies of weather modifications. In this field, exciting and interesting things are happening. If there is the kind of breakthrough which some optimists expect, these "rivers in the sky" may add as much as 2½ million acre-feet of water to the annual flow of the Colorado River at a small fraction of the costs involved under any other conceivable augmentation program.

(6) The passage of the bill will make possible an accelerated water salvage program which could save, if put into full effect, perhaps as much as 1 million acre-feet of water through canal lining, water salvage and other improvements. Salvaged water, it must be remembered, is just as good as new water added to the river.

These are things that we get on with right now.

(7) The passage of this bill will put to rest, once and for all, the troublesome and potentially divisive and dangerous disputes between the two basins on the matter of the regulation of Hoover and Glen Canyon Dams. This is no small problem to California, and its settlement is no small gain.

(8) Perhaps most important of all, this bill contains a congressional finding that augmentation of the river by $2\frac{1}{2}$ million acre-feet is a national obligation. If crude, preliminary estimates of augmentation costs referred to last year are sound, this provision alone could be a benefit to California and the whole basin equal to the excess revenues of another Hualapai Dam, or more. It may be asked why this augmentation program should be considered a national obligation and why its financing is nonreimbursable. In this regard, let me point out that the obligation to furnish this water to Mexico was created by a wartime treaty in 1944 between the United States and Mexico. We believe that the burden of this wartime commitment should be borne equally by all of the States as a national obligation. The Bureau of the Budget and this committee both concurred in this approach in consideration of last year's bill.

A careful record was made on this point last year.

For these reasons, we hope that this whole enterprise and all of the benefits of regional cooperation will not be lost because of California's demand for a priority which the Supreme Court has said it cannot equitably claim. Sensible Californians know, as every member of this committee knows, that with or without the priority, by the year 2000, the river will be short of water to meet even the most modest projections of future requirements. And we believe that they will see the wisdom and the benefits that might accrue to California under the terms of our bills.

We also appeal to our neighbors in the other Basin States to consider the wisdom of this approach, to realize the necessity of taking this first step toward solving our common problems. The hand of partnership, which we hold out here to California is also extended to our neighbors in Colorado, Nevada, Utah, New Mexico, and Wyoming. We ask their assistance, initiative, and good will in helping Arizona and California come to a friendly, statesmanlike and mutually beneficial solution of this thorny 4.4 priority problem.

We think that this is the No. 1 priority in the country and we think it is fair that the National Water Commission legislation include provisions to give this area immediate attention.

As mentioned briefly above, H.R. 9 provides for the establishment of a National Water Commission with authority and a directive to study, investigate and report on anticipated national water resource problems. In most respects, this section of our bill is similar or identical to the measure considered and passed in the Senate as S. 20 on February 6, 1967. The primary distinction between our provision and S. 20 is the priority given to the establishment of principles, standards, and procedures for the program of investigation and submittal of plans and reports relating to the Colorado River Basin.

We favor the establishment of this priority in any legislation creating the National Water Commission in recognition of the severe water

shortages and related problems in the Colorado River Basin which have been identified and established.

With these provisions, we favor the creation of a National Water Commission whether by the legislation before the committee, by independent authorization as in S. 20, or in some other form.

This, then, is the substance of our proposal. As you can see, there is no element which has not been previously considered by this committee. There is no component part which cannot be fully integrated and coordinated with development under any future plan. Each unit or feature of the project is necessary to rescue the economy and the people of central Arizona.

Mr. Chairman, this then is the substance of the proposal that we make. The remainder of our statement is, we hope, a moving appeal, a ringing appeal for good faith and help in solving the water problems of Arizona.

All three of us will be happy to respond to questions, and we would seek pledges of unequivocal support to be made by members of the committee, and, in fact, if this committee has been carried away by this presentation we would be glad to leave the room so that the bill could be reported out this morning.

I thank you.

(The prepared statement submitted by Representatives Udall, Rhodes, and Steiger reads in full as follows:)

STATEMENT OF HON. MORRIS K. UDALL, HON. JOHN J. RHODES, AND HON. SAM STEIGER, REPRESENTATIVES IN CONGRESS FROM THE STATE OF ARIZONA

Mr. Chairman and members of the Committee—This statement and the comments which I am about to make have been prepared jointly with my distinguished colleagues, the Honorable John J. Rhodes and the Honorable Sam Steiger. Our remarks are made in support of H.R. 9, H.R. 1179 and H.R. 1271, identical bills we have each introduced to authorize the construction, operation and maintenance of the Colorado River Basin Project.

In announcing these hearings, the Chairman of the full Committee pointed out that many days were spent last year, the year before, and the year before that, hearing testimony concerning similar legislation. There is little we might say here today which would not be repetitious. Accordingly, we will abide by the Chairman's sensible request that testimony be limited to new material. We will outline for the Committee the basic provisions of H.R. 9 and its companion bills, and the new issues they raise, referring to past matters only where required to put the present in focus.

Arizona has sought authorization of the Central Arizona Project in the Congress of the United States diligently over the past twenty years. During this period, Arizona was required to establish her legal right to the water she sought. And, in 1963, the Supreme Court of the United States ruled that Arizona is entitled to two million eight hundred thousand acre-feet of Colorado River water per year to help meet its water needs.

Through these years of Congressional effort, litigation and protracted negotiations which have brought us to this point in time—one undisputed fact has emerged—Arizona is—without any doubt whatsoever—in desperate need of water.

This water must now be transported to the Central Arizona area where it is most urgently needed and there put to beneficial use through the construction of necessary aqueducts, canals, reservoirs, pumping plants and other appurtenant works. We believe that this can be accomplished most successfully and effectively with the assistance of the Federal Government under the reclamation program. We seek that assistance in this legislation.

In reporting last year on H.R. 4671, the Committee said: "The extent and urgency of the need for additional water in the central Arizona area was first presented to members of the Committee in field hearings held in Arizona in November 1964. The urgency was reiterated by many witnesses during the

hearings in August 1965, and again in May 1966. The need for supplemental water in this rapidly-growing area was so conclusively demonstrated that there appears to be no controversy on this point."

The same Committee report then summarized three principal points which were firmly established and supported by testimony and documentary evidence:

First, that the economy of Arizona is threatened with disaster unless supplemental water is brought in from the Colorado River.

Second, that Arizona's water uses at present greatly exceed the water supply. The central Arizona area alone now uses roughly 4.5 million acre-feet of water per year. Rivers and surface sources provide 1 million acre-feet. In this area, about 3.5 million acre-feet of water is pumped from underground. The annual recharge to the underground source amounts to about 1.3 million acre-feet. This leaves an annual deficit of about 2.2 million acre-feet. Thus, the underground water bank which has accumulated over a period of thousands of years is being "mined" at a most dangerous rate to meet this deficit.

Third, this legislation, as it pertains to the Central Arizona unit, is strictly a "rescue" operation which will help to save a portion of the lands now being irrigated in central Arizona. No new lands will be brought into production or cultivation. In fact, a substantial portion of the water is required for growing municipal and industrial needs.

After stating its findings, the Commission then concluded by saying: "The Committee is in accord that Arizona's needs for supplemental water from the Colorado River are critical and will become more so as time goes on. For the economy of this area, it is essential that this program proceed without further delay. The Committee believes that Arizona, having proceeded with an adjudication of its rights—as directed by this Committee in 1951—is now clearly entitled to make use of its share of the water of the Colorado River."

MAJOR FEATURES, H.R. 9

This year, in H.R. 9, and its companion bills, we are asking for no more than is absolutely necessary to implement these findings and conclusions. Here is a skeleton outline of its major features:

1. Construction of the main canal (Granite-Reef aqueduct) of 3000 c.f.s. capacity from Lake Havasu to central Arizona; Orme Dam and Reservoir; Buttes Dam and Reservoir; Charleston Dam and Reservoir; Tucson aqueducts; and the Salt-Gila aqueduct.

2. Construction of Hualapai Dam and Reservoir on the same terms and conditions as provided in last year's bill.

3. Establishment of the National Water Commission with authority and a specific directive to study, investigate and report on water needs, water supplies, water quality standards and water conservation practices in the Colorado River Basin.

4. A directive to the Secretary of the Interior to investigate means of providing water to satisfy the Mexican Treaty burden.

5. A water salvage and groundwater recovery program on the same terms and conditions as provided in last year's bill.

6. Establishment of the Lower Colorado River Basin Development Fund for future authorized development of the Lower Colorado River Basin.

The features authorized by the bill would cost \$1,207,000,000. The project authorized by this legislation would have a favorable benefit-cost ratio of approximately 2.5 to 1.

This, then, is the substance of our modest proposal—the essence of our "rescue operation."

1966 PROGRAM TOO AMBITIOUS

Last year Arizona and its neighbor states asked for much more. We worked toward a regional water resource development plan which would have solved many of the present and future water supply problems of the entire Southwest. Together, we undertook to solve all of our common water problems and succeeded in reaching agreement on a sound, workable regional plan.

That plan, as considered so meticulously by this Committee last year, was a good plan, a farsighted plan, a blueprint for the essential future development of an entire segment of the country. But it was large, it was expensive, and it was ambitious. And, we regret to say, it was highly controversial. It included some elements which continue to be controversial—elements flatly unacceptable.

to some members of the Congress and unacceptable to some segments of the public. As we know, that great plan, which looked not just to the present—but 50 years into the future—was approved by this Committee, but its controversies bore heavily upon it, and it failed to clear the Rules Committee in the closing days of the 89th Congress and was never considered by the entire Congress.

After careful soul-searching—after a through and painful analysis of the legislative situation—and after another hard look at our rapidly deteriorating water situation—the Arizona Congressional delegation is now convinced that Arizona cannot wait to solve all the water supply problems of the Southwest.

Let us make it perfectly clear that we support regional water planning and action. Our bill is a regional bill; it does contain the essential foundation and skeleton on which future regional and interregional development may be built.

FEATURES ELIMINATED

A journey of a thousand miles must begin with one step, and our bill is that step and much more. But we cannot again agree to let the Central Arizona Project be used as the vehicle to carry all the problems of all other western states through the Congress. We cannot afford the luxury of unrelated and time-consuming studies and analyses suggested in connection with a regional or interregional water plan of the magnitude presented and considered last year. Arizona must be rescued before it is too late—and the Congress can start by taking the first step—now. Accordingly, we have eliminated the following major provisions which were contained in last year's bill:

1. Authorization of Marble Canyon Dam and Reservoir.
2. Authorization of specific water importation studies looking to augmentation of the Colorado River from sources outside the Basin States.
3. Provision for a 4.4 million acre-foot priority to the State of California during periods of water shortage.

We have eliminated these features only after considerable forethought and in recognition of the fact that works simply must be authorized now which will meet a current water emergency—authorized in such a way that these works may be integrated and coordinated into future regional and interregional development plans and facilities. The plan presented and proposed in H.R. 9 and the companion bills will accomplish these objectives.

We hope we can look at our experiences of last year as “an arch to build upon”—and not as an obstacle—not as an end to regional cooperation. We learned some hard lessons in last year's efforts and we intend to capitalize on that experience and avoid making similar mistakes in this session.

IMPORTATION STUDIES

For example, last year's bill, H.R. 4671, contained a provision for immediate and specific Bureau of Reclamation studies of the costs and feasibility of the importation of water from the Pacific Northwest and other areas. This provision created genuine concern and bitter resistance from the people of the Northwest. It was widely charged that we, in the Southwest, were attempting to “pirate” their future water supply. We had no such intention—but mere assurances by us were not enough.

In our judgment, the inclusion of water importation study language of the type contained in last year's bill should not be tacked onto legislation intended to authorize the Central Arizona Project. We believe studies must and should be made, but we are unwilling to demand again that they be included in our bills in a form which is sure to arouse opposition in the entire Northwest.

We hope that our friends from the other basin states will join with us in thus assuring the Pacific Northwest that, notwithstanding our imperative need for supplementing the water supply of the Colorado River, we are willing to approach the problem in an orderly step-by-step approach, with full safeguards to the rights and future needs of the people of the Northwest. With this understanding as to the future, we again earnestly solicit the support of the Northwest states in resolving today's immediate problem in the Southwest.

OPPOSITION TO NEW DAMS AND RESERVOIRS

Another of last year's experiences from which we should profit—with some degree of bitterness, I must admit—is the almost unbelievable propaganda campaign and lobbying effort directed at the Congress by various preservationist

groups. They were successful in convincing thousands of good citizens throughout the country that we were irresponsibly seeking to "flood the Grand Canyon"—to "ruin the Grand Canyon"—Arizona's and the nation's greatest scenic wonder—just to obtain a few dollars—which could be provided, if really needed, from other sources with less difficulty and expense! It is not too difficult to understand how serious and well-meaning citizens—particularly those who had never seen either the Grand Canyon or the proposed damsites—could be exhorted to flood Congressional offices with their letters of protest.

Although this Committee saw through this distorted scare campaign and recommended both dams, we have to admit that the inclusion of *both* dams, poses real and practical problems in seeking passage of a bill. We have reassessed the problem and have reluctantly decided to recommend a compromise position which would permit us to proceed on our project with less opposition. Thus, we have eliminated Marble Canyon Dam and Reservoir and here seek *only* the authorization and construction of Hualapai Dam and Reservoir. We hope that the Committee—and our critics in these preservationist groups—will agree that this is a logical and feasible course to follow.

THE 4.4 PRIORITY

H.R. 9 and its companion bills do not contain last year's 4.4 m.a.f. priority for the State of California during times of shortage. In this regard, Mr. Chairman, I am sure that my California colleagues will agree with me that the "California priority" is the most troublesome issue which our two states must face—and which our two states must finally resolve.

Our unwillingness to again agree to this priority is not an arbitrary, stubborn, emotional position based on anger and bitterness as some people would have you believe. This problem of water for our state—and water for the entire Colorado River Basin is too big—and too vital to be decided by matters of emotion or "face." We would like to take a few moments here to discuss this problem in some detail—to point out why we believe too much has been made of the 4.4 priority and to make it clear that H.R. 9 is not just an "Arizona" bill. It is indeed a "California" bill from which that State will benefit immensely, and which in its own interests it should support.

Let us consider first the history-making agreement which we reached last year in cooperation with representatives of all of the Colorado River Basin states. As between Arizona and California there were four major elements to that proposal:

1. The authorization and construction of the Central Arizona Project.
2. The study of means to augment water supplies in the Colorado River to make the River whole including meaningful studies of the possibility of water importation.
3. The establishment of a Basin Fund with revenues from the hydroelectric dams to assist in financing any future water augmentation program.
4. The establishment of a 4.4 million acre-foot priority to California at such time as shortages develop and must be allocated on the River.

Of these four points, the fourth—the California priority—was really the least important. The allocation of shortages—if it ever comes—will not come for twenty or twenty-five years. And if we can achieve the first three objectives of last year's bill, the question of allocating shortages will never be reached.

Despite some considerable dissent in Arizona, and despite our view that the form of the California priority was somewhat inequitable, we agreed to its inclusion as the price for California's support on a program of immediate action. As part of an ambitious regional bill which provided the money and the machinery to insure that the shortages of 1995 would not occur, that provision contained modest risks we could afford to take.

But the single most important lesson of 1966 was that H.R. 4671 was probably too large and controversial to pass without serious danger of amendment.

In our judgment, a less ambitious bill such as H.R. 9 *can* pass this year, but without specific importation studies, without Marble Canyon Dam, without the other elements of H.R. 4671, the risks for Arizona in last year's 4.4 priority language are simply too high.

The main effect of such a 4.4 priority would be to place on Arizona the whole incentive and burden of augmenting the river before the "crunch" of the 1990's. We could accept that burden when the machinery for augmentation was part

of the bill. But, since we cannot include this machinery for the practical reasons set forth above, we cannot accept and assume this burden. And, in our judgment, it is patently unfair to place this burden on Arizona when California has at least three sources of potential augmentation—the Colorado River, the rivers of Northern California and the entire Pacific Ocean—while we have only the Colorado—(not to mention California's numerical strength in the House of Representatives with 38 members to our 3).

Without strong language on imports—such as that with which we started out last year—we would in fact be giving California a priority in perpetuity—without the hint of a promise of help from California toward supplementing the River's dwindling water supply.

Inclusion of the 4.4 priority in the terms desired and demanded by California also means giving up much of the victory we won in *Arizona v. California*. As you know, the basic issue there was whether the doctrine of prior appropriation applied on the Colorado River as between the states. The court said that the doctrine did not apply and that the allocation of water as between the states was prescribed by Congress in the Boulder Canyon Project Act except as to rights perfected prior to this 1929 Act. Except in the context of a truly regional water development program such as we considered last year, Arizona is understandably reluctant to acquiesce in California's attempt to legislate our victory away by establishing a priority as a *quid pro quo* for their support of our project.

In this regard, we are told by some of our friends in California that authorization and construction of Arizona's project—the most urgently needed in the region—cannot go forward piecemeal, but only in the context of regional settlement and development. Apparently, however, the same principle does not apply on the west bank of the River. For at present, California representatives are seeking approval and authorization of additional federal reclamation projects and other programs to augment water supplies both in Southern and Northern California.

This very month California proponents of a bill to authorize the huge desalting plant in the Los Angeles area were before this Committee asking for a federal contribution of some 70 million dollars, all of which is nonreimbursable. This desalinization project, we are told, will produce some 150 million gallons of fresh water each day—enough water to supply the needs of cities the size of Phoenix or San Francisco, or two cities the size of Tucson—for use and consumption in Southern California.

I pointed out during the hearing on that bill that, while we support these plans for water augmentation and believe that the desalinization technology and other water resource development programs must go forward, we will not stand idly by while these projects receive priority and funding and let our own long-overdue project—which is entirely reimbursable, self-sustaining and so badly needed—be ignored.

We hope that our California neighbors will not make the mistake of concentrating so hard on a 4.4 million acre-foot priority that they lose sight of the fact that the bill which Arizona brings before this Committee has important, direct and far-reaching benefits to California. In this bill we offer our friends in California the hand of partnership.

We ask that California ponder hard and long whether that State will really be better off:

(A) If it works to defeat this legislation because it does not contain these "magic words," words which relate only to shortages and to events in the distant times—eventualities which need never occur if we work together; or,

(B) If this bill (H.R. 9) passes with "not-so-magic" language, but produces results which benefit California in the following direct ways:

(1) The passage of this bill will end the fight between Arizona and California and will begin a partnership—a partnership not just with Arizona, but a partnership involving all the Basin States. It will revive and renew the cooperative spirit we achieved last year.

(2) The passage of this bill will end the stalemate on the Colorado River. It will clear the decks so that we can all go forward together. There are important reclamation projects needed in California right now. The passage of this bill will remove any reason or incentive for Arizona, or other Basin States, to oppose or delay the authorization or funding of these projects.

(3) The passage of this bill will immediately establish a Basin Fund, the key bank account needed to finance the many important things which simply must be done if our region of the country is to survive.

(4) The passage of this bill will mean that we can begin meaningful preliminary steps and studies which are an essential prerequisite to the desperately needed augmentation of the River. The River simply will not be augmented until meaningful, far-reaching studies are made. We would have preferred that the augmentation and import studies be made under the terms and conditions provided for in last year's bill rather than by the National Water Commission as provided in Title II of H.R. 9. But the plain political and legislative facts for the foreseeable future are such that we will either have a National Water Commission study of possibilities for augmentation of the Colorado River by trans-basin diversions, or we will have no study at all. Faced with these alternatives, we favor the National Water Commission study and believe it represents a meaningful step toward resolving the long-range problems of the area.

(5) In addition to the crucial studies for augmentation from outside the Basin, the bill last year provided for other equally important studies within the Basin. H.R. 9 provides, as did last year's bill, for:

(a) Studies of the export of water from Northern California to the Colorado River and Southern California.

(b) Studies of the possibilities of augmenting Colorado River water supplies through the improvement of desalinization technology and the construction of large-scale desalting plants.

(c) Studies of weather modification. In this field, exciting and interesting things are happening. If there is the kind of breakthrough which some optimists expect, these "Rivers in the Sky" may add as much as two and one-half million acre-feet of water to the annual flow of the Colorado River at a small fraction of the costs involved under any other conceivable augmentation program.

(6) The passage of the bill will make possible an accelerated water salvage program which could save, if put into full effect, perhaps as much as 1 million acre-feet of water through canal lining, water salvage and other improvements. Salvaged water, it must be remembered, is just as good as new water added to the River.

(7) The passage of this bill will put to rest, once and for all, the troublesome and potentially divisive and dangerous disputes between the two basins on the matter of the regulation of Hoover and Glen Canyon Dams. This is no small problem to California, and its settlement is no small gain.

(8) Perhaps most important of all, this bill contains a Congressional finding that augmentation of the River by 2½ million acre-feet is a national obligation. If crude, preliminary estimates of augmentation costs are sound, this provision alone could be a benefit to California and the whole Basin equal to the excess revenues of another Hualapai Dam, or more. It may be asked why this augmentation program should be considered a national obligation and why its financing is non-reimbursable. In this regard, let me point out that the obligation to furnish this water to Mexico was created by a wartime treaty in 1944 between the United States and Mexico. We believe that the burden of this wartime commitment should be borne equally by all of the states as a national obligation. The Bureau of the Budget and this Committee both concurred in this approach in consideration of last year's bill.

For these reasons, we hope that this whole enterprise and all of the benefits of regional cooperation will not be lost because of California's demand for a priority which the Supreme Court has said it cannot equitably claim. Sensible Californians know, as every member of this Committee knows, that with or without the priority, by the year 2000, the River will be short of water to meet even the most modest projections of future requirements. And we believe that they will see the wisdom and the benefits that might accrue to California under the terms of our bills.

We also appeal to our neighbors in the other Basin States to consider the wisdom of this approach, to realize the necessity of taking this first step toward

solving our common problems. The hand of partnership which we hold out here to California is also extended to our neighbors in California, Nevada, Utah, New Mexico and Wyoming. We ask their assistance, initiative and good will in helping Arizona and California come to a friendly, statesmanlike and mutually beneficial solution of this thorny 4.4 priority problem.

NATIONAL WATER COMMISSION

As mentioned briefly above, H.R. 9 provides for the establishment of a National Water Commission with authority and a directive to study, investigate and report on anticipated national water resource problems. In most respects, this section of our bill is similar or identical to the measure considered and passed in the Senate as S. 20 on February 6, 1967. The primary distinction between our provision and S. 20 is the priority given to the establishment of principles, standards and procedures for the program of investigation and submittal of plans and reports relating to the Colorado River Basin.

We favor the establishment of this priority in any legislation creating the National Water Commission in recognition of the severe water shortages and related problems in the Colorado River Basin which have been identified and established.

With these provisions, we favor the creation of a National Water Commission whether by the legislation before the Committee, by independent authorization as in S. 20, or in some other form.

CONCLUSION

This, then, is the substance of our proposal. As you can see, there is no element which has not been previously considered by this Committee. There is no component part which cannot be fully integrated and coordinated with development under any future plan. Each unit or feature of the project is necessary to rescue the economy and the people of central Arizona.

We seek only to obtain and put to use that water which the United States Supreme Court has said belongs to Arizona. By this proposed bill we do not seek to obtain water at the expense of other states in the Colorado River Basin, or, for that matter, from the Northwest, from California, or from any other source outside the Colorado River Basin. The future water supply problems of the Colorado River Basin must be worked out in a cooperative and statesmanlike manner—among all states which are in any way affected. We pledge our full cooperation to such a program. But, notwithstanding our willingness and enthusiasm to work for long-range development in the West, we are forced by necessity to solve our present water crisis first.

We need not speculate as to what our failure in this effort will mean to Arizona. In the central Arizona area—where two-thirds of our people dwell—we find the ruins and relics of a once great civilization—a constant reminder to those who live there that a community cannot long exist without a permanent and adequate water supply. These early dwellers—referred to by present day Indians as the Hohokam—were the first to settle Arizona. With nothing more than sticks, stones, mud and hard work, they dug 125 miles of canals, built 22 villages, and irrigated more than 140,000 acres in the Salt River Valley where they prospered during the first 14 centuries of the Christian era. But time ran out on the Hohokam (a Pima word meaning "those who have gone"). Archaeologists tell us that they lost their race against time by their failure or inability to build adequate water storage facilities to support their growing needs.

We know that the country will not stand by and let the people of Arizona follow in the footsteps of the Hohokam.

We know that our long sought and critically needed Central Arizona Project will ultimately be authorized—and must some day be built if the economy of Arizona is to continue.

In many parts of our state, yesterday's necessity for supplemental water has become today's crisis.

Unless we proceed now with authorization and early construction of the Central Arizona Project—today's crisis is certain to become tomorrow's catastrophe.

Gentlemen—the people of Arizona must have your help—and I respectfully urge that this must be the year.

Mr. JOHNSON. I might say to the gentlemen from Arizona that there will be discussion by certain members of the committee. I would like, however, at this time to give Hon. John Rhodes an opportunity to extend his remarks if he so desires.

Mr. RHODES. I have no statement, Mr. Chairman, other than to associate myself with the remarks of my colleague, Mr. Udall.

I just want to thank the Chair for reconvening this great water resource court which is for the purpose, among others, of hearing the case of Arizona—the need that Arizona has for water.

These litigants who are now before you would like to assure you of our hopes that this will be the last appearance that we make on this particular matter before your honors.

Mr. JOHNSON. Now, may we have a few words from the new Member from Arizona, Hon. Sam Steiger?

Mr. STEIGER. Thank you, Mr. Chairman.

I would simply like to wholeheartedly associate myself with the remarks of both of my colleagues and to express my gratitude for the fact that the committee is very, obviously, aware of the need of Arizona and, I hope, is equally aware of the sincerity and earnestness of our approach.

I thank the chairman and the committee.

Mr. JOHNSON. You gentlemen certainly have presented a very fine statement.

I am sure that the committee has some questions.

The Chair recognizes the gentleman from Oklahoma.

Mr. EDMONDSON. Mr. Chairman, I will withhold any questions at this time. I do want to compliment the three very able representatives from Arizona on a very fine and well prepared statement, and to say that I do hope it will be possible to work out something that meets what I know is an increasingly critical water problem in that great Western State, and that this committee will be able to move out a piece of legislation along the lines of H.R. 9.

With that, I relinquish my time.

Mr. JOHNSON. The Chair recognizes the gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Thank you, Mr. Chairman.

First, I want to commend my three colleagues, to state that I am delighted with the statement you have presented. I want to welcome my ex-colleague and ex-member of this committee, Mr. Rhodes, back before the committee. In the past, he contributed much to the deliberations of this committee, and it is like old home week to have him back again.

I would also like to say to my colleagues that we have 100 percent of the Arizona delegation in front of us. That is a better percentage than the California delegation has on this committee at present, but not much.

I hope that you will take a long look down the long barrel of reality and look to my left and find that we have Mr. Johnson, the chairman of the Subcommittee on Irrigation and Reclamation of the House, and then you go down the line and you will find Mr. Burton of California, Mr. Tunney, of California, and then you look over to my right and you will find Mr. Hosmer and Mr. Reinecke. They have five of their

38 members present at this subcommittee. It is rather unusual, I am sure, to find any State with five members on any committee, let alone a subcommittee, and I have no doubt that if the central Arizona project were not pending before this subcommittee that we would not have the benefit of all of the knowledge from the State of California.

I am interested, Mr. Udall, in this:

Have you any comment on the fact that when the chairman of the full committee, Mr. Aspinall, wrote to the Department of the Interior and asked for a report that he did not ask for a report on your bill? He asked for a report on H.R. 3300, a bill which the chairman of the full committee introduced.

Mr. EDMONDSON. Will you yield?

Mr. SAYLOR. Yes.

Mr. EDMONDSON. The report indicates that the report was also requested on H.R. 9. That is the bill by Mr. Udall.

Mr. UDALL. On page 8 of the Department's response, it says that additional reports were requested on H.R. 9 and a group of other bills, in addition to H.R. 3300, and that this letter is to be considered as a response to all of the requests on these bills.

At least, that was the way that I read the report.

Mr. JOHNSON. If you will yield?

Mr. SAYLOR. I will be happy to do so.

Mr. JOHNSON. This is a part of the record now, and I am sure that the record speaks for itself, and I think that in the report from the Department it will be spelled out. H.R. 9 is also included. And the Secretary's report, representing the Department of the Interior, is pretty much on the record on this matter.

Mr. SAYLOR. I thank my colleague from Oklahoma for calling this to my attention.

Now, I would like to ask you, Mr. Udall, this question:

When the Department of the Interior published a report on H.R. 3300 and on the other bills, they said that they did not favor, in a sense, any of them. They have their own bill, and their own bill varies materially from the bills upon which you have testified. Now, if this committee in its wisdom should adopt the bill which has been forwarded by the Department of the Interior which is attached and is now a part of the record, would this meet with the approval of yourself?

Mr. UDALL. Let me make it very clear that the position of myself and my colleagues is that the kind of legislation that this committee ought to pass is H.R. 9. This is the position of our Governor, the State Water Agency, the position of the water leaders whom we consulted. We believe in crossing bridges when we get to them. If we are ever in the position of being asked to oppose a bill which includes the central Arizona project, I think that our resolve in statesmanship might be tested at that point. But we feel confident that the committee is going to produce legislation that we can support. And if the hypothetical situation that the gentleman refers to arises, we will meet it at that time.

Mr. SAYLOR. I might say that I hope this committee reports a bill that I can support, too, for the central Arizona project.

Mr. UDALL. We hope that bill will come out so that he can support it with us.

Mr. SAYLOR. It seems strange that we have the President and the Secretary of the Interior sending up a bill recommending no dams in the Colorado River. Last year, you and your colleagues wanted two dams. This year you want half a loaf; you want one dam.

Now, as the new majority leader for the Democratic position and the position of the administration as supporting no dams, I just hope I can count on the support of the Arizona delegation.

I am not surprised that you feel you cannot comment on that at this time.

I am also disturbed because in your statement you say that you want a national water commission. I notice there is such a provision. I do not believe it is that which was reported on by the Department with particular attention directed to the central Arizona or the Colorado Basin. If we authorize the national water commission without sufficient attention being directed toward the central Arizona or the Colorado Basin, would that meet with your approval?

Mr. UDALL. I am not trying to evade my friend's questions. As my friend knows, you fight legislative battles when you reach them.

We strongly favor a provision which gives some specific direction to the national water commission. If we are confronted with a situation that the gentleman describes and it is that kind of a bill or nothing, we, of course, would have to consult with the people in our State and decide where the interests of Arizona lie. I hope that we will not reach that point. I would respectfully ask my friend to let us defer judgment on that hypothetical situation until it arises.

Mr. SAYLOR. The reason I asked that is that I am convinced that water is not an area problem. It is a national problem. I think that the people who are handling water on a national basis are suddenly realizing that it is a national problem and it cannot be solved by trying to fragment it and apply certain rules and regulations to specific areas of the country.

Mr. RHODES. Will you yield to me at that point?

Mr. SAYLOR. Yes.

Mr. RHODES. I agree with you. I think that the water shortage, as well as a surplus of water in certain areas, is a national problem. We treat it as such, and we should.

The facts are, however, that the areas of Arizona which will benefit from the central Arizona project are, probably, the most water-short areas in the United States.

The reason we favor asking the national water commission to give priority to this study is caused by the very existence of that set of facts. If the problem were not acute we would not be in favor of such a direction, but since it is so acute, we think it is necessary.

Mr. SAYLOR. Mr. Rhodes, I do not want to agree thoroughly with that, although we have been talking about the Southwest being a water-short area, but, very frankly, I do not think that the Southwest is a water-short area.

Mr. RHODES. This is the thing, or one of the things, of course, which the national water commission will study.

Mr. SAYLOR. Very frankly, the people in California and the people of Arizona have gone down the line quite a ways, so far now that when you turn the spigot in any one of your communities you still get water. Now, it may be that water has been used for certain purposes in the

past that might not be in the national interest, in being put to its best and highest use. I am only hoping that as we look at this problem of your State that we can try and determine what is the best use for Arizona and for the Southwest. I am also concerned with the fact that in your testimony you have requested that the Mexican Water Treaty be made a national obligation. If there is any one thing that might cause defeat of the bill, it might be in that area, as to the obligation of the Nation to that treaty, and I would certainly hope that in your political wisdom you would not try to saddle the 50 States of the Union with the obligation of seven, because that is what you are trying to do. And I might say parenthetically that in your conclusion, Mr. Udall, you give us a statement about the early dwellers in the State of Arizona. It might be well, not only for your edification but it might be well for the members of this committee to review a little history, a little world history. You know that China, India, Egypt, all of the areas that are now classified as the backward areas of the world were all of the things that you are asking this committee to give to Arizona in the Southwest, and time ran out on them. And I am hoping that you are not asking us to obligate this country so that time will run out so that we, too, may become a nation like China, India, or Egypt.

As great and glorious as those countries were and as great and glorious as this country is, I would not like to see us following the same path. In those countries, some of their people tried to do the same thing that the Department of the Interior, particularly the Bureau of Reclamation, is trying to saddle on the future of America.

I commend you for presenting a very good statement, for trying to conscientiously represent your State and your constituents. I hope that when the chips are down that you will, being the statesman that you are, represent the entire country.

Thank you, Mr. Chairman.

Mr. JOHNSON. The Chair recognizes the gentleman from California, Mr. Tunney.

Mr. TUNNEY. I thank you, Mr. Chairman.

I would like to compliment the delegation from Arizona on a very fine statement.

There are a few items in it, however, with which I disagree.

Mr. UDALL. We expected that might be the case, although we regret it.

Mr. TUNNEY. I am interested to know how you feel about the nuclear energy plant suggested to be built out there in connection with any of these dams?

Mr. UDALL. I would say to my colleague that that was discussed at great length in last year's hearings and in the hearings the year before.

I do not think that there is an issue that has had more attention than this. I sat with my friend through these endless days of hearings and arguments.

I subscribe to the conclusion that the committee and the subcommittee reached last year, that there is a necessity for a dam, that the energy that is needed can be sold and the payout will add excess revenue to the basin fund to take care of the things that should be done.

My position has not changed.

Mr. TUNNEY. Did you have any contact with the Department of the Interior at the time that they were making the decision to strike this dam out?

Mr. UDALL. I tried to consult with the officials at the Department of the Interior and have tried to do so from time to time. [Laughter.] I try to do that at family reunions and other social functions when they occur.

I knew that they were studying options and alternatives of the kind that they finally came up with. I guess it was either Cain or Abel who asked that time-honored question: "Am I my brother's keeper?"

I do not agree with them. I think they have attempted to find an out. I think their attitude has been constructive and that they are endeavoring to solve the water problems of the region. I regret that I did not agree with their conclusions.

Mr. TUNNEY. One of the things that you mentioned in your testimony, when you referred to other bills, you felt that you needed a different approach this year from that of last year.

Are you saying, by implication, that you really do feel that the bill that we had last year was a better bill than the one that you are introducing this year?

Mr. UDALL. This was a complex bill and many provisions were better. Some were not quite as good. We were never greatly enthusiastic about the 4.4 priority, for example, but we felt, under the terms of last year's bill that this was something that we could live with. We agreed that if I could push a button right here on last year's bill and that it could or would become law, I would push that button. However, we must realize that there are 435 Members of this House and 100 Members of the other body that meets a quarter of a mile to the north of us here. We think, realistically, if we are going to get the central Arizona project and go forward on the water needs of the region, that we have to have something that is reduced in scope.

Mr. TUNNEY. Would you say that your position, of your bill, to provide for studies as to the Southwest is less controversial for instance, than perhaps the 4.4 proposition or a general study of the water problems, of getting water from other regions, et cetera?

Mr. UDALL. Because of the statesmanship in California and the experience that your State has had in transferring water from one place to another, you have been able to quiet the fears and to sensibly study these problems to an extent that has not been possible in the Pacific Northwest.

California came in and supported this bill last year—the people from all over California—with those specific provisions in it. As we went to the provisions of last year's bill, we tried to retain those features that are constructive, that are helpful, that will begin to solve the water problems of the region and are not controversial and to take out those things that would probably defeat the legislation and continue the stalemate.

Mr. TUNNEY. One of the things that I feel very definitely that would prove economically feasible is to bring water to the Southwest from northern California, then it would be economically feasible.

bring water down from the Columbia River Basin, but it seems to me that you, by requiring a study of equal treatment of water from northern California and a study of bringing water from the Columbia River Basin, only look at part of it.

Mr. UDALL. Not at all. I think that it is very important that every potential means of augmenting the water supply be studied. The question is: Who is going to study it?

Because of objections from the Northwest and because of political realities; it is apparent that the Bureau of Reclamation and the Secretary of the Interior on the terms of last year's bill are not going to be authorized to study the Northwest's reserves. The studies should go forward simultaneous but should be made by the National Water Commission at the same time as the other studies that California had wisely agreed to, of northern California's potentialities for augmenting the riverflow, of weather modification and other sources. I do not say that they should not be studied. But because of the realities, they will have to be studied by different entities.

Mr. TUNNEY. I remember, last year it was testified before the committee that the time was running out.

Now, if you have a National Water Commission and you have to have congressional confirmation of the staffing, to make nationwide studies and preparation of reports that will take 4 or 5 years, and then if you have a congressional review of the National Water Commission report, and the like, and alternative plans and congressional authorization, as to the feasibility studies, that will take 3 to 5 years more; and then if you have a completion of the feasibility study it may take 4 or 5 years more, and the Bureau of the Budget studies would take some time, too; and, then, you have congressional hearings leading to the authorization and the possibility of the implementation of the studies, which will take 4 to 5 years. And then you are talking about 35 to 40 years of studies by the National Water Commission to conduct the preliminary study. Whereas, if you had a feasibility study which was to be followed, you would have to take 7 or 8 off of that period of time, and if we are going to have a real problem about water shortages in 1990 we cannot wait 35 to 40 years, if that is the most feasible means of augmenting the water supply in the Southwest area.

Mr. UDALL. I do not agree with your premise on time.

On page 8, it says, within 250 days you turn loose the Secretary of the Interior, under the principles established by the National Water Commission, on a study of these things that do not require going outside of the basin. I would think that within 3, 4 or 5 years you would have a pretty high grade feasibility or reconnaissance study of all of the means of augmenting the river that are not controversial. There would be augmentation of the water by desalinization, weather modification and all of the rest of them.

The National Water Commission provisions in title II of the bill requires the Commission to report back in 6 years. We go beyond that and say that you do not have to take the 6 years. You ought to look at the Southwest problems first. You ought to get to this as soon as you can. I would think that if our bill passed, between 5 or 6 years at the latest, the Congress would be in a position to have before it the

studies made by the National Water Commission, the studies made by the Secretary and others in California, and by that time the Pacific Northwest would furnish the independent studies they are making. Surely, in the earlier or midseventies, the Congress would be able to make the big decision that has to be made.

Mr. TUNNEY. Instead of 35 to 40 years, it will only take 5 or 6 years, you think. I would just like to say in concluding that as far as 4.4 is concerned, I am amazed by the testimony that you feel that this will provide for a greater degree of cooperation.

I think that California is taking 5.2 from the Colorado River water and we reach down to 4.4 in the central Arizona project—that even if we do that, we are in a situation where we are using the water and have been using it since the beginning of the 20th century, and it seems to me that you are very fundamentally ignoring that.

Mr. UDALL. I do not want to take the time of the committee this morning to argue this problem with my friend. I am sure that we will be discussing it in the weeks ahead. But the people in Arizona are determined to go forward and to get their fair share of the water. And the question is not whether California may someday cut back to 4.4 if we do not go on a broad program of augmentation. I think this will come in any event. The question is whether, in short years, you are going to come back to 4.1 or 3.9, or 3.7, to something far less than what is needed. Whereas, if we solve this emotional controversy between the two States, I feel confident that the day my friend refers to will never arrive. We will never have to meet this problem.

Mr. TUNNEY. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from South Dakota.

Mr. BERRY. Thank you. I have no questions.

I just want to commend the three gentlemen from Arizona on a very fine statement. There is no question but what there are a number of areas that are in need of water. The need in this area is more critical, perhaps, than in any other area in the Nation, not just for Arizona alone, however. We are interested in the growth of the Nation. This is a critical need, in my judgment, for most of the Nation.

Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from Texas, Mr. White.

Mr. WHITE. I want to congratulate the Arizona delegation for presenting a very fine statement. I simply want to say, in regard to the Mexican Treaty, that this is a national treaty not made by the States but made by the United States. I am sure that these States regard it as an international obligation, as a part of their own, because we are a federation of 50 States. This is all of our problem and not the problem of just a few States.

Mr. UDALL. Thank you, my friend.

Mr. JOHNSON. The Chair recognizes the gentleman from California, Mr. Hosmer.

Mr. HOSMER. I, of course, do not look at the statement as the majority do. I note that our senior Senator from California is here, and I will pass my time.

Mr. JOHNSON. The Chair recognizes the gentleman from Texas, Mr. Kazen.

Mr. KAZEN. I do not have any questions at this time. Those that I would have would go to the background of this matter. I think I can get with my colleague and get the answers and not take up the time of the committee now.

I do want to commend them for a very fine presentation and to commend the delegation as a whole.

Mr. UDALL. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman. I, too, would like to commend all three of my colleagues from Arizona on a very fine statement. I would like to tell them again, as I did last year, that I am deeply sympathetic with their problem and want to help them in such ways as I can, except to participate in anything that would lead to giving away the birthright of the Northwest.

As I told you gentlemen before, I hope that the objectionable features to the legislation that we are now considering can be eliminated so I won't be forced to vote against it.

I would like to associate myself very strongly for the record with the remarks of my distinguished minority leader on this committee, Mr. Saylor, relative to the Mexican Treaty water. You were present last year, Mr. Udall, when the State Department representative testified in regard to the Mexican Water Treaty, when I asked them what amount of water the Republic of Mexico was drawing from the Colorado River at the time that treaty was entered into. Do you recall that exchange?

Mr. UDALL. Yes, I do.

Mr. WYATT. And the burden of his testimony, as I recall, was that the treaty merely formalized and recognized that Mexico was already entitled to the amount of the water which the treaty in essence has been described as giving to the Republic of Mexico. Under those circumstances, I do not see how it can be fairly considered to be a national obligation when Mexico was legally entitled to the amount of water that is defined in the treaty.

What do you have to say on that point?

Mr. UDALL. Mexico never had any legal entitlement until the 1944 treaty. They may well have claimed moral obligations or obligations resting on international comity. The fact of the matter was that they were down at the end of the pipe, and the U.S. users could have kept all of the water up there without such a treaty, if we had wanted to take a hard position about it.

Mexico has been pressing for decades for some resolution of this, for some definite fixed amount of water that they were entitled to, so that they could plan irrigation works.

In 1944, at a time when our country was under great pressure and faced great international problems, the Mexicans were pressing for a resolution of this problem; and, indeed, they were pressing for a resolution of a similar problem on the Rio Grande. It is our judgment and our belief that, had we not had this wartime emergency situation, we probably would have struck a much harder bargain with the Republic of Mexico than we made at that particular time.

All of our arguments were presented to the Budget Bureau, an organization which is not widely known for throwing taxpayers'

money carelessly around the country. The Budget Bureau and the administration agreed, in the light of all of this history, that it was an unfair thing for the people of this country to say: "We, the 48 States, place on you, the seven States, the burden of filling this great national obligation to a sister country."

We did it thinking that there was plenty of water for this to be done. We now find that we were wrong, and so we are going to help you make the river whole and make it what the State Department and the President of the United States thought it was in 1944 when they made the agreement with Mexico. This is a short answer to my friend's inquiry.

Mr. RHODES. Will my colleague yield?

Mr. WYATT. Yes, indeed.

Mr. RHODES. For amplification, I hope that my colleague will not take the position that the State Department's testimony last year is wholly uncontroverted as to the amount of water Mexico was using at the time the treaty was signed. As a matter of fact, I think that the hearing in the Senate at that time will show that the contrary may well have been so. In other words, people do disagree on the premise which the State Department made. In fact, the whole California delegation at that time was definitely against the treaty, and I think they were against it on the basis that it was giving Mexico more water than they had any legal or moral right to expect at that time.

Mr. WYATT. I am happy that my colleague has pointed this out, because I think the only statement on the record to my knowledge on this point was a very brief one by the State Department people, and I will be happy to search the record. I think that our record should show as nearly as possible what the Mexican use of the water was. I might say that I do not, certainly, agree that all people feel that Mexico had no legal right to the water prior to the treaty. There is a considerable body of authority which says that Mexico had very specific rights to certain amounts of water of the Colorado River, that is, prior to the treaty.

I have just one other point of inquiry here.

I am somewhat disturbed by the statement in the joint statement that you gentlemen have made relative to the National Water Commission in which you favor giving a priority to the establishment of principles, standards and procedures for the program of investigation relating to the Colorado River Basin.

To me, this means that you are asking that in the National Water Commission legislation that there be given a priority of a study to the Southwest's needs. The Southwest may have the most serious needs of any part of the country, but it seems to me that it is not good to create a National Water Commission, to recognize our problems as being national problems, and then to order in the same legislation a piecemeal study; in other words, to have one area studied in advance of the other studies.

If you have any comment on that, I would appreciate it.

Mr. UDALL. I do not read the directive of the bill the way my friend apparently does.

This is going to be a big impressive national study. They will study the Hudson and the Mississippi, and the Ohio Rivers, and Suwa-

nee, and all of the rest. You have 6 years in which to do it. All we are saying is that when you get through you are going to have some recommendations for a national water policy. You will have recommendations as to what can be done in specific areas. If you have on your desk four or five different areas that you are going to finally make recommendations on, you can take up any one of them first. And we say that this area, which everyone recognizes is the most crucial water-short area of the country, ought to be studied first. We are not asking that it be studied piecemeal or out of context with all of the national problems. It is simply to take all of these myriads of river basins and national water problems and integrate them into an entire national policy and that this one be given some priority in that context.

Mr. WYATT. I thank my colleague for clarifying the record in this regard.

It is my understanding, Mr. Steiger, that the State of Arizona, within the last few weeks, has gone ahead with the State development of the central water project and has authorized a plan in this regard.

What effect does that have, if any, upon this legislation before the committee now?

Mr. STEIGER. Well, I think that it is a clear expression of what the committee is obviously aware of, that the State of Arizona is genuinely concerned about receiving its share of the Colorado River. I do not know of a single advocate of a State plan who does not recognize that the Federal or the regional approach is the most desirable approach.

I would like to make that very clear, because I think if you can characterize an attitude of a State, this is the attitude of the State of Arizona. But the State legislative authorization for the investigation of a State project is simply an expression by the legislature of the State's concern over the continued failure to achieve a Federal project and a recognition that something simply must be done so far as Arizona's water needs are concerned.

As far as its effect on this legislation, the State legislation becomes inoperative in the event that a Federal project is authorized. This, in turn, I think, reemphasizes the recognition that a regional, the basin approach, is a far more satisfactory approach.

Mr. WYATT. I thank the gentleman. I yield my time.

Mr. SAYLOR. As to this Mexican Water Treaty, the history of Mexico and the United States, and of the Department of Justice, when this treaty was entered into, there was the matter of riparian rights which was brought into this water question, and not the theory which some of the Western States have advocated as to prior uses—first in time are the ones entitled to use the water. The history will show that Mexico throughout the entire period was complaining about the quality of the water that was being delivered to Mexico. This was one of the problems that the State Department will be called upon, I am sure, to testify on.

I thank my friend for yielding.

Mr. WYATT. I would just like to close by telling my colleagues I think that there was testimony which has answered some of my questions and has made a great contribution to the question before us. I thank you.

Mr. JOHNSON. The gentleman from Idaho, Mr. Hansen, is recognized.

Mr. HANSEN. Mr. Chairman, I, too, appreciate the statement by my colleagues from Arizona. I favor the central Arizona project, and hope that conditions will not be attached so that it becomes too controversial to support.

I note in the testimony this morning that this project has been before the Congress for many years and hope that we are able to approve it this time.

One of the problems that we will have concerns the overall study and the drafting of legislation for a National Water Commission so that there will not be any prejudiced and predirected conclusions in the study.

This will be a strong condition that we will have to stress. I do not wish to belabor this at this time, because we have had earlier lengthy discussions and we will have the appropriate occasion later to get into it in more depth.

I do want to commend you on your statement and on your willingness to answer the questions of committee members forthrightly. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from California, Mr. Reinecke.

Mr. REINECKE. I would like to commend you on your very persuasive and eloquent statement, although it is controversial in parts.

On page 2, you say that the area is threatened with disaster unless supplemental water is brought in from the Colorado River.

You are probably aware of several statements made by a professor from the University of Arizona in Tucson which to some degree contradicts that statement. First of all, are you aware of those?

Mr. UDALL. Yes.

Mr. REINECKE. Would you comment on that for us?

Mr. UDALL. We have always seemed to have helpful people in Arizona who want to come here and testify or to make statements against our bills and the policies which have been advocated by the Governor or the legislature, or the congressional delegation. I know the gentlemen you refer to. I consider them sincere people, and I am afraid I just sharply disagree with their comments and their conclusions.

What I would really like to do, in the interest of time, is this: I have again worked with the staff over the weekend on a memorandum answering these specific points, the specific points that they made. It is still in rough form. I would like, if you gentlemen would prefer, to get permission to insert a memorandum on this point, and then at a later point in the hearings we could, perhaps, discuss it.

Mr. REINECKE. I am sure that will be fine.

On page 3, you mention the figure \$1.8 million; is that right?

That would then fulfill the entitlement of Arizona?

Mr. UDALL. Substantially, if you can run the aqueduct all year long at that capacity that we propose; yes.

Mr. REINECKE. Just one final question.

We have talked around and around this, and that is regarding the 4.4 guarantee. If that were, in the judgment of the committee, included, would you gentlemen feel that you could support the bill?

Mr. UDALL. We would hope that it would not be included; we would hope, if it is included that there is some change in it. We thought

that the form of it last year was inequitable and unfair, for the reasons stated in our statement.

Again, I do not want to dodge questions or issues. We would like to meet that when we get down the road.

It is my feeling—and I speak for myself here, perhaps. I do not think either State has as much at stake in this 4.4 thing that a lot of the people in Arizona and California think. Some view this as a life-and-death matter for California, if it is not in there, and death for Arizona if it is. I think that if we will get together, we can solve these problems and that this will become a moot issue.

Mr. REINECKE. I am inclined to agree with you, but probably for other reasons.

You have to have some sort of a formula to work it out; 4.4 is extremely important to California. We would, also, have some 19 million people in this.

Mr. UDALL. There are people in Arizona who would say that your cutting back from 5.1 to 4.4 is not a great act of generosity; that the U.S. Supreme Court said that that was all you were entitled to and that you had been using the additional 700,000 acre-feet for 25 or 30 years without any right and that we are asking you to cut back now to something that we could have forced you to cut back to many, many years ago, and so on. I do not want to get into that argument.

I think that California's needs are far more than 5.1. We would like to help you meet them.

Mr. REINECKE. Thank you.

Mr. JOHNSON. If there is no further discussion, the next witness is Mr. Hosmer of California.

I am reminded that Governor Williams of Arizona desires to submit a statement which, without objection, will be incorporated in the record at this point.

(The prepared statement submitted by Hon. John R. Williams, Governor, State of Arizona, follows:)

STATEMENT OF GOVERNOR JACK WILLIAMS, GOVERNOR OF ARIZONA

Mr. Chairman and members of the Committee, the people of Arizona appreciate this opportunity for their Governor to present a statement to you concerning the Central Arizona Project.

As a boy I grew up on the dusty streets of Phoenix and splashed in the ditches through which flowed the water from Theodore Roosevelt Dam—water to recreate a civilization which had once perished and was rising again in the desert because of the reclamation program. You might say I was nurtured in the breast of the Reclamation Program which the Congress of the United States brought forth in 1902.

In the years of my youth, Phoenix and the Salt River Valley thrived on reclamation water as the wonderful people came from all over the Nation to put it to work for the good of all of us. If in the process I found for myself a place of any significance at all, it was as a personally involved observer and interpreter of people and the society that was abuilding. Radio station KOY in Phoenix was one medium for speaking of the people—their ambitions, hopes and needs—and water was a frequent subject. Later, as Mayor of the City of Phoenix, I was privileged to serve the people a little more directly. I have known as personal friends most of the fine, dedicated people who through the years have spent their lives in the attempt to provide the water without which Arizona cannot survive as a strong and healthy member of our family of States.

In the 1940's, when war was consuming and destroying the productive capacities of the world, the demand for Arizona's resources soared. Our copper mines,

our land, our climate—perfect for training pilots and manufacturing weather sensitive electronic devices—and our people responded. We had everything required for productive expansion—except water. And we found even that. We found it below the surface of the desert where for centuries Nature had been depositing it by the slow process of underground seepage.

I will not labor the point here. It is enough to say that Arizona spent and continues to spend its limited heritage of groundwater in response to the needs of the Nation, just as it mines its irreplaceable copper so that the United States may be strong in a troubled world.

It is true, gentlemen, that Arizona, like most of the states of the West, uses more than 90 percent of its annual water production for growing farm crops on less than one and a half million acres of land. But I have been watching, as you have, the rather startling disappearance of some food surpluses in our country, as the population of the United States and the world soar and as the non-farm uses of land devour our fertile soils. This, it seems to me, is the time to plan for greater food producing capacity in the decades ahead. The real significance of the western reclamation program lies before us, not behind us.

Yet Arizona cannot at this time talk of expansion in agriculture. We must now think only of trying to save what we have, and of providing water for our cities and industries. For this first and urgent need for survival we must depend upon our share of the Colorado River. We have had definite plans in that direction since 1947, when the Central Arizona Project was designed cooperatively by the State and the Bureau of Reclamation.

Just because the plan is 20 years old, however, does not mean that it is out of date, nor that we planned too soon; rather, we are too late with accomplishment. We already have devoured vast quantities of our groundwater while waiting for our full share of Colorado River water. What might have been a sustained source of water for occasional use in emergency years has now been dangerously depleted by continuous use. What was 20 years ago a project to rescue irrigation agriculture, is today a project upon which in a few short years our cities and towns and industries will depend for their very existence.

I am advised by the Arizona Interstate Stream Commission that a recent inquiry addressed to the cities and towns in central Arizona brought forth the information that by the year 1975, the earliest date at which water could be delivered by the Central Arizona Project if authorized this year, the cities of the area served will need at least 100,000 acre-feet annually of Project water. By the year 2000—only 33 years from now—those same cities estimate their need for Project water at nearly 500,000 acre-feet annually. This is almost one-half of the average amount of water which we hope to bring into the area annually from the Colorado River under present conditions of supply. And the estimate does not include any quantity of water needed by cities and towns outside the reach of the Project aqueduct which might be provided by application of the principle of exchange.

Gentlemen, the Central Arizona Project today is designed to meet the urgent water needs of people—not cows and carrots and cantaloupes alone—but people whose very homes and jobs depend upon the constant flow of water in their municipal delivery systems.

It is for that reason that I join with the members of Arizona's congressional delegation in a plea that authorization of the Central Arizona Project be no longer delayed. I understand and am sympathetic with the need of the other states of the Southwest to solve their water problems. I can promise our neighboring states of the basin that following authorization and construction of the Central Arizona Project we shall continue our cooperative effort with them to find solutions for our continuing mutual water development needs.

Arizona's plight is, however, so desperate that we must ask for the quickest relief possible within our established legal right, and take the second longer-range step later in its proper time.

It is in this light that the water leaders of Arizona and the people they represent are now examining our future courses of action. There is no question in our official State Government circles that a Federal reclamation project is by far the best for us. The Arizona Legislature, the State agencies involved, I, as Governor, and the responsible press of the State all acknowledge this and are solidly in support of our congressional effort in that direction.

But I ask the members of this Committee, and of the Congress, what your state would do if, faced with Arizona's dire circumstances, the Congress could

not, after 20 years, provide the necessary solution. I think you might do as we are doing now at home; that is, prepare to find other ways even though another way is hard and extremely burdensome.

Our State Legislature has taken that second searching look down the rocky path of aloneness in water development. The problems of a parochial solution are imposing, but not insurmountable, as our neighbors in California have proved so well with their own self-dependent accomplishments.

With the help of the Arizona Power Authority and the Arizona Interstate Stream Commission, the Legislature has prepared a first alternative water and power development plan which links hydroelectric power revenues with a water delivery system on the same principle which has worked so well for Federal reclamation projects.

Should this for some reason beyond our control be removed from our reach as an alternative to the more desirable Federal project authorization which is now before you, the Arizona Interstate Stream Commission is preparing a second fallback plan which involves no dependency upon State-developed hydroelectric power revenues. It would be an even greater burden upon our people and their economy. It would require money which we might otherwise have to spend on schools for our children and to meet the other needs of our fast-growing population, but even this plan has been declared to be within the financial capacity of our economy by no less an authority than the Ralph M. Parsons Company, with whom I know you are familiar.

Arizona considers these less desirable alternatives to a Federal project only because in desperation she must. If a man be without water, and thirsty in the desert, he does not forever haggle about the price of a drink.

I ask you now in the name of the people of Arizona for a Central Arizona Project, Federally authorized, to serve the best interest of this Nation and my State.

Mr. JOHNSON. You may proceed, Mr. Hosmer.

Mr. HOSMER. I thank you, sir. Our senior Senator from California is here and I would like to yield to him and to present my statement at a later time.

Mr. JOHNSON. Do I hear any objection?

Mr. SAYLOR. Reserving the right to object, I will not object. I only hope my colleague from California will deliver it at such time when we may be present.

Mr. HOSMER. I have always enjoyed your presence.

Mr. JOHNSON. It will be so ordered, there being no objection.

Our next witness is the Honorable Thomas H. Kuchel, the senior Senator from the State of California.

We welcome you before this subcommittee this morning, as the senior Senator from California.

We welcome you for your leadership in water out there.

I know that you have a very timely message for us. We will be glad to receive it at this time.

STATEMENT OF HON. THOMAS H. KUCHEL, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator KUCHEL. Thank you very much, Mr. Chairman.

I am honored to appear before this committee of the House of Representatives today to voice California's continued and enthusiastic support for regional planning to help solve the water shortages of all the States in the Colorado River Basin.

This subcommittee includes some very able Californians; yourself, my friend Congressman Hosmer who has been in the forefront of this problem for a long time, as well as my friends Congressman Tunney

and Congressman Reinecke, and, of course, Mr. Chairman, yourself. Subsequently, I am informed that Mr. Raymond R. Rummonds, the president of the Colorado River Board of California, will testify—a very able and longtime interested citizen of this problem, and Mr. Gianelli, whom you and I have had the pleasure of knowing over a long period of years will testify, and, finally, Mr. Northcutt Ely, special assistant attorney general of the State of California and attorney for the Colorado River Board and, perhaps, as eminently and as thoroughly acquainted with the whole complex background of the Colorado River legal and legislative system as anyone in this country who will testify before you on the number of bills concerned with this subject.

You have before you several bills which would help solve the Colorado River Basin's water shortages. One is H.R. 3300, introduced by your distinguished chairman, Mr. Aspinall of Colorado. My colleague, Chairman Johnson of this subcommittee, has introduced a similar bill, H.R. 744. In the Senate, Senator Moss of Utah and I have introduced S. 861. The differences between the Aspinall bill and S. 861 are matters of detail, which I believe can be readily adjusted. My distinguished friend, longtime member of your committee, Congressman Craig Hosmer of California, has introduced H.R. 6271, which is identical to S. 861. Several members of our California delegation have followed Congressman Hosmer's example. The Aspinall approach is a continuing recognition of the regional, rather than the parochial, approach to the solution of the basin's water shortages. It perseveres in the water statesmanship which united the seven basin States in the last Congress, and which I hope will be revived in the 90th Congress. It is, in my judgment, the only road to success.

I believed this when I introduced the first regional planning bill in the 89th Congress, S. 1019. My confidence in this solution was reinforced when 35 of my California colleagues in the House, and all three of Arizona's Congressmen, introduced exact counterparts of it. It was confirmed when this distinguished Committee on Interior and Insular Affairs, by a two-thirds majority, reported favorably one of these counterparts, H.R. 4671, introduced by Congressman Udall of Arizona, in the 89th Congress.

The essential elements of the regional plan, the "one-for-all, all-for-one" plan, as contrasted with the "go-it-alone" point of view, are all contained in the Aspinall-Johnson-Hosmer-Kuchel-Moss bills.

The vital features are:

(1) We propose early, vigorous, and meaningful steps to augment the inadequate flows of the Colorado River. We propose, as a first step, that the Secretary of the Interior, functioning under guidelines established by the National Water Resources Council and the proposed National Water Commission, investigate long-range water supply and demand, determine how much should be imported, determine what sources can furnish this without injury to the areas of origin, and what importation projects can be recommended to Congress for authorization.

Do we not, in this wonderful Nation of ours, seek to prevent waste wherever it occurs? Should not our Government determine where the great rivers in this country, which annually dump vast amounts of fresh water into the seas, might be used to slake its people's thirst, if

the area of origin were first carefully protected? The northwest California streams, and the mighty Columbia River systems, the possibilities of desalting sea water, all should be inventoried with the utmost care, for each one of them will help sustain Americans in future times.

There is an impending water shortage in the Colorado River Basin. It is not imaginary. It is very real. And no amount of investigation or delay will make it go away.

(2) We insist on adequate protection for the States and areas of origin of water exported to the Colorado, including full protection of the priorities of those areas, in perpetuity. California may well be such an area of origin. The Columbia Basin, if that is the area of origin, requires the same protection.

(3) We ask recognition of the Mexican Treaty burden as a national obligation, and that an appropriate share of the cost of importing water be allocated to the performance of that treaty. The Budget Bureau agreed to this principle in the 89th Congress. We agree with the upper basin States that whenever importations into the river system are accomplished to the extent of 2.5 million acre-feet annually, both basins should be relieved of the danger of curtailment of their own uses to perform the Nation's treaty obligations to Mexico. The 2.5 million acre-feet includes 1.5 million acre-feet of water which must be delivered to Mexico at the border, under the treaty, and 1 million acre-feet of losses between Lee Ferry and the border, due in part to evaporation.

(4) We agree on the necessity of balancing the operation of Lake Mead and Lake Powell, so that the benefits of wet years and the burdens of drought shall be equitably distributed between upper basin and lower basin reservoirs. The two reservoirs should go up and down together.

(5) We agree upon the authorization for construction of five upper basin projects, which are included in several of the bills and in my bill.

(6) We agree to reimbursement of the Upper Colorado River Basin fund for prior payments out of that fund to compensate reduction of the power operations at Hoover Dam occasioned by filling of Lake Powell. The bills spell out the method by which this reimbursement shall be accomplished.

(7) We agree upon the authorization for construction of Bridge Canyon (Hualapai) Dam and Powerplant, and for creation of a basin account to help finance the central Arizona project and importation works, fed by revenues from Hualapai Dam and by revenues from Hoover, Davis, and Parker Dams after they have paid out. I have gone along on the elimination of Marble Canyon Dam. But if this source of revenue is removed, I have proposed in my bill that Arizona, not the development fund, pay the cost of any increase in size of the central Arizona aqueduct above the 1,800 c.f.s. project described by the Bureau of Reclamation in its cost estimate last year, which is the project described by the Bureau of Reclamation in its project before the last session.

(8) We agree to the authorization for the construction of the central Arizona project, as part of the regional plan. But we agree only on the condition that, if the water supply of the Colorado River is

insufficient to satisfy the requirements of the projects already in existence or heretofore authorized by Congress for construction in Arizona, California, and Nevada, these existing uses shall be protected. This is subject to the limitation on California's protection imposed by the Boulder Canyon Project Act. The effect is that when the supply drops to 7.5 million acre-feet, the Metropolitan Water District of Southern California will lose nearly 700,000 acre-feet of its present supply before Arizona loses any water at all. Moreover, the central Arizona project shall bear the next share of the shortage if the supply drops below 7.5 million acre-feet annually before imported water arrives. Every water engineer who has testified before your committee or before your counterpart committee in the Senate has said that will happen within the next 25 years. To this end the priorities of existing and authorized projects will be protected as against the proposed central Arizona project, but only until works have been constructed to import at least 2.5 million acre-feet each year. This is the quantity which must be added to the river to assure availability in the Lower Basin of the 7.5 million acre-feet apportioned by the Supreme Court, if and when the Upper Basin States deplete the flow at Lee Ferry to the minimum allowed by the compact. The protection thus given to an existing and authorized project in Arizona and Nevada would be unrestricted in quantity. But the protection to California's existing projects would be limited to 4.4 million acre-feet annually, rather than the 5.1 million acre-feet which she will presently use and which she has used for many years.

I may add with respect to the exact language now in our bill protecting existing uses, that it was the acceptance of this compromise by Arizona's Governor and three Congressmen in the 89th Congress, at the urging of Secretary Udall, that enabled California to support construction of the central Arizona project. I was present at that meeting, and there was a unanimity of view among those who represented both of our States, Mr. Chairman, and a long, unhappy, unfortunate, and sometimes bitter feud was then concluded. We agreed that we should walk together with respect to helping the State of Arizona in solving the future water problems of all of the river basin States. This language simply recognizes the century old foundation of western water rights, the protection of existing uses on which California relied in building a half-billion dollars worth of projects. Without this agreed language, we would have to oppose the central Arizona project with all the means at our command.

I have summarized the points to which California agreed last year, as did Arizona's delegation in this House, the Secretary of the Interior and, finally, this distinguished House committee by a two-thirds vote. California has not changed her basic position. We supported this program then. We support it now. I am happy to say that these principles are supported in California, with complete unity, by Governor Reagan, Attorney General Lynch, the Colorado River Board of California, and the State's director of water resources. I annex to my statement a telegraph from Governor Reagan endorsing S. 861, as well as a resolution adopted by the Colorado River Board of California on March 1, 1967.

We Californians are also united in opposing enactment of the bill which Secretary Udall has now proposed as a substitute for the plan

which he helped formulate and which he so warmly endorsed last year. The Secretary's new proposal fails to protect any State other than Arizona. He abdicates his responsibility to deal with the most crucial issue, the basin's water shortages, by investigating means to relieve them. He deletes the priority protection for existing projects. He gives up on Bridge Canyon, as well as Marble Canyon Dams, sacrificing what he said last year would amount to more than \$1 billion of earnings to help finance importations as well as the central Arizona project. Gone (in his recommendation of the moment) is the regional development fund.

I well remember when Secretary Udall in January 1965, led the way to an amicable agreement between Arizona and California. We agreed to help one without damaging the other. We agreed that the central Arizona project should be built and that prior use should be respected. But we did far more. We agreed that we should prepare for the future and make more water available to every basin State as the supply in the river dwindled and as the thirst mounted. That kind of an approach was almost near congressional approval last year. I thought it would be this year, and now I express my hope that it will and that Secretary Udall will return to the fold.

Mr. JOHNSON. We thank you.

You have heard the request of the senior Senator from California that he be permitted to place a telegram from Governor Reagan endorsing S. 861 as well as a resolution adopted by the Colorado River Board of California of March 1, 1967.

Is there objection to their inclusion?

Hearing none, the telegram and the resolution will be placed in the record at this point.

(The telegram dated February 9, 1967 and the resolution referred to are as follows:)

[Telegram]

SACRAMENTO, CALIF.,
February 9, 1967.

Hon. THOMAS H. KUCHEL,
U.S. Senator, Senate Office Building, Washington D.C.

I am pleased to endorse the principles stated in your bill, S. 861, to authorize the construction of the Colorado River Basin project. S. 861 satisfies three requirements I believe essential to legislation designed to resolve Colorado River water supply problems. They are: (1) legislation to authorize the central Arizona project must recognize that the dependable water supply of the Colorado available to the lower basin is insufficient to meet existing uses in the lower basin plus the requirements of the central Arizona project; (2) existing lower basin water uses must be protected, including California uses of 4.4 million acre-feet per annum; and (3) meaningful steps to augment the inadequate flows of the Colorado River must be included. Unfortunately, the lower Colorado River Basin plan advocated by the Secretary of the Interior of February 1 does not include these essentials. I am concerned that our national administration is backing away from regional solutions to regional water problems. It is up to the States and the Congress to assume leadership in this matter.

I remain hopeful that some way can be found to reunify at least the seven Colorado River Basin States in support of regional legislation containing the essentials stated above. Your bill constitutes a worthy vehicle for seven-state unity, and you can count on my support and the assistance of my administration in pushing for its adoption.

RONALD REAGAN, Governor.

RESOLUTION OF THE COLORADO RIVER BOARD OF CALIFORNIA, MARCH 1, 1967

I

The Colorado River Board of California recommends enactment of S. 861, 90th Congress, introduced by Senator Kuchel of California and Senator Moss of Utah, and counterpart bills in the House, as introduced by Congressman Hosmer (HR 6271) and others. These bills agree in principle with those introduced by Chairman Aspinall of the House Committee on Interior and Insular Affairs and Chairman Johnson of that Committee's Subcommittee on Irrigation and Reclamation.

The foregoing bills all embody the following features, which the Colorado River Board has repeatedly endorsed, and which were contained in the bill reported out by the House Committee in the 89th Congress:

1. Recognition of the necessity for meaningful steps to augment the inadequate flows of the Colorado River.

2. Adequate protection for the states and areas of origin of water exported to the Colorado, including full protection of the priorities of those areas in perpetuity.

3. Recognition of the Mexican Treaty burden as a national obligation, and that an appropriate share of the cost of importing water should be allocated to the performance of that Treaty. Whenever importations are accomplished to the extent of 2.5 million acre feet annually, both basins should be relieved of the danger of curtailment of their own uses to perform the Nation's Treaty obligations to Mexico.

4. Balancing of the operation of Lake Mead and Lake Powell, so that the benefits of wet years and the burdens of drought shall be equitably distributed between Upper Basin and Lower Basin reservoirs. We recommend the language of the Kuchel-Moss-Hosmer bills in this respect.

5. Authorization for construction of the five projects in Colorado.

6. Reimbursement of the Upper Colorado River Basin fund for payments out of that fund to compensate reduction of the power operations at Hoover Dam occasioned by filling of Lake Powell.

7. Authorization for construction of Bridge Canyon (Hualapai) Dam and Power Plant, and creation of a basin account to help finance the Central Arizona Project and importation works, fed by revenues from Hualapai Dam and by revenues from Hoover, Davis and Parker Dams after they have paid out.

8. Authorization for the construction of the Central Arizona Project, as part of the regional plan, but on the condition that if the water supply of the Colorado River is insufficient to satisfy the requirements of the projects already in existence or heretofore authorized by Congress for construction in Arizona, California and Nevada, then shortages shall be borne as provided in those bills. The effect is that California must bear the first burden of shortage, sacrificing nearly one million acre feet of constructed capacity whenever the supply shrinks to 7.5 million acre feet annually; but that the Central Arizona Project shall bear the next share of the shortage if the supply shrinks below 7.5 million acre feet before imported water arrives. To this end the priorities of existing and authorized projects will be protected as against the proposed Central Arizona Project, but only until works have been constructed to import at least 2.5 million acre feet annually. The protection to existing and authorized projects in Arizona and Nevada would be unrestricted in quantities, but the protection to California's existing projects would be restricted to 4.4 million acre feet annually, to give effect to a limitation to which California agreed at the time of enactment of the Boulder Canyon Project Act.

II

The Colorado River Board of California recommends against enactment of the bill recommended by the Secretary of the Interior in his report on the Aspinall bill. The Secretary's proposal fails to protect the interests of any state other than Arizona. It abandons the regional solutions proposed by the Secretary in the last Congress, and which the seven states accepted in the bill (HR 4671) reported out of committee in the 89th Congress.

California followed and supported the Secretary's leadership then, and regrets his abandonment of it now. California has not changed her position. We hope

that unity among the seven states can be reestablished under the leadership of Chairman Aspinall within the framework of the principles the seven states agreed upon last year which this resolution restates.

Mr. JOHNSON. I want to thank you for a very fine and comprehensive statement, Senator Kuchel. I think, as you pointed out very well, the problems that face us in California are many.

The Chair recognizes the gentleman from Arizona, Mr. Udall.

Mr. UDALL. Thank you, Mr. Chairman.

It is always at pleasure to have Senator Kuchel here. I will say to him that he is a constructive statesman and a builder and one that I have enjoyed working with over the years.

Senator KUCHEL. Thank you, sir.

Mr. UDALL. I do not want to take the time this morning to discuss this 4.4 matter, which is the one that separates the States. We have discussed it on other occasions, and I am sure that we will again.

Let me ask you, first: It is obvious, is it not, that California's water needs are far beyond the 4.4?

Senator KUCHEL. Yes, indeed.

Mr. UDALL. If you had this guaranteed supply of 5.1 m.a.f. for the long run would that really solve California's problem?

Senator KUCHEL. I think, my friend, let me say, first of all, that you know of my high respect for you, and I thank you for your kind comments. The truth is that your great State and mine are going to continue to be thirsty in the future, and that is a matter of fact, as the population grows and certainly it will. Every State through which the Colorado River winds its way is going to be plagued with a shortage of water.

Mr. UDALL. My friend would also agree, I think, that if we could augment that river to 2.5 million acre-feet a year that this whole controversy about priority would be academic. Once we get that much additional water in the river, there would not be that question.

Senator KUCHEL. That would, at least, be a good point at which we could agree that the shortage which otherwise I think is ordained for 25 years from now would not take place.

Mr. UDALL. I thank the distinguished Senator for his statement. I agree with everything in it with the exception of the 4.4 problem. While I have the floor, I made the suggestion during my testimony that I be permitted to file a memorandum referred to my colloquy with Mr. Reinecke relating to some comments made by some Arizona professors about the need of water in Arizona. Could I have the right to have it included in the record?

Mr. JOHNSON. Do I hear objections?

Hearing none, it is so ordered.

Mr. UDALL. Thank you, Mr. Chairman.

(The memorandum referred to follows:)

MEMORANDUM

MARCH 20, 1967.

To : Congressman Morris K. Udall.

From : W. S. Gookin, State Water Engineer.

Subject : Review of articles by Dr. W. E. Martin and Dr. Robert A. Young.

You have asked for a review of the findings by Dr. Martin and Dr. Young relative to economic aspects of the Central Arizona Project. Three articles prepared by the Doctors on this general subject have come to my attention. The first was titled "The Value of Colorado River Water For Agricultural Uses in

Central Arizona." The second was titled "Arizona's Water Problem: An Economic Evaluation," and the third was titled "The Economics of Arizona's Water Problem." The last named article appeared in the March 1967 edition of "Arizona Review," published by the College of Business and Public Administration of the University of Arizona in Tucson. The fact it was published does not necessarily indicate that the views expressed in the article are endorsed by the College of Business and Public Administration or by the University.

Each of the articles appears to be a revised version of the preceding one. The conclusion supported by each is the same, namely, that there is no water shortage in Arizona because irrigation is an uneconomic use of water and should be abandoned or drastically curtailed.

In each of the articles, a "typical farm" in Pinal County is analyzed and the income and expenses thereof estimated under alternative conditions. In the first article this farm was forecasted to operate at a loss of \$4,937 annually without the Central Arizona Project. In the last two articles the farm was forecasted to operate at a profit of \$36 without the Central Arizona Project. This variation demonstrates that under the method of analysis used by the Doctors a few relatively minor changes in assumptions as to prices received and prices paid can radically alter the results of the studies and the conclusions to which the studies lead. Of course, as a practical matter, the "typical farmer" in Pinal County nets more than either figure developed by the Doctors, else the "typical farm" would no longer be in operation.

As an illustration of the wide range of potential results, the typical farm analyzed by the Doctors produced a gross income of \$105,755 in their first article which was modified to \$130,681 in the published article. Were the price projections used by the Bureau of Reclamation applied to the "typical farm" hypothesized by the Doctors, the gross income would be approximately \$170,000.

The most important single assumption fundamental to the Doctors' analyses is that the price of cotton will be 25¢ per pound and remain at that level with no corresponding decline in prices paid and no increase in crop yields. As an indication of the significance of this assumption, were it assumed that cotton would sell for 31¢ a pound as has been assumed in virtually all of the other studies made to date, the net profit to the typical farm hypothesized by the Doctors would be increased by approximately \$18,500 annually. Thus, one modification alone would completely destroy the conclusions drawn from the Doctors' published article.

Doctors Martin and Young, in their most recent article, have analyzed their typical farm on the assumption that the farmer continues to pump from his present supply (an assumption which is in itself unrealistic) or, in the alternate, purchases all of his water from the Central Arizona Project at \$10 per acre-foot at canal side, or, in the second alternate, purchases approximately 40 percent of his water from the Central Arizona Project and continues to pump the remainder. In all of the three above-named alternates, it was assumed Central Arizona Project water would be delivered to a farm which had no existing distribution system and that it would be necessary to construct, operate and maintain a distribution system and charge the entire cost thereof to whatever portion of Central Arizona Project water was purchased.

In the first analysis, the Doctors found the farm would return \$536 to management and investment in land and improvements if no water were taken from the Central Arizona Project. The farm which took all of its water from the Central Arizona Project would return a minus \$7,024 to management and investment, whereas that which took 40 percent of its water from the project would return a minus \$9,649. The Martin and Young reasoning is that a partial supply from Central Arizona Project results in a greater deficit than either no supply or a full supply because they assume the full cost of the distribution system would have to be borne by a partial supply and that the farmer's pumps which could be abandoned with a full supply would have to be kept operative with a partial supply.

The Doctors also analyzed the typical farm under a fourth hypothesis, namely, that the farm was located in an existing irrigation system and that the Central Arizona Project would furnish an unspecified portion of the total supply. The Doctors concluded that: "No difficulty in the farmers affording to buy the water is envisioned in this instance." However, even under this analysis the Doctors use an involved rationale and conclude that the Project is infeasible.

It is basic to the philosophy the Doctors have adopted to assume that the worth of water to the farmer is no greater than its value when applied to that crop

which produces the lowest net income per acre. The conclusion which the Doctors reach is that Arizona could afford to forego the production of such low income producing crops as forage crops. The Doctors, despite their academic qualifications in agriculture, have ignored the importance of low value crop production to the production of high value crops. Certainly they must be aware of the value of forage crops in such items as insect control, disease control, soil building, etc. Yet the Doctors suggest that as an alternate to the Central Arizona Project that Arizona balance its water budget by eliminating production of forage crops.

In the field of hydrology, the Doctors appear to be under the impression that the 1.2 million acre-feet which has been frequently mentioned as the proposed capacity of Granite Reef aqueduct under the Central Arizona Project accounts for all of the uncommitted portion of the 2.8 million acre-feet allocated to Arizona from the mainstream of the Colorado River. As has been well established in the testimony presented in connection with the authorization of the Central Arizona Project, Arizona's existing and committed mainstream uses from the Colorado River now total 1,230,000 acre-feet. There, therefore, remain for development 1,570,000 acre-feet instead of the 1,200,000 acre-feet cited by the Doctors. Obviously the Doctors are ignorant of the history and rationale underlying the 1,200,000 acre-foot figure.

It is apparent at several places in their articles that the Doctors have not realized that the allocations made by the Supreme Court are in terms of diversions less return flow rather than in terms of gross diversions. A case in point is the discussion which the Doctors wrote concerning uses on areas adjacent to the Colorado River.

It is also readily apparent that the Doctors are uninformed as to the practical aspects of ground water recovery. They allege that at the current "... rate of withdrawal, there will be an economically available supply for some 170 years." In one of their earlier articles they recognize that on 25 percent of the farms in the Central Arizona Project area water tables are declining at the rate of 5.12 feet per year; on 50 percent of the farms, water tables are declining at the rate of 8.15 feet per year; and on 25 percent of the farms, the rate of decline is 12 feet per year. It follows that the Doctors must believe that an increase in pumping lift ranging from 870 to 2,040 feet will not affect the economic availability of the ground water supply. This failure to realize that the farmer doesn't have the alternative of continuing to pump from present depths underlies virtually all of the article.

They have, of course, also ignored the physical limitations and water quality problems alleging these to be exceptions rather than the rule. The Casa Grande area where physical limitations exist and the Eloy area where quality problems are found are but two of several areas which serve to demonstrate that the Doctors have made an unwarranted assumption.

Actually, the figure of 700,000,000 acre-feet used by the Doctors as being economically recoverable is predicated upon the roughest sort of approximations. If this figure is accurate, which is, to say the least, doubtful, it is so highly theoretical and impractical as to be wholly misleading.

Ignoring for a moment the accuracy of the figures for water use and water supply, the water equation for the State of Arizona which the Doctors develop is such an over-simplification of a complex problem as to be extremely misleading. For example, the complete elimination of all of the alfalfa and forage crops grown in the Yuma area would do little to alleviate the water shortages in Maricopa or Pinal Counties. Nevertheless, implicit in the water equation and the conclusions reached by the Doctors is the assumption that just that would happen.

Of course, the figures themselves are subject to considerable question because they are a composite of approximations which are at least to some extent unlike. For example, the one million acre-foot figure used by the Doctors as present net diversions from the Colorado River includes some portion of unmeasured returns. Some idea of the inexactitude of these figures becomes apparent when it is recognized that the total acreage cropped in Arizona has not exceeded 1,200,000 acres since 1961. The Doctors assume 6,000,000 acre-feet annually as the total consumption by cropland irrigation. Thus it follows that there is an assumed consumption in excess of 5.0 acre-feet per acre. This is inconsistent with the assumption that deliveries to the farms in Central Arizona are 4.0 acre-feet per acre which obviously could not be 100 percent consumed. It is certainly known

to the Doctors that the croplands in the higher elevations receive less water than in central Arizona and that while the croplands in the Yuma area receive more, the irrigated area in Yuma County is less than 200,000 acres and not all of the water delivered to the farms in that area is consumed either.

The Doctors would seem to criticize Arizona by the allegation that the annual per capita consumption of water "ranks among the highest in the nation, if not in the world." One wonders whether the Doctors would expect a low annual consumption in a desert area. Their articles are further misleading in that they allege the use of water in Arizona to be "about 4,700 gallons per person per day, some three times the average for the United States." To derive this figure they have divided $6\frac{1}{2}$ million acre-feet by the number of people in Arizona. The absurdity of reducing irrigation use to a per capita use should be obvious. However, even though such a reduction were logical, they have failed to recognize that irrigation wherever practiced, is a supplement to rainfall in the production of crops. Therefore, if we should include irrigation water in determining the per capita consumption in Arizona we should increase that per capita consumption by that portion of the consumptive use of crops supplied by rainfall and similarly should include irrigation use when analyzing other areas and add to the per capita consumptive use in other areas that portion of the consumptive use by crops which is supplied by rainfall. The figures thereby derived are obviously meaningless, as is the 4,700 gallons per person per day.

In evaluating the economic aspects of the Central Arizona Project, the Doctors have adopted a new approach. They have developed what they term "multipliers" which they apply to the net profit from the farm to determine both the direct and indirect economic benefits to the agricultural sector of the economy resulting from water. The end result of the application of such multipliers in this case is to show benefits that are much lower than the benefits derived by standard methods of benefit evaluation. None of the articles present detailed data as to the derivation of the multipliers, although references are made to publications which would presumably clarify the process and rationale. Regardless of the method whereby the Doctors have derived their multipliers, it would seem to be wholly illogical to apply the multipliers designed to evaluate the indirect benefits to the agricultural sector of the economy against the net profit resulting from the use of water for irrigation. Under the Doctors' procedure if a farm were to break even, that is, show no profit and no loss, it would make no direct or indirect contribution to the agricultural sector of the economy. The fallacy of this basic premise should be self-apparent when it is recognized that a farm at the break-even point could well form the basis for the support of rather extensive processing industries, service industries, schools and tax base.

In their published article, the Doctors question whether large acreages have actually been abandoned by reason of water shortage. They point to statewide statistics to support their doubts. One would assume that the Doctors would be aware that the underground water resources of Arizona are not wholly located within one freely connected basin. There are within the state some relatively small and relatively independent basins which have been progressively developed over recent years so that new areas may be brought into cultivation in such regions as the Harquahalla Valley, the Theba area, Moon Valley, and numerous others, while existing areas in Pinal County and Maricopa County are going out of production as the water supplies become (a) exhausted, (b) too deep to permit economic pumping, or (c) too saline for further utilization. It is unfortunate that the Doctors did not have the opportunity to accompany the House Committee in 1965 when they toured some of the abandoned irrigated areas in Arizona. Perhaps they would then have understood that the farmer who loses his farm and home draws little comfort from the fact that another farmer has developed an equivalent acreage in a new hitherto untapped groundwater basin.

The entire procedure, rationale and principles embraced by the Doctors, if applied elsewhere in the United States, would demonstrate that agriculture in general should abandon the production of low income producing crops such as feed and food grains and forage, and that irrigated agriculture should not be practiced not only in Arizona but in any other state. In fact, the Doctors are reputed to have claimed to various individuals at various times that they have applied their analysis to the Central Valley Project and to the California State Water Plan and reached a conclusion that neither of these developments are economically feasible.

STATEMENT OF DR. GEORGE W. CAMPBELL, AGRICULTURAL ECONOMIST,
THE UNIVERSITY OF ARIZONA, TUCSON, ARIZ.

The article "The Economics of Arizona's Water Problem" by Drs. Young and Martin, published in the Arizona Review, March 1967, is the most recent of several articles and manuscripts authored and/or coauthored by them on the same general subject—the economics of water distribution and use in desert and semidesert countries.

Any valid economic analysis (1) describes the problem that makes the analyses desirable, (2) sets forth possible alternative courses of actions that might solve or alleviate the problem and (3) evaluates the probable consequences of alternative courses of actions.

THE PROBLEM ACCORDING TO DRs. YOUNG AND MARTIN

According to the authors the problem is that the development and allocation of water in Arizona has not been "subject to the dollars and cents discipline of the marketplace" and therefore the past, present, and proposed uses of water have not been, are not, and will not be those that will bring the most benefits to Arizona's population. The authors maintain that Arizona's water should be put to uses "which would maximize the aggregate (total) income of the State's population." In addition they would "require that no one segment of the population should gain an unfair advantage over any other segment in the distribution of income gains."

THE ALTERNATIVE SOLUTIONS ACCORDING TO DRs. YOUNG AND MARTIN

The present "target" of the authors' economic analyses is the proposed construction of the central Arizona project. The authors assert that implementation of the CAP would subsidize farmers at the expense of the nonfarmers. They conclude that "maximum economic growth" for Arizona (and therefore the most benefits to its population) can be obtained by not implementing the proposed central Arizona project, but by continuing present policies that reallocate present water supplies through "the dollars and cents discipline of the marketplace" and to "investigate the possibility of using the water (Arizona's Colorado River water requirement) near its source in the river. The authors refer to this as a "western Arizona project."

THE PROBABLE CONSEQUENCES OF THE VARIOUS ALTERNATIVES ACCORDING
TO DRs. YOUNG AND MARTIN

The central Arizona project

The authors conclude that implementing the central Arizona project will result in either (1) subsidization of farmers in central Arizona by municipal and industrial water users and/or other Arizona residents or (2) farmers using CAP water going bankrupt, (3) that cities would not be acting in the best interests of their citizens in buying water from the CAP, (4) that it is doubtful that the CAP "can generate economic benefits to the State in excess of costs entailed by its construction and operation," and (5) that "two-thirds of the overdraft would remain, the ground water level would continue to fall and the basic 'water crisis' would be with us just as it is now."

Continue present practices and abandon the CAP

According to Drs. Young and Martin the present practices of allowing the "market" to determine the uses of water in Arizona will continue to allocate water "to its most productive use for the highest rate of economic growth."

Surface water will continue to be used by agriculture until the water is needed for industrial and municipal uses. These users will buy the water away from agricultural users because they can and will pay a much higher price for the water.

Ground water will continue to be pumped for agricultural uses "as long as farmers can afford to pay the price."

Total agricultural acreage will decline as land is taken out of forage and feed-grain crops.

High valued agricultural and domestic uses will continue to use pumped water until higher valued uses need this ground water, at which time they "will bid it away just as they have done with surface waters."

A "WESTERN ARIZONA PROJECT"

Drs. Young and Martin state "there are no good data relative (pertinent) to this alternative." They do, however, say that "possibilities for further (agricultural) development include (1) the Yuma Desert (where water requirements per acre are extremely high but which has a potential for citrus production); (2) areas adjacent to present irrigation projects (the Wellton-Mohawk in particular); (3) lands in the Cibola-Ehrenbert district; and (4) some of the valleys and plains which lie from 50 to 80 miles inland from river (Cactus Plain, Renegras Plain, McMullin and Butler valleys). At least 10 townships or 230,000 acres appear promising within these areas—more than enough to absorb the 1 million acre-feet of available water.

"As in central Arizona barley, grain sorghum and forages would be marginal users of water. But surely the cost of delivering water to these crops would be less than with the central Arizona project. Whether a 'western Arizona project' would actually provide benefits above its cost would require further investigation."

PURPORTED PROOFS ACCORDING TO DRs. YOUNG AND MARTIN

Drs. Young and Martin arrive at the above conclusions by purporting to prove (1) that the CAP is not necessary to "maximize the aggregate income of the state's population" since (a) there is enough underground water economically available at the present rate of withdrawal to sustain continued economic growth for 170 years without importing water (to central Arizona) and (b) that the desired economic growth can be achieved by continuing present practices of reallocating water supplies to those uses which generate the most "personal income" per acre-foot of water and (2) that the CAP will not pay its own way unless the farmers are subsidized by municipal and industrial water users.

This "violates" the authors' "requirement" that "no one segment (irrigated agriculture) * * * should gain an unfair advantage over any other segment."

Let us now examine these purported "proofs" and their underlying assumption as presented by Drs. Young and Martin and determine whether they are sufficiently valid to support their conclusions.

CONCLUSION NO. 1: CONSTRUCTION AND OPERATION OF THE CENTRAL ARIZONA PROJECT IS NOT NECESSARY FOR THE MAXIMIZATION OF THE AGGREGATE INCOME OF THE STATE'S POPULATION

According to Drs. Young and Martin there is enough underground water economically available to support a "desired" level of economic growth for 170 years at the present rate of net withdrawal.

Let us accept as a fact (even though proof is lacking to support this "fact") that this quantity of water does exist. If the authors' "proof" that this water will support economic growth is to be valid, they have to assume that it is of sufficient quality (or can be economically made so) to be used for agricultural production and for municipal and industrial uses. There is considerable evidence from authoritative sources to indicate that the quality of water and not the quantity of water will likely be a severe limiting factor to its use as the depth to water increases. Or they will have to assume that sufficient water of sufficient quality can be economically transferred to the areas where economic growth is required.

There is presently no proven basis for either of these assumptions. It is, therefore, apparent that while the quantity of water may be sufficient to support the authors' conclusion it has yet to be proven that the economically available water would be of sufficient quality to warrant such a conclusion. In the absence of proof on the quality as well as the quantity of the economically available water the conclusion that a sufficient supply of usable water exists to support 170 years of economic growth is not valid.

According to Drs. Young and Martin the desired economic growth of Arizona can be achieved (without the cap) by continuing present practices of allowing sales of water to the highest bidders. The authors' (on p. 17) write that "with the exception of current plans for the Colorado River water under the central Arizona project, proper allocations are being made today." This statement appears to be a direct contradiction of the authors' statement on page 9 which states "they (most people in the arid Southwest) have felt that its (water)

development and allocation should not be subject to the dollars and cents discipline of the market place." The only way one can eliminate the contradictions is to assume (1) that most people in the Southwest act contrary to their feelings or (2) that Arizona residents are, in this matter at least, different from other people in the Southwest. This conclusion is valid only if the assumption that 170 years' supply of water of suitable quality is economically available is correct. We have already shown above that this assumption is incorrect. Nevertheless, let us assume for the present that the assumption above is correct.

Even if there were 170 years' supply of water of suitable quality economically available Drs. Young and Martin would have to prove that this water would, in the absence of the cap, be reallocated through the free market-for-water system in such a way as to "maximize the aggregate income of the State's population."

Drs. Young and Martin "prove" that such reallocation is presently being accomplished (and assume it would continue to be accomplished in the future) by using an "input-output model" that purports to show the "personal income" generated per acre-foot of water intake by each major sector of the Arizona economy. Drs. Young and Martin assume that maximizing the personal income of Arizona's population is the criterion for the "best" economic growth. Their economic analyses are designed to determine which of the available alternative courses of action will result in the greatest aggregate "personal income" for Arizona's population.

According to Drs. Young and Martin the table below (table 1 in the article "The Economics of Arizona's Water Problem") shows the dollars of "personal income" per acre-foot of water generated by the various sectors of the Arizona economy.

TABLE 1.—Personal income per acre-foot of water intake in Arizona sectors and rank of each, 1958¹

Sector	Dollars of personal income per acre-foot ²	Sector rank ³
Food and grains	14	10
Forage crops	18	9
High value intensive crops ⁴	80	8
Livestock and poultry	1,983	6
Agricultural processing industries	15,332	3
Utilities	2,886	5
Mining	3,248	4
Primary metals	1,685	7
Manufacturing	82,301	1
Trade, transportation, and services	60,761	2

¹ Adapted from Anilkumar G. Tjoriwala, William E. Martin and Leonard G. Bower, "The Structure of the Arizona Economy; Output Interrelationships and Their Effects on Water and Labor Requirements," Part I, the Input-Output Model and Its Interpretation" and "Part II, Statistical Supplement, Arizona Agricultural Experiment Station Technical Bulletins 180 and 181" (forthcoming), 1967.

² Personal income is here defined to include wages and salaries, rents, profits, and interest.

³ Ranked from highest to lowest value added.

⁴ Includes cotton, vegetables, citrus and other fruits.

Although many competent agricultural economists doubt seriously that maximization of total personal income of a State's population is the valid criterion of the "best" economic growth of the State, let us assume in this instance that it is the valid criterion. Let us further assume for the moment that table 1 above does indeed accurately portray the capacities of the various sectors to generate "personal income."

Even if we do assume that the above claims of Drs. Young and Martin are true there are basic underlying incorrect assumptions that completely destroy the validity of this "input-output model" and the conclusions resulting from analyses depending upon the validity of the "model."

Drs. Young and Martin have incorrectly assumed that each sector can continue to exist and create "personal income" even though contributions of other sectors are drastically reduced—perhaps even to 0. Specifically, they assume that drastic reductions in the food and feed grains and the forage sectors of the economy will only reduce, but not eliminate, the "personal income" generating

capacities of the agricultural processing industries. Drs. Young and Martin go so far as to "demonstrate" that economic growth can continue in Arizona without importation of water. "Recently, for example, a large meat processing company decided to build a livestock slaughter facility in Tolleson. Their water demands seem large—2 to 2.25 million gallons a day or about 6 to 7 acre-feet. However, in a year this plant would use no more water than would, for example, 600 acres of sorghum. Six hundred acres of sorghum generate about \$58,500 per year of gross income and about 9,000 man-hours (or perhaps $3\frac{1}{2}$ man-years) of employment. The work force contemplated for the processing plant is about 225 employees, or some 65 times as large as the sorghum corp. The relative volume of income generated by the proposed plant would probably be even larger since wages in such employment are greater than in farming. Furthermore, much of the water used in this plant would not be lost in the process, as it would be in agriculture, but would be available for use again in crop irrigation after being suitably processed."

Drs. Young and Martin do not take into account the obvious fact that the continued existence of a plant to slaughter cattle depends directly on the existence of the feeder cattle industry in the area, and that the feeder cattle industry depends for its existence on the feed grains and forages produced in the area.

The relationship is simple indeed: No feed grains and no forage equal no cattle feeding industry. No cattle feeding industry equal no cattle to slaughter. No cattle to slaughter equal no slaughter plant. No slaughter plant equal no "personal income" generated by the plant.

Drs. Young and Martin, however, by using their "input-output model" relationships conclude that feed grain and forage crops can be drastically reduced, or even eliminated by being "outbid" by "higher" water users without affecting the "personal income" generating capacity of the agricultural processing industries—specifically that of the new cattle-slaughtering facility now under construction in Tolleson.

The "input-output model" also assumes that no direct relationship exists between the production of food and feed grains and forages and the production of high value intensive crops. Drs. Young and Martin are agricultural economists. Surely they are aware that actual farming practices as well as a great deal of scientific knowledge, furnishes evidence to support the contention that crop rotation practices do beneficially affect the production of the high value intensive crops.

Drs. Young and Martin, however, by using the "input-output model" relationships conclude that drastically reduced production of food and feed grains will not adversely affect the production of high value crops.

This conclusion is obviously based, at best, on an unproven assumption—and perhaps on an incorrect one. Once again the "model" has not accurately portrayed the existing relationship between two of the sectors.

The failure of the "input-output model" to portray accurately the interdependence that exists in real life among various sectors of the economy invalidates the conclusions resulting from any analysis that depends on relationships erroneously portrayed by the model. We must, therefore, conclude that the conclusions resulting from use of such an incorrect "model" cannot be proven valid by analysis depending on the use of the "input-output model" for their validity.

Let us, however, assume for the moment that the "input-output model" does, in fact, actually portray the real life relationships existing among the various sectors of the economy, and examine the validity of the assumption of Drs. Young and Martin that "personal income" generated is the sole indicator of economic growth.

Drs. Young and Martin define "personal income" as "the sum of wages, rents, profits, and interest received by persons in each sector of the economy."

Let us assume the following:

1. A New Mexico farmer and his three grown sons have inherited an abandoned farm in Arizona. The farm has 1,000 acres of tillable land.
2. They sell their farm in New Mexico for \$400,000 and move to Arizona.
3. They "rebuild" the farm and operate it at no profit for 15 years, then abandon the farm and go back to New Mexico.
4. They did all the work themselves and never borrowed any money. They had \$100,000 of the original \$400,000 left when they returned to New Mexico.

5. While in Arizona, they paid taxes of \$50,000, paid \$60,000 for machinery, \$15,000 for groceries, and \$3 million for other items—mostly farm production input items.

This farmer and his three sons made no profit, paid and received no wages, paid no rents, and paid no interest.

According to Drs. Young and Martin, these men had received no "personal income" and, therefore, had made no contribution to the economic growth of the State of Arizona.

The generation of "personal income" as defined above by Drs. Young and Martin is obviously an erroneous indicator of the contributions made to the economic growth of the State by individuals, business firms, and/or various sectors of the economy. Its use in analyzing such contributions can lead only to incorrect and misleading conclusions. Any conclusions derived from its use would be invalid.

CONCLUSION NO. 2 : THE CAP WILL NOT PAY ITS OWN WAY UNLESS THE FARMERS ARE SUBSIDIZED BY MUNICIPAL AND INDUSTRIAL USERS OF CAP WATER

In arriving at this conclusion Drs. Young and Martin completely ignore the fact that much of the anticipated revenue resulting from the CAP would come from the sale of surplus electrical power (surplus to CAP pumping requirements) generated by a dam (or dams) in the main stream of the Colorado River. Some knowledgeable people believe that proceeds from the sale of such power would be great enough to allow CAP water sales to agricultural and other users at prices comparable to what users are now paying for water.

There is no evidence presently available to indicate that any responsible person advocates the construction of the Central Arizona project if the means of generating such surplus electrical power is not an integral part of the CAP.

Any valid and meaningful analysis of the ability of the CAP to "pay out" without bankrupting agricultural users of OAP water and "swindling" municipal users cannot be made if CAP generation and sale of surplus electrical power is not considered in the analyses.

There is nothing of record that Drs. Young and Martin have given any consideration to this essential feature of the CAP in their analyses. For this reason alone any conclusions they make from their analyses would be seriously suspect.

Drs. Young and Martin have concluded that farmers in "central Arizona" cannot afford to pay the proposed cost of CAP water for irrigation.

They base this conclusion on their analysis of the costs and returns of a "typical" farm in central Arizona.

They claim that the characteristics of this farm and its financial costs and returns are "based on a 1964 survey of over 600 Arizona farmers under the project."

In actuality, their "typical central Arizona farmers" are based on a survey of 120 farms in Pinal County and not on a survey of 600 farms under the project.

Even if one assumes that all prices, yields, costs, and returns data used in the analysis of the "typical farm" were correct, no valid conclusions could be drawn from their analysis because (1) a "typical" Pinal County farm is not a "typical" farm for the area proposed to be served by the CAP and (2) the "typical Pinal County farm" as described in various articles and manuscripts by Drs. Young and Martin is so different from one article to the next that one must conclude that Drs. Young and Martin cannot really decide what is a "typical Pinal County farm."

The following is a description of a "typical Pinal County farm" according to Drs. Young and Martin :

The "Typical" Pinal County Farms of Drs. Robert Young and William Martin

Drs. Young and Martin in two separate reports presumably based on the same research data describe the characteristics of and analyze the costs and returns for the typical central Arizona (Pinal County) farm. In the article, "The value of Colorado River water for agricultural uses in central Arizona," this "typical" farm seems to bear little relation to the "typical" central (Pinal County) Arizona farm described and analyzed in the article, "The Economics of Arizona's Water Problem" printed in the March 1967 issue of the Arizona Review. These characteristics and results of Drs. Young and Martins' analyses are shown below.

Characteristics of typical Pinal County farm (according to Drs. Young and Martin)

Item	As described in "The Value of Colorado River Water for Agricultural Uses in Central Arizona"			As described in "The Economics of Arizona's Water Problem"		
Total cropped acres.....	480			700		
Acres in cotton.....	264			273		
Percent of cropped acres in cotton.....	55			39		
Acres in alfalfa.....	43			112		
Percent of cropped acres in alfalfa.....	9			16		
Acres in barley.....	120			175		
Percent of cropped acres in barley.....	25			25		
Acres in sorghum.....	53			140		
Percent of cropped acres in sorghum.....	11			20		
Pumping lifts in feet.....	210	395	510	315	460	540
Variable pumping costs (acre-foot).....	\$4.50	\$8.50	\$11.00	\$7.05	\$10.30	\$12.08
Water used per acre (acre-feet):						
Cotton.....	5.0	5.0	5.0	6.0	5.0	5.0
Barley.....	2.5	2.5	2.5	3.0	2.5	2.0
Alfalfa hay.....	4.25	4.25	4.25	6.1	6.1	6.1
Sorghum grain.....	2.75	2.75	2.75	3.3	2.75	2.2
Total dollar income per acre:						
Cotton.....	\$330.10	\$330.10	\$330.10	\$320.54	\$310.46	\$310.46
Barley.....	77.55	77.55	77.55	91.27	85.00	77.80
Alfalfa hay.....	112.75	112.75	112.75	150.50	150.50	150.04
Sorghum grain.....	84.05	84.05	84.05			
Total dollar variable costs:						
Cotton.....	212.93	233.53	246.37	187.01	193.53	200.78
Barley.....	50.36	60.55	66.91	59.47	62.97	60.04
Alfalfa hay.....	79.95	99.21	111.28	126.56	146.27	154.17
Sorghum grain.....	58.26	69.52	76.55	70.92	74.78	71.14
Income in dollars over variable costs:						
Cotton.....	117.17	96.57	83.73	133.53	116.93	109.68
Barley.....	27.19	17.00	10.64	31.80	22.03	17.76
Alfalfa hay.....	32.80	13.54	1.49	22.94	13.23	5.33
Sorghum grain.....	25.79	14.53	7.50	33.32	22.64	17.78
Return to management and investment in land and improvements (per acre of cropped land).....	35.56	14.71	1.21	18.48	0.77	-7.09
Management return per cropped acre (with land and improvements per acre at \$500 and interest at 5 percent).....	10.56	-10.29	-23.79	-6.52	-24.23	-32.09

Let us assume for the moment, however, that the "typical Pinal County" farm described in the article "The Economics of Arizona's Water Problem" is indeed representative of the farms under the project and that all data and assumptions used in the analysis by Drs. Young and Martin are correct.

According to Drs. Young and Martin this farm even with the least amount of assumed pumping lift (315 feet) would have a minus \$6.52 per acre as the returns to management, and under the assumed 540 feet of lift would have a minus \$32.09 per acre as the returns to management.

Even the most enthusiastic and optimistic supporter of the cap knows it will be at least 10 years after its construction begins before it will be operational.

It is indeed questionable that this "typical farm" could remain financially solvent under these conditions and be an operating farm under the cap.

It is also questionable that any farm with a negative return to management could realistically be considered as "typical" in an area where the net farm income per farm is almost twice as great as net farm income per farm in the State whose farms have the second greatest net farm income per farm in the United States.

Mr. JOHNSON. The Chair recognizes the gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Senator Kuchel, I welcome you before this committee. I join with my colleagues in that welcome.

I am intrigued by your statement.

I must say that you are intending with great care to take care of the great State of California. And your statement points this out.

This committee many years ago sent the central Arizona project and the question of water in the Colorado River to the Supreme Court, and the Supreme Court finally, some years ago, handed down a decision. That decision said that of the 7.5 million acre-feet to be made available in the lower basin, California was entitled to 4.4 million acre-feet, Arizona was entitled to 2.8 million acre-feet, and the State of Nevada was entitled to 300,000 acre-feet, and if there were shortages the Secretary of the Interior should allocate the shortages.

Now, on page 4 of your statement, in paragraph 8, which you have—

Senator KUCHEL. That is the mimeographed statement that you have there?

Mr. SAYLOR. Yes. Does this not go far beyond the Supreme Court decision? Does not the statement say that California is imposing conditions which require something more than the Supreme Court decided? Is this not particular true with regard to the projects now in existence?

Senator KUCHEL. Here is my interpretation of the Supreme Court decision and why I urged that your committee take the action recommended in point 8.

The Supreme Court, using that figure of 7.5 million acre-feet, did see fit to make the apportionment to the three States precisely as you have suggested. It did not discuss the problem of how the shortages should be dealt with, except to indicate that the Secretary might have the responsibility of doing that, or, indeed, that the Congress might sit in judgment on it.

I very well remember the meeting of my committee in the other body shortly after the decision was issued, in which there was apparently a feeling that a dog-eat-dog controversy would arise when a shortage would take place, I am, I think scrupulously correct in saying that every water engineer who has dealt with the problem has testified before your committee and mine that within a quarter of a century there will be a shortage of water in the river that will in part be caused by the development of additional and necessary projects in the upper basin. Looking way down the road, on what basis would the Secretary of the Interior make an allocation of shortages?

Suppose the State from which I come continued to increase in population, as surely it will, and suppose, also, the people of Arizona increased in population. You would have a situation where the best that the Secretary could do would be to take from one thirsty mouth and put it into another thirsty mouth. What I seek to do here, for many reasons that I would be glad to go into in detail with you, is to give protection which the people of my State have asked for, and which, I think is equitable and right, that the reduced amounts of water which my State has been allocated, 4.4 million acre-feet, be given a priority over new uses, based on existing uses in California along with the existing uses which have taken place in our neighboring State of Arizona.

Congressman Saylor, the State legislature in California was required to limit itself to 4.4 million acre-feet in 1928 as a prerequisite—

Mr. SAYLOR. That grew out of the Colorado River Compact.

Senator KUCHEL. This is true.

Mr. SAYLOR. Which the representatives of your State, when they signed the Compact, limited themselves to 4.4 of the 7.5 that was in the river?

Senator KUCHEL. Congressman Saylor, I do not accept what you just said as precise legal history, but I do say, for the purpose of answering your question, that ever since water was available in the river, we have, as you know, used far more than 4.4. We have expended hundreds of millions of dollars of State moneys, not Federal moneys, in building aqueducts and the like. And I simply urge you to consider, recognizing the priority in time, rights for existing uses in Arizona as well as in California. However, with respect to my State, these rights would be lowered to the reduced figure of 4.4 rather than the existing use of 5.1.

Mr. SAYLOR. I might say, Senator Kuchel, that you are looking down the road 25 years. You are asking the Congress to tie its hands for something that will not occur for 25 years. I think that will be asking too high a price for support of this legislation, because you cannot tell what the needs of California are going to be 25 years from now, nor can anybody tell what they will be. You cannot tell where California is going to get its water 25 years from now.

I think it is basically unfair that you should put this requirement in. This is a difference of opinion, of course. And I respect your right to ask for it. I can only say that I disagree with your conclusion.

Senator KUCHEL. It does seem to me that any proposal to eliminate the hazard of shortage, is the most statesmanlike road for Congress to take. If it were possible, as I think it is, for Congress to consider what was considered last year, in your very committee, a proposal that every State in the river basin be assessed in respect to its future growing water problems, that there you would find the best way to eliminate questions with respect to existing uses, vis-a-vis new uses.

Mr. SAYLOR. With regard to page 4, paragraph 7, of your statement, you are placing quite a burden on Arizona. You say that everything above 1,800 cubic feet per second should be built by, and paid for, by Arizona itself.

Senator KUCHEL. That was the original position of the Executive Branch, as you know.

Mr. SAYLOR. Now, this committee had before it last week, and the week before, two bills affecting California. One of them calling for an amendment to an existing piece of legislation in which we were called upon or requested by representatives of your State to increase the authorized size of the canal in the central valley project, because of future developments that might take place somewhere down the line. It is very interesting to note that the representatives of your State who appeared and made out a very good case for it, asked, that the Federal Government put out the money.

Then, the other day, we also had before this committee a project for the Metropolitan Water District of Los Angeles, in which the representatives of the Department and the members of this committee of your State asked that the Federal Government give to the city of Los Angeles \$57.2 million for the construction of a desalting plant to be built on an island off the coast of your State.

How can the representatives of your State come in here and say that for California it is perfectly all right to come in and ask Uncle Sam to give you \$57.2 million for one project and to give you an enlarged canal and have Uncle Sam pay for it, but when it gets to the other side of the river, over in Arizona, because somebody came along in the years past and used only 1,800 cubic feet per second, anything above that the State of Arizona has to pay for it? I am at a loss to understand this inconsistency, and I would like to ask the Senator to explain that.

Senator KUCHEL. First, let me make this one general observation. We, in my State, represent more than 10 percent of the people of the United States, Congressman Saylor.

In the last third of a century, the central valley project, which is the Federal reclamation project, born during the depression years, has become I think one of the fine examples of the Federal Government investing in a project for the benefit of the people, the money invested by the Federal Government is being repaid with interest into the Federal Treasury.

We deal here, as you know, Representative Saylor, with water in California's streams, about which there is no inter-State problem. The water problems of our State with respect to areas of origin and areas of use have been amicably settled, and I think in a fashion that might be used as one example for our Congress.

The enlarged construction proposal for the Tehama-Colussa Canal which you have outlined is recommended by the Department of the Interior and by the Budget Bureau and does qualify on all fours with the existing criteria in the law for the expenditure of public funds. It poses a question of whether the Bureau of Reclamation should build one big ditch or two smaller ditches. No basin fund, out of which we hope to finance works to augment the water available to all basin States, will be depleted by the Tehama-Colussa bill.

Now, with respect to desalting, I would vigorously deny in this regard, and in this record, that the legislation providing for participation by the Federal Government is a gift to the people of Los Angeles. Sir, that is not so.

A group of agencies in California, public agencies and privately owned utilities, agreed to a very unique undertaking, to the construction of a 43-acre manmade island, a mile offshore—a little more than that from my friend's home, Mr. Hosmer, and about a mile from where I live, a mile from the coastline of the county, upon which a nuclear power plant and desalter will be constructed, and by which 150 million gallons of fresh water a day will be produced along with the electricity. This is an attempt, I think, to try to determine whether it is possible to have an economic breakthrough in the cost of desalting the waters of the sea.

Today, it is too expensive, over \$300 per acre-foot at most existing plants. It is even, as projected, greatly expensive in this legislation, roughly \$70 per acre-foot at plant site, and \$90 per acre-foot at the Orange County Reservoir. The Federal Government came forward through the Atomic Energy Commission and the Department of the Interior, wanting to buy information, wanting to obtain an education which, conceivably, in years ahead could constitute, at least, a partial

solution not only to our own water problems but I think, really, for the settlement of the disputes that could lead to armed conflict in other parts of this world of ours. So that it is not a gift, in my opinion. And your friends and mine in the executive branch would deny it.

Now, with respect to the 1,800 feet per second, the Bureau of Reclamation recommended that, and at the time it recommended that, Congressman Saylor, there were two—to use the vernacular—“cash registers” authorized in the legislation, Bridge and Marble, upon which a frightening conflict in our country began to take place.

I take it that it is realistic to assume that Congress would, at least, be long hesitant in authorizing both of those projects for this undertaking. So, realistically, some on your committee, and I, have introduced legislation providing for Bridge Canyon, believing we can justify that in the interests of the people—it is for that reason—and the reduced amount of potential funding by the bill itself, that I recommend 1,800 second-feet be the limit of the capacity to be financed out of the basin fund. To the extent that the basin fund bears an additional burden for the aqueduct, we reduce the money available to bring long sought, and desperately needed additional water into the river.¹

MR. SAYLOR. Senator Kuchel, I might say that I have just received a message that leads me to believe there is not that hope—and I sincerely hope it is not correct—that the people of Los Angeles could depend on it as the source of supply, if the project does not prove satisfactory as some people believe. There are those who believe this is just another example of Federal bigness with no reality whatsoever. Water will not cost what we have been told, but two or three or four times more maybe. The people of Los Angeles have also been led to believe it will cost what they have been told.

So far as the cash registers are concerned, I just want to say the administration has indicated that they do not think either cash register should be included. When the people of the United States find out that in the proposed developments, there is still left the dam to be built, which would invade Grand Canyon National Monument and Grand Canyon National Park, you would find the American public, once again, will rise up in arms and protest any invasion by this committee or by the Congress of our national parks and monuments by dams which will cause evaporation of over 100,000 acre-feet of water per year in this area which you have described as being in an area of water shortage.

Senator, it is always a pleasure to see you before the committee. I hope we can get a bill out which is like the bill I introduced last year, which will allow the construction of the central Arizona project and which will have a National Water Policy Commission and will leave everything else to the future. I am not one of those who believes that the present Members of the Congress, either sitting in the House or in the Senate, are all wise and that they can solve all of the problems for all generations to come.

¹ The precedent for letting the water users bear the cost of the aqueduct above a given size was established in your committee's H.R. 4671 last year. My bill merely changes the cost which will be borne by the basin fund from 2,500 c.f.s. to 1,800 c.f.s. of capacity. Actually, my bill will supply cheaper water to the Arizonans than will Secretary Udall's latest scheme. Without a basin fund, the water users will bear the full cost of the water, either through high ad valorem rates or high water rates.

Mr. JOHNSON. The Chair recognizes the gentleman from California.

Mr. TUNNEY. I would just like to state to you, Senator, that I thank you for expressing California's position so completely and so eloquently and so intelligently. I think that your statement was very wise. It expresses my feelings completely. I certainly appreciate the answers based on the facts that you gave to Mr. Saylor with respect to California's projects and the Colorado River Basin and the island off the shore of California. I thank you so much. As you know, I introduced your bill in the House. I think it is an excellent bill.

Senator KUCHEL. Thank you very much.

Mr. JOHNSON. The Chair recognizes the gentleman from California, Mr. Hosmer.

Mr. HOSMER. I have no questions, Mr. Chairman, but I do want to express my appreciation to Senator Kuchel for his, again, demonstrating great patience.

Senator KUCHEL. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from Texas.

Mr. KAZEN. I have no questions. Thank you, Mr. Chairman.

Mr. JOHNSON. The Chairman recognizes the gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Senator, I want to commend you upon your statement. You have expressed California's views very, very succinctly here. I would like to tell you that although I do not agree in whole with your statement in several particulars, I did introduce a bill on the House side to authorize Federal participation in the Balsa Island nuclear power and desalinization plant, and I support it. I think it is a cheap price to pay, if we can produce water as has been forecast.

I have one question that I will get off briefly.

From your statement you say that you ask recognition of the Mexican Treaty burden as a national obligation and that an appropriate share of the cost of importing water be allocated to the performance of that treaty.

Do you want to be any more specific as to what you feel is an appropriate share? If you are talking about importing, this would be a matter of several billion dollars, I am sure, as you know.

Senator KUCHEL. Thank you very much, Congressman Wyatt, for your kind comments on this paper of mine.

During the discussions in the last Congress, there were those of us who felt—and there were many—that a regional approach to the problem of the Colorado River and its shortages was a preferable one. We thought that when the Government entered into a treaty with Mexico, and the U.S. Senate approved it, that it became an obligation of the people of the United States to perform and not of the people of the semiarid Southwest alone to perform. As time has gone by and water in the river has become increasingly important, we thought that the best way to recognize the Mexican Treaty burden as a Federal obligation would be to provide that when by importation or by other means, water would come into the Lower Colorado River Basin, the first 2.5 million acre-feet of that water would be a Federal obligation, including the expenditure of funds by the Federal Government for that portion of the works which would represent 2.5 million acre-feet.

Thus, I think, when I speak of making it a Federal obligation, I mean recognizing that when the Senate ratified that commitment it did so on behalf of the American people and not just the Colorado River Basin States. Therefore, to provide that water in the future without damaging any of the Colorado River States, the Federal Government should pay an amount equivalent to that portion.

Mr. WYATT. One other question, Mr. Chairman.

To be a little more specific, if we wind up with importing 5 million acre-feet in the Colorado River Basin, would you then say that the Federal Government has a national obligation to pay one-half of that, of the whole cost of importing that amount?

Senator KUCHEL. The Mexican Treaty obligation requires the delivery of 1.5 million acre-feet of water, measured at the boundary. In order to deliver that quantity of water to the boundary, losses in transit between Lee Ferry and the Mexican border must be borne. I am told that the total losses between Lee Ferry and the Mexican border are in the order of 1 million acre-feet, due to evaporation, seepage, and unavoidable overdeliveries to Mexico, and that the fair share of this 1 million acre-feet of losses attributable to the transportation of 1.5 million acre-feet to Mexico is about 300,000 acre-feet. This means that the cost of importing, say 1.8 million acre-feet of water, should be attributable to the treaty burden and should be made non-reimbursible.

The development fund, if Hualapai dam and powerplant are built, would receive power revenues from that source, plus those of Hoover, Davis, and Parker powerplants, which would probably be adequate to pay for the remaining 700,000 acre-feet of the first 2.5 million acre-feet imported each year. I feel that the nonreimbursible allocation to the treaty obligation should be at the base of the cost pyramid so that the cost of importing the incremental 700,000 acre-feet, to be paid for out of the development fund, would be accounted for on an incremental basis and not pro rata.

Mr. WYATT. Thank you, Senator, very much.

Senator KUCHEL. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from Idaho, Mr. Hansen.

Mr. HANSEN. Thank you, Mr. Chairman.

I, too, wish to commend the gentleman from California on the very fine statement which he delivered here on the position of California on its water situation.

There are several questions that I would like to ask, but in the interest of time I shall not do so now. I shall get the answers at a later time.

I would like to note the gentleman's statement that the statesman-like road was to eliminate water shortages in the future. I could and do concur in this. When we were considering legislation in the last Congress, many of us felt that the study section for supplementary water sources of the proposed Colorado River legislation should impartially emphasize the possibilities of desalinization and other types of supplementary water honestly, seriously and objectively, along with the feasibility of the importation of water. This is some-

thing that some of our colleagues from the areas concerned were willing to cite in testimony but were not willing to allow in the legislation.

I notice in your testimony today, that you do mention desalinization, among other things, and I would like to pose a question to you: Would you support the sort of a concept in any proposed legislation that all possibilities of supplementary water be included in the legislation, without emphasis on one aspect such as the importation of water?

Senator KUCHEL. I would, indeed. And I think it is absolutely vital to the consideration of any good piece of legislation.

I failed to mention in my statement cloud seeding. I have supported weather modification programs many times in the Appropriations Committee, in the other body. So I, certainly, would, and I would hope that any legislation which was to be enacted would require a study of every conceivable means of conserving water we have and of increasing the supply.

Mr. HANSEN. My colleague from Pennsylvania, I think, followed out that thought that we could proceed too far and, perhaps, come up with the wrong answers. I think that we have to keep our considerations in a broad vein if we were going to come up with the answers that will really serve the future. I feel that legislation that is too restricted in concept, could be very costly in the long run.

I was happy to see that the Senator is broad in his intentions.

I would like, again, Mr. Chairman, to commend the distinguished Senator from California on his fine statement. I think he has a very definite and forthright way of answering questions that are very difficult.

Thank you.

Senator KUCHEL. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from California, Mr. Reinecke.

Mr. REINECKE. Thank you, Mr. Chairman. I want to commend you on a very fine statement, Senator Kuchel. We are glad to have your testimony.

Senator KUCHEL. Thank you.

Mr. JOHNSON. The chairman recognizes the gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. I would like to join in the wave of congratulations on your very fine statement, Senator Kuchel. I hope that the cordiality and the good feeling of bipartisanship that has been expressed here will continue to our mutual satisfaction. I know that you join with me in that expression. I, again, thank you.

Senator KUCHEL. Thank you very much.

Mr. JOHNSON. I, too, want to thank you for the way that you have handled yourself in answering the questions. It has been very clear thinking. Your thinking is supported, certainly, by the Governor and the people of our State who are interested in this subject. These questions will come up many times in the hearings and in the executive sessions on this particular problem.

We thank you for taking the time to appear before us.

Senator KUCHEL. I am honored and privileged to be here.

(NOTE.—With permission granted on p. 143, Mr. Hosmer's statement will be inserted in the record at this point.)

STATEMENT OF HON. CRAIG HOSMER, A REPRESENTATIVE IN CONGRESS FROM THE
STATE OF CALIFORNIA

The need to develop additional water supplies for the Colorado River Basin is widely recognized.

If nothing else has been achieved, the extensive hearings conducted by this Committee have clearly demonstrated that present and predictable future demands of the seven Basin states will soon outstrip existing supplies.

The combined record of our hearings on H.R. 4671 in the 89th Congress totals something like 1,600 pages and these proceedings will likely add about another 500 pages or more. If every word was a drop of water, our problems would be solved.

Nonetheless, this voluminous testimony cannot be deemed an inconsequential work; it is stark evidence that the Southwest's desperate water supply situation demands immediate attention. That much at least has been firmly established, if national editorial comment is any criterion.

With our objectives identified, I hope we can find the way clear to legislate them into action.

Very early in this session I introduced H.R. 722, which is identical to H.R. 4671 as reported out by this committee last year. I did so because I shared the feelings of responsible leaders in California that this remarkable piece of legislation still represented the best solution to our critical water problems. It was a consensus expression of common desires and aspirations moulded by unprecedented compromise. But when it appeared unlikely that Basin-wide unity would be restored, I realistically but reluctantly parted company with H.R. 722.

Subsequently, I joined with 13 of my fellow Californians in sponsoring House counterpart bills of S. 861, which California's senior Senator, Thomas H. Kuchel, had introduced over there with Mr. Frank Moss, of Utah. These bills are nearly identical to chairman Aspinall's proposed legislation, H.R. 3300, itself a modified compromise of H.R. 4671's principal provisions. And while there may exist some differences in language and terms, all are uniformly dedicated to the same goal and all maintain the essential seven-state characteristics of H.R. 4671.

Anything less than that would not serve the best interest of all our Colorado River states. And this brings me to the point of major emphasis in my statement. Despite the regrettable absence of total harmony on a singular strategy, I believe we can all agree that the plan of the Los Angeles Department of Water & Power for the development of the Hualapai site possesses outstanding merit. Its scope, flexibility and overall economic attractiveness demand our serious consideration, if for no other reason than the fact that this new proposal relegates existing plans to lesser rank.

Mr. Floyd L. Goss, the Department's chief electrical engineer and assistant manager, has already furnished the basic outline of the plan and additional technical details can be found in the supplemental data submitted later. I need only remind you that this is a key element in the legislation because it gives promise of providing immediate as well as long-range answers. It is veritably the cornerstone of the whole Colorado River Basin project.

One of the most impressive features of the DWP plan is its projected contribution to the proposed Development Fund. Not until the various alternative approaches have been thoroughly explored and a firm course set can the precise contribution to the fund be determined. However, this can be estimated now. If capacity at the bus bar is sold for seven dollars (\$7.00) per kilowatt-year, and I am assured this is a reasonable expectation, the contribution to the Development Fund would be two billion dollars (\$2 billion) at the end of 75 years. However, even if the bus bar price was to be as low as four dollars and sixty cents (\$4.60) per kilowatt-year, the revenue accruing to the fund would be one billion, one hundred million dollars (\$1.1 billion) at the end of the 75 years. Either amount is formidable and would give to this project a fiscal respectability much greater than the plans existing in the pending bills, the best of which would provide \$885 million during this period, and the least of

which would provide zero dollars or less. With zero hour due to arrive in the Southwest in about 25 years hence, we can enjoy the security of knowing that sufficient funds are available for the augmentation projects that most certainly will be necessary.

Make no mistake about it: passage of a Colorado River Basin Project bill without an adequate Development Fund would be less than half a loaf. It must be plain that we will be only multiplying our woes if we authorize new diversions from the river and fail to furnish the means of making up the inevitable overdraft.

The Colorado River has to be augmented by not less than 2.5 million acre-feet annually if we are to meet all the contractual and compact obligations to the seven Basin states and the Republic of Mexico. The source of the supplemental water is, of course, undeterminable at present, but don't be carried away by the soothsayers who talk wonderously about the marvels of weather modification, desalination and the like. Naturally, we are painstakingly exploring all those potential sources, and, I might add, spending substantial California money in the process. Unless there is some fantastic, unexpected breakthrough in technology, though, science cannot be expected to deliver the required quantities of new water when it will be needed. I am hopeful of such a breakthrough in connection with the possible use of peaceful nuclear explosives to improve both the recovery of rainfall and the availability of underground waters. However, at this point it cannot be guaranteed.

I think it is worthy of note that the sea-and-cloud school of thought is populated mainly by those who want to duck the issue of interbasin water transfers and the preservationists who really don't care how the Southwest gets its future water as long as the answer does not involve building the Hualapai dam. The former are short-sighted ostriches and the latter are myopic hypocrites.

Last year the preservationists hailed Theodore Roosevelt as the champion of their self-seeking crusade. Then it was discovered that the Father of Reclamation also had some nice things to say about dams, so they audaciously upped their sights this year and claimed the Deity as an ally. While claiming to save the Grand Canyon for all present and future Americans they admit, unabashed, that only a mere handful are able to make the boat trip down the Colorado River. The high mark is about 1,000 a year, which would work out to about a \$15.00 per trip subsidy on U.S. taxpayers if the anti-dam groups are successful in scuttling this project.

Against that we have to weigh the welfare of the Colorado River Basin states, their 30 million inhabitants, the added millions of the future and still many more millions from all over America who might be able to enjoy the pleasures of reservoir recreation.

If the Hualapai site was just another run-of-the-mill location, perhaps we might be justified in abandoning it to the white-water enthusiasts. However, as Mr. Goss explained to this committee, the combination of geological and hydrological attributes to be found at this spot in Bridge Canyon is a rare circumstance. Not only is it unique in the Colorado River system but few locations in the entire country would provide the setting for the development of such a large peaking power plant.

The Colorado, that tired, deficient river, is our common bond and I urge our sister states to shun temptations of unilateral action lest we regress to the bitter, debilitating interstate strife that would stifle our progress. The judiciary seems unwilling or incapable of providing an equitable answer, so it is left to us in the United States Congress to do so—in concord.

It must be understood that regional mutuality recognizes the rights and legal entitlements of existing water users. No proposal will be acceptable which does not recognize and preserve the rights of the State of California and its agencies to the annual consumptive use of 4,400,000 acre-feet of water from the Colorado River apportioned to the Lower Basin by paragraph (a) of Article III of the Colorado River compact, plus not more than one-half of any excess or surplus water unapportioned by the Compact. The prior rights of California's existing projects to this 4,400,000 acre-feet of water annually should be expressly recognized in legislation authorizing any new basin project. This is the basic principle of 100 years of Western water law, and it is the principle which the Arizona Legislature in 1961 recognized as applicable for the protection of existing rights in Arizona against the proposed Central Arizona Project. Protection of these existing California rights poses no hazard to Arizona.

There is no area in the West which has expended so much money, or made such strides in handling its water shortage problems as Southern California. The Metropolitan Water District of Southern California financed the construction of Parker Dam and the great aqueduct to the coastal plain of California. The All-American Canal and Imperial Dam were underwritten by Imperial Irrigation District and Coachella Valley County Water District.

Those projects, plus the works of the Palo Verde Irrigation District, involve a direct investment—in bond proceeds and tax monies—in excess of half a billion dollars. Millions of people, industries, homes and farms are dependent upon those works and they are not to be pawns of politics.

Mr. JOHNSON. The subcommittee will stand in recess until 2 o'clock this afternoon.

Congressman Edmondson of Oklahoma will be in the chair.

The opening witness will be the Honorable Mr. Ullman of Oregon. (Whereupon, at 12:10 p.m., a recess was taken until 2 p.m. this same day.)

AFTERNOON SESSION

Mr. EDMONDSON (now presiding). The subcommittee will come to order.

Our first witness this afternoon will be the distinguished Representative from the State of Oregon, a member now of the Committee on Ways and Means, the Honorable Al Ullman.

STATEMENT OF HON. AL ULLMAN, A REPRESENTATIVE IN CONGRESS FROM THE SECOND DISTRICT OF THE STATE OF OREGON

Mr. ULLMAN. Mr. Chairman, I am delighted to see my friend from Oklahoma in the chair and I appreciate the opportunity to testify before this most distinguished and important subcommittee of the Interior and Insular Affairs Committee.

Mr. Chairman, the Colorado Basin bill, the central Arizona project, and a National Water Commission are matters that touch on the lives of every citizen in the western United States—and indeed, in the entire Nation. I wish to commend the subcommittee and the full committee for the time and the attention that you have given to these proposals.

In the last Congress, I appeared before the committee in opposition to title 2 of H.R. 4671, the bill then under consideration to authorize the Colorado Basin project.

In order not to be repetitive, I am not repeating the testimony that I gave at that time, but in substance it still is my thinking on this basic subject.

At that time, I proposed the enactment of separate legislation to establish a National Water Commission. I am here today as the sponsor of H.R. 1416, a bill to authorize the Commission and to provide for a comprehensive review of national water resource problems and programs. The language of this bill is identical with that approved by the Interior Committee last year in sections 201-205 of H.R. 4671 and which is now under consideration in H.R. 3300 and related bills—except that no priorities are established and no reconnaissance surveys or feasibility studies of water importation works are directed.

Although I will not repeat all of the reasons why I believe such a Commission should be established by Congress separately from the authorization of a particular reclamation project, I want to emphasize here today that I continue to be opposed to language that would direct the Commission to give priority preference to the problems of a particular river basin—possibly to the detriment of other areas of the Nation. I believe that such directives by the Congress would seriously undermine the independent status so necessary to the effective work of the Commission and, in my judgment, would prejudice the objectivity of the conclusions and recommendations of the Commission.

Legislation similar to H.R. 1416 has already passed the Senate in this session of Congress. In my opinion, it is the most important matter now pending before this committee. I urge approval of the Commission separately and on its own merits. To embroil it in further controversy would be to delay the formulation of plans and policies that will certainly benefit every region and every river basin in the Nation.

Section 3(a) of H.R. 1416 outlines the objectives of this legislation. First, it directs a review of present and anticipated national water resource problems and future water requirements. Second, it directs the Commission to identify alternative ways of meeting those requirements—with consideration being given to conservation and more efficient use of existing supplies, reduction of water pollution, encouragement of higher economic uses, interbasin transfers, and technological advances in desalinization, weather modification, and waste water purification. Third, the Commission is directed to consider the full economic and social impact of various water development programs—including such factors as economic growth, institutional arrangements and esthetic values affecting the quality of life of the American people. Lastly, the Commission is authorized to advise the President on specific water resource matters and to conduct specific investigations as may hereafter be authorized by Congress. The final report of the Commission will be issued not later than 6 years after enactment of the authorizing legislation.

In conclusion, Mr. Chairman, I wish to concur in the recommendations of the Secretary of the Interior with respect to the authorization and construction of the central Arizona project and projects in the Upper Colorado Basin, and with respect to the separate enactment of an act authorizing a National Water Commission.

I would like to here indicate my admiration for the Secretary of the Interior for making this difficult decision. Believe me, it wasn't and isn't easy, particularly since he comes from a part of the country affected by the legislation. It has been my feeling that the Secretary, with his national responsibilities, and after an unbiased and objective look at the alternatives, would come to that conclusion.

It is my fervent hope that the problems and controversies that have clouded these two important legislative proposals can be ended, and that we can build upon our universal concern for meeting the pressing water development needs of the West and of the entire Nation. It is my judgment further, Mr. Chairman, that the most expeditious way of getting this matter resolved would be to enact a separate National

Water Commission. It is my feeling that if we had done it last year we would be well on the road to getting a comprehensive study under way.

The Commission is not controversial. This is the one point that all the Nation can unite on, and it is the one thing that will put this whole problem in perspective. It is my judgment that you can't get that perspective unless you take the Nation's water problem as a whole.

I believe that separate consideration and approval of the two major proposals before the subcommittee would pave the way for the unity that our common purpose requires.

Thank you very much, Mr. Chairman, for this opportunity to appear before you.

Mr. EDMONDSON. The gentleman from Arizona.

Mr. UDALL. My friend from Oregon is a statesman and builder and a man with whom I have been proud to work in Congress. I commend him for his constructive attitude today. I think that is—

Mr. ULLMAN. I want to say that I listened with admiration to the gentleman from Arizona this morning in his testimony and I hold him in the very, very highest regard.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. First I want to take this opportunity, Mr. Chairman, to welcome Mr. Ullman before this committee. He served on this committee before he went to the Ways and Means Committee, and was a valuable member of this committee. I am delighted, Mr. Ullman, with the statement that you have prepared and presented to us.

I might say I agree heartily with the approach that you have taken.

One of the reasons I think you have taken the proper approach is that it has just come to my attention since this Congress has started that with the change in specifications of the third unit at Grand Coulee, what is supposed to have been a source of water for the Pacific Southwest, namely, the Columbia River, has completely disappeared and the Secretary of the Interior being unable to operate the third unit of the Grand Coulee at capacity with the changes that have been made will require a flow which will equal two-thirds of the maximum flood that ever took place on the Columbia River.

Now, if this is true, we are building a power system and there isn't going to be any water up there to be used or exported anywhere else. And I believe as you said that the first job is to look for a national water policy because as you have so clearly stated, this is a national problem and I don't think we should limit it if this Commission is established, and I hope that it is. I think it should be established by separate legislation without being tied to any project or any area.

Mr. ULLMAN. I thank the gentleman, and I would say that upon the completion of the study by a National Water Commission and only upon the completion of such a study, will we be in a position to know really whether there is water available. If it is, then I think all of us are going to have to face up to the problem and the recommendations of this Commission, and I think we will.

Mr. SAYLOR. I think this is the kind of information we need, Mr. Ullman, before we can tie down your area or this area by legislation such as some people are trying to do. I commend you for it and

I only hope that the things you have asked for will turn out to be a reality.

Mr. ULLMAN. I appreciate the remarks of my good friend from Pennsylvania.

Mr. EDMONDSON. The gentleman from Washington.

Mr. FOLEY. With the permission of the Chair I would like to reserve my questions.

Mr. EDMONDSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. Mr. Ullman, you are not under any delusion that the water would be diverted from high up on the river where it affects these dams that Mr. Saylor is talking about, are you?

Mr. ULLMAN. No one knows where the water would be diverted from. There have been studies on the Upper Snake, but the fact remains that wherever you divert it, it will represent a demand on the total availability of water in the basin.

Mr. HOSMER. Isn't it a fact that the State of Washington has its study of water resources and needs almost completed, and so does the State of Oregon?

Mr. ULLMAN. We have just completed establishing a basin commission under the Water Resources Planning Act—the first such commission approved in the Nation. The State of Oregon is giving it the very highest priority. The legislature has just approved a budget that will enable the State to go ahead independently and study the basin needs, but we do not have that study completed.

Mr. HOSMER. Mr. Ullman, just before I came over here I picked up some of my mail and in it was a letter from a high school student in Cottage Grove, Oreg. The debate—I would assume the debate was won.

I would like you to comment on the letter. It reads:

DEAR MR. HOSMER: I want to thank you very much for the information on Oregon Water Diversion.

Our debate team was defending the statement that Oregon should send water to California, and yours was the only information we had to go on. We sent a letter to an Oregon Representative but we have yet to receive an answer.

I must admit that when I was put on the defending team, I felt Oregon shouldn't have to give up its water. But now that I have the facts on the subject I have reversed my thinking.

While gathering data on the subject I talked to a lot of people, and the general feeling is this: "I don't think California has any right to Oregon water." Then, when they are asked why California shouldn't take any of Oregon's water, they mumble something to the effect: "Because it's our water, that's why! Besides, those damned Californians use too much water anyway."

I think if these people could get the facts on the subject, they might change their minds.

I sincerely hope California gets the much-needed Columbia River surplus water. About all I can offer you, though, is my support and prayers.

Good luck, and thanks once again.

Sincerely,

And I withhold the name to protect the young and unprejudiced.

Mr. ULLMAN. Mr. Hosmer, the only comment I would make is that I wish you would send me one of those packets. Evidently they have some pretty high powered pills.

Mr. HOSMER. Thank you.

Mr. EDMONDSON. The gentleman from Oregon.

Mr. WYATT. I welcome my distinguished colleague to our committee. You made a very important contribution in your testimony last

year on the same type of bill, Mr. Ullman, and I think this is a very helpful contribution.

You stated in a general way very well the problem the people in the Northwest have, and I commend you for the leadership that you have shown in the area of resource development and for assisting us who are interested in the development of our own resources in the Northwest.

Thank you.

Mr. ULLMAN. I thank the gentleman.

Mr. SAYLOR. Will the gentleman yield?

Mr. WYATT. Yes, I yield.

Mr. SAYLOR. Mr. Ullman, you just answered a question by my colleague from California as to whether you and the State of Washington have entered into some studies. Now, it is my understanding that not only the States of Oregon and Washington but the States of Idaho, Montana, and our neighboring country of Canada are vitally affected as to the waters of the Columbia River. Is that not correct?

Mr. ULLMAN. This is, of course, correct, and in our judgment each State must make a study as to where its interests lie in the basin, but the reason we want a national water commission is that only a national water commission can really come to a complete authoritative conclusion as to where the national interests lie in the use of its water.

Mr. SAYLOR. And if it should be determined that there was surplus water in the Columbia River, it would still be necessary for this country to arrange, because of its present treaty with Canada, to determine what water, if any, could be diverted from the Columbia, is that not correct?

Mr. ULLMAN. It is a national problem, yes.

Mr. EDMONDSON. The gentleman from Oregon.

Mr. WYATT. I have just two other short questions for my colleague. You are aware, are you not, Congressman Ullman, that the Oregon legislature, at least on the house side, and I believe the senate also, has approved the appropriation of in excess of \$500 thousand to speed up one year the completion of our Oregon water study. Isn't that correct?

Mr. ULLMAN. That is my understanding, Mr. Wyatt.

Mr. WYATT. And this has happened since the hearing in 1966 in an effort on the part of the State of Oregon to speed up our studies so that we won't have this reason for saying that we would like to slow the process down.

Mr. ULLMAN. That is correct. I think the people in Oregon want to hasten the study as rapidly as possible so that we know what the problem is.

Mr. WYATT. In addition to the State studies that are going on, the water basin commission that has just been formed in the Northwest is assuming the responsibility for the completion of the Federal study, the Federal water study in the Northwest, which is costing the Federal Government approximately \$5 million and which itself won't be completed until about 1970, isn't that correct?

Mr. ULLMAN. That is correct, to my understanding.

Mr. WYATT. That is all, Mr. Chairman. Thank you.

Mr. EDMONDSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. Thank you.

Mr. Ullman, just for clarification, were your remarks here primarily addressed to H.R. 1416 which is the commission by itself or to H.R. 3300 which is the commission embodied in the whole Colorado River legislation?

Mr. ULLMAN. My remarks are addressed to H.R. 1416 because in my judgment, as I said in my testimony, the commission should be separated from the other bill. We have two legislative proposals here. They should be separated and passed.

Mr. REINECKE. I thank the gentleman. No further questions.

Mr. EDMONDSON. We have a distinguished guest from the other body. Would the gentleman from Arizona like to introduce him?

Mr. STEIGER. Thank you, Mr. Chairman. Without objection the record could show that the junior Senator, Senator Fannin, from Arizona is present and demonstrating his very real interest and genuine leadership in this problem. We appreciate it.

Mr. EDMONDSON. We will be pleased to receive any statement the Senator cares to file in connection with this legislation.

Senator FANNIN. Thank you, Mr. Chairman.

Mr. STEIGER. I do have a question, Mr. Chairman, if I may.

Mr. Ullman, in the event that this bill were to achieve favor with the commission as a part of it, would you oppose the bill on those grounds?

Mr. ULLMAN. Certainly I would, in its present form. In my judgment the two must be separated in order to establish the kind of a legislative approach to the problem that I could support, and I would hope that we can do this so that I can support the central Arizona project. I am a great believer in reclamation. I know that your State needs water. I know what great wealth would be produced with this water. And I am for it.

I hope it is possible to accomplish this purpose and I hope that by separating these two basic components you bring us a bill that I can support.

Mr. STEIGER. I have no further questions, Mr. Chairman.

Mr. EDMONDSON. Any further questions? The gentleman from Washington.

Mr. FOLEY. Thank you, Mr. Chairman.

First of all I would like to congratulate the gentleman from Oregon on his customarily clear and concise statement. The gentleman is a senior member of the congressional delegation from the Pacific Northwest and I would ask him as to his understanding of the gentleman from California, the letter from Cottage Grove, Ore.—is it not the case that the people of the Pacific Northwest are anxious to assist in the solution of the pressing problems of water in Arizona to which the central Arizona project is addressed?

Mr. ULLMAN. I am glad the gentleman has given me an opportunity to clarify this. The people of the Pacific Northwest want to proceed as expeditiously and as rapidly as possible in analyzing the water problem and finding some solution to the national water situation.

I think they wholeheartedly support a national water commission to study the problem from the point of view of the whole Nation, a study that would not be biased in any way and would not be tied to any particular development proposal that could cast a reflection on

the conclusions of the report. The people of Oregon and Washington and the Pacific Northwest want to proceed as rapidly as possible with such a study.

I don't think that they are playing a dog-in-the-manger role at all because, until they know what the availability of water is, what the future needs are, what the needs of the other basins are, what the alternatives are, they are simply not willing to let a study be tied to any particular proposal that would result in a biased and a narrow conclusion.

I think they want to get the answers. They want to get the right answers, and they feel that a national water commission would give them. I feel sure that once the conclusions were drawn by this kind of a national study, that they would be very ready and willing to cooperate to the maximum.

Mr. FOLEY. Is it not the case that there is virtually unanimous agreement among the congressional delegations from the Pacific Northwest States that we are ready at this time to support fully an objective national study of our water resource problems by a national water commission without any reservations and restrictions or conditions?

Mr. ULLMAN. As far as I know, this is the unanimous opinion of the delegations in both bodies of Congress.

Mr. FOLEY. I thank the gentleman.

Mr. EDMONDSON. Any further questions? Thank you very much.

Mr. ULLMAN. Thank you, Mr. Chairman.

Mr. EDMONDSON. We have another very able colleague whom we are pleased to have with us from the Northwest, the gentlewoman from Washington, Mrs. May.

I understand Congressman John Blatnik from Minnesota, also an author of a national water commission bill, has filed a statement with the committee. If there is no objection, his statement will be made a part of the record following the testimony of Mrs. May. Hearing no objection, so ordered.

STATEMENT OF THE HONORABLE CATHERINE MAY, A REPRESENTATIVE IN CONGRESS FROM THE FOURTH DISTRICT OF THE STATE OF WASHINGTON

Mrs. MAY. Mr. Chairman, and members of the committee, I am Catherine May, Representative in Congress from the Fourth Congressional District of the State of Washington.

It is my district, in southeastern Washington, that is bounded by the Columbia and Snake Rivers. We have, in this district, a vital and life-blood interest in sound and proper water utilization and development, as is evidenced by the developing Yakima and Columbia Basin Reclamation projects, and which is also evidenced in the proposed several irrigation and multiple purpose projects which are now pending before this distinguished committee. These latter proposed authorizations are the Kennewick division of the Yakima project, and the Touchet division of the Walla Walla project. Of course, the people of my district are hopeful that this committee will be able to consider these water resource projects this year.

Today, however, I appear before you as cosponsor of the legislation to create a national water commission. This is a good bill which I sincerely feel would satisfy a great national need, and I hope, you will approve it.

Very briefly we know the purpose of the national water commission would be to review comprehensively the national water resource problems and programs of our Nation. The national water commission of seven members would be appointed by the President to "review present and anticipated national water resource problems, and identify alternative ways of meeting our water requirements."

These are not only commendable objectives, they are necessary. Increasingly, as this committee knows probably far better than any other committee in this body, almost every region of the Nation is facing water problems, many of them serious. Taken together, these problems are national in scope.

The job of the commission would be to review objectively our present water resources policy and to make recommendations as to the courses, we as a Nation must pursue to minimize these problems. In short, the commission would be charged with the responsibility of developing proper solutions with full attention to the entire range of alternatives, and the ultimate consequences of the proposed projects.

As is suggested in the legislation, the commission would give comprehensive consideration to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including desalting, weather modification, and waste-water purification and reuse. In addition, the commission would consider economic and social consequences of water resource development, including its impact on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people.

These, it seems to me, are worthwhile objectives we all can support.

Enactment of this legislation has been urged by the President of the United States in two messages this year to the Congress. The President asked for the establishment of a national water commission in his budget message of January 24, and again in his message on protecting our natural heritage on January 30.

The national water commission would be composed of seven members from outside the Federal Government, appointed by the President. The legislation, in recognition of the need for a commission membership of ability and wide experience, specifies that each commissioner must have the ability to make an intellectually honest evaluation of our Nation's water problems and policies and have the capacity to exercise independent judgment.

I believe, Mr. Chairman, members of this committee, that the Congress is charged with the responsibility, both moral and economic, of approving this legislation. I believe full implementation of this legislation is a necessary prerequisite to consideration of any Federal participation in regional plans of one kind or another, which might operate to the detriment of other areas or to the Nation as a whole.

This is why I urge, Mr. Chairman, that the legislation to authorize a national water commission be approved by this committee, unen-

cumbered by any other special regional provisions which could jeopardize the intent and purpose of the need for objectivity in finding solution to our Nation's water problems.

It is regrettable that a national water commission is not at this very moment carrying out the terms of this legislation. Let us not make the mistake of further delaying the creation of the commission. Our national water problems are urgent and cry for objective attention.

Thank you.

Mr. EDMONDSON. Thank you for a fine statement, Mrs. May.

The gentleman from Arizona.

Mr. UDALL. Just quickly, Mr. Chairman. I want to commend the distinguished and very effective lady from Washington for her appearance here and her statement.

I noticed on the first page she referred to some projects which are pending in the State of Washington and I hope with her that this committee and Congress will be able to take these matters up at the appropriate time and as soon as possible.

Mrs. MAY. If the gentleman will forgive me, a slight commercial was inserted as a preamble.

Mr. UDALL. I just wanted to say with regard to that commercial, I was reading U.S. News last month. We had an article I guess last fall pointing out that the great and beautiful area you represent in the Northwest has 30 percent of the U.S. population and 12 percent of the water runoff. I wish we were that fortunate because as the article noted, we had 13 percent of the people and only 1 percent of the runoff. And we in Arizona haven't had a major reclamation project of any kind for more than 20 years and we have supported some of the, all, I guess, of the reclamation legislation in your area, and I would hope that this year we will be able to work out something with the help of constructive people like yourself so that we can not only go forward with your projects but we can break the logjam down on the Colorado, too.

Mrs. MAY. If the gentleman from Arizona will yield, I would like to at this time express my own complete cooperation and that of the people of our area that was expressed here earlier by the gentleman from Oregon in response to the questions from the gentleman from Washington, Mr. Foley. We feel that we do have a great cause, that you sit in a position that we have sat in in my own home territory, with a need for development. I suppose it will always be pointed out, Mr. Udall, that we areas that are potential and present reclamation areas usually have a smaller percent of the population. But here again we are the great potential food basket for this Nation and the world because we do have the soil and the water to be brought together. Every year that the demands for food increase in this Nation and the hungry countries of the world, every acre of our land becomes more and more important. As long as we have the land and water and enough people to feed the rest of the Nation and the others in the world, certainly the great need for your development and the development in my part of the country remains extremely and urgently important to the future.

Mr. UDALL. Thank you.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. Mrs. May, I welcome you before the committee and I want to commend you for the statement you presented.

Mrs. May, in that commercial plug you got in for your own district, I want to ask you several questions with regard to them because of matters that were presented to this committee this morning. It is my understanding that the Kennewick division of the Yakama project and the Touchet division of the Walla Walla project are basically a part of the Columbia Basin reclamation project, is that correct?

Mrs. MAY. They are near, but not a part of, the Columbia Basin project.

Mr. SAYLOR. If my memory serves me correctly, it was about 1951 or 1952 when the Bureau of Reclamation came out with its first basic study in which they published three or four volumes covering the Columbia Basin. Do you agree with that? I think it was about—

Mrs. MAY. In 1961, Mr. Saylor, did you say?

Mr. SAYLOR. Yes. I think it is about that; 1951 or 1952?

Mrs. MAY. I do not remember. I was not a Member of this body at that time. The first comprehensive report was made in 1932, however.

Mr. SAYLOR. Do you know of any changes that have been made in any project in the Columbia Basin from that time to this while you have been a Member of Congress?

Mrs. MAY. Now, are you speaking of actual changes as far as progress or extension of projects?

Mr. SAYLOR. Extension of projects or changes in what should be included in any project or excluded from a project.

Mrs. MAY. I hope I get the impact of your question. There have been a number of changes, of course, in the Columbia Basin area with the division of land, the amount of lots. There has been an operation and maintenance and a new repayment schedule. All of this just since 1958.

The Yakima project which is the oldest project, of course, has been paid out for some time. Kennewick would be an extension of that into another area. But in the Columbia Basin there have been some considerable changes looking forward to a sounder development on an orderly basis of the half million acres in the Columbia Basin area yet to be developed.

Mr. SAYLOR. I am delighted to have you say that because this reaffirms my recollection.

Now, I want to ask you, did you ever hear anybody from the State of Washington or Oregon or anyone else, Idaho or Montana, propose that because there were some changes in those plans that the State of Washington should pay for any changes or any increase in the size of any project?

Mrs. MAY. Well, I would not like to quote anyone without absolute recollection of any statements made.

Mr. SAYLOR. You weren't here this morning, Mrs. May.

Mrs. MAY. No; I wasn't.

Mr. SAYLOR. And I don't want you to answer this blindly but we had the senior Senator from California here this morning and he made quite a case for California and he said, however, that the provisions of the central Arizona project over and above the original

plan should all be paid for by the people of Arizona. And I just wanted to know whether or not up in your area you had ever heard tell of anything like this because it is completely new to me and—

Mr. HOSMER. If the gentleman will yield, to refresh your memory—will you yield?

Mr. SAYLOR. No. I would like—

Mrs. MAY. I would still stick to my original stand, Congressman Saylor. I have no recollection of any particular statements or speeches by any member of this committee or others. I was not in attendance this morning.

Mr. SAYLOR. I just want to say for your benefit that I don't believe that merely because the Bureau of Reclamation makes a change that the local people should have to foot that bill. This seems to be the approach of the senior Senator from California and I was just wondering whether or not this is to be applied uniformly in 17 Western States because it hasn't been applied in California.

I want to know whether or not there is one rule for California and another rule for the other 16 reclamation States.

Mrs. MAY. Well, may I say to the gentleman from Pennsylvania, if you and I were having a strictly semantic and philosophical discussion of reclamation, we would be in agreement, of course. [Laughter.]

Mr. EDMONDSON. Oh, that is a broad statement.

Mrs. MAY. On this subject, may I assure the chairman. On this subject.

Mr. SAYLOR. Mrs. May, you have not commented on the central Arizona project. It is my understanding that your position is that you have, as you have explained to our colleague, Mr. Udall, that you would support the recommendations which have come from the Department of the Interior on the central Arizona project.

Mrs. MAY. I favor the central Arizona project. I did make the statement that I do think, however, that the National Water Commission should be enacted as separate legislation.

Mr. SAYLOR. And I heartily agree with you on that.

Mrs. MAY. Thank you, sir.

Mr. SAYLOR. And I hope this committee in its wisdom will follow the recommendations from you and other Members of the Congress.

Mrs. MAY. Thank you.

Mr. SAYLOR. Thank you for your testimony.

Mr. EDMONDSON. The gentleman from Washington.

Mr. FOLEY. I would like to reserve my questions.

Mr. EDMONDSON. The gentleman from South Dakota.

Mr. BERRY. No questions, Mr. Chairman. I just want to commend the gentlelady from Washington on a very fine statement.

Mrs. MAY. Thank you.

Mr. EDMONDSON. The gentleman from Washington.

Mr. MEEDS. No questions, Mr. Chairman, but I would like to welcome my colleague to this committee. I am familiar with and commend her on her testimony.

Mrs. MAY. Thank you.

Mr. EDMONDSON. The gentleman from California.

Mr. Hosmer. Mrs. May, this job or task that you have outlined for the National Water Commission is truly a massive one and I am wondering how long do you feel it would take them to come up with something?

Mrs. May. Mr. Hosmer, I have heard several projected time estimates from people that have been actually involved in regional surveys. We have one that has just been completed for part of our Northwest that took 16 months. I felt it was pretty good. Of course, that was regional.

I suppose that it is anyone's guess. It depends exactly how the Water Commission is set up, how its work is divided, the competency of its staff members, what goals you are reaching and what fields you are working in. It could—I have heard everything from 3 to 6 years. I rather think it would be a mistake to say to them before they got started, you must have this study completed by year such and such.

Perhaps it would be good to leave it open for some time. If we felt this Commission was not doing its work quickly enough, perhaps the Congress then could put a time limit on them. But I wouldn't want to hazard a guess of how many years a really good study like this could take, or would take.

Mr. Hosmer. You think it would take a number of years.

Mrs. May. Yes. I would think certainly 1 year would certainly not be enough.

Mr. Hosmer. Do you view this so-called national water problem as one single problem or a bundle of problems that plague us in many parts of the Nation simultaneously?

Mrs. May. I see water as a problem, whether it be shortage or pollution.

Mr. Hosmer. We are all for water.

Mrs. May. That is right, and I see solutions for it as multiple, though, and probably some we haven't even thought about yet.

Mr. Hosmer. But the problem, say, of pollution of some rivers in the New England area are not necessarily related to the problem that the central Arizona project is supposed to solve, are they?

Mrs. May. If we have a National Water Commission, and that is the subject we are speaking to, I would think that anything that had to do with the availability of pure, drinkable, usable water would be part of the whole problem, whether it was rivers in New England or—

Mr. Hosmer. Let us put it this way. Whatever contribution the National Water Commission might make in connection with a quality problem in New England wouldn't necessarily apply to a quantity problem in Arizona.

Mrs. May. I expect not necessarily.

Mr. Hosmer. And there is no thought in your mind, is there, that the National Water Commission type of study and work would involve schemes to export Pacific Northwest water to New England to help them with their problem.

Mrs. May. Well, I would sincerely hope not because we are looking at this on an overall national, purely objective basis, I would say to the Congressman.

Mr. HOSMER. In other words, when we get down to solving some of our water problems, we pinpoint at some locality and the areas around it.

Mrs. MAY. I think the only way that this National Water Commission would possibly fulfill its responsibilities is to cover all the things that I have already covered so that when we come to some pinpointed solutions, we are sure that we are making good solutions for everyone, not only the area involved but the whole Nation.

Mr. HOSMER. You don't have any objection to studies being made in the universities and colleges of America about specific water problems, do you?

Mrs. MAY. No; I do not.

Mr. HOSMER. And do you think that even if they would be duplicative of each other, they would all be contributing to some common goal.

Mrs. MAY. Well, I can't answer that. I have known a great many studies that have been carried on that have probably been duplicative, but if you mean under the aegis of the National Water Commission—

Mr. HOSMER. No. I mean on their own.

Mrs. MAY. Naturally, I don't know how any of us could object to any university or college carrying on any study it wants in any field. I think if it were underwritten by Federal money there should be every effort made to avoid duplication.

Mr. HOSMER. Well, if it were true that all of the wisdom on water were consolidated into a National Water Commission, probably a duplicative effort would not be called for; but you recall in something you are very familiar with, the production of plutonium, there was a duplicative effort on the extraction of enriched uranium for bombs.

Mr. MAY. Yes.

Mr. HOSMER. We went two routes in order to achieve a national objective.

With that kind of a philosophy I am wondering if you would object if the Bureau of Reclamation or the Interior Department was instructed to study this problem of the Pacific Northwest vis-a-vis the Pacific Southwest at the same time possibly as the water commission was looking into it.

Mrs. MAY. I don't see why there should be a separation. Why don't we put the whole study under one competent group using staff, information, competent people to study it, from wherever they come, whether from Government agencies, private agencies, or others.

Mr. HOSMER. The National Water Commission has got the whole country from Florida to Washington and Maine to California to look at.

Mrs. MAY. Yes.

Mr. HOSMER. And it is logical that nongovernmental people could make some contribution by looking into it simultaneously.

Mrs. MAY. Yes. That is what I said. Why not use all of them?

Mr. HOSMER. So it might not hurt, at least, if another governmental group were looking into a phase of the overall problem of the National Water Commission, would it?

Mrs. MAY. Well, it seems to me you are asking for duplication, aren't you?

Mr. HOSMER. You don't object to the study being made by Dr. Tinney from your State?

Mrs. MAY. No; that is right.

Mr. HOSMER. On these problems.

Mrs. MAY. No. The university has a right to make the study and I would hope that it could become helpful to the water commission once it were established as part of the papers they could look at. It is a preliminary survey. It is not a completed study.

Mr. HOSMER. Do you like the Bureau of Reclamation?

Mrs. MAY. Yes; indeed I do. I practically go steady with them in Congress. [Laughter.]

Mr. HOSMER. You do believe that they are quite competent to make such a study?

Mrs. MAY. Quite competent. I am not sure I understood the thrust of your question. You kept saying would I have an objection to a separate study. I have come here to talk about the National Water Commission and its facets. I am sure the Bureau keeps on doing studies at all times in these areas.

Mr. HOSMER. You understand that one or two of these other bills before us simultaneously do direct the Bureau to make a study and even one of them a reconnaissance report on the possibility of an interbasin diversion and that is why I asked you the question.

Mrs. MAY. I would have no objection to the study being made. I would want some control as to how much weight it carried in the final decision of a really objective water commission study.

Mr. HOSMER. Well, you do understand that there is no bill before this committee that provides for the diversion of a drop of water from the Pacific Northwest to any place, but that only the bills provide for studies concerning the subject. You understand that.

Mrs. MAY. I understand that completely. I also, although I have had a comparatively short time in Congress, understand that many times studies become preambles to action and I want to be sure that if this is preamble to action, that we have all the possible information as to what the impact of that action will be.

Mr. HOSMER. Just so you understand because I didn't want you to become confused by some of the statements that were made by some of my colleagues on this side of the table.

Mrs. MAY. I am deeply grateful to the gentleman. Thank you.

Mr. HOSMER. Thank you, Mr. Chairman.

Mr. EDMONDSON. The gentleman from Oregon.

Mr. WYATT. I will reserve my questions other than to comment that I welcome my able and distinguished colleague from Washington and I appreciate the statement very much.

Mrs. MAY. I thank the gentleman.

Mr. EDMONDSON. The gentleman from California.

Mr. REINECKE. I have no questions, Mrs. May. I want to say thank you for your statement.

Mr. EDMONDSON. The gentleman from Arizona.

Mr. STEIGER. I would just like the record to show that I was tremendously impressed by the grace, beauty, and wit of the witness

and that I join with my colleague, Mr. Udall, in welcoming her support for the Central Arizona project, and I know the generosity of her offer of support was exceeded only by her knowledge of the situation.

Thank you very much.

Mr. EDMONDSON. The gentleman from Idaho.

Any other members of the subcommittee have questions? The gentleman from Washington.

Mr. FOLEY. First of all, I would like to associate myself with the well-deserved compliments tendered to the gentle lady from Washington on a very fine statement.

I would just like to ask this question. The gentleman from California, Mr. Hosmer, suggested that perhaps the quality of water in New England would not necessarily be related to the problems of water quantity in the Southwest. It is, however, not true, Mrs. May, that problems of water quality on the Great Lakes and water quantity in the Missouri Basin might well be related to problems of water quantity in the Southwest?

Mrs. MAY. I certainly agree with the gentleman. I tried to indicate that in a general statement in answer to the gentleman from California, that it is very difficult until you get down to the pinpointed study of something like this, where water quality and quantity could be inseparable in some cases. In other cases you might be able to separate them, but it is not a basic rule.

Mr. FOLEY. And it is not true also that those of us who like yourself support a National Water Commission directed merely to consider objectively all the pressing water problems of the United States do not constitute an opinion or position designed to limit the scope of study and investigation of these problems, but to expand it and to permit this body to carry on deliberations without restrictions or condition of limitations of any kind, that that is our judgment of the best and most useful and productive way to resolve not only problems of New England and the Great Lakes but also the Southwest.

Mrs. MAY. I could not agree more with the gentleman. I think that is the only way we can be fair to everyone in the United States. Its findings, its recommendations, its studies might prove to be controversial among regions but at least we will have done, at a time the studies are completed, as exhaustive and as objective a job for the best interests of every State when we finish.

Mr. FOLEY. The gentle lady is well informed that the provisions of her bill and other bills of similar character call upon the water resources agencies of the United States to cooperate fully with the National Water Commission in undertaking any research or studies that they be directed to make.

Mrs. MAY. That is right. As a matter of fact, I think it would be a great loss to this Water Commission if material already existing and the talents that we know are in these various places were not made available to them.

Mr. FOLEY. I thank the lady.

Mr. SAYLOR. Will the gentleman yield?

Mr. FOLEY. I yield.

Mr. SAYLOR. I just want to say I appreciate the questions you asked and the answers given by our colleague from Washington because I

have just taken a look at Rand-McNally's Rural Atlas and I find that from Walla Walla, Wash., to Lake Superior is a shorter distance than from Walla Walla to Tucson, Ariz.

Mrs. MAY. It is an interesting fact. I thank the gentleman from Pennsylvania. I had not known that before.

Mr. EDMONDSON. Any further questions of the witness? If not, I want to thank you, Mrs. May.

Mrs. MAY. Thank you, Mr. Chairman. Thank you, members of the committee.

(The statement referred to follows:)

STATEMENT OF JOHN A. BLATNIK, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MINNESOTA

Mr. Chairman, due to the complexity and the nature of water itself, the wisdom of establishing a National Water Commission should be without question. This Commission, composed of non-Federal water experts, will be an invaluable guide to the Nation's long range water supply problems. The Commission has been before the Congress before and has already been successfully reported out of the Senate this session.

I do hope the House will follow similar action so that in the very near future, we, as a Nation, can draw on the knowledge of designated water experts so that the Nation's planning for the control of its water problems will not have to be "piece-meal."

Since water by its very definition does not respect boundaries, we must look at it as the Nation's problem. There is no reason that we, as a Nation, should be leaders of the space, but losers in the fight to control flooding and drought throughout the land. Water is such a basic element in our society that we have too long taken it for granted and too long abused its intended use. We are now faced with herculean task of restoring our water to a usable state. In my 20 years in Congress, few problems have been so sadly neglected as that of the whole water problem in this Nation.

I do hope that the enactment of the National Water Commission will be soon and I am sure we will all profit by an early selection of able men to fulfill this need. I want to especially commend the Committee for its extensive hearings and I know we can look forward to this bill's early passage and the initial establishment of a National Water Commission.

Mr. EDMONDSON. The Chair notes the presence of a very distinguished Member of the Congress, former senior member of this committee, the Honorable William Harrison. We are very pleased to have you with us.

Mr. HARRISON. Thank you very much.

Mr. EDMONDSON. If you have a statement for the record, we will be pleased to have it filed for the record.

STATEMENT OF HON. WILLIAM HARRISON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WYOMING

Mr. HARRISON. Only, Mr. Chairman, that representing the Equality State of Wyoming, I have a very deep interest in the action that this committee will take as far as the bill which they are considering at the present time. I know, having served on this committee for so many years, that you will give it very careful consideration and I know that you will keep the needs of Wyoming and the other States in mind so that the legislation will be, as you usually turn out, a very fine piece of legislation.

Mr. EDMONDSON. We thank the gentleman. We are quite sure if we should happen to overlook the interests of Wyoming, we will be reminded of it forcibly.

Mr. HARRISON. I will do my best.

Mr. EDMONDSON. When we get before the Appropriations Committee we will find out about it.

Mr. HARRISON. That is right.

Mr. SAYLOR. I want to say I am delighted to have our former colleague, Mr. Harrison, with us. I hope we take care of these problems before they ever get to the Appropriations Committee.

Mr. EDMONDSON. We have a statement here from our colleague from California, Congressman Van Deerlin. With no objection it will be made a part of the record. Hearing no objection, so ordered.

(The statement of Congressman Van Deerlin follows:)

STATEMENT OF HON. LIONEL VAN DEERLIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. Chairman, members of the Subcommittee. I am glad to have this opportunity today to make known my strong support for the Colorado River Development bills modeled on S. 861, which was introduced in the Senate last month by the senior Senator from California. Along with a number of my California colleagues, I have offered companion legislation in the House. My bill is H.R. 6848.

Many of us are concerned about the possible consequences if we abandon the regional approach, incorporated so successfully by your Committee last year in H.R. 4671, in favor of short-sighted sectionalism.

Our legislation would not only authorize the central Arizona project, a laudable and long-overdue endeavor to furnish that State a fair share of Colorado River water; it also would protect the just interests of the six other States that share the Colorado River basin.

California would be guaranteed 4.4 million acre-feet of water from the river each year. It would be difficult for California to live with a bill that did not carry such assurance, for my State already is using some 5 million acre-feet. At the same time, California's rapid population growth is creating an inexorable demand for an additional 200,000 acre-feet every 12 months.

Like H.R. 4671, the legislation we are recommending would direct the Secretary of the Interior to make a reconnaissance report on potential new sources of water for replenishing the Colorado and, if that were favorable, to make a followup feasibility study.

Again, the need for such a feature in the legislation seems self-evident to me. The Colorado simply does not have enough water to meet the existing and future demands upon it. Within 25 years, we are told, the annual deficit will be about 4.5 million acre-feet—unless we can somehow locate and import enough water from other sources to sustain the Colorado. The projected shortage, incidentally, is greater than the entire entitlement proposed by my bill for California.

I might note, at this point, that S. 861 and its companion measures have been given the unqualified endorsement of most of California's leading water agencies, including the Metropolitan Water District of Southern California, the Colorado River Board of California and the Feather River Project Association.

I would like to mention the single dam at Bridge Canyon which would be authorized by our bill. The Hualapai Dam, as it is known, would eventually produce revenues, through the sale of electric power, of more than \$400 million—a necessary economic base for the central Arizona project and also for future impatation proposals.

It is my belief that the single dam represents a sound compromise between the two dams that were originally proposed and the prohibition against any dam at all that is sought by some conservationist groups. While I respect and applaud the view that the Grand Canyon should be maintained, to the maximum extent possible, in its original, pristine state, I cannot subscribe to the fears that the one dam would create any significant flooding of the canyon.

Our bill has the drawback of any compromise: not everyone is going to be wildly enthusiastic about it. But in balance, it is a forward looking and equitable plan recognizing, as it does, that our critical western water shortage is a problem that no individual state, acting alone, can solve—even within its own boundaries. The Colorado is a shared resource, and we must unite in a regional effort to make its precious water last forever.

Mr. EDMONDSON. We have a statement submitted by our colleague from New Jersey, Congressman Patten. With no objection it will be made a part of the record. Hearing no objection, so ordered.
(The statement of Congressman Patten follows:)

STATEMENT OF HON. EDWARD J. PATTEN, A REPRESENTATIVE IN CONGRESS
FROM THE STATE OF NEW JERSEY

Mr. Chairman and members of the Interior and Insular Affairs Committee: During the past few years, several areas in the nation have suffered from severe drought. In some sections—such as the Northeast—disaster actually was near.

During mid-1965, New Jersey's Governor, Richard J. Hughes, declared a state of emergency because of the critical shortage of water. It sounds impossible, but 121 communities in the Northeastern part of New Jersey would have been deprived of water in September, or October, if the Governor did not act.

Other states in the area were also seriously affected:

If New York State had failed to act, New York City could have exhausted its water supply in March, 1966!

And two-thirds of the water supply of another great city—Philadelphia—was in jeopardy—because of the long and devastating drought.

Our Nation is growing with amazing speed—more homes are being built, more industries are being constructed, and more commercial enterprises are being created. And this is good to see and know, for it shows that we are prospering and moving forward.

But we must realize that without adequate water—in both quantity and quality—there would be stagnation and disaster, instead of progress and security.

So I strongly recommend prompt approval of legislation that would establish a National Water Commission and provide for a comprehensive review of national water resource problems and progress.

President Johnson reminded us of the water crisis, when he warned on January 24, 1967, that, "Many regions of the country are facing increasingly critical problems of adequate supply and efficient use of water."

Mr. Chairman and members of this committee, this is not only a warning, but a challenge—to our resourcefulness, vision and leadership. And it is a challenge we must defeat, for we discovered in 1965 that a prolonged drought could possibly do what no enemy has been able to do: endanger—and perhaps even immobilize—the large cities of the United States of America.

Mr. EDMONDSON. We have notations here that three members of the committee, the Honorable Thomas S. Foley, author of H.R. 3298, Wendell Wyatt, author of H.R. 1458, and Ed Reinecke, author of H.R. 5346, are all interested as authors of legislation on the subject of the National Water Commission. Do any of these members of the committee desire to be heard at this time?

Mr. FOLEY. Mr. Chairman, for my part I do not choose to be heard at this time and I think the testimony of witnesses this afternoon has eloquently and effectively spoken for the needs for the National Water Commission.

Mr. EDMONDSON. The gentleman from Oregon.

Mr. WYATT. I would say, Mr. Chairman, my position is the same. I do not wish to take up any time of the committee.

Mr. EDMONDSON. The gentleman from California.

Mr. REINECKE. Mr. Chairman, as I originally introduced the National Water Commission bill in 1965, one point which has not been brought up, I think, is to try to encourage this Commission to emphasize water management practices as a means of developing new resources of water, and specifically in the bill before us I have added a section to point this up by the fact I have instructed the Commission to look into the possibility of soil-measuring devices as a means of trying to improve or diminish the agricultural requirements of water so that more could be made available for M. & I. or other agricultural uses. And I sincerely hope if the committee sees in its wisdom that we should pass the Commission, either as a part of the Arizona bill or by itself, that this part will be maintained because I think it is important that the committee recognize that the usage, management, application of water are now a very major factor in our overall water resource availability and I think we must recognize this in the legislation as well as in the hearings in order to be certain that these conservation practices are made a part of our everyday life.

Thank you, Mr. Chairman.

Mr. EDMONDSON. I think the gentleman has a very fine point. I certainly will agree with him.

If there are no further witnesses who are members of the committee who want to be heard on this subject, the next witness to be heard is a representative of the State of California, the director of the California Department of Water Resources, representing Governor Reagan, Mr. William R. Gianelli.

Mr. Gianelli, will you come forward, please? I understand that you are accompanied by several others.

STATEMENT OF WILLIAM R. GIANELLI, DIRECTOR, CALIFORNIA DEPARTMENT OF WATER RESOURCES; ACCOMPANIED BY RAYMOND R. RUMMONDS, CHAIRMAN, COLORADO RIVER BOARD OF CALIFORNIA; NORTHCUTT ELY, SPECIAL COUNSEL, COLORADO RIVER BOARD OF CALIFORNIA AND SPECIAL ASSISTANT ATTORNEY GENERAL; DALLAS COLE, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA; MYRON B. HOLBURT, PRINCIPAL ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA; AND DON MAUGHAN, PRINCIPAL ENGINEER, CALIFORNIA DEPARTMENT OF WATER RESOURCES

Mr. GIANELLI. Mr. Chairman, we have two other witnesses. If they could be permitted to come up at the same time it might save the committee's time.

Mr. EDMONDSON. Will you please present them and identify them for the record.

Mr. GIANELLI. Yes.

Mr. Raymond Rummonds, chairman of the Colorado River Board of California; Mr. Northcutt Ely, an attorney who is here on behalf of the attorney general of the State of California and also as an assistant to Mr. Rummonds.

Mr. EDMONDSON. Is Mr. Lynch a part of your party too?

Mr. GIANELLI. Mr. Ely is presenting a statement on behalf of the attorney general of California, Mr. Thomas C. Lynch.

Mr. EDMONDSON. Mr. Lynch is not here?

Mr. GIANELLI. He is not here, Mr. Chairman.

Mr. EDMONDSON. We have the statement of Mr. Gianelli, do we not? Are you going to read the Governor's statement?

Mr. GIANELLI. Yes, sir.

What I would like to do is file the full statement for the record and then just read portions of it, in the interests of saving the time of the committee, if that is permissible—

Mr. SAYLOR. Mr. Chairman, reserving the right to object—and I won't object—I just want to call the committee's attention to the fact that neither the statement of Governor Reagan nor the statement of Mr. Rummonds were filed in accordance with the rules and regulations of the committee, and despite that fact, I will not object to their being considered at the present time. I will withdraw my reservation.

Mr. EDMONDSON. I thank the gentleman for his indulgence in that. I would agree there has been a breach of the committee's rules with regard to the time of filing, and I would hope that any witnesses scheduled to appear in the future will comply with the committee rule on the filing of statements.

I think in this instance, too, to insist upon the rule would delay the committee itself and I appreciate the gentleman from Pennsylvania—

Mr. SAYLOR. I just want to say I am not interested in delaying the hearing. I am doing this for the purpose of calling the committee's attention to certain things that happened to witnesses who appeared before this committee last year in opposition to the bill, and I just want to say that if we expect to apply the yardstick, I expect it to be applied on both sides.

Mr. EDMONDSON. For the information of others who may be planning to testify who are in the room, the requirement of the committee is for advance filing of the statement, which is intended to make possible a study of the materials and evidence submitted in the statement by members of the committee in advance of the hearing. It puts the committee in a little better position to question intelligently, and it is a convenience, I think, to the witness as well as to the committee to have that advance opportunity. It gives our staff an opportunity to examine the statements and suggests questions that would be constructive. So we would appreciate it if the rules would be followed by witnesses in the future.

Mr. GIANELLI. We appreciate that suggestion, Mr. Chairman. It might save the time of the committee if we could present all three of our statements and then have questions by the committee of all three members of the panel who are here if that suits your pleasure.

One other thing, I would like to have the record show that we also have in attendance Mr. Dallas Cole, chief engineer of the Colorado River Board, and also Mr. Don Maughan, principal hydraulic engineer with the department of water resources who in the case of technical questions might have a response, and Myron Holburt, principal hydraulic engineer, Colorado River Board of California.

Mr. EDMONDSON. With the understanding that you will hit the highlights of each of these statements so that we do have them reviewed for us, since we haven't had an advance opportunity to look them over, if there is no objection, the statement of Governor Reagan, the statement of Mr. Rummonds, and the statement of Mr. Ely will all be made a part of the record at this point.

Mr. SAYLOR. Mr. Chairman, reserving the right to object, and I will not object, I have had handed to me with these three statements a map marked "California developments of the Colorado River." It is not attached to any one of the three statements and I am wondering whether or not this is a part of any of the three statements.

Mr. GIANELLI. I think, Mr. Chairman, that is part of Mr. Rummonds' statement.

Mr. EDMONDSON. It is attached to Mr. Rummonds' statement in the materials I have here. Without objection, it will appear immediately following Mr. Rummonds' statement. Hearing no objection, the two requests are granted.

Mr. GIANELLI. Thank you. On page 3 of the Governor's statement there is a one-word omission. On the sixth line, the word "augmentation" should follow the word "river." It is a typographical omission.

Mr. EDMONDSON. Making it read "Until the river augmentation is"

Mr. GIANELLI. "Sources of Colorado River augmentation". The word "augmentation" should be added.

Mr. EDMONDSON. On page 3?

Mr. GIANELLI. Yes. Line 6. Page 3 of the Governor's statement.

Mr. EDMONDSON. Of the "Colorado River augmentation". Thank you.

STATEMENT OF HON. RONALD REAGAN, GOVERNOR OF THE STATE OF CALIFORNIA, AS PRESENTED BY WILLIAM R. GIANELLI

Mr. GIANELLI. Mr. Chairman, for the record my name is William Gianelli. I am director of the Department of Water Resources, State of California, and it is a pleasure for me to appear here and present this statement on behalf of Gov. Ronald Reagan.

We welcome this opportunity to make known the official views of California's new administration on the important water legislation now before this subcommittee. There is no need to recite in detail the importance of water to California and the West. And there is nothing I need add to reinforce the fact that the Colorado River Basin and the Pacific Southwest face imminent and widespread water deficiencies. The record compiled at previous hearings before this distinguished body established those facts beyond a shadow of a doubt.

It would be my objective to bring to your attention principles that California believes essential to this legislation.

We ask first that the legislation recognize the generally accepted fact that the dependable natural supply of the Colorado River is insufficient to meet all compact and decree appointments to the seven States of the Colorado River Basin; and the further fact that the dependable supply available to the lower basin will be unable to meet existing uses and the added burden of the Central Arizona Project beyond perhaps 1990 or the turn of the century, even with California's existing uses limited to 4.4 million acre-feet per year. While it appears that the lower Colorado supply has the potential of satisfying existing uses and those of the Central Arizona Project for perhaps 25 years, this is the case only because several of the other States are not at this time using all of the water to which they are entitled and because California's present uses will be cut back from 5.1 to 4.4 million acre-feet per year when the Central Arizona Project goes into operation.

The only certain way of assuring continued development and prosperity in the Pacific Southwest and of bringing peace to the Colorado River is to increase the natural supplies of the region. The legislation then should contain a reasonable promise that the additional burden of the Central Arizona Project will be relieved within a quarter of a century by augmentation of supply of the Colorado.

While we are convinced in California that meaningful steps must be taken to bring about augmentation of the supply of the Colorado River as a part of the legislation before you, we recognize that there has been neither a westwide nor a national consensus on definition of these steps. A legislative position on this issue that is acceptable to the Southwest but is unacceptable to the Northwest has little, if any, utility. The converse, a solution acceptable to the Northwest but not to the Southwest, is no better.

As you know, the study provisions of title II of H.R. 4671, as favorably reported by the House Interior and Insular Affairs Committee last year, were endorsed by the Southwest but opposed vigorously by the Northwest. These study provisions, we felt, were eminently fair in that they called for impartial analysis of all potential sources of the Colorado River, including the rivers of our north coastal area. Nevertheless, spokesmen for the Pacific Northwest insisted upon their deletion from the Colorado River Basin project legislation.

The West, then, faces an impasse unless the States of both the Northwest and Southwest and the Congress concentrate on expanding common ground.

Expanding these two ideas, it appears that the essential ingredients of a viable augmentation study are that it be conducted under the supervision of an impartial body; that it be completed on a timely basis; that the rights of the States and regions be fully respected; that the affected States be permitted to participate effectively; that all related factors be considered, including those outside the purely engineering and economic fields; and that the expertise of existing State and Federal agencies be used to the maximum extent possible.

It should be possible to reach agreement on each of these elements and I urge the subcommittee to bend all efforts to do so and to obtain agreement on the augmentation studies issue.

I would like to parenthetically state that it appears to me there are other benefits to augmenting the Colorado River and that is the vast improvement of water quality that would result as a result of importation of water in that stream.

We support authorization of the central Arizona project but ask that authorization include, in addition to studies of means of augmenting the supply of the Colorado, protection of existing uses until the river is adequately supplemented.

The merits of protecting existing water uses in the Lower Colorado River Basin, with California's uses being protected to the extent of 4.4 million acre-feet per year have been fully debated before this subcommittee.

And Mr. Ely will fully explore this in his presentation to you.

In summary we regard the national administration's position as announced by Secretary Udall on February 1 as a long step backward from the regional approach, which he initiated in 1963 and promoted before this subcommittee throughout the subcommittee's sessions during the last 2 years. The piecemeal approach now proposed by the

Secretary avoids the fundamental water problem facing the entire West. The administration's proposal would add materially to the burden of demand on the river without attempting to solve the basic problem of an insufficient supply in the Colorado. California urges the subcommittee to reject the administration's proposal and to continue to seek a regional solution to what is truly a regional problem.

Thank you, Mr. Chairman.

(The statement of Governor Reagan follows:)

STATEMENT OF GOV. RONALD REAGAN ON COLORADO RIVER AND NATIONAL WATER COMMISSION LEGISLATION ¹

I welcome this opportunity to make known the official views of California's new administration on the important water legislation now before this Subcommittee. There is no need to recite in detail the importance of water to California and the West. And there is nothing I need add to reinforce the fact that the Colorado River Basin and the Pacific Southwest face imminent and widespread water deficiencies. The record compiled at previous hearings before this distinguished body established those facts beyond a shadow of doubt.

The goals are clear, the need for action unmistakable—what the entire Pacific Southwest needs now is legislation which satisfies the region's immediate needs through added development of the limited resources of the Colorado River, but recognizes also the area's longer range requirements and sets in motion a program to augment the supplies of the Colorado. It is my objective today to bring to your attention principles that California believes essential to this legislation.

We ask that the legislation recognize the generally accepted fact that the dependable natural supply of the Colorado River is insufficient to meet all compact and decree apportionments to the seven states of the Colorado River Basin; and the further fact that the dependable supply available to the Lower Basin will be unable to meet existing uses and the added burden of the Central Arizona Project beyond perhaps 1990 or the turn of the century, even with California's existing uses limited to 4.4 million acre-feet per year. While it appears that the Lower Colorado supply has the potential of satisfying existing uses and those of the Central Arizona Project for perhaps 25 years, this is the case only because several of the other states are not at this time using all of the water to which they are entitled and because California's present uses will be cut back from 5.1 to 4.4 million acre-feet per year when the Central Arizona Project goes into operation.

The only certain way of assuring continued development and prosperity in the Pacific Southwest and of bringing peace to the Colorado River is to increase the natural supplies of the region. The legislation then should contain a reasonable promise that the additional burden of the Central Arizona Project will be relieved within a quarter of a century by augmentation of supply of the Colorado.

While we are convinced in California that meaningful steps must be taken to bring about augmentation of the supply of the Colorado River as a part of the legislation before you, we recognize that there has been either a westwide nor a national consensus on definition of these steps. A legislative position on this issue that is acceptable to the Southwest but is unacceptable to the Northwest has little, if any, utility. The converse, a solution acceptable to the Northwest but not to the Southwest, is no better.

As you know, the study provisions of Title II of HR 4671, as favorably reported by the House Interior and Insular Affairs Committee last year, were endorsed by the Southwest but opposed vigorously by the Northwest. These study provisions, we felt, were eminently fair in that they called for impartial analysis of all potential sources of Colorado River augmentation, including the rivers of our own North Coastal area. Nevertheless, spokesmen for the Pacific Northwest insisted upon their deletion from the Colorado River Basin Project legislation. Complete failure to deal with this aspect of the problem, however—as I've already indicated—would prove inimicable to the best interests and welfare of the Pacific Southwest. The West, then, faces an impasse, unless the

¹ For presentation by William R. Gianelli, Director of the Department of Water Resources, before the House Subcommittee on Irrigation and Reclamation in Washington, D.C., the week of March 13-17, 1967.

states of both the Northwest and the Southwest and the Congress concentrate on expanding common ground.

The creation of a National Water Commission so strongly favored by the Northwest was accepted by the Southwest as part of last year's HR 4671. Both regions endorse the concept that when studies of river augmentation are undertaken, they must be objective and must encompass all real alternatives.

Expanding these two ideas, it appears that the essential ingredients of a viable augmentation study are that it be conducted under the supervision of an impartial body; that it be completed on a timely basis; that the rights of the states and regions be fully respected; that the affected states be permitted to participate effectively; that all related factors be considered, including those outside the purely engineering and economic fields; and that the expertise of existing state and federal agencies be used to the maximum extent possible.

It should be possible to reach agreement on each of these elements and I urge the Subcommittee to bend all efforts to do so and to obtain agreement on the augmentation studies issue.

We support authorization of the Central Arizona Project but ask that authorization include, in addition to studies of means of augmenting the supply of the Colorado, protection of existing uses until the River is adequately supplemented.

The merits of protecting existing water uses in the Lower Colorado River Basin, with California's uses being protected to the extent of 4.4 million acre-feet per annum, have been fully debated before this Subcommittee. The Colorado River Basin States struggled with this problem for months before resolving it early in 1965 in favor of protecting existing uses and rights. This solution was acceptable to this Subcommittee, the full Committee on Interior and Insular Affairs, and to the National Administration last year. Secretary Udall's report to Chairman Aspinall on HR 3300, dated February 15, 1967, states that "the questions of whether there should be statutory priority and of its terms are primarily for resolution by the states involved and the Congress. If agreement can be reached upon an interstate priority, the Administration would offer no objection. The Bureau of Reclamation water supply studies, financial analysis and feasibility determination for the Central Arizona project have been made in the light of a priority of 4,400,000 acre-feet per annum for California uses and for existing rights and uses in Nevada and Arizona." There is no cogent reason to upset the accord established last year and continued in the Secretary's report.

Some of the bills before you contain, in addition to the Central Arizona Project, authorizations for the construction, operation, and maintenance of five new projects in the Upper Basin. Since it is our understanding that these features are favored by the state directly affected; are economically justified on the basis of Bureau of Reclamation studies; and, on the basis of both entitlement and physical availability, can reasonably be expected to have an adequate water supply, we support their authorization.

We regard the National Administration's position as announced by Secretary Udall on February 1 as a long step backward from the regional approach which he initiated in 1963 and promoted before this Subcommittee throughout the Subcommittee's sessions during the last two years. The piecemeal approach now proposed by the Secretary avoids the fundamental water problem facing the entire West. The Administration's proposal would add materially to the burden of demand on the River without attempting to solve the basic problem of an insufficient supply in the Colorado. California urges the Subcommittee to reject the Administration's proposal and to continue to seek a regional solution to what is truly a regional problem.

Mr. GIANELLI. Now, Mr. Chairman, if Mr. Rummonds could proceed.

Mr. EDMONDSON. All right.

STATEMENT OF RAYMOND R. RUMMONDS, CHAIRMAN OF THE COLORADO RIVER BOARD OF CALIFORNIA

Mr. RUMMONDS. My name is Raymond R. Rummonds. I am chairman of the Colorado River Board of California. This is an agency of the State created by the legislature, charged with responsibility for the protection of California's interests in the waters of the Colorado River. By law, the chairman of the board is California's Colorado

River commissioner, responsible for interstate negotiations involving the river, subject to the constitutional control of such matters by the Governor.

The six board members are appointed by the Governor from nominations submitted by the six agencies owning Colorado River water rights: Imperial Irrigation District, Coachella Valley County Water District, Palo Verde Irrigation District, the city of Los Angeles, the Metropolitan Water District of Southern California, the San Diego County Water Authority.

On March 1, the Colorado River Board unanimously adopted the following resolution:

RESOLUTION, COLORADO RIVER BOARD OF CALIFORNIA, MARCH 1, 1967

I

The Colorado River Board of California recommends enactment of S. 861, 90th Congress, introduced by Senator Kuchel of California and Senator Moss of Utah, and counterpart bills in the House, as introduced by Congressman Hosmer (H. R. 6271) and others. These bills agree in principle with those introduced by Chairman Aspinall of the House Committee on Interior and Insular Affairs and Charman Johnson of that Committee's Subcommittee on Irrigation and Reclamation.

The foregoing bills all embody the following features, which the Colorado River Board has repeatedly endorsed, and which were contained in the bill reported out by the House Committee in the 89th Congress:

1. Recognition of the necessity for meaningful steps to augment the inadequate flows of the Colorado River.

2. Adequate protection for the States and areas of origin of water exported to the Colorado, including full protection of the priorities of those areas in perpetuity.

3. Recognition of the Mexican Treaty burden as a national obligation, and that an appropriate share of the cost of importing water should be allocated to the performance of that Treaty. Whenever importations are accomplished to the extent of 2.5 million acre feet annually both basins should be relieved of the danger of curtailment of their own uses to perform the Nation's Treaty obligations to Mexico.

4. Balancing of the operation of Lake Mead and Lake Powell, so that the benefits of wet years and the burdens of drought shall be equitably distributed between Upper Basin and Lower Basin reservoirs. We recommend the language of the Kuchel-Moss-Hosmer bills in this respect.

5. Authorization for construction of the five projects in Colorado.

6. Reimbursement of the Upper Colorado River Basin fund for payments out of that fund to compensate reduction of the power operations at Hoover Dam occasioned by filling of Lake Powell.

7. Authorization for construction of Bridge Canyon (Hualapai) dam and Power Plant, and creation of a basin account to help finance the Central Arizona project and importation works, fed by revenues from Hualapai Dam and by revenues from Hoover, Davis and Parker Dams after they had paid out.

8. Authorization for the construction of the Central Arizona Project, as part of the regional plan, but on the condition that if the water supply of the Colorado River is insufficient to satisfy the requirements of the projects already in existence or heretofore authorized by Congress for construction in Arizona, California and Nevada, then shortages shall be borne as provided in those bills. The effect is that California must bear the first burden of shortage, sacrificing nearly one million acre feet of constructed capacity whenever the supply shrinks to 7.5 million acre feet annually; but that the Central Arizona Project shall bear the next share of the shortage if the supply shrinks below 7.5 million acre feet before imported water arrives. To this end the priorities of existing and authorized projects will be protected as against the proposed Central Arizona Project, but only until works have been constructed to import at least 2.5 million acre feet annually. The protection to existing and authorized projects in Arizona and Nevada would be unrestricted in quantities but the protection to California's

existing projects would be restricted to 4.4 million acre feet annually, to give effect to a limitation to which California agreed at the time of enactment of the Boulder Canyon Project Act.

II

The Colorado River Board of California recommends against enactment of the bill recommended by the Secretary of the Interior in his report on the Aspinall bill. The Secretary's proposal fails to protect the interests of any State other than Arizona. It abandons the regional solutions proposed by the Secretary in the last Congress, and which the seven States accepted in the bill (H.R. 4671) reported out of committee in the 89th Congress.

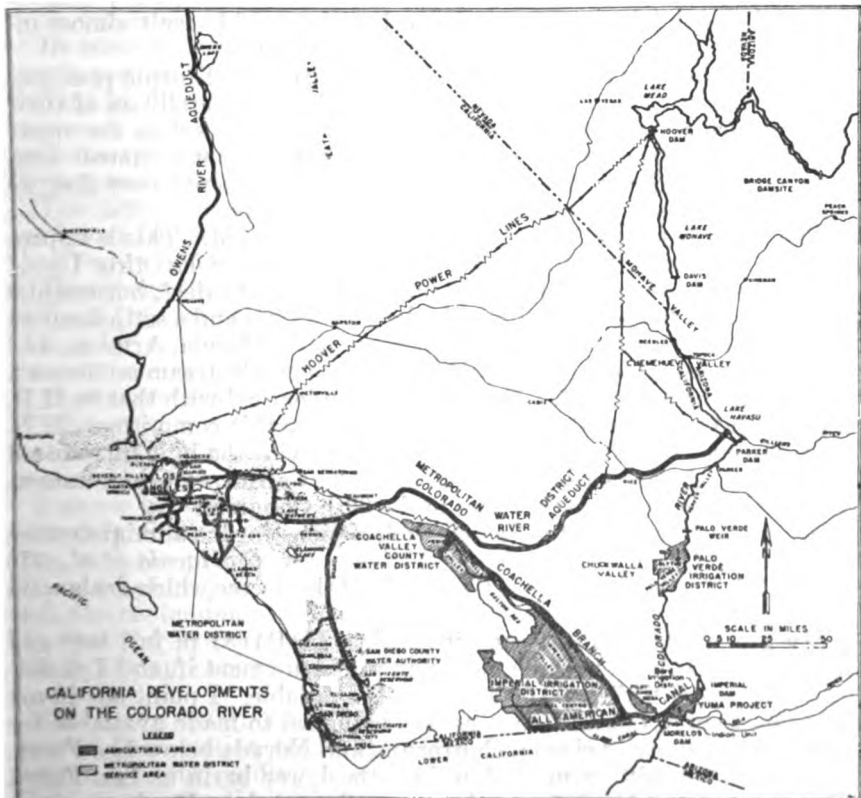
California followed and supported the Secretary's leadership then, and regrets his abandonment of it now. California has not changed her position. We hope that unity among the seven States can be reestablished under the leadership of Chairman Aspinall within the framework of the principles of the seven States agreed upon last year which this resolution restates.

State of California }
County of Los Angeles }

I, HAROLD F. PELLEGRIN, Executive Secretary of the Colorado River Board of California, do hereby certify that the foregoing is a true copy of a resolution unanimously adopted by said Board at a Regular Meeting thereof, duly convened and held at its office in Los Angeles on the 1st day of March, 1967, at which a quorum of said Board was present and acting throughout.

Dated this 2nd day of March, 1967.

HAROLD F. PELLEGRIN,
Executive Secretary.



STATEMENT OF NORTHCUTT ELY, SPECIAL COUNSEL, COLORADO RIVER BOARD OF CALIFORNIA, AND SPECIAL ASSISTANT ATTORNEY GENERAL OF CALIFORNIA

Mr. ELY. Mr. Chairman, my name is Northcutt Ely. I am a member of the law firm of Ely & Duncan of Washington, D.C. And I appear today as special assistant attorney general of the State of California, as well as special counsel of the Colorado River Board of California.

Attorney General Thomas C. Lynch of our State, who is unable to be here today, to his regret, has authorized me to present the following statement on his behalf, as well as on behalf of the Colorado River Board.

One of the great differences between the group of bills headed by the Aspinall bill, H.R. 3300, and Secretary Udall's new substitute for that bill is this: The Secretary deletes the settlement between Arizona and California which made it possible for California to support the central Arizona project in the 89th Congress, and which this committee approved in H.R. 4671. A second great difference is that the Secretary deletes the underpinning of the settlement between the upper and lower basins. That underpinning was the reasonable expectation of the importation of at least 2.5 million acre-feet annually.

We ask the committee to restore these settlements. They dispose peacefully and fairly of issues that otherwise would result almost inevitably in further litigation, which no one wants.

I will confine my remarks today to the Arizona-California problem. I understand that later on the upper basin States will tell you of their own concern about the effect of the Secretary's proposal on the upper basin-lower basin compromise. Accordingly, I will not volunteer comment on that today, unless you ask me questions, except to say that we share their concern.

The lower basin settlement is contained in title III. This is appropriately captioned "Authorized Units: Protection of Existing Uses." It authorizes construction of the central Arizona project, but couples this with a settlement with New Mexico on the Gila and a settlement on the main stream with the existing projects in California, Arizona, and Nevada. I am addressing myself solely to the mainstream settlement. It appears in section 305. The language is identical with that in H.R. 4671, 89th Congress, as reported favorably by this committee. H.R. 4671, in turn, was identical, in this respect, with the bills introduced by all three Arizona Congressmen, 35 of 38 California Congressmen, and by California's two Senators in the 89th Congress.

Section 305(a) gives the Secretary directions for his administration of article II(B)(3) of the decree in *Arizona v. California et al.*, 376 U.S. 340, 342 (1964). This is the article of the decree which deals with shortages.

My prepared statement contains article II(B)(3) in full text and also article II(B)(1) which makes an apportionment if, and I underscore the word "if," 7,500,000 acre-feet is available. I point out in my footnote that if 7½ million acre-feet is indeed to be made available for consumptive use in Arizona, California, and Nevada below Lee Ferry, then about 10 million must flow into the lower basin at Lee Ferry. This is because 1,500,000 acre-feet must flow on into Mexico and an-

other million acre-feet is lost by evaporation. In my footnote I continue with the comparison of article III(d) of the compact, which obligates the upper division not to deplete the Lee Ferry flow below an aggregate of 75 million acre-feet in 10 years. I make reference to article III(c), which adds a contingent obligation to deliver additional water from Mexico, but the meaning of article III(c) is in dispute.

To continue: Article II(b) (3) of the decree in *Arizona v. California*, which is the subject of section 305(a) of the Aspinall bill, says in substance that if insufficient water is available for release from Lake Mead to satisfy annual consumptive use of 7,500,000 acre-feet in Arizona, California, and Nevada, the Secretary of the Interior shall do two things,

First, the Secretary shall satisfy present perfected rights in the three States. Present perfected rights, defined in article I (G) and (H) of the decree, are rights established under State law before passage of the Boulder Canyon Project Act, which became effective in 1929. These rights are measured by the quantity of water put to use before that date. The three States and the United States filed their claims to present perfected rights March 9, 1967, last week, pursuant to the direction in article VI of the same decree.

The totals of the Federal and State claims within each State were approximately as follows: Arizona, 780,000 acre-feet; California, 3,125,000 acre-feet; Nevada, 6,500, for a grand total of about 3,910,000.

In another footnote I point out that the claims of the United States are in terms of diversions and not consumptive use, which the decree defines as diversions minus returns to the river, so that these totals represent some element of correlation between the Federal diversions and the true consumptive use. But they correspond well with the Government's exhibits in *Arizona v. California*.

The decree directs that if the States cannot agree upon these present perfected rights figures, the courts will determine the quantities and the priority dates. We hope to be able to stipulate.

The second thing that article II(B) (3) of the decree tells the Secretary of Interior to do is this. It tells the Secretary that after providing for satisfaction of present perfected rights, he may "apportion the amounts remaining available for consumptive use in such manner as is consistent with the Boulder Canyon Project Act as interpreted by the opinion of this court herein, and other applicable Federal statutes, but in no event shall more than 4.4 million acre-feet be apportioned for use in California including all present perfected rights."

I pause here to emphasize two things. One, the direction that the Secretary shall apportion the remaining available water in accordance with the project act and other applicable Federal statutes. The bill now before you would be the applicable Federal statute, and second, the contemplation that the apportionment to California, even in the event of shortage may be as much as 4,400,000 acre-feet, because this figure appears in the shortage article of the decree which I just read you.

The figure 4,400,000 acre-feet is explained in my footnote as being derived from section 4(a) of the Boulder Canyon Project Act. This section, without reading it in full here, required California's Legislature to enact a limitation upon the uses in California of 4,400,000

acre-feet of the waters apportioned to the lower basin by paragraph (a) of article III of the Colorado River compact plus one-half of the excess of surplus waters not apportioned by the compact if, and only if, six States and not seven States should ratify the Colorado River compact. This was because Arizona then refused to ratify and indeed refused for 22 years. This self-limitation was exacted at us as the alternative to seven-State ratification. Section 4(a) directed that if seven States had not ratified within 6 months but if six States had and if, in the latter event, California had enacted the limitation act, then the President might proclaim the Project Act effective with only six States' ratification.

This happened. The Legislature of California did enact the limitation. The President, President Hoover, did proclaim the act effective June 25, 1929, and proclaim the compact effective as a six-State compact on that date.

I will return to the text of my statement to say that article IX of the decree provides that any of the parties may apply at the foot of the decree for its amendment or for further relief. The opinion itself in *Arizona v. California* reserves to the court the power to review the Secretary's shortage allocation, and the opinion adds:

At this time the Secretary has made no decision at all based on an actual or anticipated shortage of water, and so there is no action of his in this respect for us to review. Finally, as the Master pointed out, Congress still has broad powers over this navigable international stream. Congress can undoubtedly reduce or enlarge the Secretary's power if it wishes.

This accords with the special master's statement in his report

If ever the equities between California's existing uses and new uses in the Colorado River Basin have to be resolved it will be for Congress to resolve them.

We ask Congress to resolve these equities now, as this committee did last year, by adherence to the century-old rule of western water law which prohibits the destruction of existing uses established under senior appropriations to make way for new projects.

Parenthetically, it should be noted here that article II(B) (3) of the decree wipes out the shortage formula which was proposed by the special master. He had proposed that shortages be borne in fixed ratios: 44/75 by California, 28/75 by Arizona, 3/75 by Nevada. The Supreme Court was unanimous in rejecting the master's formula. In place of it, three Justices voted to apply the law of priority of appropriation, interstate, but five Justices, as I have indicated, voted to remit this question to Congress or, failing action by Congress, reserved jurisdiction to another day to review some future allocation of the Secretary's. The effect of the Court's decree is to limit the fund of water which the Secretary or this legislation can control to the quantity which represents the difference between the sum of present perfected rights, which now appear to be about 3.9 million, and the actual water supply, whenever that supply is less than 7.5 million.

Section 305 of H.R. 3300, as I indicated earlier, would constitute the "other applicable Federal statute" referred to in the decree, exercising the plenary power of Congress to "reduce or enlarge the Secretary's power," to borrow the Supreme Court's language, and making it unnecessary to resort again to the Court under article IX to review a future shortage decision of the secretary.

If the States do have to go back to Court, three great convulsive issues will have to be resolved, which the bill now before you would put to rest. These issues are:

First, how much water the lower basin is entitled to receive from the upper basin at Lee Ferry. The upper basin has given notice that it must litigate this if the bill does not settle the question.

Second, by what formula shall the excess of the lower basin's supply above the requirements of present perfected rights be divided, if the total supply is less than 7.5 million acre-feet. No formula permissible under article II (B) (3) of the decree could possibly fill the central Arizona aqueduct permanently.

Third, if the Secretary's formula destroys existing uses in California to create new ones in Arizona, then, in the unlikely event that the Court sustains the Secretary's scheme, is the destruction compensable?

Damage which would certainly be caused by taking vested rights away from California to create new uses in Arizona would far outweigh the benefits thereby conferred on Arizona. The special master recognized the compensability problem. He said on page 161 of his report:

... there is no need to pass on questions of ownership of water in navigable streams or of the validity against the United States of rights therein recognized by state law. There has been no showing that non-perfected rights recognized by state law as of June 25, 1929, if any, have not been satisfied since Hoover Dam was constructed. If it develops that such rights are not satisfied in the future, that will be time enough to determine whether they are of such character as require compensation for their taking.

In order to sustain the Project Act as applied in this case, it need only be held that the United States may, under the Commerce clause of the Constitution, impound waters in a navigable stream and regulate the disposition thereof as long as perfected rights are satisfied, leaving open the question whether non-perfected rights recognized under state law must be compensated if they are not satisfied.

Mr. SAYLOR. Mr. Chairman, I interrupt the witness at this point to call attention to the fact that we were to have these statements summarized in 10 minutes. But this has already taken 16 and there is absolutely nothing in his statement which has not been presented to this committee before with one exception, and that is that they have filed a case in the Supreme Court affecting another matter some time this month.

Now, I do that because there has been handed to me by the committee an agenda which points up some of the inequities which are existent. I notice that on Friday, March 17, 1967, there is this notation on the schedule of witnesses:

"Alan P. Carlin, Economist, if his statement qualifies."

Now, statements such as we will have received from the three witnesses before us today are nothing but a rehash of everything that has been admitted before, and if this is the rule to be applied, then I will insist that the same rule be applied to the witnesses who appear against this project. And I do not like any member of the staff or anybody else saying that statements will be admitted if they qualify. This is a matter for this committee to determine, not any member of the staff.

Mr. EDMONDSON. May I ask the gentleman how much time he requires?

Mr. ELY. It will take about 12 or 15 minutes longer.

Mr. SAYLOR. Mr. Chairman, I am going to object because we have his entire statement in the record and he has already used more than 15 minutes.

Mr. EDMONDSON. The Chair will have to state that he personally was not acquainted with the 10-minute rule on witnesses referred to by the gentleman from Pennsylvania.

Mr. SAYLOR. That is what the chairman announced this morning.

Mr. EDMONDSON. I don't think we held the witnesses appearing prior to this witness to the 10-minute rule and I would hesitate to invoke the 10-minute rule on any witness in the absence of a clear understanding in the committee that there will be a 10-minute rule.

Mr. SAYLOR. That is perfectly all right with me, Mr. Chairman, if it isn't done but I want you to understand that if this is the rule for the proponents, it is also going to be the rule for the opponents.

Mr. EDMONDSON. Well, if the gentleman can tell me any witness who has appeared before us today that has been held to 10 minutes—

Mr. SAYLOR. The rules of the committee do not apply to Members of the Congress. It was so stated by the chairman of the subcommittee this morning when we had our hearing. I do not expect to raise that question with regard to Members of Congress. I just want to get the record clear with regard to what ought to be the approach by people who appear in favor of legislation and those who appear opposed to it. And if the same rules are applied, Mr. Chairman, Mr. Ely can talk for an hour as far as I am concerned.

Mr. EDMONDSON. Mr. Ely, I was not present when the statement was made by the subcommittee chairman, but he hoped to have witnesses conclude in 10 minutes, and I would like to follow the wishes of the subcommittee chairman. I also want to have an opportunity to question you because I think your statement contains some information that should call for questioning. I think you are reading very well, but I finished reading your statement about 5 minutes ago myself and I think most members of the committee have probably read through it. So if you can complete the highlights of your statement in a few minutes, it would be I think in the interests of your own presentation.

Mr. ELY. Mr. Chairman, of course I am in your hands.

Mr. STEIGER. Will the chairman yield on this point?

Mr. EDMONDSON. Yes.

Mr. STEIGER. There is a copy of a press release apparently issued by Mr. Ely of two pages that sums up his comments before this committee and possibly it might be expeditious to have him simply read this press release so as not to embarrass him.

Mr. ELY. Mr. Chairman, if I might have a minute or two of your time, I am in your hands obviously—

Mr. EDMONDSON. Let's give the witness 2 minutes to complete the—

Mr. HOSMER. Mr. Chairman, this came in the middle of Mr. Ely's testimony and certainly I think that he is entitled to the courtesy of, if you are going to ask him to summarize, to take such time as he requires to do so. This is a carefully woven fabric designed to inform the committee here which I appreciate deeply.

Mr. EDMONDSON. Let me ask—

Mr. Hosmer. As he talks—and I can read with him—very complicated—

Mr. EDMONDSON. Let me ask the members of the committee if there are any members of the committee that haven't read through the statement of Mr. Ely.

The gentleman from California, Mr. Tunney, and the gentleman from California, Mr. Hosmer. [Laughter.]

Mr. EDMONDSON. I know you gentlemen are going to be influenced greatly by the forensic skill of Mr. Ely.

Mr. Hosmer. Not only that, we are going to be elucidated.

Mr. UDALL. I would like to make a unanimous consent request and preface it with this. There was some negotiation and we agreed that the official representatives of the States should have an adequate opportunity to present their case. It just happened that Arizona's case was presented by the three Members of the Congress and no restriction was placed upon us. They represent a State of 20 million people. This is a matter of vital importance to them.

I would ask unanimous consent, in all fairness, that Mr. Ely be given another 10 minutes to summarize or complete or read as he sees fit. This is a matter of great moment and we were treated fairly and I would like to see California treated equally.

Mr. EDMONDSON. Is there objection to the unanimous request—

Mr. SAYLOR. Reserving the right to object—

Mr. EDMONDSON. The gentleman from Pennsylvania reserves the right to object.

Mr. SAYLOR. I would just like to have the gentleman from Arizona point out anything in Mr. Ely's statement which is new.

Mr. ELY. You are about to hear it.

Mr. SAYLOR. After all, when the chairman of the subcommittee started out this morning, he stated that the purpose of these hearings was to prevent duplication and the only thing this committee was to hear was new evidence.

Now, I am very familiar with Mr. Northcutt Ely. I have watched him perform before this committee for a good many years. I am very familiar with what he told this committee when we discussed this bill in the 89th Congress.

There isn't anything new in his statement that I found except that he tells us they went to the Supreme Court on another matter.

Now, if my colleague from Arizona can point out anything new, I would be delighted to have him do it.

Mr. UDALL. If I tried to do it, Mr. Chairman—

Mr. SAYLOR. I am going to withdraw my reservation. I do this for the purpose of pointing out just how foolish the rules and regulations which were attempted to be laid down by the chairman of the subcommittee are when we have witnesses like the representatives that we have before us now.

Mr. EDMONDSON. Is there objection to the unanimous consent request—

Mr. FOLEY. Reserving the right to object, Mr. Chairman—

Mr. EDMONDSON. The gentleman from Washington.

Mr. FOLEY. I feel Mr. Ely is, in my judgment, perhaps the most effective and skilled witness that appeared before this committee last

year and may perhaps win that title again this year. I will not object to continued testimony by Mr. Ely. I think it is in the interests of elucidation of the committee but I do want to underscore in this reservation that equality of treatment by the subcommittee is an important consideration in these hearings, and that I agree with the statement of the gentleman from Arizona, that certainly California should have its full opportunity to testify similar to that of Arizona.

I would also, however, like to lay the groundwork, if I may for a similar urging of members of this committee when representatives of the Pacific Northwest present their testimony later this week, and I would hope that the subcommittee and the subcommittee chairman would not apply the rules of restriction to those witnesses that have not been applied today by this subcommittee sitting in this case.

Mr. HOSMER. Reserving the right to object—

Mr. EDMONDSON. The gentleman from California.

Mr. HOSMER. I recall last year we had a similar rule which, when it was attempted to apply it, the attempts were rebuffed. We are going through the same thing this year. So I don't think that we need to look forward in the next few days to anybody getting chopped down on their time.

Mr. FOLEY. Will the gentleman from California yield?

Mr. HOSMER. Yes.

Mr. FOLEY. I take that as a commitment from the gentleman.

Mr. HOSMER. No. It is a speculation, observation, and practically a prediction.

Mr. EDMONDSON. Without objection, the unanimous-consent request is agreed to. The gentleman will complete the summary in 10 minutes.

Mr. ELY. Mr. Chairman, may I say that to our Congressman Udall, first of all, I thank you for your kind statement. Congressman Udall is exactly correct in reminding the Chair that the rule this morning was not that representatives of the States should be held to 10 minutes. The rule was that the representatives of the States were not subject to the 10-minute rule, and that was the order of the Chair this morning.

Had I been told in advance we had 10 minutes, I would have proceeded differently. I proceeded on the basis of the Chair's ruling this morning, which was that we were not limited.

Mr. EDMONDSON. I want to tell the witness that had I been present when the discussion of the rule took place, I would have been in a better position to rule on the question, but I came in immediately after that discussion and did not hear it.

Mr. ELY. I think, Mr. Chairman, I would have long since finished, I may say, if Mr. Saylor had not objected, but I shall not trespass on your time. I am simply attempting in the minutes made available to the State of California to answer a long presentation made this morning by Congressman Udall, as you said, under the privilege of being presented by a Member.

California has three projects with \$500 million at stake here built in reliance upon a statutory compact between this Congress, this committee, its predecessor, and the Legislature of California.

Mr. EDMONDSON. I think your statement says \$600 million, on page 12.

Mr. ELY. I am trying not to read it, and if I may be permitted, I will be accurate about it. I am trying to conclude in the minutes allowed me.

There is indeed \$600 million invested. It is money invested in reliance upon a limitation that is somewhat like a speed limit, and when the limitation is 44 miles an hour, this doesn't mean forty-four seventy fifths of 44 miles an hour. If a deed says 44 acres, that doesn't mean forty-four seventy fifths of 44 acres. And when it says, 4,400,000 acre-feet and we build projects, spend \$500 million, \$600 million, to build them, to put the water to use, this doesn't mean that afterward we shall be second-guessed and have a new rule of the road imposed upon us.

We ask that Congress keep its bargain with California as we have kept ours with the Congress.

This morning Mr. Saylor indicated we had gone to the U.S. Supreme Court. We didn't go. Arizona did, brought the suit. Mr. Saylor indicated that there had come out of it an apportionment which we are now trying to alter. This is not correct. The fact is that the Supreme Court declined to pass upon the shortage issue and remitted it here.

We are asking that this committee recognize the same rule that the Legislature of Arizona has invoked against the Central Arizona project in its own legislation to prevent that project from taking water from existing projects in their State.

The effect of the bargain that we made with the Congress in 1929 was that we might use up 4,400,000 acre-feet as the other side of the coin under which we agreed that if we took more than that, it was at the hazard of the availability of supply.

We have lived up to it. We are sacrificing 662,000 acre-feet now being put to use by the metropolitan water district to keep our half of that bargain, and we ask that the other half of it, namely, the recognition of our right to keep 4,400,000 acre-feet of the water we have put to use, be respected.

Thank you, Mr. Chairman.

Mr. EDMONDSON. Mr. Ely, you still have about 5 or 6 minutes.

Mr. ELY. Well, thank you. I appreciate your generosity but—

Mr. EDMONDSON. I want to say this. You have an outstanding statement—

Mr. ELY. Thank you.

Mr. EDMONDSON. And I read it with very keen interest and appreciation of the skill which it entailed.

Mr. ELY. Thank you. If I might—

Mr. EDMONDSON. I will withhold my own questions at this point. I will yield to the gentleman from Pennsylvania.

Mr. ELY. Since I do have this time, let me just quote to you Senator Hayden's statement to the U.S. Senate on two occasions as to the meaning of the bargain then being exacted of California.

Here is Senator Hayden—this is on page 13 of my statement—telling Congress in 1928 what the Project Act would give California. He said:

"The Senator (Shortridge of California) thoroughly understands, I hope,"

This is Hayden speaking—

"that under the set-up to which the senior Senator from California (Johnson) has so often referred, there will be available at Boulder Dam on the average about nine and one-half million acre-feet of water. There are varying estimates, but they all arrive at about that conclusion.

The bill itself provides that a million acre-feet may be used in the vicinity of Los Angeles, and some three and one-half million acre-feet through the all-American canal to irrigate the Imperial Valley. Then there is another half million acre-feet which may be used in the vicinity of Yuma and Paloverde Valley, leaving about 4,000,000 acre-feet of water unused, and which cannot go anywhere else except to Mexico, unless the State of Arizona undertakes this very plan of development which the Senator from California seems to indicate is impossible of accomplishment.

He was referring to Arizona's so-called Gila project. Here is Senator Hayden in 1930, 2 years later, testifying before the Senate Appropriations Committee in opposition to the first Hoover Dam Appropriations Act—in opposition, I emphasize:

What will happen is that the waters of the Colorado River will be impounded in the Boulder Canyon Reservoir and made available for use; large quantities of water will be taken out of the Colorado River into the great all-American canal; over 1,000,000 acre-feet will be further taken out of the river by a pumping plant, and taken over into the coastal plain of California in the vicinity of Los Angeles; they will be put to beneficial use; and, once having acquired a prior right to its use, no other State can obtain the use of those waters.

Congress nevertheless appropriated the money and Hoover Dam was built.

We did build those very works he was talking about. Those are the works that will be destroyed if their priority is not here protected.

Here is Governor Osborne, of Arizona, telling his legislature in 1943, when the Arizona water contract was up for discussion:

Now, of course, we would like to take from California some of that 4,400,000 acre-feet of water, but neither unrecognized filings against it, nor wishful thinking on our part can accomplish that. . . . The Federal Government, having expended tens of millions of dollars of the people's money to provide irrigation and power facilities for the use of this water in one State, will not wipe out that investment and divert that water to another State. Arizona cannot compel that any more than we can turn back the pages of history. The time has long since passed when Arizona could obtain the water which California has put to beneficial use.

We ask the committee to confirm Governor Osborne's judgment in that respect.

Thank you, Mr. Chairman.

STATEMENT OF NORTHCUTT ELY, SPECIAL COUNSEL, COLORADO RIVER BOARD OF CALIFORNIA, AND SPECIAL ASSISTANT ATTORNEY GENERAL OF CALIFORNIA

Mr. ELY. My name is Northcutt Ely. I am a member of the law firm of Ely & Duncan, Washington, D.C. I appear today as special assistant attorney general of the State of California, and special counsel of the Colorado River Board of California.

Attorney General Thomas C. Lynch of California, who is unable to be here today, has authorized me to present the following statement on his behalf, as well as on behalf of the Colorado River Board.

One of the great differences between the group of bills headed by the Aspinall bill, H.R. 3300, and Secretary Udall's new substitute for that bill is this: The Secretary deletes the settlement between Arizona and California which made it possible for California to support the central Arizona project in the 89th Congress, and which this committee approved in H.R. 4671. A second great difference is that the Secretary deletes the underpinning of the settlement between

the upper and lower basins. That underpinning was the reasonable expectation of the importation of at least 2.5 million acre-feet annually.

We ask the committee to restore these settlements. They dispose peacefully and fairly of issues that otherwise would result almost inevitably in further litigation, which no one wants.

I will confine my remarks today to the Arizona-California problem. I understand that later on, the upper basin States will tell you of their own concern about the effect of the Secretary's proposal on the upper basin-lower basin compromise. Accordingly, I will not volunteer comment on that today, except to say that we share their concern.

The lower basin settlement is contained in title III. This is appropriately captioned "Authorized Units: Protection of Existing Uses." It authorizes construction of the central Arizona project, but couples this with a settlement with New Mexico on the Gila and a settlement on the main stream with the existing projects in California, Arizona, and Nevada. I am addressing myself solely to the mainstream settlement. It appears in section 305. The language is identical with that in H.R. 4671, 89th Congress, as reported favorably by this committee. H.R. 4671, in turn, was identical, in this respect, with the bills introduced by all three Arizona Congressmen, 35 of 38 California Congressmen, and by California's two Senators in the 89th Congress.

SECTION 305: ITS RELATION TO THE DECREE IN ARIZONA V. CALIFORNIA

Section 305(a) gives the Secretary directions for his administration of article II(B)(3) of the decree in *Arizona v. California, et al.*, 376 U.S. 340, 342 (1964). This is the article of the decree which deals with shortages. This article¹ says, in substance, that if insufficient water is available for release from Lake Mead to satisfy annual consumptive use of 7,500,000 acre-feet in Arizona, California, and Nevada, the Secretary of the Interior shall do two things:

First, the Secretary shall satisfy present perfected rights in the three States. Present perfected rights, defined in articles I, G, and H, are rights established under State law before passage of the Boulder Canyon Project Act, which became effective in 1929. These rights are measured by the quantity of water put to use before that date. The three States, and the United States, filed their claims to present perfected rights March 9, 1967. The totals of the Federal² and State claims within each State were approximately as follows: Arizona, 750,000 acre-feet; California, 3,125,000 acre-feet; Nevada, 6,500; grand total, about 3,910,000. If the States cannot agree, the Court will determine the quantities and priority dates. We hope to be able to stipulate.

Second, article II(B)(3) of the decree tells the Secretary that, after providing for satisfaction of present perfected rights, he "... may apportion the amount

¹ The text of Article II(B)(3) reads:

"(3) If insufficient mainstream water is available for release, as determined by the Secretary of the Interior, to satisfy annual consumptive use of 7,500,000 acre-feet in the aforesaid three states, then the Secretary of the Interior, after providing for satisfaction of present perfected rights in the order of their priority dates without regard to state lines and after consultation with the parties to major delivery contracts and such representatives as the respective states may designate, may apportion the amount remaining available for consumptive use in such manner as is consistent with the Boulder Canyon Project Act as interpreted by the opinion of this Court herein, and with other applicable federal statutes, but in no event shall more than 4,400,000 acre-feet be apportioned for use in California including all present perfected rights."

Article II(B)(1) makes the following apportionment if—I underscore if—7.5 million acre feet is available:

"(1) If sufficient mainstream water is available for release, as determined by the Secretary of the Interior, to satisfy 7,500,000 acre-feet of annual consumptive use in the aforesaid three states, then of such 7,500,000 acre-feet of consumptive use, there shall be apportioned 2,800,000 acre-feet for use in Arizona, 4,400,000 acre-feet for use in California, and 300,000 acre-feet for use in Nevada."

But if 7.5 is to be made available for consumptive use in Arizona, California, and Nevada below Lee Ferry, about 10 million must flow into the Lower Basin at Lee Ferry. This is because 1.5 million must be redelivered to Mexico at the boundary, and another million is lost to evaporation in transit between Lee Ferry and the border. Article III(d) of the Compact, for comparison, obligates the Upper Division not to deplete the Lee Ferry flow below an aggregate of 75 million acre-feet in ten years. Article III(c) adds a contingent obligation to deliver additional water for Mexico. Its meaning is in dispute.

² Claims of the United States for federal establishments are not stated in the decree in acre-feet of consumptive use, but in (1) "diversions," or (2) the quantity required for consumptive use on a specified number of acres, whichever of (1) or (2) is less. The figures in the text of this statement are therefore approximations of the consumptive use (diversions less returns to the river) which correlate with the diversion rights claimed by the United States.

remaining available for consumptive use in such manner as is consistent with the Boulder Canyon Project Act as interpreted by the opinion of this Court herein and other applicable federal statutes, but in no event shall more than 4,400,000 acre-feet be apportioned for use in California including all present perfected rights."³

Article IX of the decree provides that any of the parties may apply at the foot of the decree for its amendment or for further relief. The opinion itself (*Arizona v. California, et al.*, 373 U.S. 546, 594 (1963)) reserves power to the Court to review the Secretary's shortage allocation, and adds:

"... At this time the Secretary has made no decision at all based on an actual or anticipated shortage of water, and so there is no action of his in this respect for us to review. Finally, as the Master pointed out, Congress still has broad powers over this navigable international stream. Congress can undoubtedly reduce or enlarge the Secretary's power if it wishes."

This accords with the Special Master's statement:

"... if ever the equities between California's existing uses and new uses in the Colorado River Basin have to be resolved, it will be for Congress to resolve them." (Report, p. 114.)

We ask Congress to resolve these equities now, as this committee did last year, by adherence to the century-old rule of western water law which prohibits the destruction of existing uses established under senior appropriations to make way for new projects.

Parenthetically, it should be noted here that article II(B)(3) of the decree wipes out the shortage formula proposed by the special master. He had proposed that shortages be borne in fixed ratios: 44-75 by California, 28-75 by Arizona, 3-75 by Nevada. The court was unanimous in rejecting the master's formula. In place of it, three justices voted to apply the law of priority of appropriation, interstate, but five Justices, as I have indicated, voted to remit this question to Congress or, failing action by Congress, reserved jurisdiction to another day to review some future allocation of the Secretary's. The effect of the Court's decree is to limit the fund of water which the Secretary or this legislation can control to the quantity which represents the difference between the sum of present perfected rights, which now appear to be about 3.9 million, and the actual water supply, whenever that supply is less than 7.5 million.

Section 305 of H.R. 3300 would constitute the "other applicable Federal statute" referred to in the decree, exercising the power of Congress to "reduce or enlarge the Secretary's power," and making it unnecessary to resort again to the court under article IX to review a future shortage decision of the Secretary.

If the States do have to go back to court, three great convulsive issues will have to be resolved, which the bill now before you would put to rest. These issues are:

(1) How much water the lower basin is entitled to receive from the upper basin at Lee Ferry. The upper basin has given notice that it must litigate this if the bill does not settle the question.

(2) By what formula shall the excess of the lower basin's supply above the requirements of present perfect rights be divided, if the total supply is less than 7.5 million acre-feet. No formula permissible under article II(B)(3) of the decree could possibly fill the Central Arizona aqueduct permanently.

³The figure of 4.4 million acre-feet originated in Section 4(a) of the Boulder Canyon Project Act, which provided:

"Sec. 4. (a) This Act shall not take effect . . . until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact, . . . and the President by public proclamation shall have so declared, or (2) if said States fail to ratify the said compact within six months from the date of the passage of this Act then, until six of said States, including the State of California, shall ratify said compact . . . and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this Act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this Act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin States by paragraph (a) of Article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact."

Arizona refused to ratify the compact. California's legislative therefore enacted the Limitation Act, in order for the President to proclaim the Project Act effective notwithstanding Arizona's refusal to ratify. This he did, June 25, 1929, 46 Stat. 3000.

(3) If the Secretary's formula destroys existing uses in California to create new ones in Arizona, then, in the unlikely event that the court sustains the Secretary's scheme, is the destruction compensable?

Damage which would certainly be caused by taking vested rights away from California to create new uses in Arizona would far outweigh the benefits thereby conferred on Arizona. The special master recognized the compensability problem. He said (report, p. 161):

"... there is no need to pass on questions of ownership of water in navigable streams or of the validity against the United States of rights therein recognized by state law. There has been no showing that non-perfected rights recognized by state law as of June 25, 1929, if any, have not been satisfied since Hoover Dam was constructed. If it develops that such rights are not satisfied in the future, that will be time enough to determine whether they are of such character as require compensation for their taking.

"In order to sustain the Project Act as applied in this case, it need only be held that the United States may, under the Commerce clause of the Constitution, impound waters in a navigable stream and regulate the disposition thereof as long as perfected rights are satisfied, leaving open the question whether non-perfected rights recognized under state law must be compensated if they are not satisfied."

He thought the question would never arise, saying, in oral argument, that under his decision:

"... neither in my lifetime, nor in your lifetime, nor the lifetime of your children and great grandchildren will there be an inadequate supply of water [for the Metropolitan aqueduct] or for its contemplated expansion." (Tr. 23084.)

He expected Congress to reach the same conclusion, saying:

"It is for Congress to determine the limits of new construction in the Basin and thus the extent to which California's existing uses risk curtailment." (Report, p. 115.)

"And even if these projects are eventually constructed, there may well be enough water apportioned to California to satisfy the scale of her existing uses, although greater efficiency may be required." (Report, p. 115.)⁴

The Supreme Court found no reason to disagree with this assertion of the master; it simply erased the argument as to whether his shortage formula would indeed destroy existing uses, by discarding his whole formula and remitting to Congress the responsibility for writing one. The court significantly left the compensation problem untouched.

I turn now from the grim alternative of further litigation to the happier prospect of an end to 45 years of conflict held out by the Aspinall bill and its fellows, now before you.

The basic essential of peace on the Colorado is the necessity of importing more water, a reality which the Aspinall bill accepts but the Secretary's new proposal sweeps under the rug. The demonstrable lower basin deficiency is at least 2.5 million acre-feet. The whole fund of water available for the Secretary's allocation, which is only the meager excess of the supply above the requirements of present perfected rights, is a good deal less than that, unless the upper basin's development is to be stunted.⁵ No scheme for shoving shortages around can make the overall deficiency disappear. But, until imported water does arrive, peace on the Colorado would be maintained by section 305 of this bill. This would allow the burden on the river to be increased by the construction of the Central Arizona aqueduct, on certain clear-cut conditions for the protection of existing investments.

THE BILL'S SHORTAGE FORMULA

Section 305 does two things with respect to shortages:

First, section 305(a) says, in substance, that article II(B)(3) of the decree shall be so administered by the Secretary that if there is insufficient water to

⁴The master reported California's existing uses as 4,482,885 acre-feet as of 1957 (report, p. 128). The testimony before this committee shows that the efficiency of California's projects is among the highest of any in the Nation.

⁵The "fund" susceptible of allocation under article II(B)(3), that is, the excess of supply above present perfected rights of 3.9 million, is about 1.1 million if the compact is construed as permitting the upper basin to deplete the Lee Ferry flow to 75 million acre-feet per decade (averaging 7.5 million per year). The fund is 1.9 million of the upper basin must add half of the Mexican Treaty requirements. The calculation: Gross inflow 7.5 (or 8.3) million, less 1.5 million for Mexico, and less 1 million for losses in excess of tributary inflow, or a net supply of 5 (or 5.8) million, from which 3,900,000 must be subtracted to satisfy present perfected rights.

satisfy 7.5 million acre-feet of consumptive use in the three States, diversions for the Central Arizona project shall be so limited as to assure sufficient water to satisfy rights now served by diversion works heretofore constructed and existing Federal reservations in the three States, including, of course, present perfected rights, but not to exceed, in California's case, 4.4 million acre-feet altogether. The section is solely a settlement between Arizona and California, specifically leaving Nevada unaffected. It does not amend any provision of the decree, and does not affect in any way the rights and obligations of the upper basin. These are protected in title VI.

Second, article 305(b) provides that this limitation on the Central Arizona project shall cease whenever the President proclaims that works have been completed to import 2.5 million acre-feet annually into the main stream below Lee Ferry. This quantity reappears twice more in the bill, in connection with the upper basin settlement. It is the quantity which must be added to the river to assure availability of 7.5 million acre-feet annually for use in Arizona, California, and Nevada whenever the upper basin depletes the flow at Lee Ferry to the compact minimum.

THE PRINCIPLE

The bill's shortage formula simply adopts as Federal law for the administration of Lake Mead the principle of western water law to which all seven States adhere in their own laws, and which the Secretary of the Interior now follows within each State. This is the principle of the protection of existing uses. It is limited, in California's case, to 4.4 million acre-feet, to give effect to the project's limitation on such protection.

Since we are now told by Arizona that we no longer have an agreement with that State on this shortage formula, let me briefly, for the record, say why it is fair and why this committee should again approve it.

The criterion we urge Congress to write is the one that has been developed in a hundred years of evolution of western water law, in the Supreme Court, and the State courts, in the State legislatures, and in 37 previous acts of Congress: the doctrine of "equitable apportionment," that is, the protection of existing uses against shortage occasioned by new projects. It is the criterion that the Supreme Court itself has applied in interstate cases and would apply here if Congress had not reserved the question to itself by making a "statutory apportionment." That protection should apply to existing uses in all three States, but in California's case would be limited to 4.4 million acre-feet because of the Limitation Act.

RELATION TO THE PROJECT ACT

The formula proposed in H.R. 3300 is simply the second half of the shortage formula that Congress wrote into section 4(a) of the Boulder Canyon Project Act. It there required California to bear the first shock of shortages if the supply should drop to 7.5 million acre-feet, but, in return, recognized California's right to appropriate up to 4.4 million. The effect, as has been pointed out before, is that California must give up 700,000 acre-feet of existing uses to reduce these to 4.4 million acre-feet, whenever the total mainstream supply drops to 7.5. California has built projects at a cost exceeding \$600 million to put that water to use, in reliance on that agreement with Congress. The Project Act contemplated that, if we did so, we could keep 4.4 million of the 5.4 million acre-feet of water that those projects were built to use. Arizona has called this agreement between Congress and the Legislature of California a statutory compact and that is a good description of it. We have kept that agreement. Last year this committee directed the Secretary to keep it, in H.R. 4671, and should do so again, in H.R. 3300. The very meaning of a limitation is that rights up to that limit may be lawfully enjoyed and must be respected. A speed limit of 44 miles an hour does not mean forty-four seventy fifths of 44 miles per hour. A deed which concedes 44 acres does not mean forty-four seventy fifths of 44 acres. A boundary fence marks both sides of the line, not just one. An agreement 40 years old is not to be rewritten after \$600 million has been irrevocably expended in reliance upon it.

What I have said here corresponds exactly with Arizona's repeated representation to the Congress and the public as to the meaning of this statutory compact.

Here is Senator Hayden, telling Congress in 1928 what the Project Act would give California (70 Congressional Record 464) :

The Senator [Shortridge of California] thoroughly understands, I hope, that under the set-up to which the senior Senator from California [Johnson] has so often referred, there will be available at Boulder Dam on the average about nine and one-half million acre-feet of water.* There are varying estimates, but they all arrive at about that conclusion.

The bill itself provides that a million acre-feet may be used in the vicinity of Los Angeles, and some three and one-half million acre-feet through the all-American canal to irrigate the Imperial Valley. Then there is another half million acre-feet which may be used in the vicinity of Yuma and Paloverde Valley, leaving about 4,000,000 acre-feet of water unused, and which cannot go anywhere else except to Mexico, unless the State of Arizona undertakes this very plan of development which the Senator from California seems to indicate is impossible of accomplishment.

Here is Senator Hayden, in 1930, testifying before the Senate Appropriations Committee in opposition to the first Hoover Dam Appropriation Act :

"What will happen is that the waters of the Colorado River will be impounded in the Boulder Canyon Reservoir and made available for use; large quantities of water will be taken out of the Colorado River into the great all-American canal; over 1,000,000 acre-feet will be further taken out of the river by a pumping plant, and taken over into the coastal plain of California in the vicinity of Los Angeles; they will be put to beneficial use; and, once having acquired a prior right to its use, no other State can obtain the use of those waters."*

Here is Governor Osborne of Arizona, telling his legislature in 1948 :

"Now, of course, we would like to take from California some of that 4,400,000 acre feet of water, but neither unrecognized filings against it, nor wishful thinking on our part can accomplish that. . . . The Federal Government, having expended tens of millions of dollars of the people's money to provide irrigation and power facilities for the use of this water in one state, will not wipe out that investment and divert that water to another state. Arizona cannot compel that any more than we can turn back the pages of history. The time has long since passed when Arizona could obtain the water which California has put to beneficial use."†

Ours is the same principle that the Arizona legislature has twice enacted to protect existing Arizona projects against the central Arizona project. A 1961 Arizona statute appropriating funds to study the central Arizona project under contract with the Bureau of Reclamation subordinates that project's rights to those of all existing contractees and users of main stream water in Arizona :

"[T]he contract with the bureau of reclamation shall provide that the investigations and studies shall be restricted to only that quantity of water which may be available for use in Arizona, after the satisfaction of all existing water delivery contracts between the secretary of the interior and users in Arizona for the delivery of main stream water, and that nothing shall be done thereunder which will impair existing rights in Arizona for the diversion and use of Colorado River water."‡

Similarly, a 1962 statute amending the authority of the Arizona Interstate Stream Commission embodied the same principle :

"B. The powers and duties herein given the Arizona interstate commission shall be limited and restricted to only that quantity of water which may be available for use in the state of Arizona, after the satisfaction of all existing contracts between the secretary of the interior and users in the state of Arizona for the delivery of water of the main stream of the Colorado river, and shall not extend to any such contracts, any amendments or supplements thereto, or to any federal statute enacted before the effective date of this section pertaining to any federal reclamation project within the state of Arizona constructed and using water of the main stream of the Colorado river before the effective date of this section. Nothing shall be done hereunder which will impair existing rights in the state of Arizona for the diversion and use of Colorado river water."§

*Secretary Udall now estimates as available for regulated release from Hoover Dam 10,064,000 acre-feet in 1975, 9,382,000 in 2000. (Summary report, central Arizona project, February 1967, p. 21.)

†Hearings on H.R. 12902 before a subcommittee of the Senate Committee on Appropriations, 71st Cong., 2d sess., 171 (1930).

‡Arizona Senate Journal, 16th Legislature, 1st special session, 1944, at 16.

§Arizona laws 1962, ch. 39, sec. 2, at 108.

•Arizona laws 1962, ch. 109, sec. 1B, at 258.

THE CONSEQUENCES TO ARIZONA AND CALIFORNIA

The effect of an amendment protecting 4.4 million (of 5.1 million) acre-feet of California's existing uses, applied to the Secretary's forecast of water supply, would be this: Arizona's central Arizona aqueduct would have a supply of more than 1,200,000 acre-feet until 1990, or about 35 years from now. Thereafter, if no imported water arrived, the central Arizona aqueduct diversions would have to gradually shrink, dropping to about 676,000 acre-feet, by the year 2030, some 65 years hence.¹⁰ The Secretary reports that the project could readily pay out on this basis, is quite justifiable, and has an excellent benefit-cost ratio, all predicated on priority protection to 4.4 million acre-feet of California's existing uses.¹¹ The worst that could happen to Arizona is that, more than a half century from now, she might have only a half-full aqueduct. But this is the best that California can hope for, beginning very soon after the central Arizona project starts its diversions. Our supply would then drop from 5.1 million acre-feet, presently used, to 4.4 million, and Metropolitan would be reduced from its present use of 1.1 million to 550,000 acre-feet.

California offers Arizona a fair proposal: that our two States share both the hope that imported water will be brought in, and the risk that it will not. If we are disappointed in this, let both States share the burden, each of them having a half-full aqueduct. This is the result required by the bargain which Congress exacted of us in 1928, to obtain construction of Hoover Dam despite Arizona's obduracy in opposing its construction and in rejecting the Colorado River compact. We ask Congress to keep this 40-year-old-statutory compact with California now, just as California has kept her agreement with Congress.

It is not right that the bargain be changed, that the existing Metropolitan aqueduct be dried up in order that the new central Arizona aqueduct may run full, with the certainty of further litigation before such a result could be forced upon us.

We are confident that the committee will reaffirm the conclusion it reached last year: that the settlement to which Arizona then agreed, embodied in H.R. 4671 as reported, repeated word for word in section 305 of H.R. 3300 now before you, should become the law of the river.

Mr. EDMONDSON. The gentleman from Pennsylvania.

Mr. SAYLOR. Mr. Gianelli, I believe this is the first time that you have appeared before this committee, is that correct?

Mr. GIANELLI. Mr. Saylor, I have appeared here before in another capacity. This is my first time as director of the Department of Water Resources. I have been a consulting engineer in Sacramento for some period of time and have appeared in connection with other legislation.

Mr. SAYLOR. I think your immediate predecessor was Mr. Warne.

Mr. GIANELLI. That is correct.

Mr. SAYLOR. And you now occupy the job of director of the Department of Water Resources of the State of California?

Mr. GIANELLI. Yes, sir; that is correct.

Mr. SAYLOR. How long have you had that job?

Mr. GIANELLI. Since January 1.

Mr. SAYLOR. January 1. In your statement you stated on the first page, what the Southwest needs is legislation which satisfies the region's immediate needs through added development of limited resources in the Colorado River Basin, but recognizes also the area's long-range requirements and sets in motion a program to augment the supplies of the Colorado.

I would like to call your attention to the fact that this is just what the committee did last year and because of the fact that it had so many

¹⁰ Summary report (1967), p. 21.

¹¹ *Id.*, pp. 18, 19, 23.

facets involved, that when it got out of the full committee, and before the Rules Committee, even the proponents of the legislation from your State were afraid to call it up because of what might happen. You know, that project involved two dams in Grand Canyon and the American public let it be known that they didn't look favorably upon that and they were afraid that maybe a substitute which I had prepared which would eliminate these two dams, would be acceptable to the Members and passed on the floor.

Now, this theory of augmentation is something which is new and strange and, you might say, is the real problem in this entire project.

Now, where, sir, do you expect to get water to augment the flow of the Colorado?

Mr. GIANELLI. I think, Mr. Saylor, that this is one of the things that certainly we believe needs to be done. I think there have to be studies made on perhaps the possibility of augmenting from several sources the supply of the Colorado River and there are, of course, a number of sources.

Mr. SAYLOR. Well, what if the record shows that, and a study when it is made would show that there is no possibility of augmentation into the Colorado River. Then what is your position?

Mr. GIANELLI. I don't think this is what the studies would show, Mr. Saylor. I think that there are possibilities of augmentation of the Colorado River.

Mr. SAYLOR. Well, I just might call your attention to the fact that sitting in that chair just a few days ago we had the Assistant Secretary of the Interior who took a very dim view of moving water from one river basin to another and stated that many of the problems that are now being caused by failure of the Bureau of Reclamation to take cognizance of certain problems such as water quality are causing problems, and he didn't know whether augmentation into any basin was going to be justified.

Mr. GIANELLI. Well, let me just comment this way, Mr. Saylor. I think that if we in the United States adopt the position, for example, that if we have an adequate water supply in one area and there is another area that is deficient, that it is not possible to transport water from one basin to another, then I think we are in real trouble in the entire United States. Within our own State we faced this at the State level, and after years and years of argument we have overcome that problem. We are transporting water from the northern part of our State, which has a surplus, to the San Francisco Bay area, the San Joaquin Valley, and the Los Angeles area, which are water deficient areas. I think the same principle can be used between States. I can see no reason why it should not.

Mr. SAYLOR. I might just tell you there are certain people who are cognizant with the water problems of your State who are saying that what you have done has created some real problems in the northern part of your State and that water quality has been really affected in the Northern States.

Now, I assume you believe that water quality can be improved by augmentation from the Colorado. Is that correct?

Mr. GIANELLI. Yes; that is correct, assuming you have sources of good supply—

Mr. SAYLOR. Well now, one of the things that happens when water is transported over large areas is—over great distances—is that it picks up various particles as it goes along; is that not correct?

Mr. GIANELLI. It depends on how it is transported, Mr. Saylor.

Mr. SAYLOR. Well, in the kind of transportation of $2\frac{1}{2}$ million acre-feet which is the absolute minimum which has been suggested here, how do you propose that we transport it?

Mr. GIANELLI. This is exactly why you need studies, to take a look. I am not making any suggestion to you with respect to how it should be transported. Your supposition that water necessarily deteriorates as it is being transported is not necessarily true.

Mr. SAYLOR. You say it depends on how it is transported. In other words, if it is transported through a concrete canal or a closed conduit, you may be correct.

Mr. GIANELLI. That is correct.

Mr. SAYLOR. But have you ever heard of anybody proposing this from the Pacific Northwest down to the Colorado?

Mr. GIANELLI. Not specifically.

Mr. SAYLOR. Every person that I have heard talk about it has talked about transporting it in open ditches. This may—

Mr. GIANELLI. Your supposition is not necessarily correct, Mr. Saylor. Water can be transported in open ditches and not have it deteriorate materially. It just depends upon the nature of the material through which the water is flowing.

Mr. SAYLOR. But your basis for the water quality improvement is based upon the fact that the water you bring in will be a better quality than that water that is now on the Colorado River.

Mr. GIANELLI. That is correct.

Mr. SAYLOR. Or at least as good.

Mr. GIANELLI. That is correct.

Mr. SAYLOR. Mr. Rummonds, it is always a pleasure to welcome you before the committee. I noticed that the board of which you have the honor to be president is in favor of the bill which we reported out last year. This is about right, isn't it?

Mr. RUMMONDS. The one last year and the new ones this year.

Mr. SAYLOR. The new ones for this year which are substantially the same as the bills that were reported out last year.

Mr. RUMMONDS. With some variation, yes.

Mr. SAYLOR. Since you are down in one of the irrigation districts and you asked that $2\frac{1}{2}$ million acre-feet which will be imported be used to take care of the Mexican Water Treaty, in view of the fact that the Mexican Water Treaty only calls for the delivery of a million and a half acre-feet, what happens to the other million acre-feet?

Mr. RUMMONDS. It is lost in transpiration, evaporation, and so forth, down the river.

Mr. SAYLOR. You don't believe that $2\frac{1}{2}$ million acre-feet would give you any water to use either in California, Arizona, or Nevada.

Mr. RUMMONDS. Not any in addition to the water we are using now.

Mr. SAYLOR. Would it give you any above the 4.4?

Mr. RUMMONDS. Not when you brought it up to $7\frac{1}{2}$, it wouldn't, and that is what it is anticipated it will do.

Mr. SAYLOR. Well, if we have $7\frac{1}{2}$ plus $2\frac{1}{2}$, that is 10. Now, I just want to know how much California is looking for out of that $2\frac{1}{2}$, if anything.

Mr. RUMMONDS. That $2\frac{1}{2}$ will bring us up to our 4.4 by the time the delivery at Lee's Ferry is reduced to 75 million every 10 years.

Mr. SAYLOR. Now, Mr. Ely, it is my understanding that in the lawsuit which you say you didn't go to court with, but that you got taken to court by Arizona on, you represented the State of California; is that correct?

Mr. ELY. Yes, sir. I was special assistant to attorney general in charge of that case under the direction of the attorney general.

Mr. SAYLOR. And at least it is my understanding that California didn't win that case.

Mr. ELY. Well, unfortunately.

Mr. SAYLOR. That is an understatement.

Mr. ELY. Unfortunately, in that respect, you are largely correct.

Mr. SAYLOR. I just want to tell you that if this committee adopts some of the recommendations which you have put in your statement, it will be the first time I know of in recorded history where somebody lost a case in the Supreme Court and ended up with all the marbles. And I don't expect to see California end up, having lost the case before the Supreme Court, in that enviable position.

Now—

Mr. ELY. Is that a question, sir? May I answer?

Mr. SAYLOR. Yes.

Mr. ELY. Well, Mr. Saylor, I was just getting to that point. I understand now why you weren't willing to have me read it.

The fact is that the U.S. Supreme Court had before it a suit brought by Arizona which asked the Court to resolve three questions specifically, and these questions were:

First, whether the State of California's 4,400,000 acre-feet is to be diminished by reservoir evaporation losses. That is question No. 1.

The U.S. Supreme Court answered that, "No." The master answered it the same way in California's favor, in other words.

The second question was whether California was precluded from participation in the 1 million acre-feet of water referred to in article III(B) of the Colorado River compact. Arizona said we are precluded by our Limitation Act. California said they weren't. The special master answered that we weren't. California is not precluded. He answered that, too, in California's favor. So did the Supreme Court.

And the third question was, how do you measure beneficial consumptive use? Arizona said, we measure it by the resulting depletion of the flow of the main stream, taking credit for salvage. California said, you don't do any such thing. You measure consumptive use as diversion less returns to the river. The answer by the master and by the U.S. Supreme Court was you measure diversions minus returns, as California insists.

California won the three issues that Arizona pleaded.

Nevertheless, in 1958, at the conclusion of the trial, Arizona had substituted new counsel who filed a statement with the special master that they regarded everything filed by Arizona up until that time as

error and they wished to present a new theory of the case. This was after the evidence was in. And the new theory was that the Congress of the United States in ratifying the Colorado River compact had intended to exclude the tributaries from the accounting between Arizona and California, although the statute on its face incorporates the compact and the compact defines the apportionment as including the tributaries.

This concept was bought by the special master. He approved it.

Now, I may interject here that, had Arizona pleaded that contention, the upper basin States would have been in this lawsuit up to their ears instantly. But the upper basin States successfully opposed being impleaded into this lawsuit in 1954 by California on the ground that no compact questions were involved. So having happily mouse-trapped both California and the upper basin States by this set of pleadings, Arizona succeeded in selling this construction of the statute to the U.S. Supreme Court. The Court established that to be the law of the river: The tributaries are not included in the accounting period.

That was a victory for Arizona of the first rank. It excluded her accounting for her uses on the Gila and her other tributaries.

The other great question that was before the Court was, having excluded the tributaries and this created a legal shortage, if not a hydrological shortage, how do you allocate shortages? The special master had no trouble with this at all. I have read you his apportionment. He said everybody bears shortages pro rata. The effect, in California's case, he spelled out as meticulously as could be. If the flow is 6 million acre-feet, we get 44/75 of that, 3,500,000. If California's present perfected rights are 3,520,000 acre-feet, we get present perfected rights only, that is the water we put to use before Hoover Dam was built, and not one bucketful of the water stored by Hoover Dam, the dam that we had to underwrite, that Arizona fought and opposed.

Now, this didn't appeal to us, particularly, and in the U.S. Supreme Court in oral argument I told the Court that whatever else it did, it had to rectify this obviously wacky formula on the special master. I used perhaps a more polite word. And the U.S. Supreme Court did rectify it. It threw it in the ash can and wrote its own.

The Supreme Court said, you must first satisfy present perfected rights. Only the excess above that can be allocated by any shortage formula. The margin that the Secretary or this committee has to deal with is a very meager margin. If present perfected rights are indeed nearly 4 million acre-feet, as we now know them to be, and if the upper basin States deplete the flow at Lees Ferry as they claim the right to, to the point where there is only 7½ million acre-feet annually, and if a million and a half of that has to go off to Mexico, and another million evaporates in transit, there is left 5 million acre-feet altogether to divide up among three States. But 4 million or thereabouts is accounted for by present perfected rights. So the Secretary of the Interior can allocate about a million, say 1,100,000 acre-feet, on that basis, and not the full 5 million. Or, if the upper basin States lost their contest with Arizona as to whether they must add water at Lees Ferry for Mexico, this figure for the division of

the lower basin would rise to about 5,800,000, but of this the Secretary or the Congress can allocate only about 1,900,000. The rest is present perfected rights, protected by decree of the U.S. Supreme Court.

So that is the difference, to answer your question, as to whose marbles are here on the table. The suit brought by Arizona presenting the three questions she asked to have answered were answered in California's favor but the question she didn't ask to have answered until after the case was over was answered in her favor, the tributaries are out.

The shortage issue the Court refused to decide, sent that to you gentlemen, and that is why we are here as a court. We are asking you to do what every court that has met the question in the last 100 years has done, what Congress has done on 37 occasions, to respect existing uses, apply the law of priority appropriation.

I do not recall any instance when any Congressman has introduced a bill to divide the waters of, let us say, the Delaware between New York and New Jersey and Pennsylvania, or to authorize the Secretary of the Interior to do so, to take water being used by one to give it to another.

In every instance, existing uses, whether by Philadelphia or New York or any other city, have been respected when the aqueducts are built, and we ask you not to undo that great rule.

Mr. SAYLOR. Let me say very vehemently, New York just refused to comply with the U.S. Supreme Court decision regarding the amount of water they should take out of the Delaware. Now, you, Mr. Ely, had better confine yourself to western water because you are an authority on that, but I just want to tell you that some of the rest of us who have practiced law in the East know a little bit about eastern water law, and will match wits with you any day in the week on eastern water law.

And I just want to tell you that your interpretation of the Supreme Court decision is just one lawyer's opinion of the decision. I respect you as a lawyer, you are listed in Martindale-Hubbell as having an excellent record and a fine reputation.

Mr. ELY. Thank you, sir.

Mr. SAYLOR. And a top priority, and that gives weight to what your interpretation of what the master's report and what the Supreme Court decision amounted to, but there are other lawyers who are equally competent who come to entirely different conclusions.

Now, let me ask you this. You referred to certain comments made by the present senior Senator from Arizona. I think it is located back here on page 13. You talked about requirements. Senator Hayden talked about them in 1928, and then Senator Hayden talked about them in 1930.

Now, Mr. Ely, you are cognizant, I am sure, of the fact that no one Congress can bind another, and I am sure that you are cognizant of the fact that anything that was said in the 70th Congress won't bind the 90th, and that we can do anything we want to as far as this legislation is concerned. Isn't that correct?

Mr. ELY. Not in this instance, Mr. Saylor. This is an agreement that the act of Congress says on California's part shall be irrevocable

and unconditional agreement. We read into that as an agreement, a statutory compact, with the State of California. I do not deny that the Congress of the United States can break its contract. It rarely does. And when it does do it, the breach is compensable. I am satisfied this committee is not going to break new ground by breaking an old contract.

Mr. SAYLOR. Well now, you talked about this compact which the six States entered into following the Boulder Canyon Project Act.

Now, if my memory serves me correctly, as a result of that, Congress reduced Arizona's share of water in the Colorado River from 3 million acre-feet down to 2.8, is that not correct?

Mr. ELY. No, Mr. Saylor. The Colorado River compact itself, whether you call it a seven-State or six-State compact, made no apportionment among individual States at all. It made a basin versus basin apportionment.

Mr. SAYLOR. Well, I am afraid that if we follow your reasoning, we will reduce Arizona's share below 2.8.

Now, Mr. Ely, our staff has done some work on this and I would like to read you and have your comments on some of the work our staff has done.

In 1927 the Governors of the seven Colorado River Basin States held a series of meetings in Denver in a further effort to settle the division of the lower basin water supply, bringing about a seven-State ratification of the compact. Out of the Governors' conference came the proposal that the average annual $7\frac{1}{2}$ million acre-feet of water delivered on the upper basin States at Lees Ferry would be divided as follows: 300,000 acre-feet to Nevada, 3 million acre-feet to Arizona, and 4.2 to California.

These proposals were not accepted by either Arizona or California. Then the Boulder Canyon Project Act and the California Limitation Act, which were enacted in December of 1928, waived the compact requirements of the seven-State approval and provided in the absence of the seven-States approval it would be effective when approved by California and the five other States, provided California would limit its consumptive use of Colorado River water.

Now then, California met this requirement by passing the California Limitation Act in March 1929, thus accepting the limitation imposed by the project act of 4.4 million acre-feet of the $7\frac{1}{2}$ million acre-feet allocated to the lower basin, plus one-half of the surplus or excess water available.

Do you agree with that? Is that a correct statement?

Mr. ELY. Yes, that is substantially correct.

Mr. SAYLOR. Now, you make much of the fact that California is now using more than 4.4 million acre-feet.

Now, is it not a fact that when you used anything above 4.4, you did it with full knowledge that if, as, and when there were other uses demanded in the river by Arizona and Nevada, that you would have to cut back to 4.4 acre-feet?

Mr. ELY. It isn't quite that. The fact is that in the language you read, to the extent that we built works to use more than 4,400,000 acre-feet, we were by the terms of our agreement using waters that were excess or surplus, unapportioned by the Colorado River compact.

There were such waters, there are to this day, our agreement gave us half of that surplus, and our projects have put them to use.

You are quite right, that we did so with knowledge that if the surplus waters disappeared, either through drought or through the mortgage to Mexico, we would have to yield that use of surplus. We have kept that bargain. We are doing so. We are in the process of yielding 662,000 acre-feet of water which has, in fact, been put to use by the Metropolitan Water District, in this category of excess or surplus.

But what I am telling you today is the other half of that coin is this: that we were permitted to keep up to 4,400,000 acre-feet. If Congress intended that we should prorate below that, it would have said so, just as it told us we had to prorate any surplus above 7½ million. It didn't. It put a ceiling, a limit, in so many words, a limitation upon the quantity that we could claim as a firm right. That was 4,400,000 acre-feet. We claimed it as a firm right.

As to the balance of it, above 4,400,000 we admit the hazard. We are living up to it, but we say that was the only exaction Congress made of us. Had Congress intended to say you shall also yield part of the 4,400,000, having put it to use, it would have said so, and had it said so, the California Legislature could then have decided whether to accept that bargain or not.

Mr. SAYLOR. Now, Mr. Ely, you have heard the testimony before this committee ever since this matter has been discussed—at least the past 18 years—of which I have knowledge. You have heard of the augmentation which was suggested during the 89th Congress.

Now, some of the provisions which you people in California are asking this committee to endorse and to pass out, again call for an importation of water to be used to take care of the Mexican Water Treaty and for other uses in both the upper and lower basins.

Now, if there is such an augmentation to take care of any one or all three of the needs, will California be willing to pay the incremental costs of that water which will be over and above the 2½ million acre-feet to take care of the Mexican Water Treaty, or do you just want to pay the proportionate costs of the increase over and above 2½ million acre-feet?

Mr. ELY. To sort these points out as I understand them from your question, Mr. Saylor, the importation of 2½ million acre-feet would make possible the use in the lower basin of the 7½ million acre-feet apportioned by the Supreme Court. This quantity of importations would become necessary whenever the upper basin diminishes the flow at Lee Ferry to the minimum to which they say they are entitled to reduce the flow there.

Mr. SAYLOR. That is right; and it will take care of a million acre-feet of evaporation or transpiration or any other losses that you want to comment on in the upper basin and the lower basin at the present time.

Mr. ELY. No. The million acre-feet of losses that have been referred to are the losses between Lee Ferry and the Mexican boundary in excess of the tributary inflow. In other words, of the water that is visible and measurable at Lee Ferry, 2½ million acre-feet today is not usable in the United States. A million and a half must flow

on down to be delivered as a guarantee to Mexico at the border and a million is lost in transit.

Now, I think some misunderstanding has arisen as to whether we attribute the whole $2\frac{1}{2}$ million acre-feet to the Mexican Water Treaty. The Budget Bureau last year approved the principle of treating the cost of importing water to balance the million and a half acre-feet as being nonreimbursable, as a national obligation. We think that not only the million and a half acre-feet should be so accounted for as nonreimbursable, but that it should be increased by a fair proportion of the losses in transit.

I do not claim that the whole million acre-feet is so attributable, but a fair part of it, perhaps 200,000 or 300,000 acre-feet.

Now, to answer another part of your question as I understand it. Mr. Saylor, we think that the cost of the importation works that is to be written off as nonreimbursable, as accountable to the Mexican Water Treaty, should fairly be treated as the base of the pyramid, the first money expended, and that the balance of it, the incremental cost of the balance of the 2.5 million, should be paid out of the development fund. That was the structure of H.R. 4671 last year. The cash registers were Davis, Parker, Hoover after payout, Bridge, and Marble.

Marble has now disappeared by apparently general consent out of the plan.

These revenues from these dams would be of the order of \$2 billion, according to the Bureau's figures, over a 50- or 60-year payout. We think that this, plus the writeoff at the base of the pyramid of the treaty would probably make the importation of $2\frac{1}{2}$ acre-feet feasible in the sense that the prices could be paid for by the users within their capacity to pay.

Beyond that, if you increase the quantity, you are getting into areas where the subsidy, in the sense of the treaty writeoff, or from the power revenues, has been used up and I don't represent to you that I personally know of any way to balance the books beyond the $2\frac{1}{2}$ million acre-feet.

Mr. SAYLOR. Well, it becomes very important because the Bureau of the Budget, in which all of you people are relying on by what they said last year, have approved an entirely new bill that has been sent up this year and they have gotten rid of those two cash registers and have provided for power from another source.

Now, the difference between two ways of accounting is very important here, because it makes a difference of whether the entire country is going to be called upon to pay this increased water cost or whether or not the basin States are going to pay for it.

Mr. ELY. You are quite right; it is important. May I speak to that briefly?

Mr. SAYLOR. Yes.

Mr. ELY. This morning questions were asked about the quantity of water Mexico was putting to use before the treaty. I think Mr. Wyatt asked that. The fact is that Mexico had used, before Hoover Dam was built, a maximum of 750,000 acre-feet annually. The uncontrolled river came down in great floods in the spring and washed out the Mexican diversion works, and she was doing well to be able to use 750,000 acre-feet.

Mr. SAYLOR. I might say, parenthetically, that California was using much more than that at that time.

Mr. ELY. Our present perfected rights, the quantity used before Hoover Dam was built totaled 3,100,000 acre-feet. This had been put to use now, with great difficulty by the farmers of the Palo Verde and Imperial Valleys who had to dredge out their canals and who suffered from floods, but they did it, by their own efforts, without Federal money.

When Hoover Dam was built and the water was stored and the river regulated, Mexico had a windfall right away. A regulated supply was reaching her. The dam had been closed in 1935 and her uses shot right up.

Some American cotton speculators got hold of Mexican land and truly made a windfall out of it. It mushroomed. And our Government was confronted by a demand from Mexico for water, for a treaty. This was wartime, in 1943 and 1944.

At the same time, the Rio Grande was in trouble. There the situation was reversed. The river rises in Mexico.

Senator Pittman, of Nevada, had been chairman of the Foreign Relations Committee at the time the Boulder Canyon Project Act was passed. He is on record with the firmest pronouncement ever made that section 1 of the Boulder Canyon Project Act, which prohibits the use of stored waters except within the United States, was intended to tell every future Secretary of the Interior, every future President, he couldn't negotiate a treaty with Mexico which gave Mexico the benefit of this storage, paid for by the Americans.

Notwithstanding this, in wartime, the Colorado was traded off for the Rio Grande. We undertook a guarantee to Mexico, a million and a half acre-feet at boundary. Mexico undertook a delivery of Rio Grande water to the United States, not a guarantee, a 5-year average. We were saddled on the Colorado with this doubling of the Mexican burden made possible only by the construction of storage at our expense.

Furthermore, the all-American canal, paid for entirely by the farmers of the Imperial Valley, was burdened with the obligation to deliver 500,000 acre-feet of water to Mexico if she wanted it.

From that time on we struggled with the Mexican problem. Our treaty negotiators reported to the Senate that the Mexicans understood completely that they had to take this water irrespective of quality. Even if it would be totally useless, they had to take it. The Senators from some of the Colorado Basin States expressed their extreme skepticism.

The Mexican Treaty negotiators went home and told their Senate this was nonsense, that, of course, they are entitled to water of usable quality, and from that time on quality has been a sore point.

Now, the contemporary story to this, in answer to Mr. Wyatt's question, can be found in Senate Document 279 in the 79th Congress, which is called "Light on the Mexican Water Treaty From the Ratification Proceedings in Mexico." This was indeed a national obligation, mushrooming the Mexican claim as part of a wartime settlement. It is a mortgage that the States of the Colorado River Basin

have never been able to satisfactorily shoulder, and shouldn't have to shoulder. Their uses should not be cut to make good this treaty obligation.

They must be cut because this is the word of the United States and our word is good.

Mr. SAYLOR. Mr. Ely, you find yourself on the horns of a dilemma. In the one case, you say that when Congress makes an agreement, you must stick to it.

Mr. ELY. Quite so.

Mr. SAYLOR. On the other hand, when you make an agreement that adversely affects you, it must cease to be an obligation of the river and become a national obligation.

Mr. ELY. I didn't say that.

Mr. SAYLOR. Well, this is just about what you said.

Mr. ELY. No, sir.

Mr. SAYLOR. Now, this is the conclusion, the only conclusion I can come to.

Mr. ELY. Well, you misunderstood me, then.

Mr. SAYLOR. With regard to 4.4, that is a binding contract, but when the same Congress makes an agreement with Mexico on the basis of the treaty, and says it is the obligation of the river, you now want to say that we have got to change that and make it a national obligation.

Mr. ELY. No. Apparently, I have not made myself clear. We say Congress has made two commitments. It should keep both of them. It is keeping its commitment to Mexico. Delivery is being made good. It made a commitment to California that the excess and surplus waters could be taken away from us, but California could keep the 4,400,000 acre-feet. Congress didn't say we will take that away, too, to give to Mexico. That wasn't in the compact between Congress and California's legislature.

That wasn't in our bargain. But the effect is that if our uses are reduced below 4,400,000 acre-feet, it is in consequence of dispositions made by the United States of the water that Congress told us we could keep.

We say the States of the Colorado River Basin are entitled in all fairness to look to the Treasury of the United States to come to the rescue, to help support this national obligation, to bear a part of the cost of importing water to balance the books again. The Columbia fortunately receives 20 million acre-feet from Canada each year. We unfortunately are subject to a first mortgage of a million and a half acre-feet to Mexico. We don't say that the water necessarily has to come from the Columbia, but if it did, we would be getting only a small fraction of the water that our Nation receives from its neighbor to the north in order to balance the obligation that our Nation has undertaken to our neighbor to the south.

And what is wrong with that?

Mr. SAYLOR. Well, the only thing I can think of at the present time is about 1,500 miles is wrong with it. One is on the northern border and the other is on the southern border, and that is like saying that you entered into a treaty with one effect with Germany and

you entered into one completely opposite over in Japan, and therefore the people in the middle should try and make them equal.

This just doesn't follow. It is not one of the things that follows necessarily at all.

Mr. Ely, it is always a pleasure to see you. As I said before, I am delighted to hear you rehash your case before the Supreme Court. With due deference to your excellent statement, there is nothing new in it. You didn't comply with the committee requirements as the chairman asked that we not have anything except new testimony presented, but I am delighted to know that you started another case before the Supreme Court. This is the only nugget that we have had that is new and startling, and I will be interested in following that to its ultimate conclusion.

Mr. ELY. Well, first, let me——

Mr. SAYLOR. I only hope that those witnesses who appear on the other side of the coin will be treated as courteously as I tried to treat you.

Mr. ELY. Well, Mr. Saylor, you are always courteous and the fact that you and I may seem to converse on the subjects with some animation is simply, on my part, a recognition that I am facing a man who is intellectually honest, and with whom I can trade blows with mutual respect.

Now, second, as to starting a new case in the Supreme Court, that is not it. You have got the wrong impression of what I said.

Article VI of the decree in the Arizona versus California case told the States to file by March 9, 1967, their claims for present perfected rights. This they did last week. This is not a new case. Hopefully, it is the last phase of the old case.

Thank you, sir.

Mr. SAYLOR. And, in other words, you aren't going to come forward and tell us as a result of that, that you have won the case. [Laughter.]

Mr. ELY. I make no promises. [Laughter.]

Mr. EDMONDSON. The gentleman from Arizona.

Mr. UDALL. Mr. Chairman, the hour is late and I will move along as quickly as I can.

I do have a few things to take up. I want to say to Mr. Gianelli that no red-blooded Democrat could watch with equanimity the change in the party control in the State house at Sacramento, but I appreciated very much the chance to meet you and Governor Reagan the other day, and I appreciate his, I think, constructive approach to the problem before us, and obviously the very fine reports on you, and we look forward to working with you on common problems.

I wanted to say to Mr. Rummonds that he is one of the great constructive leaders in California and we thank you for the opportunity to be your guest with some of the other Members of the Congress from California recently, and I welcome back my old last year's ally and presently this year's antagonist in some respects on this important legislation.

Mr. Ely, you say on page 7, the third paragraph down at the bottom, at least you make reference to the question of compensability, and you have explained it in your statement. I think you have explained your theory further in response to Mr. Saylor's questions. But, and I guess

my question could be answered with a yes or no, although I won't restrict you to that—is it seriously contended by the eminent California counsel that having had the Colorado Compact dividing the water at $7\frac{1}{2}$ Upper and $7\frac{1}{2}$ Lower, and the Congress having made a legislative apportionment in 1928 in which California then accepted by the self-limitation act of 4.4, and having then gotten to the Supreme Court at Arizona's insistence in the 1950's and 1960's, is the Court saying that the Secretary could allocate shortages and could, if his means were reasonable, cut California down below 4.4 in times of shortage, that lawyers say California water users could then sue the United States for taking away water?

Mr. ELY. You say, did lawyers say that—I am a member of the bar, although there are some differences of opinion whether I am a lawyer—but I say, yes, that this is a point that the master recognized, faced up to, and said the question of compensability remained open, and I tell you that if the Secretary should promulgate a shortage formula, that destroyed existing projects in California, within the 4,400,000 acre-feet, the destruction so wrought would indeed be compensable.

And I further have gone on to say that the balancing of damage to California against the benefits of Arizona results in easy demonstration that you are destroying more than you are creating.

Mr. UDALL. Well, you have answered my question, then. The counterpart of the question deals with my reference to different principles on the east bank and west bank of the river this morning. As I understand your position, you would say that Arizona's allotment could be cut down by the Secretary well below 2.8 and we wouldn't have any right to compensation because we have unfortunately enough not to be able to put our water to use.

Mr. ELY. That is the difference. If the Secretary cuts uses in Arizona to a point where projects that you had built to put that water to use were destroyed or adversely affected, I would say you might very well have a right to compensation.

Mr. UDALL. I find this rather incredible.

Mr. ELY. I don't say this, Mr. Udall, except because of the comparison of the destruction of existing uses to create new ones. If the effect were that there weren't water enough to satisfy existing uses in the two States, I don't claim that the consequences of this are chargeable to anyone.

Mr. UDALL. Well, this is not very comforting to me, of course, and I certainly question this, but I am not going to pursue it further today.

Mr. Chairman, I have attempted to undertake a cross examination of Mr. Ely which one does at his peril on this subject, on the interpretation of the Supreme Court decision. A lot of my lawyers from Arizona, some of whom opposed Mr. Ely, have been "Nervous Nellies" back there today, and are very uneasy about some of the interpretations he has placed on the master's statement and, of course, the decree.

We are making legislative history, and it seems to me that my silence and that of my colleague, Mr. Steiger, on interpretation of the compact and the Supreme Court decision might be implied, might be interpreted later on as acquiescence. So I would like to have 5 days in which to file a statement with the help of my Arizona lawyers, countering and commenting in part upon the first part of Mr. Ely's statement,

where he interprets the Supreme Court decision. In fairness, I would suggest giving Mr. Ely the right to respond to that memorandum within five days so that at least Arizona's legal position would not be left in doubt.

The first part of his statement, the first six or seven pages, were really an interpretation, his interpretation and his opinion of the meaning of the Supreme Court decree and opinion. I wouldn't want to leave it unchallenged because my lawyers do quarrel with some of the points he made.

Mr. SAYLOR. Will the Chairman yield to me?

Mr. ELY. Couldn't we hold that brief to the 10-minute rule?

Mr. EDMONDSON. Is there objection to the request? The chair hears none.

Without objection, the gentleman from Arizona will be given 5 days to file an answer and statement, and 5 days thereafter for Mr. Ely to file a statement if he wishes.

HOUSE OF REPRESENTATIVES,
Washington, D.C., March 21, 1967.

HON. WAYNE N. ASPINALL,
Chairman, Committee on Interior and Insular Affairs,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: As you will recall, during the recent hearings on H.R. 3300, H.R. 9, and related bills, I noted my disagreement with certain legal conclusions and opinions relating to Arizona v. California as made by Mr. Northcutt Ely, Special Assistant Attorney General of California, in his formal statement and remarks before the Committee. I requested and was granted permission to respond to these remarks and to enter our response in the record.

To this end, I asked Mr. Ozell M. Trask to prepare the attached legal opinion in response to those portions of Mr. Ely's statement with which Arizona disagrees.

Mr. Trask is Chief Counsel for the Arizona Interstate Stream Commission. He is also one of the name partners in one of our outstanding Arizona law firms, Jennings, Strouss, Salmon and Trask.

I am asking that this letter and Mr. Trask's opinion be made a part of the record of the hearing. An extra copy of both these documents are enclosed for your information and use, and I am sending a copy of them to Mr. Ely.

Sincerely yours,

MORRIS K. UDALL.

ARIZONA INTERSTATE STREAM COMMISSION,
Phoenix, Ariz., March 20, 1967.

HON. MORRIS K. UDALL,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN UDALL: You have requested that I, as the attorney for the Arizona Interstate Stream Commission, review the formal written statement of Mr. Northcutt Ely, Special Assistant Attorney General of California, which was submitted to the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, House of Representatives, on Monday, March 13, 1967. You have also requested that I consider the oral remarks made by Mr. Ely in support of his statement. I understand this review is for the purpose of advising you whether the statement and the extended remarks are technically accurate in stating the law, since the California position is based upon the law as thus represented.

I find that there are portions of the statement and the remarks which do not accurately state the law. I further advise you that the law—accurately stated—does not support the California position in demanding a guarantee of a priority to 4.4 m.a.f. of water per year in times of shortage as set out in S. 861 and H.R. 6271.

Preliminarily, with respect to Mr. Ely's comment on the filings of present perfected rights, (i.e. those water rights existing on June 25, 1929, when the

Boulder Canyon Project Act became effective) by the Lower Basin States, no agreement has been reached between those states with respect to the accuracy of these claims.

The principal thesis of Mr. Ely's statement to the Subcommittee is that, under the opinion and decree of the Supreme Court of the United States in *Arizona v. California*, 373 U.S. 546 (1963), Congress is left with the responsibility for the allocation of shortages during times of shortage of water in the river. He then asserts that, in deciding how the water should be divided during times of shortage, Congress should apply the law of prior appropriation or equitable apportionment since these doctrines are frequently followed and are established in the law of the West.

We take no issue with Mr. Ely's assertion that Congress may enact a law establishing a rigid and fixed formula for the allocation of the water of the Colorado River during times of shortage or any other time since the power of Congress over the navigable streams of the country is plenary. We do disagree, however, that this matter was left or reserved for future action by Congress. For, in the enactment of the Boulder Canyon Project Act, Congress affirmatively acted to vest the Secretary of the Interior with broad discretion in allocating shortages subject only to the condition that any such allocation should be subject to present perfected rights.

This broad discretion was sustained by the Supreme Court in *Arizona v. California*, without equivocation in holding that the Secretary could allocate such shortages unfettered by any rigid formula. As pointed out by the Court:

"It must be remembered that the Secretary's decision may have an effect not only on irrigation uses but also on other important functions for which Congress brought this great project into being—flood control, improvement of navigation, regulation of flow, generation and distribution of electric power. *Requiring the Secretary to prorate shortages would strip him of the very choice which we think Congress, for reasons satisfactory to it, vested in him and which we should not impair or take away from him.* (Emphasis supplied.) 373 U.S. at 593."

The wisdom of maintaining this flexibility was apparent to Congress in enacting the Boulder Canyon Project Act, to the Supreme Court in its interpretation of the Act, and the reasons therefor are even more compelling today. For, what might be "fair" at one time might be "unfair" at another. For instance, had the Secretary been called upon to allocate shortages in the 1940's, he might have found:

1. Great California need.
2. No import facilities from the water abundant northern counties even remotely available.
3. No desalting available.
4. No imports from outside the state possible.
5. No weather modification even considered.
6. Arizona and Nevada needs not developed.

He might thereupon have decided that California should in that shortage situation be accorded a 4.4 priority. On the other hand, in allocating shortages in 1977 he might find:

1. California with a 2 m.a.f. per year or more from northern counties via Feather River,
2. huge desalting plants and weather modification programs creating additional water supply,
3. access to water in northern counties or the Columbia River,
4. Colorado River supply in use,
5. Arizona in great need with none of these facilities,

and determine that California should accord a priority to the extent of 2.8 m.a.f. per year to Arizona.

Mr. Ely has urged the adoption of the "principle of the protection of existing uses" in the pending legislation. He then asserts, beginning at page 11 of the statement, and in his remarks, that, when Section 4(a) of the Boulder Canyon Project Act required California to enact a Limitation Act limiting herself irrevocably and unconditionally to a maximum of 4.4 m.a.f. per year as a condition for the construction of Boulder Dam, this constituted an "agreement" by the United States that California would have the 4.4 m.a.f. every year. But, the language of the Boulder Canyon Project Act does not support this contention or this "principle." Nor does the language of the California Limitation Act support this contention. The argument was made by Mr. Ely to the Special Master and

be flatly rejected it (Report p. 231). The opinion of the Supreme Court of the United States does not even mention it.

At page 231 of the Master's Report, Mr. Rifkind states:

"The first paragraph of Section 4(a) is a limitation on California, not a grant to her, and hence cannot be a source of her rights to water as against the other Lower Basin States. The critical words in the first paragraph state that consumptive uses of water in California 'shall not exceed' certain quantities per annum. This provision, that California's uses 'shall not exceed' the specified quantity, does not mean that she is entitled to that quantity."

The argument, therefore, that California has built projects at a cost of some \$600,000,000 in reliance upon such an "agreement" with Congress is without merit. The written statement would have been more accurate had it pointed out that this argument had been urged and rejected. California cannot, by a course of continuous opposition over the years, keep Arizona from the use of its decreed water and then assert that uses made of that water during the struggle have become "established" as "prior appropriations" so that Arizona may not claim its entitlement as against California's.

There follow in the written statement certain quotations of Senator Hayden in 1928 and in 1930, and of Governor Osborne indicating a fear that California's uses would create rights. Such fears did exist. That is part of the reason for the Limitation Act and the statutory plan which did not adopt the theory of prior appropriation or protection of existing uses. California's aqueduct and All-American canal were both built after the adoption of the statutory plan of the Boulder Canyon Project Act, and not before it, and therefore not in reliance upon any theory of protection of existing uses.

In deference to the length of this memorandum, we have not discussed Mr. Ely's "convulsive issues" listed on page 7 of his statement. Only one of them deserves attention. That is the third (page 7 of statement) in which the question has been raised as to what might occur if the Secretary, in apportioning shortages, should destroy existing uses. It is inferred that such destruction might be compensable and that the compensation "would far outweigh the benefits thereby conferred on Arizona." The inference is that the usefulness of the Metropolitan Water District aqueduct and the All-American canal may be destroyed, thus creating the spectre of the huge damages which may be involved.

In support of this contention, Mr. Ely quotes from the report of the Special Master, stating in part:

"There has been no showing that non-perfected rights recognized by state law as of June 25, 1929, if any, have not been satisfied since Hoover Dam was constructed. If it develops that such rights are not satisfied in the future, that will be time enough to determine whether they are of such character as require compensation for their taking."

In this regard, we wish to point out that the Master, in speaking of rights which might possibly be compensable, was still proceeding on the assumption that the State law of prior appropriation applies as between water users within the State. This assumption and the Master's conclusion on this point was specifically rejected by the Supreme Court:

"Moreover, contrary to the Master's conclusion, we hold that the Secretary in choosing between water users within each state and in settling the terms of his contracts is not bound by these sections to follow State law. 373 U.S. at 586."

It is fundamental that the right of just compensation is limited to "property rights" under the 5th Amendment of the Constitution. Such right must arise either under applicable State law or by way of a Congressional grant of such rights. The decision and decree in *Arizona v. California* make it clear that State law is inapplicable in this regard. And, under the Boulder Canyon Project Act, only present perfected rights are protected.

Present perfected rights are defined as those rights established under State law prior to June 25, 1929 (Decree, *Arizona v. California*). California has submitted to the Supreme Court its list of such claimed rights on March 9, 1967. If there were any other uses existing prior to June 25, 1929, they apparently had not been perfected according to State law. Consequently, no property right has been established as to the water involved.

After June 25, 1929, when the Boulder Canyon Project Act became effective, the only method of obtaining a right to mainstream water of the Colorado River was through a valid contract with the Secretary of the Interior. These con-

tracts were all made subject to the terms and conditions of the Boulder Canyon Project Act, leaving it to the Secretary to allocate water when shortages occurred as set forth hereinabove.

The All-American Canal and the Metropolitan Aqueduct were both constructed after the Boulder Canyon Project Act was enacted. Water acquired by contract entered into pursuant to the Boulder Canyon Project Act is simply not compensable when taken away because of short supply.

Since all rights which were perfected prior to 1929 are protected as "present perfected rights" and all uses and rights thereafter obtained are by contract and subject to the terms and conditions of the Boulder Canyon Project Act, there could be no taking of property rights which would require the payment of compensation. The spectre of damages, we submit, is therefore a myth.

I wish to point out that the conclusions that I have reached herein with regard to Mr. Ely's primary points are in accord with those stated by Mr. Edward Weinberg, Deputy Solicitor Department of the Interior, in response to questions by Congressman Tunney of California in the current hearings. I believe Mr. Weinberg's interpretation of the Act and of the holding and decree in *Arizona v. California* more correctly states the applicable law than Mr. Ely's statement before the Committee.

Respectfully,

OZELL M. TRASK,
Chief Counsel, Arizona Interstate Stream Commission.

MARCH 28, 1967.

HON. WAYNE N. ASPINALL,
Chairman, House Committee on Interior and Insular Affairs, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for the opportunity of replying to Mr. Trask's letter dated March 20th, received here March 22.

First: With respect to the question of whether the Committee should keep in the bill the shortage formula to which Arizona agreed last year. Mr. Trask says that Arizona disagrees "that this matter was left or reserved for future action by Congress," when Congress enacted the Project Act. The Supreme Court has answered this (373 U.S. 546, 594):

"Congress can undoubtedly reduce or enlarge the Secretary's power if it wishes."

Second: Mr. Trask rejects Arizona's earlier characterization as a "statutory compact" the agreement between Congress and California, evidenced in the reciprocal legislation of Congress in enacting Section 4(a) of the Project Act, and the legislation of California accepting the limitation there proposed. If it was not an agreement, why did Section 4(a) characterize California's reciprocal statute "as an express covenant and in consideration of the passage of this Act"?

Third: The problem of compensability, which the master raised but did not answer, should never arise. We are confident that Congress will not take from California the water that Congress agreed in 1928 that California might keep, and that we have put to use in reliance upon that agreement.

It is not right to cast upon California the consequences of Arizona's 22 years' delay in ratifying the Compact, as though the slower development that Arizona thereby elected for herself—a go-it-alone policy—somehow gives her the right to dismantle the California projects built during this period in reliance upon the Colorado River Compact, the Project Act, and its reciprocal covenants with California, all of which Arizona unsuccessfully sued to destroy. As the Supreme Court said 35 years ago, in *Arizona v. California*, 292 U.S. 341 (1934):

"If Arizona's rights are in doubt, it is, in large part, because she has not entered into the Colorado River Compact or into the suggested subcompact."

So also with respect to the more recent thirteen years' delay consumed by Arizona's fourth lawsuit in the Supreme Court.

When this proposed suit was first discussed, nearly twenty years ago, Governor Earl Warren wrote Governor Sidney R. Osborn of Arizona, March 3, 1947, saying:¹

"The negotiations of the past have failed to bring about agreement between Arizona and California but I am of the opinion that there must be some fair

¹ This correspondence appears in *Hearings of the Senate Committee on Public Lands on S. 1175, 80th Cong., first session, pp. 485-88.*

basis upon which their respective rights can be determined. The only methods that occur to me are (1) negotiation of a compact, (2) arbitration, and (3) judicial determination.

"I would therefore like to suggest that we three Governors of the affected States endeavor first to enter into a compact which will resolve our differences and finally determine our respective rights.

"In the event you believe for any reason that this cannot be done, I suggest that we submit all our differences to arbitration, agreeing to be bound by the results thereof.

"If this is not feasible, I propose that we join in requesting Congress to authorize a suit to determine our rights in the Supreme Court of the United States, which suit could, if agreeable to the States, be submitted on an agreed statement of facts."

(Emphasis added.)

Arizona's Governor refused. He wrote Governor Warren twice, saying, on March 12, 1947:

"Arizona recognizes the right of California to use the quantity of water to which California, by the statutory agreement, is forever limited.

"Arizona does not claim the right to the use of any water to which California is entitled, nor the right to the use of any water to which Nevada is entitled, and I am sure that Nevada does not claim the right to the use of any water to which California is entitled, nor the right to the use of any water to which Arizona is entitled."

Again on May 23, 1947:

"California has unconditionally and irrevocably limited herself forever to the quantity of water set out in the California Self-Limitation Act. Arizona has by contract recognized the right of California to the quantity of water set out in that act and Arizona does not intend to and will not attempt to utilize water to which California is entitled.

"Arizona respects her commitments." (Emphasis added.)

Governor Osborn had already told his own legislature:

"Now, of course, we would like to take from California some of that 4,400,000 acre feet of water, but neither unrecognized filings against it, nor wishful thinking on our part can accomplish that. . . . The Federal Government, having expended tens of millions of dollars of the people's money to provide irrigation and power facilities for the use of this water in one state, will not wipe out that investment and divert that water to another state. Arizona cannot compel that any more than we can turn back the pages of history. The time has long since passed when Arizona could obtain the water which California has put to beneficial use."

Fourth: If Congress does take away water that California has put to use within the agreed limitation of 4.4 million acre-feet, Mr. Trask appears to believe that compensability is limited to the quantity of water put to use before the Project Act was passed. But all water projects, Arizona's included, if correctly planned, are built for the requirements of the future, not yesterday. The 4.4 million figure itself reflects this. Congress was told by Senator Hayden in 1930:

"What will happen is that the waters of the Colorado River will be impounded in the Boulder Canyon Reservoir and made available for use; large quantities of water will be taken out of the Colorado River into the great all-American canal; over 1,000,000 acre-feet will be further taken out of the river by a pumping plant, and taken over into the coastal plain of California in the vicinity of Los Angeles; they will be put to beneficial use; and, once having acquired a prior right to its use, no other State can obtain the use of those waters."

For this same reason, the water law of all the western states measures the appropriative right, not merely by the quantity initially used, but by the greater quantity initially appropriated, provided that it is put to use with reasonable diligence. The right to the larger quantity initially appropriated vests when the works are built to divert and conduct that quantity to the place of use. When the full quantity is ultimately used (assuming diligence in doing so) the right to that ultimate quantity relates back to the date of appropriation. The right to ultimate use of the full quantity appropriated plus the right there upon to relate back, to the date of appropriation, the priority covering that quantity,

¹ Arizona Senate Journal, 16th Legis., First Special Session, 1944, at 16.

² Hearings on H.R. 12902 Before a Subcommittee of the Senate Committee on Appropriations, 71st Cong., second session, 171 (1930).

are essential components of the vested right. For example, the City of Yuma, Arizona, and the irrigation districts surrounding the Yuma project in Arizona, have not yet fully put to use the quantities that they appropriated many years ago. Does Arizona deny that they have vested rights to the quantities appropriated, even though not yet used? Does Arizona now contend that if the Secretary should cut off these Arizona users with the quantities that they put to use before the Boulder Canyon Project Act became effective, June 25, 1929 (called their "present perfected rights," in the language of the decree), the taking of their vested rights in excess of the quantities perfected by use prior to 1929, and reassigned of these rights to some new user would not be compensable? Arizona's legislature has twice enacted laws preserving the priorities of these same users against the Central Arizona Project.

And even if this could happen in Arizona, for lack of Congressional recognition in the Project Act of the right of these water users to use water up to stated quantities, it cannot—or should not—happen in California, for the reason that Congress, in Section 4(a), expressly recognized California's right to use water up to 4.4 million acre-feet. Congress made a purposeful distinction between California's obligation to prorate the supply needed to satisfy uses in excess of 4.4 million, and California's right to appropriate and keep up a 4.4 million.

Respectively,

NORTHCUTT ELY,
Special Assistant Attorney General, State of California, and
Special Counsel, Colorado River Board of California.

Mr. UDALL. I will yield to Mr. Saylor.

Mr. SAYLOR. I am delighted to hear you say that because, as I said to Mr. Ely, his interpretation was one lawyer's opinion of what the Supreme Court decision meant.

That is all.

Mr. UDALL. That is the point. And while he is one of the most able lawyers I have ever met, we have some good ones in Arizona who don't entirely agree with some of the interpretations he arrived at. I wanted to give them a chance to be heard.

Now, gentlemen, Senator Kuchel this morning said unless we have the 4.4 priority in the exact pristine form that occurred last year, the Californians would have to oppose the central Arizona project with all the means at their command. I don't want to make a debating point and drag on the proceedings this afternoon, but let me take up another point and then I will have concluded.

The California position that I just quoted Senator Kuchel as stating is one that disturbs me. Let me pose to you a hypothetical situation because I don't think that a stalemate is to your advantage or to ours. And I don't think California has the stake that people think they have in this 4.4 priority.

Let's assume that you defeat the bill and stalemate it on the river. Let's assume further that Arizona cannot go it alone, as some of our people want to do, and build a State project in that eventuality and we find that Arizona can't even take water out of the river along the Colorado on some kind of a go-it-alone basis.

Let's assume that the river continues to flow along with about the supply which we have had in recent years and that we have stalemate with the upper basin, too, making it impossible for them to build any more projects.

Now, under those circumstances, in years of shortage, certainly California would have 4.4 coming to it. This 4.4 does not solve California's problems in the 1970's or 1980's, does it?

Mr. ELY. I am glad to have a chance to clear that up, Mr. Udall. Of course, our requirements, as you properly pointed out this morn-

ing, are more than 4.4 million. We built projects to use 5,362,000. We have put 5,100,000 to use, and we are about to lose 700,000 of that when your project goes on the line.

We accept that result of our 1929 bargain. But we do not anticipate ever getting more than 5,362,000 acre-feet, if we were indeed that fortunate, from the Colorado River. It is true that southern California's demands are far greater than that, but no one would be so foolish as to build another project to divert out of the Colorado River. He couldn't get a water contract with the Secretary. He knows the *Arizona v. California* result and that we would do well to fill the three projects that we now have. We can't possibly fill them.

Mr. UDALL. This is precisely my point: The stalemate that Senator Kuchel says California would have to fight for does not solve California's water problems.

Mr. ELY. If we won every possible issue on the Colorado River, we would need millions of acre-feet beyond that, and we would have to get it from other sources, not through our three Colorado River projects.

Mr. UDALL. This is precisely my point.

Mr. ELY. But the question of stalemate on the Colorado River doesn't affect that. As I say, if we got everything that our three projects were built to use, we would still need millions of acre-feet more which we are trying hard to get from our own northern California rivers, and desalination, and every place else, but the burden on the Colorado River would not rise. We can't go above 5,362,000, and we have no intention of it.

Mr. UDALL. All right.

Let's contrast the situation which would exist with passage of the bill we propose, H.R. 9, to build the central Arizona project, to build Hualapai, to have a basin fund. The bill would establish a national obligation to provide 2½ million acre-feet. You can make the studies in northern California, weather modifications and water salvage programs. Do sincere and honorable people in California really believe that, without a guarantee in the bill, the year 1991 is going to arrive without anything having been done to augment the River? Do they believe that the people in the United States will back away and let this whole region dry up?

Mr. ELY. We would certainly hope not, Mr. Udall. We will put it this way, that we think that the two States should share the benefit of bringing in of imports in this next 25 years. If imports do arrive to the extent of two and a half million acre-feet we are going to have 4 million, 400,000 and you are going to have 2,800,000. We are still short of our capacity of our constructed works.

But if the imports don't arrive in this 25 years, or 35, or whatever the period may be, these are the consequences: You would have a full aqueduct, according to the Secretary's figures until about 1990 and only thereafter would your supply be reduced, so that by the year 2030, some 65 years from now, you would still have 675,000 acre-feet a year coursing through your aqueduct. Yours is then more than half full. But our metropolitan aqueduct would be only half full, commencing the day that yours goes on the line.

Our shortage would be immediate, your is delayed, perhaps never come if the happy event of importation occurs, but at least you have no shortage at all for 25 years, whereas we have a shortage instantly when your project goes on the line.

We say that the two States should share this burden, share this risk, share the benefit. We say it is not fair that the metropolitan water district aqueduct be dried up so that yours may run full.

Mr. UDALL. Well, I was trying to contrast the choices that I see California has as between, (a) trying to stalemate the situation along the Colorado, and, (b) passing the kind of bill that we have offered this year.

It seemed to me that the risks for California (and there is no risk-free course for any of us in this world) are far less with passage of our bill than with a stalemate.

Mr. ELY. Mr. Udall, this is a matter of judgment, obviously, but our considered judgment in California is that no legislation is going to succeed unless it is backed by the seven States of the Colorado River Basin. We have a basinwide problem and we think, if I may say so, that with great difficulty all of us brought these seven States together last year on an agreed program under the leadership of Secretary Stewart Udall and Congressman Morris Udall. We regret greatly that this year Arizona has broken ranks. In our judgment, this is a most unfortunate event. California stands exactly where we stood last year. We have not run away from you. Arizona has run away from us. We think we will make progress if we all get back in the same harness, pulling in the same direction, and that we don't get anywhere by becoming adversaries.

Mr. UDALL. Let me follow through on a minor point and one of some consequence on the question of breaking ranks. I take it that California supports the Aspinall bill, H.R. 3300.

Mr. ELY. That is correct. There are minor differences between that and the Kuchel bill but they will be developed in the testimony. They are not major ones.

Mr. UDALL. One of those not so minor differences was the size of our aqueduct.

Mr. ELY. Yes; you are right on that.

Mr. UDALL. The bill last year is 2500 and the Aspinall bill is 2500 and in the Hosmer and Kuchel bill it is 1800.

Mr. ELY. You are quite right—I misspoke. The explanation is this: I am sorry Mr. Saylor is not here but the principle was established last year, as a result of rather heated negotiations in Phoenix that you may remember, and California, that the size of the central Arizona aqueduct might be increased from 1,800 cubic feet per second to 2,500 cubic feet per second, 1,800 being the basis of the cost estimate the Bureau had presented to your committee, and that the development fund would pick up the tab for this increase of 700 cubic feet per second which means about an added burden of \$60 million.

Beyond that if you wanted a still bigger aqueduct, Arizona would have to find a way to pay for it. The development fund would not. That is what H.R. 4671 said.

We agreed to go along on the addition of \$60 million to the burden on the development fund at a time when Marble Canyon was one of the contributors to that fund. By common agreement Marble Canyon is out this year, so Senator Kuchel's bill reverts to the 1,800 second-foot capacity that the Bureau presented in its cost estimates, and says if the capacity goes above 1,800 c.f.s. Arizona shall find a way to pay for it.

This is still a whole lot cheaper for you than going it alone and selling bonds to build the aqueduct as the State's legislation last Friday would contemplate your doing.

Mr. UDALL. It is the position then of California that anything above 1,800 second-feet should be paid for by the State of Arizona.

Mr. ELY. We think this is fair.

The Secretary's bill proposes that you increase the cost of your water, municipal water, as high as \$56, because he deletes Bridge Canyon power revenues. You would not have to go if you kept Bridge Canyon in, as we propose, nor would you have to impose taxation on your local counties to balance the budget financially. We impose a less burden than that on you.

Mr. UDALL. This comes as a shock to me because I sat here in the same seat four days ago and voted for a bill in California sponsored by the chairman of this subcommittee to enlarge an aqueduct on the theory that you ought to make your aqueduct big enough as you go along and, if it is part of the reclamation project, it ought to be paid for as the rest of the project is paid for.

Mr. ELY. I was not here but the point here is that although seven States are in effect beneficiaries of the development fund, we agreed that Arizona might have a preferred position to the extent of an added \$60 or \$70 million burden by increasing the size of your aqueduct, that the other States' interest in the development fund be reduced that much. This was an adjustment by the partners in that venture for Arizona's accommodation.

Mr. UDALL. I simply wanted to get clear which position California takes on the capacity of the aqueduct.

Let me go on to one final matter. I want to discuss for just a moment the 4.4 priority problem in a little different context. Assume that we could reach again, as we did a year ago, an agreement on some sort of a priority for California, some sort of an understanding on this question. Let me ask the California Representatives here, in the light of Mr. Ely's comments a few moments ago, to consider when the pinch would really begin on Arizona's aqueduct and California's aqueduct.

And then let me ask: What is wrong with a guarantee for 20 or 25 years?

We take the burden for the next 20 or 25 or 30 years. We give you assurances for the next two or three decades. This gives us time to get the river augmented. Arizona has the primary incentive to get the river augmented. Then, 25 years from now, your grandchildren and mine pick up the problem again and try to augment it, if it has not been done by that time. What is unfair about that?

Mr. ELY. Senator Kuchel gave the best answer when he said it is precisely like an insurance policy which by its terms lapses on the

death of the insured. The guarantee for our present existing uses expires at the precise time when the guarantee becomes necessary, when there is a shortage, and you are giving nothing by conceding that we would have 4.4 until then.

Your aqueduct would be full, too. It is a question of what happens if, and if importations don't arrive, the 25 years having expired. The monkey is on our back, not yours. You go ahead with a full aqueduct. Ours dries up completely.

The metropolitan aqueduct goes half full, the day yours goes on the line if importations do not arrive but yours remains full another quarter century. We agreed to that. But under your proposal ours goes completely dry, while yours remains full, and that is what we are objecting to, Mr. Udall.

Mr. UDALL. All right.

Now, this 4.4 thing is emotional on both sides of the river and I want to take up one other aspect of it and then I really am through, Mr. Chairman.

The one thing that our people could not really understand last year, the one thing that we were criticized for with regard to the magic words that we had in the bill last year, can be illustrated this way: Assume that we have the language of the guarantee that we had last year.

We go to northern California and to the Columbia River and we find 2½ million acre-feet. The engineers build us a big canal and we start down toward southern California and southern Arizona, and assume that under the plan we run this 2½ million acre-feet on into Lake Mead and up into the Colorado River.

At this point under last year's language the guarantee would be extinguished. Is this correct?

Mr. ELY. That is correct.

Mr. UDALL. All right.

Let's suppose we get halfway down to southern California and southern Arizona with that 2½ million acre-feet, and the engineers say, "No, it would be a lot easier, and a lot cheaper if we turned that aqueduct and ran it into Los Angeles or ran it into the Coachella Valley and delivered the water down there." And let us suppose that we get into a dry year thereafter.

Under the language last year you would be entitled to your 4.4, or, if it is prorated, you would have a minimum, 4.4 million acre-feet.

You would have that additional 2½ million being delivered into southern California. But because it did not go into the main stem of the river, the guarantee would still be effective even though the canal was built entirely with Federal funds.

Now, we in Arizona ask what is fair about that?

What is reasonable about that language in last year's guarantee?

Mr. ELY. If that apprehension really exists in Arizona, I am very grateful to you for the opportunity to put it at rest right now.

Unless water goes directly into the main stream, the other States get no advantage out of this importation at all. It is a Mexican treaty burden that is the primary problem. The upper basin States want to be free to curtail the deliveries at Lee Ferry to 7½ million acre-feet per year, 75 million per decade.

Even if they did that, they still would not have enough water left to full satisfy the apportionment under the compact under all the current water supply studies.

But when upper basin deliveries are reduced to 7.5 million at Lee Ferry, then $2\frac{1}{2}$ million acre-feet additional has to go into the main stream between Lee Ferry and the Mexican boundary in order to make available the $7\frac{1}{2}$ million which the Supreme Court apportioned.

You don't accomplish that result for the benefit of the other States by taking water down the spine of California and delivering it to Los Angeles or to anybody else.

You get it by putting it in the main stream where it is available in part to satisfy Mexico.

Now, the fact is, Mr. Udall, that the only possibility of exchange that is physically possible, not involving importations into the main stream, is exchange with the metropolitan water district.

The metropolitan water district has an interest of only 550,000 acre-feet in the 4.4 million. Its interest beyond that is in excess and surplus, and by hypothesis this is lost. If you dried up the metropolitan aqueduct, abandoned it, built at a cost of \$300 million, treated it as a pyramid, let it dry in the sun, and instead found a way to deliver water to Los Angeles, you would lift only 550,000 acre-feet from the demands on the river.

This does not solve your problem. Your shortage in the main stream is $2\frac{1}{2}$ million.

Now, what other California projects can you dry up by bringing in water down the spine of California? The next in line in the Secretary's priority list are Coachella Valley and Imperial Valley, through the All-American Canal. These projects receive water by gravity from the main stream. It just does not make sense that you bring water from the Eel, the Trinity, the Klamath, pump it 3,000 feet and deliver it within literally eyesight of the Colorado River, in replacement of water flowing by gravity from the Colorado.

You just can't envision this kind of a conclusion and when you get all done, who are the beneficiaries? Metropolitan, Imperial, Coachella. They should not be charged for substitute water. They are now paying for main stream water. It will cost you \$75 an acre-foot, perhaps, to bring it from the Eel, Trinity or Klamath. Are you going to find a way to subsidize that, to deliver that to these irrigators in Imperial and Coachella in substitution for the water they are already using from the Colorado?

This was the inherent flaw in Secretary Udall's first specific Southwest plan: The notion that somehow you could trade off a million, two hundred thousand acre-feet of California's take from the Colorado River, reducing us to 3.2 million of Colorado water, by delivering water from northern streams within the interior of California. It had not dawned on him, really, that only 550,000 acre-feet of that could go to metropolitan, and the rest had to be in replacement of the water you are going to stop Imperial and Coachella from using out of the main stream. It just won't work.

MR. UDALL. Mr. Chairman, I am afraid I have taken too much time. I can pursue this further but I will conclude my questioning at this point.

Mr. EDMONDSON. The gentleman from California?

Mr. HOSMER. Mr. Ely, in the interests of time if you have a couple of good answers you want to make, I will supply the questions later. [Laughter.]

Mr. ELY. I appreciate your thoughtfulness. I have taken a great deal of your time and I am very grateful for it.

Mr. HOSMER. Thank you.

Mr. EDMONDSON. I thought you were going to ask him for a definition of bumper stripping. [Laughter.]

Mr. ELY. I have a final observation. We do not want a fight with Arizona. We want to get our past unity reestablished, and we just hope that this spirit prevails on both sides of the river.

Mr. EDMONDSON. The gentleman from California, Mr. Tunney.

Mr. TUNNEY. Thank you, Mr. Chairman. As Mr. Hosmer and Mr. Udall, I have a number of questions but I won't ask them in the interests of time, but I do have one question which I would like to ask.

Isn't it true, Mr. Ely, that we do have currently on the Colorado River an interbasin transfer and that when you talk about the interbasin transfers from northern California or the Northwest to the Colorado River, we are not breaking all kinds of new ground.

This is not something which is unique and which has never been done before.

Isn't it true that, for instance, right now water is being transferred from the Colorado River Basin to the Missouri River Basin and to the Arkansas River Basin, Rio Grande River Basin, and the Great Basin and South Coastal Basin?

Mr. ELY. That is correct.

Mr. TUNNEY. So actually right now we have on the Colorado River interbasin transfers and there is no reason at all that if it is feasible that we should not have interbasin transfers from northern California or from the Northwest if it proves to be economically feasible.

Mr. ELY. That is a very good point.

Colorado has been an area of origin, of export, to all of these other basins you described.

Mr. TUNNEY. Thank you.

Mr. EDMONDSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. I have a rather interesting question.

You don't have to answer it if you don't want to.

Maybe it will take three separate answers.

Because of the shortages that exist on both banks of the river, inasmuch as I think we would like to have equal justice under the law as our friends from Arizona pointed out the other day, what would be your feelings if the basic reclamation law were amended to provide for some fundamental allocation between municipal and industrial and agricultural water?

What I am getting at here is that use of the municipal and industrial water be accelerated. The pleas we hear up here continually are the great population centers and yet in no case have we found more than 10 percent of the water is ever used in the population centers.

The rest is all going on the fields.

I am not knocking the agricultural business. Certainly that is I think one of California's principal sources of income and likewise

Arizona's, but at the same time if we are talking about spending billions of dollars for all of these waterworks, maybe we had better stop and find out how we are using this water before we go looking for more.

So I am suggesting here, and I realize it is a little bombshell, that those in reclamation projects give some consideration to an allocation formula.

Mr. ELY. To which of us are you handing this wet baby?

Mr. REINECKE. Well, I think there probably are at least two distinct answers.

Mr. GIANELLI. Let me take a crack at it.

First of all, you have to relate it specifically to a stream. If you are talking about the Colorado River there are matters of prior water rights which must be recognized; so I think you can't do some of the things you talked about.

Now, with respect to reclamation law it is my understanding that reclamation law was primarily designed for irrigation in its initial instance and although there have been also projects for a municipal use, I think basically what you are suggesting would be to change the whole basis of reclamation law as I understand it.

Mr. REINECKE. I believe this is right.

The original law did foresee irrigation but it foresaw power only as a secondary utilization.

It did not say anything about navigation or water quality control, fish and wildlife preservation, recreation, M & I.

All these other uses have come in since the basic reclamation law and I am not talking about changing anything in the past.

I realize that would be too difficult to do, but on future authorizations I am interested to get a feeling for what the State of California would think with reference to—

Mr. GIANELLI. We have a priority under our State law which recognizes municipal uses. You are probably aware of this. It is difficult to generalize in responding to a question such as the one you raised. You have to take a look at the project and area you are talking about and then decide on how you are going to handle it.

If you are talking about irrigation, for example, in our own Central Valley, it is a prime requirement and certainly it has to be taken care of and put into the proper perspective along with other requirements throughout the State, whether it be for municipal use or whatever.

The answer to your question is that it would be very difficult to give a specific reply and say that you should change, for example, reclamation law to give M & I a priority over other uses.

Mr. REINECKE. Mr. Rummonds, what would you say?

Mr. RUMMONDS. I would agree with Mr. Gianelli, that you ask a question there that is a basic question of complete change in reclamation law and possibly there should be more recognition given to the fish and wildlife than has been given in the past in some of these projects, and I think it is recognized now, but how you would change that law, you are right when you say you had a bombshell there.

It would take somebody a lot more knowledgeable than I in law fields.

Mr. REINECKE. Mr. Ely?

Mr. ELY. The question breaks down into two parts really. If you are dealing with creation of a new project, as Mr. Gianelli indicates, you have a clean slate to write on. Everyone makes his investment and knows the rules of the game. The Secretary proposes that in the central Arizona project bill before you. The contracts for agricultural use are not for permanent service, as contracts made under the Boulder Canyon Project Act are under the terms of that statute. They are contracts for 50 years or thereabouts, with the idea of a gradual increase in municipal use in Arizona and consequent curtailment of the agricultural contracts on renewal, I suppose.

In Nevada the Secretary's drafted contract with the southern Nevada project provides specifically for preference to municipal and industrial use and shortages fall on agriculture.

When these are new rules set up prospectively, that is one thing. If the law is changed retroactively so that investments already made in agriculture are subject to an unexpected hazard of reallocation of water, that is another. That reallocation certainly should not be effected without compensation. It is a great question of policy whether indeed you should interfere with the normal economic laws to diminish the value of farm lands, which is dependent entirely on its water supply by putting a sword of Damocles over it, a power on anybody's part to reallocate.

Mr. REINECKE. My purpose in asking this question is that we hear so frequently the talk about the highest economic use of water and yet we very seldom use it that way. A given quantity of water used in industry will create far more income to a given area than that same quantity of water on a farm.

Mr. ELY. That is true, and as population builds up and industrial pressure does, the water which has been put to use on farms is bought and paid for by the higher use that can afford to pay for it.

In Salt River Valley I am told that 50,000 to 75,000 acres have gone out of farm into urban development and we know what has happened in southern California. The orchard lands and water rights were bought up for subdivisions.

Mr. REINECKE. Thank you. No further questions, Mr. Chairman.

Mr. EDMONDSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Chairman, before I ask a very few very short questions of the witnesses, I wonder if I could just suggest for the record that although I and other members are accustomed to the inexorable effect of seniority, the testimony of the gentlemen from California has been very provocative and interesting. I would hope that later in the week if the committee is not otherwise occupied and the gentlemen are present in the hearing room perhaps some of us at the end of the table would have an opportunity to request their recall for some of the questions we have not and won't have an opportunity to ask today.

I know the chair can't bind itself or the subcommittee at this time but I merely mention this request which some of us junior to our colleagues might be interested in presenting.

Mr. JOHNSON (presiding). In the interests of a little information here from the witnesses, would you be in town for the balance of the week?

Mr. ELY. I will.

Mr. GIANELLI. I won't be, Mr. Chairman, but we will have somebody here.

Mr. JOHNSON. There will be at least three members of the delegation that appeared here other than Mr. Gianelli for the balance of the week.

Now, the calendar is quite crowded with witnesses and I am sure that if we could squeeze them in, we will do so and we will have a further opportunity to question the California witnesses.

Mr. FOLEY. Thank you.

Mr. Gianelli, in your statement you refer on page 2 to the position of the Southwest versus the position of the Northwest, both in historical context and as to this present legislation we are considering.

My question to you is this: Do you consider the State of Arizona to be a part of the Southwest?

Mr. GIANELLI. Yes.

Mr. FOLEY. And I take it you consider the State of California to be at least in part?

Mr. GIANELLI. Yes; that is correct.

Mr. FOLEY. Considering the fact that statement was received this morning by the congressional delegation of the State of Arizona, all three members, eliminating in their recommendations to the committee some provisions of last year's proposed legislation, I would like to ask you is it the position of the State of California that there should be an authorization of Marble Canyon Dam?

Mr. GIANELLI. I don't think we have taken that specific position.

Mr. FOLEY. Can you give me any statement at this time as to your position?

Mr. GIANELLI. Marble Canyon Dam has been eliminated from some of the legislation to which we have indicated general support.

Mr. FOLEY. I see.

You are not at this time advocating the authorization?

Mr. GIANELLI. We are certainly not wedded to Marble; that is correct.

Mr. FOLEY. What is the position of California with respect to authorization of specific water importation studies looking to augmentation of the Colorado River from sources outside the basin States?

Are you now taking the position that that is no longer essential to your legislative position?

Mr. GIANELLI. No. The Governor said in his statement that basically there is a problem of shortage in the whole Colorado River Basin. Until you face the problem of importation by some meaningful method you really are not directing your attention toward a solution of the problem.

We feel there has to be some meaningful attempt made to augment the supply of the Colorado River.

Mr. FOLEY. Does it mean that you are supporting and insisting on specific water importation studies looking on the augmentation of the Colorado River?

Mr. GIANELLI. Yes.

Mr. FOLEY. Are you speaking for the Governor in this statement?

Mr. GIANELLI. Yes; I think this is his intention.

Mr. FOLEY. Regarding the provision for 4.4 million acre-feet priority for the State of California during periods of water shortage, I take it you are insisting on that position as you did last year?

Mr. GIANELLI. Yes; and I think Mr. Ely has covered that quite well.

Mr. FOLEY. Yes.

In view of the fact that the position of the three members from the State of Arizona is that they are now eliminating these three provisions, I just made from their recommendations to the subcommittee and Congress, could you fairly say that Southwest has an integral position on this legislation?

Mr. GIANELLI. No. I don't believe they have.

Mr. FOLEY. Well, wouldn't it be more accurate then in your statement if you refer to the State of California rather than the Southwest?

Mr. GIANELLI. We were addressing ourselves to some of these matters which I think were before the committee last year.

Mr. FOLEY. I just did not want the implication to be left with the subcommittee that in your judgment the primary differences of opinion existed in this legislation between the Southwest and the Northwest.

In fact, the principal disagreements now exist among members of the Southwest; isn't that correct?

Mr. GIANELLI. You are talking about current legislation?

Mr. FOLEY. Yes.

Mr. GIANELLI. Yes.

Mr. FOLEY. Mention was made of water studies, Mr. Gianelli. Have there been water studies conducted by the State of California or in cooperation with the State of California regarding the availability of northern coastal streams in the State of California to meet the needs of southern California?

Mr. GIANELLI. Yes; we are looking at those now in connection with our California water plan.

Mr. FOLEY. You have not completed those studies as yet?

Mr. GIANELLI. There have been some studies completed but there are many more to be undertaken at a feasibility level.

Mr. FOLEY. You are not satisfied, then, as the director of the department that California has exhausted its needs to study this particular question?

Mr. GIANELLI. I don't think the studies have been completed with respect to this.

Mr. FOLEY. How long is it going to take you to complete those studies?

Mr. GIANELLI. We are concerned right now, in the requirements of our State in terms of our California water plan, particularly as they relate to the north coast.

If you are talking about studies which relate to things connected with this legislation, it goes much further than what we are talking about within our State in terms of our own studies. The broader studies ought to be taken on in cooperation with probably some Federal agencies because they go far beyond what we are doing within our own State in terms of our own studies at this particular time.

Mr. FOLEY. Wouldn't you say it is fair to assume that, in view of your experience, it is difficult to set any precise time limits on the exhaustion of your State's study of its own water resources and related problems?

Mr. GIANELLI. Are you relating it to our own State water project or the entire water requirements of the State?

Mr. FOLEY. I am talking about the entire requirements of the State of California.

You are, in other words, assuming that by January 1, 1969, or 1970, you will have completed a satisfactory compendium of all the water studies affecting the needs of the State of California?

Mr. GIANELLI. We are carrying on certain studies which are aimed at augmenting supplies for our State water project. We are not looking at them at the present time with respect to augmenting the Colorado River.

Mr. FOLEY. As to those relating to your own needs, you have a definite timetable for completing?

Mr. GIANELLI. We have a first-phase study which we hope to have completed in the next 2 or 3 years.

Mr. FOLEY. You have beyond that a second stage?

Mr. GIANELLI. There will be many additional stages, I suspect.

Mr. FOLEY. Thank you.

Mr. Ely, in your statement I would like to have an opportunity—time is late—I will just ask you this question for clarification.

You suggested in answer to Mr. Udall's questions that the Secretary could not, in your judgment, under the decree of the Supreme Court allocate shortages among the various States of less than the perfected rights of the State of California without compensation.

Is that fair?

Mr. ELY. Yes. That is a provision in the decree itself. The decree doesn't speak of compensation. The Secretary is directed to satisfy present perfected rights in order of priority without regard to State lines.

Mr. FOLEY. The question of compensation is somewhat a difficult legal question, is it not?

Mr. ELY. It is.

Mr. FOLEY. And there are occasions or have been occasions in the past, have there not, in your judgment where general legislation has resulted in extinguishment of private contractual rights without compensation?

Mr. ELY. In the exercise of navigation servitude, that is correct.

Mr. FOLEY. It is your judgment that the Congress does not possess the constitutional authority or legal or legislative authority to apportion shortages among the States of less than approximately 4 million acre-feet to California if that represents the perfected rights?

Mr. ELY. Congress unquestionably has the constitutional power to deal with this stream. Its power is plenary with respect to navigable international streams is concerned. That does not mean that it has the power to take vested rights without compensation. This is the question the master said was unnecessary for him to decide.

Mr. FOLEY. And you are not stating at this time that it is your judgment that Congress does not have the authority to take those rights without compensation?

Mr. ELY. The difference is between authority and the consequences of the exercise of the authority. You may take my house for occupancy by a Federal official, let's say, but the taking is compensable.

Mr. FOLEY. What I am arriving at, was it your statement as to your own opinion that the Congress could not apportion less than approximately 4 million acre-feet to California without compensation?

Mr. ELY. I think first as to the figure I did not say 4 million. If you refer to perfected rights, 3,900,000 is the sum of the present perfected rights protected by the decree in all three States.

Of this about 3,100,000 is in California. And I do say that those rights are protected by decree and could not be divested for the benefit of a junior user without getting an amendment of the decree and—

Mr. FOLEY. Without compensation?

Mr. ELY. Yes, this is *res judicata*. These are vested decreed rights.

Now, there are additional vested rights that are not in the status of "present perfected rights," to use the words of act that the compact, the project act and decree use.

Present perfected rights are rights measured by the quantity of water put to use prior to June 25, 1929. But in addition there are vested rights, 1.3 of our 4.4 million—vested in the sense of rights to water validly initiated in conformity with the statutory compact stipulated in the project act, and served by projects actually constructed. The quantities that are vested, but not perfected, are the quantities in excess of those used prior to June 25, 1929, the difference between 4.4 and 3.1 million.

The Palo Verde Irrigation District is an example. It has rights dating back to the 1870's. It was using, prior to June 25, 1929, 208,000 acre-feet. It is using pursuant to those same appropriations now, about 350,000.

Now, the question is whether if you take Palo Verdes rights in excess of 280,000 the taking is compensable. We say it is. Palo Verde is in no great danger because its priorities are superior to the All-American and the metropolitan water district, but that illustrates the problem.

Mr. FOLEY. Much of your testimony seems to me to argue that the Congress had the authority to guarantee to California an absolute right of 4.4 million acre-feet regardless of shortages in the river.

By the same token is it your judgment, I take it from your response, that the Congress has the right to fix any other formula to apportion shortages?

Mr. ELY. There are two problems here. The 4.4 agreement was made in 1929 as a statutory compact in the form of reciprocal legislation of Congress and the State of California.

That agreement is 30-odd years old. And that is the one under which we built our works. We say that investments made in reliance upon that agreement with Congress, if now destroyed, are compensable.

Mr. FOLEY. The Congress has the right to make determination of shortages regardless of these previous statutory acts as you see it.

I am talking about the wisdom. I am talking—

Mr. ELY. The power?

Mr. FOLEY. The power?

Mr. ELY. The power in my view is restricted to the excess of the uses in the three States above the "present perfected rights" protected by the decree of about 3.9 million acre-feet.

Mr. FOLEY. Congress does not have the power to go below that.

Mr. ELY. Not in my view without violating the decree.

The United States is bound by the decree. It is a party to the suit and I would suppose that this is a vested property right. I am not saying that in the exercise of some other constitutional power Congress could not take a vested right, but it must be paid for.

Mr. FOLEY. Under its authority and power of the control of navigable power, Congress does not have the authority to go below that right of perfected rights in your judgment?

Mr. ELY. It has exercised its power to the full extent it elected to. It sought a Supreme Court decree which has determined the boundaries left untouched by the exercise of that power and I don't say that you don't have the power to destroy the decree and to allocate to others the water decreed to the present perfected rights, but the rights so destroyed are compensable.

I think Congress does have plenary power as I say to take property that has been decreed to you or me, but the taking is compensable.

Mr. FOLEY. Under the Congress part of the jurisdiction of navigable waters?

Mr. ELY. Yes; but it is unthinkable to me that you would exercise—

Mr. FOLEY. I understand your view that we would not do it but I want to—we have the full power so to do.

Mr. ELY. Yes; I don't challenge that. There may be others that would challenge it and they may be right but I concede the plenary power of Congress.

Mr. FOLEY. With my previous reservation about wishing to have the opportunity if circumstances permit, I will yield to the Chair.

Mr. JOHNSON. Do you have a unanimous consent request to make, Mr. Tunney?

Mr. TUNNEY. Yes, Mr. Chairman. I would like to ask unanimous consent to placing in the record at the appropriate time a statement by Mr. Robert F. Carter, general manager, of the Imperial Irrigation District.

Mr. JOHNSON. Without objection, the statement will appear at the close or at the end of the questioning of Mr. Gianelli, Mr. Rummond, and Mr. Ely.

Mr. Steiger?

Mr. STEIGER. Mr. Chairman, I will dispense with the amenities. You gentlemen will be assured of my respect and admiration on your presentation.

Mr. Ely, I am impressed but not entirely persuaded by your what I consider somewhat tortured reasoning on the Supreme Court decision. However, I must inform you that I am not burdened with legal training, so I am not qualified to debate the specific issues, but I would call your attention to page 4 of your statement, Mr. Ely, in which you in your own language refer to the article II(b)(3) of the decree that dictates that after the satisfaction of the present perfected rights, the Secretary shall be entitled to apportion, but in no event shall more—in no event shall more than 4.4 million acre-feet be apportioned.

Now, Mr. Ely, you cite this as one of the evidences of the propriety of the 4.4 million figure. I with my lay background interpret this as a maximum figure and not as a minimum figure, and then subsequent testimony by yourself has revealed there is some 3,100,000 acre-feet of perfected rights. So we have an area in which 1,300,000 acre-feet, theoretically, which we can fluctuate or deviate below the 4.4 million.

I would like to know if indeed you interpret this use of the 4.4 million as a minimum rather than a maximum.

Mr. ELY. No. The decree speaks for itself.

It says in so many words that in no event shall more than 4.4 million acre-feet be apportioned for use in California including all present perfected rights, but the significance is that this limitation of 4.4 million acre-feet appears in the very article of the decree, article II(b)(3), which deals with the allocation of shortages.

This implies that in a shortage formula, when there is less than seven and a half million acre-feet available, you may indeed give California as much as 4.4 million acre-feet.

Mr. STEIGER. So that admittedly this is one interpretation. And then I referred earlier to your press release in today's testimony and the thrust of this release is the emphasis on the necessity for some kind of an augmentation or importation.

I heartily concur. I note that in your presentation and in the cross examination you were required to dwell on the 4.4 rather than the importation.

I trust that you agree that discussion of the 4.4 is really very much secondary to the discussion of the necessity of some kind of augmentation.

Mr. ELY. Well, it should be.

And it would be if the Arizona position were now as it was last year committed to a bill which does indeed provide for a realistic early investigation of importations including the specific figure of two and a half million acre-feet.

It is not. This whole subject by the new Arizona bills, if I may say so, is swept under the rug. The buck is passed to a water commission to be set up under a separate bill and the Secretary is given no functions here which are realistically related to bringing in that quantity of water.

In fact, we are driven to talk about the protection of our 4.4 million acre-feet largely because it is now apparent that the Secretary of Interior and Arizona have abandoned ship upon the seven-State program of driving for importations. But that is the key to harmony between the upper and lower basin, harmony between Arizona and California.

You now want to build your project without any very specific investigation of imports being made a key to the structure. This was the key to Secretary Udall's Pacific Southwest plan.

Mr. STEIGER. I am sure you recognize, Mr. Ely, that there is nothing in the Arizona bill, so-called, that would preclude any study, indeed, it is obviously the position regardless of the language that augmentation is central.

Is it your view that the National Water Commission will not achieve augmentation?

Mr. ELY. I read the testimony on the Water Commission before the Senate committee, and heard part of it, the testimony of the witnesses

describing the function of the proposed National Water Commission.

The plan there described was to create what they called the Hoover Commission made up of men from several walks of life, a doctor perhaps, dealing with public health matters, a conservationist, an irrigation specialist, and so forth, and perhaps a lawyer, perhaps an engineer. These people were to review Federal policy on the use of water resources.

A large part of the testimony was in criticism of the very point that Mr. Reinecke made, that water is being delivered for agriculture underpriced. Irrigation is subsidized when it should not be, according to these professors. And that they would put a stop to this; let economic forces determine how water is to be used.

Now, the end result of that type of a commission's work, like that of the Hoover Commission, is recommendations to Congress. It is many a year now since the Hoover Commission finished, and only about half its recommendations have become law. I think that this type of recommendation, that you stop subsidizing reclamation, would provoke debate in this committee that would last for years before there is legislation on it.

This Commission was not described as a type that would undertake the investigation of specific engineering jobs, like the Inter-Oceanic Canal Commission to decide where to build the next canal across the isthmus. Not that type at all. It is a policy commission.

Now, what concerns me is if you set up a National Water Commission superimposed upon the National Water Resources Council and the 17 Basin Commissions throughout the United States that are already at work, some of them with millions of dollars at their disposal such as the Pacific Northwest Commission with \$5,000,000, if this great army of specialists that work in this field cannot produce the work and you are going to turn to a commission made up of sociologists, physicians and so forth, I am worried as to whether that commission in 6 years is going to decide what the shortages are in the Colorado River and how you are going to relieve them when it also has to consider the great social problems involved in the stagnation of Lake Erie or the water shortages in New York and what is to be done about the Panhandle area in Texas?

The Southwest problem alone is going to require a great deal of manpower, a great deal of money, and the problems are entirely different from those of Lake Erie or New England and I just think we are fooling ourselves if we think by creating a National Water Commission, Hoover Commission, we are going to solve our Colorado River shortages.

I am delighted to have a National Water Commission created. I wish it had happened years ago. But this does not mean that a new Hoover Commission is going to solve the problem we are talking about.

Mr. STEIGER. On the other hand, in my view, the only State's problems solved by stalemate, by an objection, is the State of California at this point.

Mr. ELY. I did not hear you, sir. I didn't understand.

Mr. STEIGER. The only State who is served at this point in time by a stalemate, by being able to continue to utilize the waters they are utilizing from the Colorado River, is California.

It must occur to you, as I am sure it has often, that the pressures of necessity, which are so very real, of augmentation, are going to be felt on this commission or whatever other vehicle is used to force augmentation, as you have demonstrated in your own statement by the active research on northern California water itself, and it disturbs me when we all appear to be agreed as to need.

We all agree that, to use your very good language, we can't dispose of shortages by shuffling them around, and yet it seems to me that at least as far as Arizona is concerned, until we can arrive at either a minimal conclusion or some conclusion, we must continue to—we must continue to do without.

There is no alternative to that.

Mr. ELY. Let me say at once, Mr. Steiger, in response to your gracious remark, that California does not want any stalemate.

Quite the contrary. We are the ones, we now discover, who are most earnestly driving for realistic language in this bill looking to bring water into this basin. We stand exactly where we stood last year. We hope that Arizona will join hands with us to accomplish this.

These two States combined are a rather powerful factor to bring that about. If we fall apart, obviously we are not.

Now, let me say this, too, that if two and a half million acre-feet is imported from the streams of northern California—and it may very well come from there—the maximum advantage that California can get out of that is of the order of a few hundred thousand acre-feet. This is all we have at risk on any foreseeable shortage allocation formula the Secretary could dream up and that the Supreme Court would sustain in light of the article II(b)(2) of the decree.

We are prepared to have the Secretary, the Commission, anybody else, seriously look at a plan to take from the streams of northern California two and a half million acre-feet for the rescue of the entire Colorado River Basin by putting that quantity into the main stream, even though the amount we get back out of it is less than 20 percent of what we contribute. I am not saying that that will be the end result, but it is a conceivable one and we are willing to have that possibility put on the chopping block with every other plan.

We are not seeking stalemate. We are seeking survival for all of us, even if it means we dedicate more water from our streams to the Colorado that we take out, by a considerable margin.

Mr. STEIGER. Thank you, Mr. Chairman.

Mr. JOHNSON. I guess that completes the questioning of the witnesses.

Does counsel have any questions?

Mr. MCFARLAND. No, Mr. Chairman.

Mr. JOHNSON. I am very sorry I was unable to be here and hear you gentlemen from California in your testimony this afternoon but I was detained in another meeting dealing with the intertie.

I want to say that power problems are just about as complicated as water matters. We sat for 3 hours this afternoon while you people were here giving us the benefit of your testimony.

Especially, Mr. Gianelli, I want to welcome you here today as our new Water Resources Director from the State of California. I have had an acquaintance with you for a long time. I served in the

Senate of the State of California and since coming to Washington, I want to say that I am very proud to have you representing the State of California.

Mr. GIANELLI. Thank you, sir.

Mr. JOHNSON. I have no questions because I did not get the benefit of your testimony. I do know that you all made a good case for California's position in this and I am sure that you will follow the legislation as it progresses. We hope it does progress.

(The following statement of Robert F. Carter is included in the record at this point with permission granted of p. .)

STATEMENT BY ROBERT F. CARTER, GENERAL MANAGER, IMPERIAL IRRIGATION DISTRICT

Mr. Chairman, members of the committee, my name is Robert F. Carter, and I am general manager of the Imperial Irrigation District. It gives me great pleasure to have this opportunity to appear before your committee.

The purpose of my remarks will be to focus attention on the subject of losses in the All-American Canal within the scope of water conservation and salvage.

The Bureau of Reclamation has advocated that lining of the All-American Canal would result in a significant savings of water. I refer to testimony before this committee, August 23, 1965, by Mr. Floyd E. Dominy, Commissioner, Bureau of Reclamation, at page 112 of the official transcript of Hearings on H.R. 4671, six lines from bottom of the page: "... The lining of canals, such as the All-American Canal system, is another source of significant water savings . . ."; and to testimony before the Senate Subcommittee on Irrigation and Reclamation, April 9, 1964, by Mr. Stewart L. Udall, Secretary of the Interior, at page 315 of the official transcript of Hearings on S. 1658, in the second paragraph of the item titled "Water Salvage": "... The lining of canals such as the All-American Canal system, is another source of significant water savings . . ."

Reference is also made to a colloquy between Congressman Foley and Congressman Udall at page 276 of the official transcript of Hearings on H.R. 4671, in which Congressman Udall states that the All-American Canal "... is not a lined canal, of course, and needs linings and a good deal of water could be saved if it were done. That is part of the bill, to have studies made and determinations made as to how the losses in the All-American Canal could be cut down."

Nothing is said in the referenced testimony, however, about the quantity of water to be salvaged or the tremendous cost involved. My purpose in making this presentation today, is to spread the facts before this committee in order that an impartial judgment may be made as to what constitutes "significant water savings," and what the cost of such water savings would be.

The All-American Canal heads at Imperial Dam on the Colorado River and flows westerly for a distance of 79.7 miles into the Imperial Valley. Enroute it serves the Reservation Division of the Yuma Project in California, the Valley Division of the Yuma Project in Arizona, and transports a portion of the waters destined for Mexico in satisfaction of the Treaty. It then serves the Coachella Valley County Water District via the Coachella Branch of the All-American Canal and the Imperial Irrigation District in Southern California.

Topography divides the Canal into four general reaches as follows:

1. The first reach of 20.1 miles, downstream to Pilot Knob, roughly parallels the River, and it is generally accepted that any seepage in this reach finds its way back to the River. For this reason lining is not being planned for this reach at this time, we believe, and the first reach of the Canal down to Pilot Knob will not be considered in the remainder of my remarks.

2. The second reach of 15.3 miles, designated as Ponding Test Reach No. 2 on the map before you (Exhibit 1) runs from Pilot Knob to Drop No. 1 at the Coachella Canal turnout, and is considered to be the reach of greatest loss in that it traverses the sand hills area of the desert.

3. The third reach of 20.3 miles traverses the East Mesa Unit from Drop No. 1 to the East Highline Canal at the eastern edge of Imperial Valley. This also is a desert reach, but losses are less here than in the second reach.

4. The fourth reach of 24.0 miles stretches across the floor of Imperial Valley from the East Highline Canal to the West Side Main Canal. In this reach, which includes Ponding Test Reach No. 1 on the map before you (Exhibit 1) the losses are exceptionally low.

I will be referring to the second, third and fourth geographically divided reaches of the Canal in my remarks to follow, therefore, I would like to call your attention again to the general map (Exhibit 1) and point out these divisions as follows:

The second reach is coincident with Ponding Test Reach No. 2 as marked on the map, the third reach extends from the western or left end of Ponding Test Reach No. 2 to East Highline Canal turnout near the center of the map. The third reach extends from the East Highline Canal to the end of the All-American at West Side Main Canal turnout.

The All-American Canal, as I have described it, has been in service for twenty-five years as an unlined canal and I will present facts to demonstrate that it has substantially sealed itself over those years. The size of the Canal is shown by its capacities, which, in the first reach varies from 15,155 to 13,155 c.f.s.; in the second reach its capacity is 10,155 c.f.s.; in the third reach the capacity varies from 7,600 to 6,800 c.f.s.; and in the fourth reach the capacity varies from 5,060 to 2,600 c.f.s.

Until 1966, the best information on losses in the All-American Canal was based on inflow-outflow operational records for the various reaches relying primarily in current meter measurements.

Following the hearings in 1965, on H.R. 4671, officials of the Southern California Development Office of the Bureau of Reclamation contacted us regarding the possibility of conducting ponding tests on the All-American Canal for determination of loss rates. We were glad to cooperate and the two tests were subsequently performed. During January 17-19, 1966, a forty-eight hour ponding test, for determination of seepage loss rate, was conducted on the terminal 6.5 miles of the All-American Canal shown on Exhibit 1 as Ponding Test Reach No. 1. The test was carried out under the observation of the Southern California Development Office of the Bureau of Reclamation, San Bernardino, California. The results of the test showed an exceptionally low rate of loss of 0.04 cfd (cubic feet per square foot of wetted area per day). The loss rate of 0.04 cfd falls below the range of loss for concrete lining, which is generally accepted as 0.05 to 0.5 cfd depending upon age and condition. In the Department of Interior's Pacific Southwest Water Plan—1964, Chapter IX, page 1, under "Canal Lining and Sealant," it is stated that "Limited seepage tests have shown that linings will reduce seepage to an average value of approximately 0.2 cubic foot per square foot per day. One presently existing intangible factor is the cost of maintaining the lining in a serviceable condition."

The first test was in the reach of least expected loss rate. We then turned to the area of greatest expected loss rate, the second reach, Pilot Knob to Dye No. 1, shown on Exhibit 1 as Ponding Test Reach No. 2. From January 10 to 5, 1967, a forty-eight hour ponding test, for determination of seepage loss rate, was conducted on this 15.3 mile sand hill reach. This test was also carried out under the observation of the Southern California Development Office of the Bureau of Reclamation. Other observers included representatives of the United States Geological Survey, Ground Water and Surface Water Branches, Yuma, Arizona. The test revealed a loss rate of 0.40 cfd, only one third as much as the 1.2 cfd the Bureau of Reclamation had estimated the rate to be. Please refer to Exhibit 3 for a comparison. Again I wish to point out that the loss rate of 0.40 cfd in this desert reach is within the accepted range for concrete linings of 0.05 to 0.5 cfd.

Again referring to Exhibit 3, it will be noticed that the loss in acre-feet per year based on the design wetted area is only 55,000 acre-feet and not 165,000 acre-feet as estimated by the Bureau of Reclamation.

The Imperial Irrigation District plans to conduct seepage loss tests on a portion of the All-American Canal lying between ponding test Reaches No. 1 and No. 2. However, it can be reasonably expected that the loss rate for an intermediate portion of the Canal would range between the established rates of 0.40 and 0.05 cfd.

Turning briefly to the fourth or terminal reach across the Imperial Valley floor, the loss rate established of 0.05 cfd in Ponding Test Reach No. 1, we indicate that the Canal has sealed itself in this reach obviating the need for further consideration of concrete lining.

This, then, will confine the remainder of my remarks to Ponding Test Reach No. 2 and the third reach from Drop No. 1 to East Highline Canal. In this third reach the average annual loss based on operational records for the period 1962 to 1966, is 42,000 acre-feet. Using the design wetted area, the loss rate for this reach is only 0.28 cfd or slightly above the 0.2 cfd that the Government has determined as the approximate average for concrete lining. This fact also demonstrates that the Canal has quite effectively developed a natural seal.

Referring once again to the Pacific Southwest Water Plan—1964, Chapter VIII, page 5, it is "estimated that 500,000 acre-feet of water could be conserved annually" by "lining of canals in Imperial and Coachella Valleys." It may be that the Bureau of Reclamation has revised this figure downward upon further study, we do not know. We do know, however, that the lining of the desert reach of the All-American will not produce but a fraction of this amount in water saved. I will demonstrate this point as follows:

The ponding test in Test Reach No. 2 revealed the loss rate to be 0.40 cfd and the loss between Pilot Knob and Drop No. 1, therefore, to be 55,000 acre-feet per year. See Exhibit 3. The five year average loss in the third reach, Drop No. 1 to East Highline Canal is 42,000 acre-feet, for a total loss between Pilot Knob and East Highline Canal of 97,000 acre-feet per year for this 35.6 mile reach.

To those acquainted with the service area of the All-American Canal, it is obvious that the present Canal cannot be taken out of service for long enough periods for it to be lined and that a new canal would have to be constructed. The All-American Canal serves almost 60,000 irrigated acres in Coachella Valley and 435,000 irrigated acres in Imperial Valley, and, in fact, is the only source of water for the cities and farms of Imperial Valley. It is interesting to note that during the ponding test in the Pilot Knob-Drop 1 reach, it was necessary to stop the flow of water for the 48-hour test period and this became the first time in twenty years the Canal had stopped flowing.

Assuming that a new concrete-lined canal were to be constructed for this 35.6 mile reach, the wetted area would not be more than one fourth less than that of the present earth section due to the relatively flat gradient involved. Taking the present design wetted area of the Pilot Knob-Drop 1 reach and reducing it by 25 percent for a new concrete section, and applying the average loss rate for concrete linings of 0.2 cfd, the annual loss for the 35.6 mile reach would be 45,000 acre-feet. Comparing this to the present loss of 97,000 acre-feet would result in a saving of 52,000 acre-feet per year, or 2,000,000 acre-feet in the forty-year pay out period of the new canal.

It is generally agreed that it would cost \$1,000,000 to \$1,500,000 per mile to line the All-American Canal. Applying these unit costs in proportion to the size of the section in the reaches involved we have the following:

15.3 miles at \$1,500,000-----	\$22, 950, 000
20.3 miles at \$1,000,000-----	20, 300, 000
Total (35.6 miles)-----	43, 250, 000

Say \$43 million.

To amortize \$43,000,000 over a 40-year pay out period at 3½ percent would add \$28,000,000 in interest for a total cost of \$71,000,000.

When the \$71,000,000 is divided by the 2,000,000 acre-feet of water to be saved, the result is a unit cost of \$35.50 per acre-foot. Obviously the agricultural economy of Imperial Valley could not survive with an additional burden of \$35.50 an acre-foot added to its present obligations.

At this point I would like to refer to my statement before this committee on August 27, 1965, found on pages 604 to 606 of the official transcript of Hearings on H.R. 4671. I state therein that the total number of canals and drains within the service area of the Imperial Irrigation District amounts to over 3,000 miles. Deducting the drains leaves 1,600 miles of canals and laterals of which over 300 miles will have been concrete lined by the end of this year. Of the 1,300 miles remaining, approximately half would not result in any significant water savings from lining because of sections lying below the natural surface or in impervious soils. The remaining 600 to 700 miles is programmed for lining at the current rate of 70 miles per year and an annual cost ranging from \$1,260,000 to \$2,800,000, or, to put it another way, from \$18,000 to \$40,000 per mile.

In conclusion I would like to refer you to Exhibit 2, which is a diagrammatic sketch titled "Water Transportation Hoover Dam to the Water User," in order to demonstrate graphically what is involved in getting water to the fertile fields of Imperial Valley. I would also like to emphasize that the All-American Canal structures and several structures on the main canal distribution system are controlled electronically from the Imperial headquarters of the District in the interest of water conservation. Further, I would like to say that the water is then taken over by *zanjeros* in radio-equipped District pickups who move it on through the system to the farmers' delivery gates in a way that uses the water to the greatest advantage as far as conservation is concerned.

To summarize briefly, water loss on the All-American Canal is not nearly as great as some have believed it to be. Seepage losses in the Imperial Dam-Pilot Knob reach ultimately return to the Colorado River and concrete lining of that reach is not advocated by the Department of the Interior, we believe. A controlled ponding test in the Pilot Knob-Drop No. 1 reach revealed the loss rate to be only one-third of what the Government had estimated it to be. Operational records show that the third reach, Drop No. 1 to East Highline Canal, has a loss rate only slightly higher than the approximate average for concrete linings. The fourth reach from the East Highline to West Side Main Canal should not be considered for lining in that the controlled ponding test included in this reach showed the loss rate to be extremely low and would not be reduced by lining.

Therefore, any consideration for saving water on the All-American Canal by concrete lining would have to be from Pilot Knob to East Highline Canal. The demonstrated savings in water of approximately 52,000 acre-feet per year as a result of concrete lining would cost approximately \$35 an acre-foot over a 40-year pay out period at 3½ percent simple interest. This would result in a financial burden too heavy for the agricultural economy of Imperial Valley to bear.

As an alternative we would like to suggest that the Bureau of Reclamation engage in a study of other less costly means of salvaging this water. For example, a ground-water pump farm system along the desert reach of the Canal could be operated under demand conditions, which would have the dual effect of saving water by direct salvage and by regulation of flows.

We are desirous of conserving water where practical and will continue to cooperate in any reasonable program to do so.

[illegible]

EXHIBIT 3

LOSSES IN ALL-AMERICAN CANAL, PILOT KNOB TO DEOP No. 1, PONDING TEST
REACH No. 2, COMPARISON OF USBR AND IID FIGURES

U.S.B.R.

The Southern California Development Office of the U.S.B.R. has used an annual loss for this reach of 165,000 acre-feet, from which they obtain a loss rate of 1.2 cu.ft./sq.ft./day (cfd).

This annual loss figure was arrived at as follows:

U.S.B.R. loss rate 1.2 cfd.
Design wetted area 16,370,496 square feet.
 $16,370,496 \times 1.2 = 19,644,595$ cu.ft./day.
 $19,644,595 / 43,560 = 451$ A.F./day.
 $451 \times 365 = 164,615$, Say 165,000 A.F./year.

I.I.D.

The ponding test conducted January 3-5, 1967, under the observation of the Southern California Development Office of the U.S.B.R., revealed the loss rate to be 0.4 cu.ft./sq.ft./day (cfd).

I.I.D. loss rate 0.4 cfd.
Design wetted area 16,370,496 square feet.
 $16,370,496 \times 0.4 = 6,548,198$ cu.ft./day.
 $6,548,198 / 43,560 = 150$ A.F./day.
 $150 \times 365 = 54,750$, Say 55,000 A.F./year.

Mr. JOHNSON. Tomorrow morning we will open up with the Secretary of the Interior as the first witness.

So the meeting stands adjourned until 9:45 tomorrow.

(Whereupon at 5:30 p.m. the committee adjourned, to reconvene at 9:45 a.m., Tuesday, March 14.)

H.R. 3300 AND SIMILAR BILLS TO AUTHORIZE THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE COLORADO RIVER BASIN PROJECT, AND FOR OTHER PURPOSES

S. 20 AND SIMILAR BILLS TO PROVIDE FOR A COMPREHENSIVE REVIEW OF NATIONAL WATER RESOURCE PROBLEMS AND PROGRAMS, AND FOR OTHER PURPOSES

TUESDAY, MARCH 14, 1967

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION OF
THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met, pursuant to recess, at 9:50 a.m., in room 1324, Longworth House Office Building, Hon. Harold T. Johnson (chairman of the subcommittee) presiding.

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs will come to order.

The purpose of our hearing today is to take testimony in connection with the various bills that were put into the record yesterday concerning the development on the Colorado River and the National Water Commission.

This morning our witnesses will be Hon. Stewart L. Udall, Secretary of the Interior, who has a full football team here with him this morning, I see: Assistant Secretary Kenneth Holum, Commissioner Floyd E. Dominy of the Bureau of Reclamation, Assistant Commissioner N. B. Bennett, Jr., Bureau of Reclamation, and Edward Weinberg, Solicitor, Department of the Interior.

I notice that Commissioner Dominy has his wife with him here this morning. I wonder if she would please stand up? [Applause.]

Mr. JOHNSON. We are very happy to have you here.

The Chair recognizes the gentleman from Colorado, Mr. Aspinall.

Mr. ASPINALL. I do not know whether the Commissioner is on the spot or the Secretary is on the spot or the Assistant Secretary is on the spot, but I can assure Mrs. Dominy that there will be no blood-letting this morning. [Laughter.]

Mr. JOHNSON. Mr. Secretary, we are very glad to have you before us this morning, with your full team.

You can give us the benefit of your views in connection with the development on the Colorado River and, also, the National Water Commission. You were a former member of this committee prior to my arrival here. I enjoyed serving with you in the Congress. We have had a very happy relationship since you have been Secretary, in matters dealing with the Nation and also with my own State and my own district.

I know you have a complete statement for us this morning, and if you will give us the benefit of that now, we will appreciate it very much.

STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE INTERIOR; ACCOMPANIED BY KENNETH HOLM, ASSISTANT SECRETARY, FLOYD E. DOMINY, COMMISSIONER, BUREAU OF RECLAMATION, N. B. BENNETT, JR., ASSISTANT COMMISSIONER, BUREAU OF RECLAMATION, AND EDWARD WEINBERG, DEPUTY SOLICITOR, DEPARTMENT OF THE INTERIOR

Secretary UDALL. Thank you very much, Mr. Chairman.

I do have a prepared statement. I shall read it. It is fairly concise. I think it covers the main points.

I will say to the chairman I am using the 3-5-4 formation here, if that is all right with you.

Once again, Mr. Chairman, it is my responsibility to appear before this committee on legislation dealing with Colorado River water problems.

Your hearings on the Colorado River legislation are combined this year with hearings on the National Water Commission bill, S. 20. I am indeed pleased that the committee has decided to hold combined hearings, for these two issues—how best to provide for Colorado River development, and the establishment of a broad-gaged, nongovernmental panel to consider and advise, from a national point of view, on fundamental issues and approaches covering the spectrum of water supply problems—are indeed interrelated. This interrelationship was noted by President Johnson in his January 30 message on conservation—"Protecting Our Natural Heritage"—for in renewing his recommendations for the establishment of the Commission, the President spoke specifically of the need to thoroughly explore every means for assuring an adequate supply of pure water to areas like the Southwest.

Accordingly, while we propose separate legislation—the Commission's responsibilities will encompass problems of all water-short areas—I shall deal with both in the course of these remarks.

As you have requested, Mr. Chairman, I am confining my testimony essentially to new matters not dealt with in our report of last year on H.R. 4671 or covered in the testimony which the Department presented at that time.

In August of 1965, when I appeared before this committee at the initial hearings on Colorado River Basin project legislation, hopes were high that a program to alleviate the most urgent water deficiencies and to initiate a long-range, comprehensive solution to the basin's water problems would be enacted by the 89th Congress. Unfortu-

nately, the issues involved proved to be so complex that time ran out before they could be fully resolved.

Although certain issues still remain in question a great deal of progress has been made. Although some still remain, in my estimation widespread agreement now has been reached on the proper disposition of a number of key issues. On the foundation of agreement already achieved I am optimistic that, in this session, the Congress can mold and enact legislation that will be an acceptable, as well as an adequate, basis for meeting both the short- and long-term water needs of the Colorado River Basin.

H.R. 3300 and related bills follow, to a considerable degree, H.R. 4671 as reported by this committee last August. We propose now an approach that differs in some particulars from that bill, but one which shares its basic objectives. These objectives are: (1) the establishment of a basis on which a comprehensive long-range solution to the many, varied, and complex water problems of the basin can be developed and carried forward; and (2) the authorization of water supply works to alleviate the most pressing and immediate water supply deficiency of the basin; namely, that of central Arizona. While the administration's original proposals have been modified in the light of further study and the developments over the past several years, these two principal objectives have remained and still remain paramount.

The Department's report on H.R. 3300 presents in detail the administration's views on Colorado River Basin project legislation pending before this committee. Enclosed with that report was a draft of bill incorporating the administration's recommendations.

As reported to you in the hearings on H.R. 4671 in August 1965, the administration proposed that certain broad issues of policy essential to development of a comprehensive solution to the water problems of the Colorado River Basin should be reviewed by a national water commission. This remains the view of the administration. I believe it highly important that such a commission be established now so that an early start can be made on the necessary studies. We have already lost more than a year in launching these studies. The Senate has already acted favorably on S. 20. I urge that this committee likewise take prompt and favorable action upon it, as well as upon the legislation dealing with the central Arizona project, the authorization of the Dolores and Animas La Plata projects, and other associated Colorado River Basin matters (in this legislation). I am confident that, once established, the National Water Commission will, of necessity, give urgent attention to the problems of the Colorado River Basin.

The Commission would be directed to review our national water resource problems in terms of projected needs and the alternatives available to satisfy these needs. These alternatives may involve improving the quality of our existing water supplies, discouraging marginal uses of water, redistributing it where approximate, or augmenting present supplies by a variety of techniques including desalination, weather modification, or other processing methods, and interbasin transfers. The Commission would also be directed to consider the sociological effects of water development as it affects the many aspects of the quality of our American environment.

As Chairman of the Water Resources Council, I can say that the studies and recommendations of the National Water Commission will be of great significance and value to the Council. We expect to be working very closely with the Commission and the legislation provides for such a close relationship. The Commission must, of course, report directly to the President, but we expect to participate very closely with the Commission as it prepares its reports as well as providing our views to the President on the Commission's studies presented to him.

The Commission will provide a means for obtaining the opinions and assistance of an independent and informed body of nationally recognized water experts. We all recognize that there exists a tremendous job to be done by such a Commission and we are anxious to take every step necessary to get this job started.

I have mentioned the Colorado and associated problems as only one example of the type of program which must be undertaken by this Commission. There are, of course, many others. I hesitate to enumerate these since to do so might incorrectly be construed as disapproval of those not mentioned. This I most certainly do not wish to do.

We are threatened yearly with water crises in different parts of the country, involving pollution, drought, and floods. Other examples abound of man's urgent need effectively to control the most important of our natural resources; a supply of usable water. The National Water Commission proposal takes another important step in the direction of recognizing the national nature of the water problems which we all know exist.

Another aspect of regional development involves the creation of a lower Colorado River development fund. Establishment of such a fund was recommended in our report on H.R. 4671 last year. It was essential, under previous proposals, to the financial integrity of the central Arizona project. Our present proposal for the central Arizona project, which I shall discuss later, eliminates its dependence on a development fund for financial assistance. However, should the Congress desire to establish such a development fund to provide financial assistance for future water projects for the lower basin, the administration offers no objection. Legislative language designed to accomplish this objective is included in our report.

Substantial questions related to the comprehensive development of the Colorado River, both as to propriety and necessity, are involved in determining whether main stream dams should be built at either the Marble Canyon or Hualapai sites. This has been one of the most controversial issues involved in Colorado River Basin project legislation. Our report on H.R. 4671 supported authorization of the Marble Canyon Dam while recommending that decision on Hualapai Dam be deferred pending review by the National Water Commission.

Our present proposal for the central Arizona project provides a substitute for the low cost pumping power and financial assistance that would have been furnished by the Marble Canyon development. In view of this, and after further consideration of all aspects of the matter, we have concluded that the highest and best use of the Marble

Canyon site is to retain it in its natural state as an addition to the existing Grand Canyon National Park.

Following our formal report on H.R. 3300 we transmitted to the Congress a draft bill to accomplish this addition. This has been within the last few days. Should it be the committee's desire, Mr. Chairman, to include the park extension in the legislation authorizing the central Arizona project, we would have no objection.

As shown on the map referred to in the draft bill, the Marble Canyon addition to the park would extend up the river about 55 miles, following generally the westerly rim of the canyon to the section line above Lee's Ferry.

The addition includes 28,300 acres of which 14,336 acres are national forest lands, 11,264 acres are public lands administered by the Department, and 2,700 acres previously withdrawn for the Glen Canyon project which is also, of course, administered by this Department. By agreement with the Secretary of Agriculture, some small additional amount of national forest land would also be included in the Marble Canyon addition to areas for scenic overlooks. The proposed addition does not include the easterly side of the canyon within the Navajo Indian Reservation.

We also propose, with the concurrence of Secretary Freeman and the Forest Service, to round out Grand Canyon National Park by adding two other areas now adjacent to the park within the Kaibab National Forest. One is a very small area of 640 acres contiguous to the present south boundary to protect the south rim drive; the other—the Kanab Creek area of some 38,500 acres—contains the north side of the Grand Canyon itself and the lower 7 miles of the spectacular Kanab Creek Canyon. Of this area, a small portion, 1,170 acres, is public land under the jurisdiction of this Department. In addition to straightening a portion of the boundary to the east of the Kanab Creek area, we propose to delete about 200 acres of park land and add 400 acres of national forest land.

In respect to the Hualapai Dam, the position of the administration remains unchanged. We believe that consideration of it should be deferred pending evaluation of the issues by the National Water Commission. In the meantime, this site, as well as the Marble site if the park addition proposal is not included in this bill, should be removed from the operation of part I of the Federal Power Act. In view of our recommendations respecting the central Arizona project, deferment of decision on Hualapai need not affect authorization of the central Arizona project, nor will deferment of decision for a period of some years be critical to long-range plans for the Colorado River Basin. Once the report of the National Water Commission is available, decisions concerning the long-term water future of the Colorado Basin can be made.

A final comment I would like to make on the general provisions of H.R. 3300 concerns the so-called "4.4 million acre-foot priority to California." Provisions similar to those of H.R. 3300 were included in H.R. 4671 by agreement among the States. In reporting on that measure in April 1965, we stated the belief that such a priority would not have to be invoked but we regarded it as appropriate since it represented what was then an agreed upon compromise between Arizona and California. The year before, in reporting out S. 1658 in the 88th

Congress, the Senate Interior Committee had also included a "4.4 priority" with a 25-year limit.

Recent studies of the central Arizona project by the Bureau of Reclamation have assumed a "4.4 priority" to be in effect, a plan that we are presenting here today. As a planning assumption, the "4.4 priority" is conservative in that, of the various probable methods of apportioning shortages, it assumes the economic and financial conditions most adverse to the central Arizona project. Nevertheless, the project has a benefit-cost ratio of 2.5 to 1.0 on both a 50-year and a 100-year basis, considering total benefits, and a 1.5 to 1.0 benefit-cost ratio on both a 100-year and a 50-year basis if only the direct benefits are considered. If the "4.4 priority" were omitted from the assumptions, the benefit-cost ratio and repayment of the project would be improved.

The administration continues to believe that the question of an interstate priority is one for resolution primarily by the States involved and by the Congress. If agreement can be reached on an interstate priority, we would offer no objection to it.

In respect of the second principal objective of our proposed program for the Colorado River Basin, that of alleviating the most immediately urgent water supply deficiencies, the required action at this time in the lower basin remains the authorization and construction of the central Arizona project.

The rapidly lowering ground water levels, the agricultural lands going out of production and that have already gone out of production, the expanding population, the mounting needs for municipal and industrial water, and the prospects of economic stagnation if relief is not provided, all argue strongly for the need to go ahead with the central Arizona project. Our studies, which show that the benefits from the project will exceed costs by a wide margin and that repayment of all reimbursable costs is in prospect, amply demonstrate the economic and financial soundness of the project. I know of no serious opposition to the central Arizona project nor of any valid question as to its justification.

Thus, we continue to urge that the central Arizona project be authorized. This year, as I have already indicated, we have developed a plan that eliminates the need for a Colorado River hydro project and for reliance on a development fund.

Following the close of the last session of the Congress, the Department of the Interior, in concert with the Bureau of the Budget, made an exhaustive study of alternative plans to serve the central Arizona area involving both old and new concepts. The one ultimately selected is the one involving Federal prepayment power arrangements embodied in the draft bill we have transmitted to this committee. A summary report on this plan was submitted to the committee as a supplement to the Department's legislative report on H.R. 3300.

The proposed plan of development for the central Arizona project remains the same in all major physical features as previously proposed except for the source of pumping energy required for project pumping needs. I would like to discuss briefly how the Federal prepayment arrangements for project pumping power and energy would work.

Current studies indicate that 400,000 kilowatts of capacity would be required in connection with the central Arizona project, with the Granite Reef aqueduct sized at 2,500 cubic feet per second.

Under our proposal the Secretary of the Interior would make arrangements with non-Federal interests to acquire the right to a portion of capacity and associated energy from the output of a large thermal generating powerplant as necessary to serve project pumping purposes. The right would also include delivery of the power over jointly shared transmission facilities.

Payment for the capacity entitlement would be made to the plant owners from time to time during the construction period by advancing a portion of construction costs in a ratio not to exceed the ratio of the capacity entitlement acquired to the total plant capacity. Transmission of power and energy to points of project use would be provided both by Federal construction of transmission lines and by payment for capacity in lines jointly used by the plant owners and the Government, through the Government advancing a portion of the costs of such dual-use lines, again in a ratio not exceeding the ratio of the capacity requirement of the Government to the total capacity of such facilities.

In addition to the payments associated with construction, the Government would also meet currently a commensurate portion of the annual operation and maintenance requirements, including such items as advances for working capital, and replacement costs as they occur. The United States should not participate in such costs as interest, financing charges, taxes, or other similar items. The agreement would be so drawn as to provide adequate security for the Government's investment.

Moreover, there will need to be arrangements for exchanges of power, under contract, to assure backup and continuation of essential pumping during periods of equipment outages.

In this way, the project would obtain assured power for pumping at a low cost reflecting the economy—that can be achieved today—of large thermal electric powerplants; shared economical, high-capacity, extra-high-voltage transmission facilities; and the benefits of Federal financing.

The Federal costs would become costs of the central Arizona project to be repaid by the project beneficiaries as are other reimbursable costs, following long-established reclamation policies.

For purposes of estimating power prepayment cost, we have assumed that the coal-fired powerplant would be located near Page, Ariz., adjacent to Lake Powell. It is contemplated that such a plant would burn coal obtained from the Black Mesa fields of the Navajo-Hopi Indian Reservations in northeastern Arizona. The actual plant which would be involved would, of course, depend upon the plans of the utilities as well as upon upcoming negotiations.

An outstanding example of a large-scale prepayment arrangement for future power is the purchase by a group of Pacific Northwest public and private utilities for a 30-year period of Canada's share of increased power generation under the Columbia River Treaty. Another recent example is the prepaid purchase by the Salt River Project Agricultural Improvement and Power District of a portion of the output of the steamplant at Hayden, Colo., constructed by Colorado-Ute Electric Association, Inc.

While the prepaid purchase of pumping power from a non-Federal thermal electric plant is new in reclamation history, the provision of pumping power for project use is, itself, customary.

On the basis of discussions we have had with them, I anticipate no difficulty in negotiating arrangements, consistent with the principles I have discussed, with the members of the WEST planning group that have expressed an interest and willingness to participate in the project. Through such arrangements we estimate that project pumping energy would be available at a cost to the central Arizona project of 3 mills per kilowatt hour for irrigation water pumping and 5 mills per kilowatt hour for municipal and industrial water pumping. Power and energy surplus to project pumping requirements—which will not contribute significant quantities until after 1990, and then only if Colorado River water deficiencies have not been overcome—is assumed to have an average value of 5 miles per kilowatt hour. The disposition of this surplus power will benefit the project in amortizing the prepayment investment and in assisting in repayment of project costs allocated to irrigation.

With the availability of such low-cost power, central Arizona project revenues could repay all reimbursable project costs within 50 years with the necessity for outside financial assistance. Irrigation water would be sold at an average canal side rate of \$10 per acre-foot. No new lands would be developed and the water made available for irrigation would be restricted to replacing ground water now being pumped. Municipal and industrial water could be sold at a rate of \$50 per acre-foot in combination with an ad valorem tax of six-tenths of a mill per dollar of assessed valuation on the taxable real property of the central Arizona service area, the three counties which would benefit. Alternatively, municipal and industrial water could be sold for \$56 per acre-foot with no ad valorem tax, or some combination which would produce the same financial results might be adopted. We take a flexible approach to this part of the problem. These decisions as to municipal water rates and ad valorem taxes will involve close consultation with the local people; we take a flexible approach. They should make those decisions. The legislation we propose will provide the necessary flexibility.

I have included as an attachment to this statement a table summarizing the economic and financial analysis of the central Arizona project as we propose it at this time.

Like H.R. 4671, H.R. 3300 contains provisions authorizing certain upper basin projects as additions to the Colorado River storage project. It also contains a number of provisions affecting Upper and Lower Colorado River Basin relationships. On these matters our position is essentially as it was last year. Authorization now if the Animas-La Plata and Dolores projects is recommended. We do not object to the inclusion of the substance of the provisions dealing with upper and lower basin matters of common concern; the draft of bill accompanying our report on H.R. 3300 includes them.

The major features of legislation which the administration supports, and which I have just outlined, would, I believe, solve the most immediately urgent water deficiencies in the Colorado River Basin and provide a significant start toward a comprehensive long-range solution to the overall water problems of the basin. The decisions

which we recommend be deferred are not critical, nor essential to moving ahead at this time. If made in light of the guidance and advice of a distinguished National Water Commission, they will merit widespread confidence and support. I am confident, under such a climate, the prospects of moving swiftly and harmoniously toward a full solution to the many complex and varied water problems of the Colorado River Basin will be immeasurably enhanced.

It is my hope that the Congress will follow this path.

I will be delighted to answer any questions that you may have at this time.

Mr. JOHNSON. Thank you, Secretary Udall. The table that is attached to your statement will appear in the record.

Do I hear any objection?

Hearing none, it will be so ordered.

(The table entitled "Central Arizona Project" follows:)

Central Arizona project, economic and financial analysts

Project costs:	
Main aqueduct system-----	\$416,860,000
Reservoir system-----	132,237,000
Drainage system-----	10,500,000
Power generation and transmission arrangements-----	91,950,000
Indian distribution system-----	19,970,000
Water salvage and recovery program-----	42,450,000
Fish hatcheries and wildlife refuge-----	5,250,000
Total -----	719,217,000
Cost allocation:	
Reimbursable:	
Irrigation -----	322,301,000
Municipal and industrial-----	194,029,000
Power -----	91,950,000
Irrigation -----	48,366,000
M. & I. and commercial-----	43,584,000
Recreation -----	1,525,000
Fish and wildlife-----	294,000
Total reimbursable-----	610,099,000
Nonreimbursable:	
Flood control-----	11,164,000
Recreation -----	4,818,000
Fish and wildlife-----	23,835,000
Indian distribution system-----	19,970,000
Water salvage and recovery-----	42,450,000
Fish hatcheries and wildlife refuge-----	5,250,000
Total nonreimbursable-----	107,487,000
Prepaid investigation costs-----	1,631,000
Total -----	719,217,000
Benefit-cost ratios:	
Total benefits (both 100 and 50 years) -----	2.5 to 1.0
Direct benefits (both 100 and 50 years)-----	1.5 to 1.0

Repayment

All reimbursable costs would be repaid within a 50-year period from project revenues. Estimated average rates for project services are as follows: irrigation water \$10 per acre-foot at canalside; municipal and industrial water—\$50 per acre-foot at canalside in conjunction with an ad valorem tax of 0.6 mills per

dollar of assessed valuation on taxable real property in the central service area or \$56 per acre-foot without an ad valorem tax; commercial power—5 mills per kilowatt-hour. Reimbursable recreation and fish and wildlife costs would be returned from local contributions.

Mr. JOHNSON. Are there any further statements to be made on the part of the people accompanying you here?

Secretary UDALL. They are here to be sure that we have all of the answers to all of the questions, if we can, Mr. Chairman.

Mr. JOHNSON. All right.

Your recommendations which you sent to the committee some time ago, at the committee's request, have been included in the record, along with the proposed bill that you have suggested—they have been made a part of the record.

I will now turn to the chairman of the full committee, the gentleman from Colorado.

Mr. ASPINALL. Thank you, Mr. Chairman. I am happy to be back in this meeting where we are speaking again about the central Arizona project and related matters. In 1944 we became aware of this situation in Arizona and its ambitions to use this water. And, after that, the people of Arizona decided that it was better to go along with the other people in the basin. I became favorably impressed with their ambition. I know of their need. On the other hand, I must say that I have been at a loss a good many times between that period and today, to understand some things.

In 1949, an entirely different project was proposed, and during the last 5 years there have been three projects proposed for Arizona. I have since wondered if those who purportedly speak for Arizona wish to go into this matter of the development of whatever resources they have in the Colorado River.

Still, cooperating with them, I, as chairman of this committee, tried to get an overall program for the development of the Southwest. I assure you that, while I desire something that is beneficial for Arizona, I also desire something that is beneficial to the other users along the river and that is at least a good business operation for the Government of the United States, as well as for the people of the area.

What you propose in the new bill, Mr. Secretary, is, in reality, a new reclamation policy as far as repayment is concerned, is it not?

Secretary UDALL. Insofar as the repayment of power proposal, this does represent a new policy.

Personally, Mr. Chairman, I hate to see the reclamation program, in view of what it has done for the West and is doing and will do in the future, tied permanently to any one method. I think that if the committee will look openmindedly at the power prepayment proposal, that this may be very useful, when one looks on down the road 25 years, in making the reclamation program a more viable program in the future.

Mr. ASPINALL. Mr. Secretary, if we are going to have a departure from the established policy, is it not better to have a clean-cut determination of whether or not this policy is going to be changed, rather than bringing it into a project authorization such as this?

Secretary UDALL. I understand the point that you are making, Mr. Chairman. I think, we acted of necessity, unlike the conditions leading to some of the changes that were made, for example, in terms of

cost sharing for recreation benefits. Perhaps it would be more ideal to consider this proposed policy separately. However, it came up in connection with this legislation, it has been pushed forward, and I do hope that the committee can give serious consideration to it in this context.

Mr. ASPINALL. Mr. Secretary, just how much further do we have to go, if we go ahead and establish the policy that the Department, and the administration, asks for in this legislation wherein the Department of the Interior, through the Bureau of Reclamation, would begin to own and operate steam power plants and nuclear power plants?

Secretary UDALL. I want to answer this question, Mr. Chairman, very directly, because this was one of the things that we had to give very serious consideration to in making our studies last fall. I think that, as should be very obvious to all members of the committee, substantially what we have attempted to do in this new approach is to reduce the cost and to reduce controversy. These were the two major objectives. As far as the prepayment-of-power part of the total picture, it was our feeling, on the basis of the analysis that we made, in terms of the problems that confronted this committee in writing legislation, in terms of the economics of the project, and in terms of taking advantage of the most modern technology, that this would represent a very good solution.

However, at no time did we consider seriously—I want to make a record on that, Mr. Chairman—the alternative of having the Bureau of Reclamation own, operate or get into the thermal power business.

I cannot think of anything else that we could do that would end in a new controversy and that would be even more inflammatory than some of the existing controversies. I think that if you will look carefully at what we have proposed—not that the Federal Government own a plant, but that it purchase power under prepayment arrangements which have been tested and tried—this is the safe ledge on which to put the new policy and not that of ownership. Nor are we proposing a future policy of ownership of thermal plants.

Mr. ASPINALL. Mr. Chairman—let me take another step—I think that the Secretary has gotten around a direct answer to the question. Let me go a step further. I do not want to produce any more controversy in this bill. In fact, it is controversy that you are trying to get rid of that promoted you to take this position on this bill at the present time. It is not on the cost of it.

Secretary UDALL. Both, Mr. Chairman. I think that with the type of very large thermal units that can be built now, that are on the drawing boards, that are under construction, that we are going to find that if we can participate, as we are confident we can, in one of these plants, that we will have economic factors that are favorable as well. This is particularly so, as compared with the Marble Canyon project, which we proposed a year ago and which quite frankly is not a first-rate hydroelectric power project.

Mr. ASPINALL. The question seems to be, Mr. Secretary, that these are assumptions all based on projections which may be good or which may not be good. There will be very few that would argue with you, at the present time that hydroelectric is cheaper, as far as this general power is concerned, than thermal power. That is the question.

Assuming the year 2025, which is a reasonable period within the consideration of the project now under study, with a 50-year repayment program, do you know what the contribution of the Hualapai Dam and power facilities would be to the overall economy with power prices as they are at the present time? Do you have that picture?

Secretary UDALL. Yes, sir; we do.

Mr. DOMINY. Its contribution to the development fund would be \$370 million, Mr. Chairman, by the year 2025, with a canal size of 2,500 second-feet for the Arizona aqueduct.

Mr. ASPINALL. What would the figure be for the contribution of Hualapai and its facilities, plus the funds that could be realized from Hoover, Parker, and Davis?

Mr. DOMINY. That would accumulate by the year 2025 a surplus in the development fund of \$768,166,000.

Mr. ASPINALL. And what would be the contribution of the prepayment plan as proposed by the administration, for the year 2025?

Mr. DOMINY. Under the prepayment powerplan, the development fund contribution would be zero, but it would have paid about \$72 million of the cost of the central Arizona project.

Mr. ASPINALL. That would have been paid, also, by the other plan?

Mr. DOMINY. That is correct; the development fund would have contributed a somewhat larger amount to financially assist the central Arizona project.

Mr. ASPINALL. Now, let us assume a period of 22 years later—which is a minor period for the contribution of a dam—the contribution would still be practically the same as your prepaid plan, so far as that is concerned. Is that not correct? You would not have anything after the year 2025.

Mr. DOMINY. Yes, we would have \$109,557,000 accumulated over and above the cost of the project that would be authorized here, Mr. Chairman.

Mr. ASPINALL. All right, then, what are the monetary benefits over the year 2047, which is the year I am using Hualapai and the power facilities?

Mr. DOMINY. That would be \$845,300,000 into the development plan.

Mr. ASPINALL. What would be the benefits of Hualapai Dam and power facilities, plus the contribution to the development fund of Parker, Hoover, and Davis?

Mr. DOMINY. That would be \$1,849,343,000.

Mr. ASPINALL. In other words, Mr. Secretary, your statement was correct as far as trying to get rid of the controversy is concerned. It is not, however, good economics, in my opinion, because you have very little left after the year 2025 through the prepay plan, and you have \$1 billion-plus—several times as much—from the other facilities. And this, of course, is the advantage of hydroelectric powerplants.

Secretary UDALL. If I may continue the dialog with you, there is one other aspect of this thing that particularly concerns me when I look at the long-term future of water development in the West, and I think the committee ought to reflect on it a little bit.

There are only so many prime hydroelectric damsites on the rivers. There is a limited number in the Colorado River Basin. We are al-

ready nearing the end of the line. Hualapai is really the last first-rate dam site on the river.

I am trying to stay out of controversy. [Laughter.]

Mr. ASPINALL. You say that you are trying to stay out of controversy. We thrive on it in this committee.

Secretary UDALL. The point that I am trying to make is that I think that in the long run there will have to be some solution. I do not like to see the reclamation program tied to hydros, because you can look on any chart that has been prepared on the future of hydroelectric power in this country and as to hydros there are only a limited number of sites, and they are going down and nuclear is coming up. This is the reason, in my judgment, that the prepayment approach with the private utilities in the region is not controversial and, I think, is the way out for the future of reclamation. I think that we are striking a blow for the future of reclamation in proposing it. I will make that very plain.

Mr. ASPINALL. I could not object to what you say, but you know as well as I do that there would not have been one single project in the upper basin without hydroelectric power production.

Secretary UDALL. I do not argue that at all. The whole past record of reclamation has been made possible because of hydro. What I am talking about is the next 50 years; where do we go from here?

That is what I am asking.

Mr. ASPINALL. The question is whether or not you want to stay with a constructive approach or whether you want to go someplace else. I know, as well as I do anything, that there are several groups—different groups—that are waiting, just for the determination of these hearings, to go before the Federal Power Commission in order to get licenses to go ahead and build that dam at Hualapai, or Bridge Canyon, and the dam at Marble Canyon, and perhaps another one at Kanab. They are here waiting for this. We are not going to get rid of the controversy just by this operation.

The question is whether or not you are going to work against the welfare of the general public or whether you are going to give encouragement to the general public, including private investors who would like to make a profit on this.

We do not settle anything by taking the administration's approach. We leave it wide open. The representatives of the Arizona Power Authority and representatives of the Southern California Edison Co. have been in my offices lately stating their ambitions and their plans. I am interested in their ambitions and in their plans. Anybody who has any position on the construction of facilities in the Grand Canyon is of interest, but this piece of legislation, that they are dreaming about, is a heaven that is out of reach.

Secretary UDALL. I want to make my position clear, because, in my judgment, the control on the Colorado River and other crucial areas or rivers should be in the Congress; it should be right in this committee, and that is what I am in favor of and what we have proposed. If the committee follows it, you would decide the Marble Canyon issue. The Congress would do so. This committee would. You would suspend the power of the Federal Power Commission with regard to the Hualapai site and reserve that power to this committee and to the Congress.

Mr. ASPINALL. Yes. That means that human beings will have to go through this controversy in the next 10, 15, or 40 years. That is all that means, if you do that.

Secretary UDALL. Where these types of interests converge as they have converged here, I am in favor of the Congress rather than the Federal Power Commission making the decision, and this is what I think needs to be done.

Mr. ASPINALL. Do you think that the Congress is going to go contrary to the wishes of the Federal Power Commission and its legitimate procedure on the question of the operation of the granting of licenses in Marble Canyon or at the Hualapai site?

Secretary UDALL. Mr. Chairman, the powers that the Federal Power Commission has were granted by the Congress, and I simply suggest that the Congress should make a decision on the rivers that are important in this country, and you decide what power the Federal Power Commission has. I do not think that the Federal Power Commission wants controversy any more than this committee does.

Mr. ASPINALL. That would take it out of this committee and put it in another committee. That is all that this means.

You say that you know of no serious opposition to the central Arizona Project that the administration proposed.

The problem, of course, under your proposal, is that there is no provision for long-term water supply for the central Arizona project, nor is there any provision that studies will be made; is that true?

Secretary UDALL. No, I could not accept that as a statement of the situation. We have adequate water, even assuming—as we assume in all of our studies the 4.4 priority for a viable project with a sound cost-benefit ratio.

Mr. ASPINALL. At whose expense?

Secretary UDALL. Well, I think at no one's expense.

Mr. ASPINALL. You are going to continue the central Arizona project as you propose it, to make it a lasting project, to serve the amount of water that is needed to make this a feasible project, and, if so who has to furnish that water, if you do that?

Secretary UDALL. Mr. Chairman, I want to make my position very clear on this point. I think one very big and bold and necessary assumption must be made.

As far as the long-term future of the river is concerned, the river is in short supply. This is the main fact of life on the river. This is what all of us have been talking about for the last 2 or 3 years, and I am convinced that the people of this large and fast-growing region are not going to sit by without providing plans that will be timely. And when the year 1990 or the year 2000 comes, you will have augmenting plans to the river whole.

I just proceed on this assumption.

So that I think, in terms of anybody bearing any shortage or deficiency, if we do our work right in the Congress and in the region, I do not think that there will be any deficiency.

Mr. ASPINALL. You do not answer my question: At whose expense must this project get water, even from the beginning?

Secretary UDALL. I do not understand. I do not understand your question. At whose expense—

Mr. ASPINALL. Under the provisions of the Colorado River compact, and along the river, whose entitlement will be used to make this project a feasible project?

Secretary UDALL. I think the anticipation is that water that Arizona uses during this period, as we have planned it, is water that will be available in the river that moves down the river by gravity, Mr. Chairman. That is all that I can say. I do not think it is taken from anybody. You cannot.

Mr. ASPINALL. Under any reasonable study of the water in the river at the present time, how much water is Arizona going to get from this whole priority in the lower basin of the 7.5 million acre-feet of water to be delivered at Lee's Ferry? How much water will be available under anybody's study at the present time for Arizona?

Mr. DOMINY. It is true that in the early years—

Mr. ASPINALL. What is true?

Mr. DOMINY. Under this project, it is true that upper basin water would be available, because your project—

Mr. ASPINALL. That is what bothers me. I thought that you would say that. I thought that the Secretary would say that.

Secretary UDALL. I concur with whatever he says. [Laughter.]

Mr. ASPINALL. I wonder who is going to be the receiver of the kick-off and who is going to be the final ball carrier? That is what I wondered when you came in. I would like to have Mr. Dominy give us these figures, because I have told you already that I was in favor of this project, but I am not about to permit entitlement of the upper basin to be jeopardized by this project.

Mr. DOMINY. Nor do we have any intention that it would be so, Mr. Chairman. We have worked diligently with all of the water authorities in your State and the other States of the upper basin as well as the lower basin, getting firm estimates as to the rate of project development that would be reasonable to forecast, and on the basis of all of those reviews with your people and others, we think that there will be 1,650 million acre-feet or 1,650,000 acre-feet available in the Colorado River up to 1975 for the Central Arizona Project.

By 1990, we think that will drop down to an average of 1,255,000 because of other uses being developed. Under the rights of the compact, by the year 2000, we are predicting that that will drop to an annual average of 1,026,000 acre-feet available for central Arizona.

Mr. ASPINALL. I will stop you there. In order to take care of Arizona's needs from this project, how much water do you need? Not to pay off the project, but to go ahead and take care of the needs of Arizona?

Mr. DOMINY. We recognized from the very start that this project is not a total panacea for the problems of the water supply in Arizona.

Mr. ASPINALL. I did not ask you that. I just want to know: How much water Arizona has to have and how much Arizona will have if you develop the upper basin by the year 2000?

Mr. DOMINY. By the year 2000 Arizona would still be needing, if it took care of all of its overdraft, more than 2 million acre-feet of water, instead of the 1 million that we think will be available. We know that there will be a declining agriculture base in Arizona unless there is augmentation to the river supply to pick up that deficiency.

But our studies, so far as the project-benefit cost ratios are concerned—the payouts are concerned—are based on a realistic appraisal that the water will not be there, because you have the rights under the compact to develop your projects in the upper basin, and we think that you will develop them on schedule by the year 2000.

Mr. ASPINALL. Maybe you will be able to place it in the record without going around the bush.

How much water does Arizona intend to take out of the Colorado River when this project is completed?

Mr. DOMINY. We would hope to divert on the average in the early years of 1,650,000 acre-feet.

Mr. ASPINALL. And how much do you expect to take out by the year 2000?

Mr. DOMINY. About 1,026,000 acre-feet, on the average.

Mr. ASPINALL. If the upper basin gets its entitlement, keeping in mind that the lower basin is entitled to the first 7.5 million acre-feet of water, what is Arizona's present entitlement out of the Colorado River.

Mr. DOMINY. It would drop ultimately to an average of about 675,000 acre-feet.

Mr. ASPINALL. That is it.

Mr. DOMINY. That amount would remain when you get all of your water put to work. We have calculated our studies on that basis.

Mr. ASPINALL. Mr. Chairman and Mr. Secretary, you referred to the fact that the legislation known as H.R. 3300, together with a combination of other bills which have been put into the record, carry the provision for the establishment of a National Water Commission. The Water Resources Planning Act of 1965, title I, states that the Water Resources Planning Council shall, and I quote:

Section 102(a) Maintain a continuing study and prepare an assessment biennially, or at such less frequent intervals as council may determine, of the adequacy of supplies of water necessary to meet the water requirements in each water resource region in the United States and the national interest therein; and

(b) Maintain a continuing study of the relation of regional or river basin plans and programs to the requirements of larger regions of the nation and of the adequacy of administrative and statutory means for the coordination of the water and related land resources, policies and programs of the several Federal agencies. It shall appraise the adequacy of existing and proposed policies and programs to meet such requirements; and it shall make recommendations to the President with respect to Federal policies and programs.

What is there in the bill recently passed by the other body, and in the proposal that is contained in H.R. 3300 and several other bills, that would give more power, or additional power, than is presently authorized in that law?

Secretary UDALL. I will have to agree with you that the Water Resources Council, under the act that you read, has very broad powers. It has the power to make very thorough-going studies of the kind contemplated by the National Water Commission, and some of these powers are being used.

The essence of the National Water Commission approach, however, is that this is really like the Paley Commission which studied minerals, raw materials, and some of the Hoover Commission findings.

It is an outside Government approach to the problem on the assumption, I think, that when you look at the big water problems that we face in the next 25 or 50 years, that it is wise from time to time not merely to have Government agencies and Government people make studies but to have distinguished outside people who, perhaps can detach themselves from the vested interests that Government agencies have.

So, I would have to agree with you that the Water Resources Council does have the power. Whether it is wise to have the Water Resources Council be given extra money to make such a study or to have a National Water Commission created, this is the problem, really.

Mr. ASPINALL. In the end, though, the Federal agencies and the Congress will make the decision, and the agencies will evaluate, first, the findings of the National Water Commission.

Secretary UDALL. This is quite so, Mr. Chairman, and we specifically—or I rather, as Chairman of the Water Resources Council—feel that we should not only work along with the Commission but that its report should come to the Water Resources Council, that we should make our own comments to the President and our own analyses, and that the final decisions, as we all know, will be made right here.

Mr. ASPINALL. At the end of the 5-year period, which is, as I understand it, the term of the National Water Commission, how much will we have paid out to have this duplicatory process, perhaps a necessary operation otherwise, that could have been taken care of by the National Water Resources Council?

Secretary UDALL. I am told that there is no figure in the bill. I think that this is a detail that perhaps we need to go into.

Mr. ASPINALL. When you come before this committee on this legislation, on the bill yourself, you will have to have a figure to justify it. The other body, does not care about the cost of these operations particularly, but we are a little bit more careful about that. I would suggest that if you do not have that figure now that you had better get it and put it in the record at this place.

And if they can do that, Mr. Chairman, I would ask unanimous consent that it be done.

Secretary UDALL. That is a very good point, and I think that we should provide a solid estimate for the committee.

Mr. JOHNSON. The gentleman from Colorado has asked for unanimous consent to have this inserted into the record.

Is there any objection?

Hearing none, it is so ordered.

(The information follows:)

It is estimated that the National Water Commission will require total appropriations of 5 million dollars. This represents appropriations of about one million dollars per year for the five-year term of the Commission. These funds would be used to finance the staff and administration costs of the Commission as well provide funds for studies which would not otherwise be funded by the Water Resources Council or through the regular programs of other Federal agencies.

Mr. ASPINALL. I reserve the balance of my time.

Mr. JOHNSON. The Chair recognizes the gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Mr. Secretary, once again I find myself in a rather unusual position.

I am supposed to be the loyal opposition to the administration down at the other end of Pennsylvania Avenue, and for some strange reason I find myself burdened with the responsibilities that they have, because I, apparently, am one of the few on this committee who feels that they are on the right track.

So, Mr. Secretary, I would like to——

Secretary UDALL. We will take all of the allies we can get. [Laughter.]

Mr. SAYLOR. I told you before, that when I think you are right I am for you, and I reserve the right, however, to oppose you when I think that you are wrong.

On this proposition, I want to tell you that I think you are right; that is, in what you have recommended to this committee.

There has been quite a fuss raised here about whether or not this is a new policy and whether or not we should not contribute all new hearings to a new policy. If my memory serves me correctly, there was a project in Colorado that this committee approved which completely changed the entire philosophy of the Bureau of Reclamation. It had to do with a specific policy known as the Collbran project, a formula, in which we suddenly ended up having the Bureau of Reclamation come forward and tell us that hereafter all of these projects would comply with that formula.

Has anybody in your Department—Have you heard of anybody putting up any objection to the Bureau having used the Collbran formula in another place?

Secretary UDALL. I think that you are correct in the sense that there have been policies evolved. This is the point that I was trying to make to the chairman a moment ago. I think that the ideal way is to make policy interpret legislation, but some of the important reclamation policies, such as the Collbran formula, were developed out of actually processing of legislation, particular legislation, by the committee.

Mr. SAYLOR. Now, Mr. Secretary, I just wanted to tell you that we have had some questions asked here about how much we were going to have in this fund by 1990, and I would like to ask: How much will we have in that fund, if we take the proceeds from Hoover, Parker, and Davis dams, by the year 1990?

Mr. DOMINY. There would be no Hoover, Parker, Davis contribution by the year 1990. By the year 2025 it would be \$500 million, and by the year 2047, it would be \$828 million, Mr. Saylor.

Mr. SAYLOR. I am just glad to know that it goes back up in the billions. I am sure that if we did not build Bridge Canyon we would be down in small figures.

They have made great pains about that, and I would like to ask you whether or not the information that I have gained over the years is correct: If we build large reservoirs in that area, we have a larger factor known as evaporation. Is my information correct?

Mr. DOMINY. That is certainly true on the large storage reservoirs like Lake Powell and Lake Mead.

Mr. SAYLOR. Something has been said about Bridge Canyon, about its evaporation losses. What would the annual evaporation be if we built Bridge Canyon?

Mr. DOMINY. The Hualapai Reservoir, of course, is smaller, much smaller as a reservoir, and it would only evaporate about 85,000 acre-feet per year.

Mr. SAYLOR. Mr. Dominy, you may call Hualapai if you want. You can change its name to anything you want to change it to. It is still in Bridge Canyon, being built in the Grand Canyon of the Colorado River, and is built to specifications which I have seen. It will invade Grand Canyon National Monument and proceed on out some distance into Grand Canyon National Park.

One other thing, Mr. Secretary, that disturbs me about these bills that have been introduced. Instead of trying to attack the problem which Arizona has, which is what we started out to do, it seems that everybody in the Nation wants to get into the picture. It seems that we have saddled onto this project everything in the upper basin and in the lower basin.

Now, have we any precedent for this? And, since we are looking for precedence here, has there ever been a case where one project in a basin has had to carry all or most all of the projects or new projects in the basin?

Secretary UDALL. Congressman Saylor, this river is a river in trouble which is shared by seven States, and, naturally, they all have keen interest in it.

The gentleman from Colorado, the chairman of the committee, pointed out Colorado's interest in protecting its water, being sure that its rights are not preempted.

I think, since this is the last major project on the river, Arizona—and it has only itself to blame, as you know—for over 20 years did not even join the compact; it stayed outside and criticized it, and for that and other reasons it is the last State to get its major project on the river. And it is inevitable that everyone else wants to be sure their rights are protected.

So, I think, really, what has happened is quite natural and to be expected.

Mr. SAYLOR. It may be quite natural, so far as you are concerned, but it seems very unnatural to me, because to some of us who do not live on the river and whose constituents are not in the room and are not worried about that, we have to protect the uses of your State. I happen to come from an area whereby I can look at this whole thing objectively. I told the chairman of the full committee that if he has any bills which meet the standards of the Bureau of Reclamation for authorized projects in Colorado, I am willing to go along with them. That holds true for the other basins, and this is why I wonder why we have to saddle everything on this little bill.

I have heard Members of the Congress all along say that no one bill should have to bear all of the burdens and make all of the policy for everything. I do not see why this bill should have to do so.

One of the things, Mr. Secretary, that I am disturbed about is that I read here where you sent up to this committee a proposed draft of a bill to revise the boundaries of the Grand Canyon National Park,

and for other purposes. I looked at the bill with interest, because it follows very closely the bill which I introduced sometime before, except that you have gone up the river a little farther; you are going up a little above Lee's Ferry; you have gone over on the north side of the canyon, and you have taken in quite a large section of the Kanab National Forest, and I have looked at the maps which were presented to us called Colorado River Basin project reference maps, and on No. 1, the central Arizona project, I notice you have the Grand Canyon National Park—those are the old boundaries as they are presently assigned, and I was agreeably astounded to find that there was not anything about the Grand Canyon National Monument that President Roosevelt set aside by Executive order. I was wondering whether or not you intended to get rid of the Grand Canyon National Monument?

Secretary UDALL. I can only say that I have not looked at this. That is an unfortunate omission.

Mr. SAYLOR. Thank you, Mr. Secretary.

Now, on the basis of setting up a National Water Commission it is my understanding that the people on the other side of the Capitol have already held hearings and have reported out that bill.

Is that correct?

Secretary UDALL. I think it has already passed the Senate.

Mr. SAYLOR. It has passed the Senate?

Secretary UDALL. Yes.

Mr. SAYLOR. If this committee, in its wisdom, could take up that bill as a separate item and pass it and have both Houses therefore pass it, the President could appoint that Commission and it could go to work at once.

Secretary UDALL. It would be possible to do this. This is one of the decisions that has to be made. It is the committee's decision as to how it wants to handle it.

Mr. SAYLOR. Mr. Secretary, I hope we might be able to separate this bill and get that part out of the way very rapidly.

Mr. Secretary, if this committee, in its wisdom, decides to put a provision in the bill which would be that the Federal Power Commission cannot issue any licenses for erection of dams anywhere on the Colorado, we being the agency which created the Federal Power Commission, we have the right to tell them what they can and cannot do; is that not correct?

Secretary UDALL. I tried to make my position clear earlier. Where the different interests in this river have converged, you have the final decision to make. I think that the committees of Congress and the Congress itself ought to make the decisions. Quite frankly, I wonder sometimes whether the Federal Power Commission, having plenty of controversies over there without thrusting others on them, would not be quite happy to have the committee decide what should be done, or whether some decision should be deferred until later and have it left to the Congress.

Mr. SAYLOR. Now, Mr. Secretary, as far as augmentation of the supply of water in the river is concerned, do you know whether or not anybody in the Interior Department has ever made a study of

where we have so-called surpluses of water, considering the development of water resources of each area?

Secretary UDALL. We have not made any of the broad type of thoroughgoing studies that we are talking about where you look at the whole western part of the United States or a whole region, in the past.

Mr. SAYLOR. The reason I ask that question is you have informed this committee, pursuant to a bill that was passed last year authorizing the construction of the third unit at Grand Coulee—that your experts in the Bureau of Reclamation have determined that there should be a basic change in certain types of generators which are on the river. Is this correct?

Secretary UDALL. Yes. The American manufacturers tell us that they can build 600,000-kilowatt units which are far larger than any that have ever been built before.

Mr. SAYLOR. This is the same information that I have received. They are in the process of building some of those generators right now for the Bureau of Reclamation. It is my understanding that if they are built and installed, this committee has been so informed, that they will require more water than the units that were established before; is this correct?

Mr. DOMINY. Actually, Congressman Saylor, we planned to put in, under the plan we had when we got that authorized, 12 300-megawatt units. Now we are going to put in six 600-megawatt units. There would be no more water required to operate the six than the 12. But in making the final studies on this, the Bonneville Power Administration pointed out that with the Canadian Treaty and with the power growth curves in prospect there would be sufficient water and sufficient regulation to justify not six 600-megawatt units but ultimately 12 600-megawatt units. We are not authorized to do so, as you know, but we can provide now for the ultimate capacity and if this proves to be a good investment, we would come back and seek authorization for the additional six.

Mr. SAYLOR. And if those six were authorized, this would place another drain or demand upon the waters of the Columbia River.

Mr. DOMINY. But we believe the waters are there for peaking purposes.

Mr. SAYLOR. This is correct; this is the information I have received from independent sources, that there is such water available.

I bring this out for the people in the Pacific Northwest, because they were entitled to put their water in there first, and, as was called to the attention of the committee yesterday, when we looked at the great map of the United States in Rand McNally, we noticed that it is just about the same distance from Walla Walla, Wash., to the western end of the Great Lakes as it is from Walla Walla, Wash., down to Tucson, Ariz. So, we have to look at this in perspective. We cannot look at it on a small regional basis to get the picture of the entire benefits or what happens to the entire water resources of the United States.

I hope we can get a piece of legislation out of this committee, Mr. Secretary, that is not burdened down with too many appendages, so that it can be supported by the people in these other sections of the

country who are looking to the West to help develop it and to see to it that the States of the Union are entitled to use the water that is allocated in the Supreme Court decision. I would hate to see them have to go to the Supreme Court, as the result of a motion which I made years ago, and then end up losing the lawsuit in this agency. Perhaps, that is one of the things that the people in some areas are trying to do.

Thank You, Mr. Secretary.

Mr. JOHNSON. The Chair recognizes the gentleman from Florida.

Mr. HALEY. Thank you very much, Mr. Chairman.

I do not have any questions. I just want to make an observation. Mr. Secretary.

In the beginning of the hearing on this Colorado River Basin, I stated that the gentleman from Florida had not made up his own mind as to who is stealing whose water.

Mr. Secretary, I also want to say—and this is a little out of context here—that I thank you very much for having your Mr. Luce come down to the reenactment of the landing of DeSoto in Manatee County. I might say that he made a very fine impression with the several thousand people that we had at that event. I think that your Department probably made a lot of friends through his efforts down there.

I yield my time to the gentleman from Colorado.

Mr. ASPINALL. Have you ever followed the Collbran formula: have you ever used that in any other project?

Mr. DOMINY. Not exactly in that formula, Mr. Chairman. It is not as much of a deviation of present practice, however, as some people might assume.

Mr. ASPINALL. Not only have you not used it, but apparently it was not as successful a formula as some people thought it was; is that not correct?

Mr. DOMINY. That is correct.

Mr. ASPINALL. In terms of the Collbran formula, so far as the repayment of the obligations of the Federal funds were concerned, it would have been a whole lot better if the Collbran project had become a part of the Colorado River storage project.

Mr. DOMINY. That is correct.

Mr. BURTON of Utah. Will you yield?

Mr. ASPINALL. Yes.

Mr. BURTON of Utah. I would like to ask the chairman of the full committee to explain to some of us who are not familiar with it, the Collbran formula.

Mr. ASPINALL. The gentleman from Pennsylvania pronounced it as Collbrain, but it is Collbran. Would you explain the Collbran formula to the gentleman, Mr. Dominy, so that he will understand?

Mr. DOMINY. I would like to put a brief statement in the record on that, to save time.

Mr. JOHNSON. The Chair will accept your explanation for the record. Any objection? None. So ordered.

(The information requested follows:)

The Collbran Project located in western Colorado was authorized by the act of July 3, 1952 (66 Stat. 325). As part of the repayment provisions, this act provided "... net revenues derived from the sale of commercial power and from the

furnishing of water or municipal, domestic, and industrial use shall be applied, first, to the amortization, with interest, of those portions of the actual cost of the construction of the project which are allocated respectively to commercial power and to municipal and domestic and industrial water supply; and thereafter shall be applied to amortization of that portion of the costs allocated to irrigation which are beyond the ability of the irrigation water users to repay within the period specified . . . " (Fifty years in the case of the Collbran Project.)

The repayment requirements under the act, while limiting the repayment obligation of the irrigation water users to fifty years, specify no time period for use in the payout of commercial power costs or in the completion of the payout of costs allocated to irrigation which are beyond the ability of the water users. Repayment contracts for municipal, domestic, and industrial water supply were limited to a period not to exceed fifty years.

This so-called "Collbran formula" has not been followed by Congress in establishing repayment requirements for other projects.

Mr. HALEY. I reserve the balance of my time.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer, is recognized.

Mr. HOSMER. It looks as though the situation is that, whereas the administration last year was willing to give Pat Brown one dam, this year it will not give a dam for Governor Reagan.

Secretary UDALL. Congressman Hosmer, the way that I read the record, the dam last year was for Sam Goddard. And they voted him out of office.

Mr. HOSMER. That was a magnificent dam.

Secretary UDALL. That is right.

Mr. HOSMER. It was recommended to this committee rather enthusiastically by you and your colleagues; is that correct?

Secretary UDALL. We tried to have our usual enthusiasm.

Mr. HOSMER. I assume that you did recommend it. It was a well-planned dam and reservoir. You recommended it?

Secretary UDALL. I think you will find, if you go back to the record, that we said that we thought it was adequate to take care of the pumping power needs, and also to help pay for the central Arizona project. It does not compare with the Hualapai site at all, in terms of its capacity. I will say that it is a second-rate damsite.

Mr. HOSMER. Is the Hualapai proposal a well-planned one?

Secretary UDALL. The Hualapai site is the best hydro site on the Colorado in terms of capacity.

Mr. HOSMER. It was well planned; is that right?

Secretary UDALL. We are not proposing any plan for the Hualapai.

Mr. HOSMER. You have plans down there that you were working on?

Secretary UDALL. In terms of just a site. The Hoover Dam site is a good one; Glen Canyon is a good one. Hualapai is a better one, just in terms of its location and the head that you have, and so on, as a hydro-site.

Mr. HOSMER. No dam is on order today?

Secretary UDALL. We do not feel any dams are needed at this point.

Mr. HOSMER. And the revenues to pay for the project that you recommend would come from the sale of the water?

Secretary UDALL. It would come primarily from the sale of the water, and the people of Arizona will pay it themselves.

Mr. HOSMER. Just from the sale of the water?

Secretary UDALL. That is right.

Mr. HOSMER. What about this ad valorem tax?

Secretary UDALL. That is another alternative that can be used. This is up to the Arizona people to decide.

I, personally, think it is good to have a mix. There are three ways, really, that you can pay the irrigation subsidy—from the sale of power, from making the water users pay more for the water, or from an ad valorem tax. All three have been used in the past. The ad valorem tax is nothing new. It is involved in the Colorado projects that the chairman is interested in, in this legislation.

Mr. HOSMER. In what you are recommending to this Congress are you giving us a choice of these three ways?

Secretary UDALL. No, our basic recommendation, as far as the payment of the Arizona project is \$10 for irrigation water, \$50 for municipal-industrial water, and then the "and/or" as far as the extra money required. It could be financed in one or two ways: either to raise the municipal-industrial water rate to \$56 or to have each and every property owner in three counties pay about one mill or one-half a mill ad valorem tax. You can do it either way.

Mr. HOSMER. You mean you are letting the Congress then determine the needs of Arizona?

Secretary UDALL. No, indeed.

Mr. HOSMER. One way or the other, by writing something into the legislation?

Secretary UDALL. We think you can write it in such a way that the Arizona people can go either way that they want to go. I think that you would agree it is better to have the Arizona water users pay for it than to have the California power users pay for it, for example.

Mr. HOSMER. I guess that Mr. Brower approves of your no-dam view?

Secretary UDALL. I do not gather from the New York Times that they are very happy about it. I do not think that anybody wants anyone to have any victory on this; that is, at this point—as I said a month ago when we came out with the original plan.

Mr. HOSMER. I take it that you would rather have the \$10,000 ad in the New York Times. It was mostly taking off on the gentleman from Colorado. I believe that you read that.

Secretary UDALL. I did not have time to read it in detail.

Mr. HOSMER. You know, some people think that there is something wrong with your vision on dams. They charge that you have myopic vision in one eye and astigmatism in the other with respect to the way you view these things. [Laughter.]

Secretary UDALL. I think that, in terms of where the people in the regions stand, that the best alternative is not to get into an argument about dams at this point. Rather we should move on down the road and put Marble Canyon into the National Park and reserve Bridge Canyon Dam question for the Congress to decide later. I think this is the part of wisdom if we want action; if we want controversy and delay, I think that we can start out arguing about dams.

Mr. HOSMER. With regard to your views, I appreciate that this is your view?

Secretary UDALL. I am always at fault, whatever my views are. [Laughter.]

Mr. Hosmer. I should like to determine your vision.

Secretary Udall. I have long ago never pretended to know all of the answers, when you sit where I sit.

Mr. Hosmer. I will show you this. Can you see what is written on this?

(A large brown sheet of paper was exhibited.)

Secretary Udall. I see some writing in the middle but I cannot quite make it out.

Mr. Hosmer. All right. Then, we will take another look at it. Can you read that (uncovering part of a white card)?

Secretary Udall. Yes, indeed.

Mr. Hosmer. What does it say?

Secretary Udall. "President Johnson, February 8, 1965, in a message to Congress on natural beauty."

Mr. Hosmer. All right. Now, read this (uncovering the rest of the white card).

Secretary Udall. "We will continue to conserve the water and power for tomorrow's needs with well-planned reservoirs and power dams."

Mr. Hosmer. That is what you then recommended to us, and what you have recommended to us then were not well-planned dams; otherwise you would be recommending them to us, I presume.

Secretary Udall. Well, the decision on Marble Canyon Dam is what you are referring to, really, in terms of that.

Mr. Hosmer. I am referring to both of them.

Secretary Udall. In terms of our further analysis of the overall resource potential in the region it was our judgment at this point—the members of this committee can express their own judgment on this—that the best thing to do is to enlarge the park and to put Marble Canyon in it and to let the decision on Bridge Canyon await the study of the National Water Commission. This is the best path to follow.

Mr. Hosmer. As Secretary of the Interior and as Chairman of the National Water Resources Council, I have difficulty in understanding why you wish to stand aside for some new organization not yet experienced, staffed, or manned, to take over the investigation of these projects.

Secretary Udall. This does not bother me at all, because I think from time to time in the field of resources it is good to have a broad gaged outside outfit, out of the Government group, such as the Paley Commission, such as the Hoover Commission task forces, look at our problems.

Those of us involved on a day-to-day basis may get kind of myopic sometimes, and it is helpful to have people draw back at a certain point and take a very broad look at the national picture.

I must confess that 2 years ago I was not very enthusiastic about the National Water Commission idea. Mr. Staats of the Bureau of the Budget had the idea. It was not ours, but the more I thought about it and the more I have gone into it, the more I have real enthusiasm for it.

Mr. Hosmer. It did not come up with anything on this Arizona project for a long time, did it?

Secretary UDALL. It would make broad national studies for 5 years, and it would come in with its reports, and I think it would command your respect.

Mr. HOSMER. They would only be in general terms, in loose phraseology, and hence nobody would be able to start to work on the basic specific plans that were so recommended, would they?

Secretary UDALL. I think the idea of this would be that it would give the proper framework for making big decisions, not only on the Colorado which is in trouble, but in other parts of the country. In my judgment, if it were done right, it would help get the type of national support that is going to be needed in the long run to do something about the Colorado River shortage. I think it will focus attention on the water problems.

Mr. HOSMER. It seems to me that the U.S. Congress, through the entire history of our country has had the duty and obligation to look to the national picture. Why should it be on the sidelines for 5 years and stay there, while some sociological group is massaging the problem?

Secretary UDALL. Well, Congressman Hosmer, I think if we act now and get this started, no time will be lost. The Colorado River water crisis problem is not critical until after 1990. I know that we have to have about a 10-year leadtime on large projects, but we do have time for this. Nobody is going to be hurt if we have National Water Commission studies.

Mr. HOSMER. I yield to the gentleman from Colorado.

Mr. ASPINALL. Mr. Secretary, we have had two commissions on water matters since I have been in Congress. The Hoover Commission made a study of the Missouri Basin. I was a member of that. Maybe that has been used by experts, I do not know, but very little has ever grown out of that study. We spent over \$1 million on it.

Two things developed, however, that had no relation at all:

One was that Congressman Ben Jensen, then the ranking member of the Committee on Appropriations, made a request that was granted and we got some order out of chaos. Of course, the other was that we did have some good planning from the Bureau of Reclamation. We began the development of the river with the Garrison project, and we now have another project—the Oahe. Not another thing has ever grown out of that Commission.

Mr. Eisenhower had a water study made. Not a thing has ever grown out of that.

This is the reason that it bothers me when you talk about these commissions which just furnish some kind of a working operation for people outside of the Government to make a study, to draw some pretty good sized salaries or wages, and then put the recommendations on the shelf.

I have never forgotten when President Eisenhower put the Truman study on the shelf, and it has remained there to this day. It nearly broke my heart when he took it away from former Congressman Clifford Hope of Kansas.

This is the reason why the Outdoor Recreation Resources Review Commission, which was operated by Congress, came up and had two of its principal recommendations enacted within 2 years.

At the present time, I have a study going on for the Public Lands. I am doing my best to fight against some of the pitfalls that have happened to three previous studies on public lands, so that we will have something. This is the reason that I asked you the question that I did. I think that the gentleman from California put his finger on the problem.

Secretary UDALL. I certainly have a great respect for what the chairman has just said, because I know of his experience of over 20 years with these various studies.

The one thing that I would suggest, though, that is really new in the picture is that, in terms of the whole water future is that we have a new awareness of water problems. We have a lot of new water problems, water quality problems in particular, that are going to be very crucial over the country, and the type of study proposed by really distinguished people could make a real contribution.

Mr. ASPINALL. I think that they could, if they worked closely enough with the Congress, but they probably would not. And when you talk about water pollution, you get into a divided operation here. We have gotten mixed up on that.

I yield back my time.

Mr. HOSMER. The gentleman from Colorado touched on a point that I have on water pollution. There are rather overall nebulous problems concerned there, and then there are some very specific ones. The specific ones we are catching up with now are in connection with Commission activities. They will not buy progress; they will buy delay.

Mr. ASPINALL. What has been done under the authority granted to the administration in the Water Resources Planning Act?

Secretary UDALL. With the Water Resources Council?

Mr. ASPINALL. Yes. We have not received anything.

Secretary UDALL. Mr. Chairman, I would like to give you a summary of what we have done, what we are doing. We are doing significant water-planning work in the field, but of course, it has the focus of a particular river basin, a particular problem, rather than looking at the national needs.

I would hope that the National Water Commission would have the usefulness that the Paley Commission study had. I think this had a considerable influence on the decisions made in regard to many factors.

Mr. ASPINALL. At the same time, would you enumerate to this committee the benefits that have grown out of the Paley Commission report?

Secretary UDALL. I would like to submit something on that for the record, yes, Mr. Chairman.

Mr. JOHNSON. You have heard the request of the chairman of the full committee, the gentleman from Colorado, Mr. Aspinall. Is there any objection to this request?

Hearing none, the Secretary will submit the necessary material for the record which will be put into the record at this point.

(The information follows:)

BENEFITS OF THE PALEY COMMISSION REPORT

The President's Materials Policy Commission, generally known as the Paley Commission, reported to President Truman in 1952. The benefits that have grown out of its report are both general and specific.

In general the report directed national attention to the crucial problem of developing and utilizing our material resources, both from the point of view of meeting our security requirements and of assuring the necessary resource base for continued growth of the economy. It emphasized that the problem is not necessarily exhaustion of our resources in the foreseeable future, but the threat of having to secure materials at increasing real costs as the demand for them grows and as available supplies slowly diminish in both quantity and quality. To avoid even a gradual rise in real costs of materials that might result if the Commission's comprehensive long-range projections of materials' demand were realized, the Commission especially emphasized the general need for vigorous development of all technological possibilities through strong support of research and development. Through both public and private financial support of research and development, in continually increasing amounts since 1952, the Nation has clearly supported this basic policy advanced strongly by the Commission.

The Paley Commission also made 78 formal recommendations, as well as a number of suggestions which were not formalized as recommendations. It has not been possible to ascertain all the specific benefits that may have grown out of the Commission's report in the time available. Nevertheless, several substantial and readily identifiable consequences are clear:

1. *Atomic Energy.*—The Commission's encouragement of development of economical ways to obtain electric power from atomic sources, at the "maximum level permitted by urgent security demands" subsequently stimulated and supported legislation specifying the conditions under which electrical utilities could operate commercially to benefit from atomic power research, development, and production.

2. *Coal.*—The Commission recommended that the Federal Government undertake with the cooperation of private industry, labor, and private research organizations a thorough appraisal of present research and development work relating to coal, and the formulation of a strong program to advance coal technology to be carried out by a combination of private and public efforts. This recommendation supported and no doubt encouraged establishment of the program of Interior's Office of Coal Research, furthered in-house government research, and increased industry research efforts. Substantial advances in coal research have subsequently been made.

3. *Small Mining Operations.*—The Commission recommended that legislation be enacted to establish a long-run system of financial assistance to small mining operations to support domestic prospecting for new deposits of minerals of strategic importance for which domestic reserves are inadequate or for exploration and development of known deposits of such minerals. Subsequently the basic objectives of this recommendation were achieved by P.L. 85-701; the Defense Minerals Exploration Administration was terminated on June 30, 1958, and aid to small mining operations on a long-term basis has since continued.

4. *Percentage Depletion.*—The Commission's recommendation that percentage depletion be retained because of its strong inducement to risk capital to enter mineral industries no doubt strengthened substantially the position of those who favor percentage depletion, and this feature of the Internal Revenue Code has been retained.

5. *Offshore Oil.*—The Commission's recommendation that the Federal Government encourage immediate exploration for oil on publicly owned offshore lands no doubt encouraged enactment in 1953 of the Submerged Lands Act (43 U.S.C. 1301 *et seq.*)

6. *St. Lawrence Seaway.*—The Commission's strong recommendation that the St. Lawrence seaway "be initiated in the near future for transportation purposes" added strength to groups supporting the seaway which Congress later authorized.

7. *Hydroelectric Power.*—The Commission's recommendation that "the Nation's hydroelectric potential be developed as fully and as rapidly as is economically possible" added strength to groups who have long supported such development.

Many of the formal recommendations of the Paley Commission related to increased levels of appropriations in support of on-going research and other programs. The Commission's support was probably helpful in bringing about the increased levels that have occurred.

In its informal advice, the Commission endorsed the view that water resources development should be in "the form of basin programs which deal with entire



basins as units and which take into account all relevant purposes of water and land development." This thought, together with its view that the Federal Government should play a substantial role in water pollution abatement, was not new then—to say nothing of now. But only in more recent years—with authorization of basin development programs such as the Colorado River Storage Project, passage of the Federal Water Projects Recreation Act, and major water pollution control legislation of this decade—have we begun as a Nation to approximate in practice what the Paley Commission and others encouraged some fifteen or more years ago.

PROGRESS UNDER THE WATER RESOURCES PLANNING ACT

Substantial progress has been made in implementation of the Water Resources Planning Act, including development of organizational arrangements, appropriation of funds, establishment of procedures, and acquisition of staff for further progress.

The Water Resources Council, established by Title I, has met ten times since enactment of the Act in July 1965. Immediately upon enactment and for the first few months, Council meetings were focused almost solely upon consideration of emergency measures to combat the drought in the Northeastern States. Subsequently, Council meetings were devoted to selection of an Executive Director, establishment of the Council Organization that is set forth in Part 701, Chapter VI, Title 18 of the Code of Federal Regulations, and to other steps necessary for prompt and orderly implementation. In addition to meetings of Council members themselves, representatives of Council members have met frequently, at least once every two weeks.

TITLE I—WATER RESOURCES COUNCIL

By section 102 of Title I of the Act, the Council is directed to "maintain a continuing study and prepare an assessment biennially . . . of the adequacy of supplies of water necessary to meet the water requirements in each water resource region in the United States and the national interest therein." The Council has decided upon plans and procedures for making the first national assessment and has scheduled a report for completion at the end of 1967. This report, based on available data, will establish the water situation for a base year, identify current problem areas, and include projections of water requirements for larger regions of the country. Long-run water management problems will also be identified. In addition to national summaries, regional chapters are being prepared by field personnel of member agencies and cooperating States.

Concurrently with the preparation of this first report, a more fundamental and detailed analytic system, including plans for needed data, is being developed for use in the preparation of subsequent national assessments. Research and data requirements are being identified and discussed with the Office of Water Resources Research, Geological Survey, and Water Pollution Control Administration of the U.S. Department of the Interior; the Economic Research Service of the U.S. Department of Agriculture; the Corps of Engineers of the Department of the Army; the Office of Business Economics of the U.S. Department of Commerce; and several other agencies. And cooperative arrangements have been made with the Office of Water Resources Research pointing toward possible funding of research under Title II of the Water Resources Research Act for development of improved analytical systems that would help the Council carry out its continuing responsibility for national assessment.

The work of the Water Resources Council in the acquisition, organization, and analysis of available information on the Nation's water situation, and identification of water problems, is expected to be helpful to the proposed National Water Commission if and when it is established. The information developed by the Council, together with such supplementary information and analyses as the Commission may desire, should be most useful to the Commission in making an early start in its independent review and evaluation of national water problems. No duplication of effort is anticipated. The legislation proposed to establish the National Water Commission clearly contemplates close cooperation and assistance of Federal agencies with the Commission.

Under section 103 of the Act, the Council is directed to establish, after consultation with appropriate interested Federal and non-Federal entities, and with

approval of the President, principles, standards, and procedures for Federal participation in comprehensive regional or river basin plans and for the formulation and evaluation of Federal water and related land resource projects. The principles, standards, and procedures for this purpose that were approved by the President on May 15, 1962, and published as Senate Document No. 97, 87th Congress, 2d Session, are considered to be in full force and effect, except as they were modified with regard to the definition of primary direct navigation benefits by the act establishing the Department of Transportation (P.L. 89-670). The Council has studies underway looking toward their clarification, expansion, possible revision, and then establishment under section 103.

Under sections 102 and 103 of the Act, the Council has underway studies of flood control planning criteria and various proposals for improved flood control policy. This work stems from a Task Force Report on Flood Control Policy which the President transmitted to the Congress on August 10, 1966 (House Document No. 465, 89th Congress, 2d Session). Consideration is also being given to the implications for other flood control policy of the report on flood insurance by the Secretary of Housing and Urban Development which was transmitted by the President to the Congress on August 12, 1966 (Committee Print No. 43, House Committee on Public Works, 89th Congress, 2d Session).

Consistent with sections 102 and 103 of the Act and at the request of the Bureau of the Budget, the Water Resources Council coordinates schedules, budgets, and programs of Federal agencies in comprehensive interagency regional or river basin planning. Comprehensive framework studies to plan major strategy for water resource development are underway in the Ohio, Missouri, Pacific Northwest, Upper Mississippi, North Atlantic, Upper and Lower Colorado, and California regions. Consistent with section 102(b) of the Act, the Council plans complete coverage of the United States with these comprehensive framework studies for large regions of the Nation by 1972. Under the aegis of the Council, 15 more detailed comprehensive studies are also underway which will result in a comprehensive plan and the identification of projects that should be developed in the next 10 to 15 years.

TITLE II—RIVER BASIN COMMISSIONS

Under Title II of the Act, the Governors of the concerned States have requested and the Council has recommended the establishment of river basin commissions for New England, Great Lakes, Pacific Northwest, and Souris-Red-Rainy regions. The President established the Pacific Northwest River Basins Commission by Executive Order 11331 on March 6, 1967, and appointed Charles W. Hodde of the State of Washington as Chairman. Establishment of the three other commissions, and appointment of their chairman, is being actively pursued.

Governors of States within the Missouri River Basin and the Ohio River Basin have requested establishment of commissions for those basins, but the number so far is insufficient for Council action.

TITLE III—FINANCIAL GRANTS TO STATES

Under Title III of the Act, the Congress authorized the appropriation of \$5,000,000 per year for 10 years for 50-percent matching grants to States "to assist them in developing and participating in the development of comprehensive water and related land resources plans." The Council developed and published for review proposed Rules and Regulations, held three informal hearings in San Francisco, Omaha, and Washington, D.C., and then finally adopted Rules and Regulations as published in Part 703, Chapter VI, Title 18 of the Code of Federal Regulations for the administration of the grant program. A Committee for State Grants has been formed, with the approval of the President, to coordinate the Title III program with other Federal programs in accordance with section 301(b) of the Act.

For F.Y. 1967, the first year of the grant program, the Congress appropriated \$1,750,000. The Council received 46 applications, out of a potential 53, and has approved, thus far, 44 of the applications. Alaska and Puerto Rico are in process of developing further and amending their applications. Of a total of \$1,603,910 in grants under approved applications, \$1,146,221 has been disbursed to date.

The 44 States which have received grants in F.Y. 1967, and the total amounts for each, are: Arkansas, \$40,910; California, \$63,290; Colorado, \$40,320; Delaware, \$32,820; District of Columbia, \$7,380; Florida, \$26,240; Hawaii, \$34,600; Idaho, \$43,450; Illinois, \$43,100; Iowa, \$38,130; Kansas, \$39,200; Kentucky, \$45,280; Louisiana, \$33,000; Maine, \$19,000; Maryland, \$34,050; Massachusetts, \$36,500; Michigan, \$45,420; Minnesota, \$26,000; Missouri, \$41,720; Montana, \$40,350; Nebraska, \$37,980; Nevada, \$36,490; New Hampshire, \$27,000; New Jersey, \$38,120; New Mexico, \$22,500; New York, \$53,850; North Carolina, \$43,900; North Dakota, \$16,650; Ohio, \$47,590; Oklahoma, \$24,930; Oregon, \$44,560; Pennsylvania, \$47,000; Rhode Island, \$24,920; South Carolina, \$45,170; South Dakota, \$21,300; Tennessee, \$41,710; Texas, \$68,450; Utah, \$38,580; Vermont, \$25,150; Virginia, \$45,130; Washington, \$25,000; Wisconsin, \$39,890; West Virginia, \$30,600; and Wyoming, \$26,680.

Mr. HOSMER. If my reference is correct, there are currently 53 different separate individual sets of water commissions of one type or another. It seems to me that the authorization of a 54th may not be very advantageous, but your opinion is different, I know.

Has anyone introduced this bill that the Department sent up here on the House side?

Secretary UDALL. Not so far as I know.

Mr. HOSMER. It is not very popular, I guess. I suppose if introduced we will have to include it in our considerations. Does that bill have anything about the Mexican Treaty obligation in it?

Secretary UDALL. The bill that we have submitted does not discuss the subject.

Mr. HOSMER. Do you feel that there should be a U.S. obligation?

Secretary UDALL. This is my own personal feeling: I think most of my people feel the same way, as far as the Colorado River is concerned, that we ought to see and assume this as a paramount national obligation and that we ought to have, roughly, the same pattern on the Colorado that we have on the Rio Grande, which is the other river that this country shares with Mexico.

Mr. HOSMER. As Secretary of the Interior, is your opinion different than your personal opinion?

Secretary UDALL. I say that I am not here presenting an administration position on it. I am giving you my personal view at this moment.

Mr. HOSMER. Last year—Go ahead.

Secretary UDALL. That is all.

Mr. HOSMER. Last year, you brought up a regional water plan. This year, you have brought up a more or less go-it-alone type of plan. You used that terminology. Will you give us what help or benefit the plan you now propose would be to the other basin States?

Secretary UDALL. Congressman Hosmer, I do not think that the plan that we have submitted here backs away at all from the idea of river basin planning.

Mr. HOSMER. It just circles it.

Secretary UDALL. It does not at all. I want to keep the flag flying, with the help of the chairman of this committee, as was the case 4 years ago. The flag was run up then at a time when many people did not see that the paramount water fact of life in the Colorado River Basin was that the river was short and that a miscalculation had been made in projecting future water supplies as a basis for the division of its waters. Therefore, the entire basin needed to work

together. I think we have a much broader basis of support for taking whatever steps are necessary if the committee wants to take those steps.

Mr. Hosmer. This is not in your bill?

Secretary Udall. What?

Mr. Hosmer. This is not in your bill. What are you giving us? Some kind of a skeleton on which we can add onto to put on all of these things?

Secretary Udall. The only significant difference is that last year we proposed the basin account because we had to put Marble Canyon into the basin account to financially assist the central Arizona project. We have dropped Marble Canyon out now as it is not needed under our current proposal. We have said to the committee that if you want to create a basin account out of Hoover, Parker, and Davis revenues, go ahead. Indeed, as I read the act that authorized Hoover Dam, a basin account has already been created.

I do not think that the administration has backed away for a moment. I would not agree with that statement.

Regional planning and the river basin approach, including a basin account is still the way out. It is the way to solve the big problems that exist.

Mr. Hosmer. Last year, we had a plan in, at least, for a reservoir. We had a study about importation schemes, which required determination as to the feasibility.

Secretary Udall. Our position on that is the same today as it was a year ago.

Mr. Hosmer. You do not want to legislate it?

Secretary Udall. I think that the way to get a study started is to turn the National Water Commission loose, to get them started. We have lost a year on that.

Mr. Hosmer. The way you get it started? There is not much to get it underway. You keep talking in terms of 1990 as being the year in which water importation on the Colorado will be required. Certainly, there are some other elements that foreshorten that time, are there not?

Secretary Udall. Any estimate that anyone would make is merely the best appraisal that he can make, taking into account the many variable factors that are present. I suppose you can build a case for the year 2000 or the year 1985 or the year 1980, depending upon what assumptions you want to make.

Mr. Hosmer. We have heard quite a bit of talk from some of our people about this relationship. We know that the Mexicans are on our back constantly about the quality of the water that they get. Do you not think that the quality problem alone is going to require some kind of augmentation prior to 1990?

Secretary Udall. I think that we are going to have to be much more careful than we have been in the past with the water-quality problem. Among other reasons, we are going to have to have water-quality standards on our rivers, and we are going to clean up the water pollution in our rivers, and we are going to be much more water-quality conscious than we have been in the past.

I think that we have largely resolved the quality crisis that we have had with Mexico, which relates to the Wellton-Mohawk project. The situation is improving.

So, I do not see any quality of water crisis with Mexico in the near future if we do our work right in terms of cleaning up the Colorado.

Mr. HOSMER. You could not guarantee that we have these 23¾ years, until 1990, to solve this problem? You cannot guarantee that, can you?

Secretary UDALL. The two areas that have the most critical problems undoubtedly are California and Arizona. My people tell me that Arizona will face a water crisis problem earlier than California.

Your State project will be on the line within the next 2 or 3 years. There will be an infusion of new water.

Mr. HOSMER. You will recognize that in the Imperial Valley there are several cities now that are taking water, far more polluted than they should.

Secretary UDALL. I am afraid that I do not know what you have reference to, but I do not see insurmountable water-quality problems plaguing us in the next 20, 25 years. I think we are going to see many facets of water quality improve, as a matter of fact.

Mr. HOSMER. But you will have to do something to do it, or to have it, will you not. Something will have to be done on the Colorado River, is that not correct?

Secretary UDALL. To augment the river supply.

Mr. HOSMER. To handle the quality situation.

Secretary UDALL. I think that in the main this will mean better management of the existing supplies and better treatment by cities on the river.

This is one example: Yuma, Ariz., has no waste treatment at all for its municipal sewage. It dumps it right into the river. That is part of the problem. If it cleans up its discharge to the river as it will have to do under the pollution program the water quality improves, rather than diminishes.

Mr. HOSMER. Suppose that it is below the intake for the municipal water, I imagine—

Secretary UDALL. I am afraid that I cannot give you all of the gory details on that. [Laughter.]

Mr. HOSMER. Let us take this 4.4 for just a moment. I gather from your statement that you are neither here nor there on that. It does not include that; is that right?

Secretary UDALL. Our position on the 4.4 is the same as it was before. We have assumed, in all of our studies in the plan that we presented to you, that Congress will adopt a 4.4 priority. As to whether the Congress should write this provision into the bill, we think this is a matter between the two States and that this committee is going to work the problem out. We have no objection if you work out an agreement of one kind or another and put it in. There are many kinds of 4.4 guarantees, I might say. I do not think it would behoove us to try and tell the States what they should do in terms of resolving this conflict between them.

Mr. HOSMER. As to the 4.4 guarantee, you find that the central Arizona project will stay out of trouble regardless of whether it is in or out?

Secretary UDALL. That is right.

Mr. Hosmer. You also say that there is no question that the Congress has the authority to legislate on it?

Secretary Udall. That is correct.

Mr. Hosmer. And you have no objection to the Congress doing so?

Secretary Udall. Our position is just that.

Mr. Hosmer. One other phase here, and then I am through.

About this aqueduct. What size of aqueduct are you recommending?

Secretary Udall. 2,500 cubic feet per second.

Mr. Hosmer. That was ballooned from some earlier figure that was under consideration, was it not?

Secretary Udall. We talked about 1,800 cubic feet per second.

Mr. Hosmer. And who is to pay the cost of the difference?

Mr. Dominy. It is all included in the project cost that will be repaid from the municipal water user excess revenues and the irrigation returns, and from some power revenues under the prepayment plan.

Mr. Hosmer. Does that pertain to this 33,000 cubic foot per second?

Mr. Dominy. I do not know anything about any 33,000.

Mr. Hosmer. 3,000 feet.

Mr. Dominy. 3,000 feet, yes. It would be basically the same. It would have to be repaid from project revenues, regardless of what size and what cost.

Mr. Hosmer. That means upping the price of the water?

Mr. Dominy. It might mean that.

Mr. Hosmer. And the property taxes in Arizona?

Mr. Dominy. What was that?

Mr. Hosmer. Upping the taxes in Arizona.

Mr. Dominy. As the Secretary testified the Department has proposed either an increase in the municipal water rate or an ad valorem tax or some combination of the two.

Mr. Hosmer. What power are you going to use to get the Arizona Legislature to raise taxes if that is decided to be the way?

Secretary Udall. In most of our reclamation projects that require water conservancy districts, the State is ready to face its responsibilities. I think you are going to find that the people of Arizona, one way or the other, are quite ready to pay for the water. They are not going to ask California or Nevada or New Mexico to pay for it. They are quite ready to discharge their obligation in one way or the other; that is, repayment of the cost.

Mr. Hosmer. There was an editorial in one of the Arizona newspapers that screamed bloody murder about this, raising the water rates, did it not?

Mr. Holum. Can I interject myself here?

Mr. Hosmer. Yes.

Mr. Holum. The Bureau of Reclamation has put the same stipulations on South Dakota. This is an established practice. The voters were asked in the last general election to vote on the question of whether or not, in South Dakota, they would be willing to pay an ad valorem tax up to 1 mill, to carry the measure. The vote carried by over 80 percent. There were, actually, more people who voted on the tax question in South Dakota for water development purposes than voted for the Governor.

Mr. Hosmer. You have to have the Arizona people vote on this. I only gathered their inclinations from reading the newspapers.

Secretary Udall. The only way I can interpret that—I am familiar with the newspaper comment that you have indicated—is that some people think that they would rather have the water users pay it than pay part of it by ad valorem taxes. You can do it either way. We are not suggesting that you have to have a tax. I, personally, can think of various systems of sharing the burden on a broader base, which makes some sense. Every propertyowner in these three Arizona counties, whatever kind of property he has, is benefited by the fact that he has a water floor under him, in our judgment it means that the value of his property is increased.

Mr. Hosmer. I take it that you do not want to be Senator from Arizona.

Secretary Udall. I am very happy where I am.

Mr. Hosmer. Have you made any studies at all relative to what you prefer to call the Bridge Canyon Dam in utilizing the pump-up storage and as to this nuclear power system and conventional power that you are going to talk about, to increase by a considerable factor the revenues from that dam alone?

Secretary Udall. The pump-back storage?

Mr. Hosmer. Yes.

Secretary Udall. Yes, we made such studies.

Mr. Hosmer. Do they look pretty good?

Mr. Holum. We have made studies, a wide variety of studies. One of the alternatives that we have considered was pump-back combined with large nuclear plants. We did not get results that were favorable. I would not want to suggest that we face the two or three years' time that would be needed to perfect these studies, but the indications were that it was going to be difficult to find the type of project that would be useful.

Mr. Hosmer. It would seem that if you find a favorable study that you would want to come up with like that, and if it was unfavorable, you would not.

Mr. Holum. I think not. These were aboveboard studies. They were all right in that respect.

Mr. Hosmer. Do you know anything about the tunnel, instead of the aqueduct, which has not been under study since 1957, and the other, the 1946 study?

Secretary Udall. We have not taken any new look at this subject of tunneling.

Mr. Dominy. You mean a tunnel from the Grand Canyon to the central Arizona area?

We have in the past examined possible alternative routes, but the presently proposed aqueduct proved the more economical.

Mr. Hosmer. A man named Ramsing, 325 West Cypress Street, Phoenix, who is an engineer, said that it would cost \$300 million and \$400 million for a tunnel alternative to an aqueduct.

Mr. Dominy. Our studies do not show an advantage for the tunnel plan.

Mr. Hosmer. You do have some kind of new group looking into tunnels, do you not?

Mr. DOMINY. We have the new mole approach to tunnel building in some of our tunnel work now that is advancing the art of tunnel building, as far as the time of construction is concerned, but I do not know that it is reducing the cost substantially.

Mr. HOSMER. Since it has been 10 years ago, do you not think that it is about time to dust this off and take another look at it?

Mr. DOMINY. Well, as I say, we keep a continuing check on these things, Congressman Hosmer.

There is one other problem here. If we were to divert the water from Lake Powell and move it south, this would create some problems under the compact, and would decrease the power revenues from downstream power plants, and other things that have to be considered as well. And this all has to be gone into, in the course of comparison between these two plants.

Mr. HOSMER. I understand that there was some hydroelectric capacity between Cornville and South.

Mr. DOMINY. There would be.

Mr. HOSMER. Thank you.

Mr. JOHNSON. The Chair recognizes the gentleman from Oklahoma.

Mr. EDMONDSON. Mr. Chairman, let me begin by saying that in order to correct the situation that we have here in the committee which has, apparently, made a lot of conversation, I will introduce the Secretary's bill here today so that we will have it before the committee in the morning.

Mr. SAYLOR. Will you yield?

Mr. EDMONDSON. Yes.

Mr. SAYLOR. And that will be a bipartisan effort. Because I have asked to have the same thing done. It will be on both sides of the aisle.

Secretary UDALL. That will make the whole morning worthwhile.

Mr. EDMONDSON. Mr. Secretary, before you organize any further celebrations you should know that I am interested in getting it before the committee only for consideration, and that I have not reached a firm conclusion as to what is the best course of action to follow in this situation. I said on the opening day of the session that I was sympathetic to Arizona's very critical water shortage, and I thought that it was imperative that we get some legislation out to meet that problem.

The gentleman from Florida, Mr. Haley, informed you about Mr. Di Luzio coming down there and thanking you for letting him come down to Florida. I want to thank you for permitting Mrs. Udall to come down to Oklahoma to visit our Indian country.

She created quite a favorable impression, and was very graciously received by the people of Oklahoma. I think she made a lot of friends for you and for the administration.

I have about two or three questions to ask. I do not think that it will take more than 2 or 3 minutes.

In the first place, I am interested in knowing what the basic questions are regarding Hualapai Dam that you believe should be submitted to the National Water Commission.

Secretary UDALL. I think that the basic question, really, relates to what the highest and best use of this region of the river is for the long future best interests of the country. I can almost put it that

simply. Is it so unique that it should become a part of our national park system? Is it such a good power site? Is it so needed that you ought to commit it for other use?

I think this is, really, the big question that has already been very thoroughly debated. Rather than rush into a decision on it, since the dam is not needed—this is our basic view—let us take a little time and analyze it and see what the water needs of the region are and what other alternatives are available.

The modern method of making resource decisions is to look at alternatives and analyze the alternatives very thoroughly, not only on the basis of economics, but on the basis of what one conceives to be the long-term future of the country.

Mr. EDMONDSON. On that subject, you think that the National Water Commission in the charter contained in this legislation would be a proper body to make that determination initially.

Secretary UDALL. No. All they can do is to make a recommendation and an analysis. I think that their views on the value of a water resource and its importance to the region could have a significant bearing on the decision that will ultimately have to be made, and that is right here.

Mr. UDALL. Will you yield on that point?

Mr. EDMONDSON. Yes.

Mr. UDALL. What single piece of information that we do not have in these 1,800 pages of transcript and 3 years of hearings could the National Water Commission come up with that we do not have now? That is the thing that I am getting at.

Secretary UDALL. Quite frankly, I think much of the discussion up to this point has been a discussion involving some passionate people. I would like to see some dispassionate people analyzed.

Mr. EDMONDSON. In your approach of the facts, you are looking for objectivity?

Secretary UDALL. There may be some factors that no one has given consideration to. The considerations to this point have been related to a dam versus park. There may be a lot of other factors that enter in here. I am not at all sure that if we all backed off and gave it some thought that there would not be some new things emerge in the picture that might help us make a decision on it.

Mr. EDMONDSON. Would it be an intrusion upon departmental privacy to ask if there was a difference of opinion within the Department, between your outdoor recreation and park people, and your reclamation people, as to the advisability of this?

Secretary UDALL. I have a beautiful dispute within my Department, of course.

Mr. EDMONDSON. Basically, your reclamation people believe that the dam is a good idea and should be built, and your outdoor recreation park people disagree?

Secretary UDALL. That is right. That is what makes my job so happy. [Laughter.]

Mr. EDMONDSON. One further question in connection with what you refer to as the WEST planning group, mentioned on page 4 of your statement.

Secretary UDALL. Congressman Edmondson, this is a group of utilities in southern California and the whole Colorado River Basin. It

is somewhat similar to, but not entirely similar to, a utility group that has interconnections in the Oklahoma-Arizona area. It is a power planning organization trying to determine how to build large nuclear or thermal plants. Emphasis now is mostly on coal plants to provide power for the whole region and on integration of transmission systems.

Mr. EDMONDSON. May I ask you if there has been any groundwork in this area toward an interchange of transmission facilities between these power companies and between your REA's and your municipal companies, et cetera?

Secretary UDALL. The whole objective is to get the most efficient, economical generation system. They are already building three, or have scheduled to build three plants, and this Page plant we are talking about would be a fourth plant.

The whole pattern is already set. We are merely proposing to you the type of operation that has already been developed in the region.

Mr. EDMONDSON. Do you have reason to believe from the WEST people that they would be willing to permit the use of their transmission lines by the REA and the municipal power units if you entered into this company with them to assist in the construction of this big power unit?

Secretary UDALL. We have had many conversations with the WEST group. Although we do not officially belong to the organization, we are a very vital part of it, because we have control over the rights-of-way. We have the coal resources which must be developed. We control the water needed for cooling. Therefore, we are an integral part of the organization. I do have a letter, Mr. Chairman, that I would like to put into the record at this point, dated 2 or 3 days ago, from the three key members of the WEST organization, indicating that they think that the chance of negotiating the type of prepayment agreement is highly feasible.

Mr. EDMONDSON. That letter includes their willingness to permit the use of their transmission lines?

Secretary UDALL. On a joint basis, yes.

Mr. EDMONDSON. By the REA's and the like?

Secretary UDALL. You are now talking about that.

Mr. EDMONDSON. And the power groups on a local basis?

Secretary UDALL. Congressman Edmondson, the thing that makes it a unique organization is that membership is not limited to the private utilities. The municipals, Salt River project, the city of Los Angeles, and the REA's and G. & T.'s also belong to WEST. So, we are striving to get a completely integrated organization, where power should move and move most economically.

Mr. EDMONDSON. Thank you.

Mr. JOHNSON. You heard the request of the Secretary. You have all received a copy of the letter referred to.

Is there any objection to including it in the record?

Hearing none, it is so ordered.

Mr. SAYLOR. I move that it be made a part of the record. I may have some questions about this at a later time.

Mr. JOHNSON. Hearing no objection, the letter will appear in the record at this point.

(The letter dated March 10, 1967, follows:)

ARIZONA PUBLIC SERVICE Co.,
March 10, 1967.

The Honorable STEWART L. UDALL,
Secretary of the Interior,
Department of the Interior, Washington, D.C.

DEAR MR. SECRETARY: As you know, WEST Associates is now made up of some 22 public and private electric utilities in the West. This group has made great strides in cooperative planning of electric resources, and this planning has and will continue to provide benefits to the electric power consumers of the Western United States. The Department of Interior's cooperation in connection with the plants at Four Corners and Mohave have contributed to these efforts.

As you recall, on November 22, 1966, Salt River Project of Arizona, Southern California Edison Company and Arizona Public Service—all of whom are members of WEST—wrote to you and stated we were considering building a large coal-fired steam electric generating station in the vicinity of Page, Arizona, in which we contemplated the use of coal located on Indian Reservations and the use of Arizona Upper Basin water which has not been put to beneficial use. We indicated we would like to negotiate for the use of this water for the proposed Page plant and further, if appropriate assurance for the use of the water could be worked out, we would proceed with our investigation and studies necessary to determine the feasibility of the project. We also stated we would negotiate arrangements with appropriate entities, including Indian Tribal Councils and the State of Arizona, as well as your Department.

Following this letter, discussions were held among representatives of our three utilities and you in which we repeated our interest in a proposed plant near Page. At that time you stated the Administration was studying a number of different combinations of hydro and/or thermal power as sources for the Central Arizona Project pumping requirements. Further, you said that the Administration would be making its recommendation on the lower Colorado legislation, following completion of these studies. You asked for an indication of our willingness to cooperate in helping work out power arrangements, whether the power source be thermal or hydro. We stated at that time it was impossible to give anything more than a general assurance of cooperation until a specific plan is presented on the basis of which details could be worked out. At that meeting we outlined to you the factors involved in marketing large blocks of low load factor hydro power, transmission distance between point of production and load centers, integration of large units into resource schedules and the economies involved in large scale thermal plants.

Since that time, the Administration's proposal on the Lower Colorado River Legislation has been announced and involves a prepayment purchase of power and transmission service from a thermal plant as a source of pumping power for the Central Arizona Project. You have asked for our opinion as to whether such a prepayment and allocation of power for pumping from a large thermal plant would be feasible and whether we would cooperate in connection with our proposed construction of the Page plant. We think that such a plan is feasible and we will cooperate in attempting to work out a satisfactory solution. As we stated to you in our earlier discussions, we are not in a position to advocate what power features will be the best solution for the water considerations involved in the Lower Colorado legislation, which involves many different water agencies and states with diverse interests. We are merely stating we think the power solution proposed by the Administration is feasible and is capable of being worked out to the mutual satisfaction of the entities involved.

So there will be no misunderstanding, if we are asked to comment on other proposals on the Lower Colorado which involve hydro development, and therefore other factors, we would also state our intention to cooperate, as we did in our earlier meeting with you referred to above. I would expect the utilities would be pleased to undertake joint studies concerning the marketing of power produced from any hydro development power features that may be adopted in any Lower Colorado River legislation.

Sincerely yours,

WALTER LUSKING.

Mr. JOHNSON. The Chair recognizes the gentleman from Kansas.
Mr. SKUBITZ. I have no questions. I yield my time back to Mr. Saylor.

Mr. SAYLOR. Yesterday, we had the senior Senator from California before this committee. He had a very sound statement. He suggested that if the central Arizona project were authorized by this committee that anything above 1,800 cubic feet per second would have to be paid for by the people from Arizona on their own, and that it could not be included in the general blend that we have.

It seems to me that a few days ago we had the Bureau of Reclamation before our committee requesting an enlargement of a canal in California, and that recommendation said that it should be paid for by the Federal Government.

Now, do you know, or do any one of the people you have around you know, of any other case where the Bureau of Reclamation has changed its plan and increased the size and capacity of a unit, of any reclamation project, that the local people were called upon to pay that increased cost on their own and not to make it a charge against the project itself?

Mr. DOMINY. As you well know, from your long years on this committee, each of the projects is a separate entity and planned to handle a custom-built situation. For instance, the Tehama-Colusa canal that you refer to in California is one that will serve a number of irrigation districts, and this enlargement would be embodied into the Central Valley project cost and paid for out of the returns of the sales of the water for irrigation, for municipal water, and for power. Certainly, that is the way the administration feels the central Arizona project should be handled, too.

The reason we have increased from 1,800 second-feet up to 2,500 second-feet is recognizing that in the early years there is more water available. Since we have a ground water mining problem, the more water we can put through that aqueduct in the early years when it is available in the river, the more we can alleviate the overmining of ground water to that extent.

So, up to reasonable amounts, the larger an aqueduct, the more important it becomes in solving the problem of the central Arizona area. And with the 4.4 guarantee to California, which our present plans are predicated upon, the 2,500-second-foot canal does come out to be a sound investment in the total project planned.

Mr. SAYLOR. And you have included in your plans which you have presented to this committee a study of the 2,500 feet?

Mr. DOMINY. That is correct.

Mr. SAYLOR. In the canal?

Mr. DOMINY. Yes.

Mr. SAYLOR. And that, in the opinion of the Bureau of Reclamation can be paid for by the water users of Arizona and that this would be a feasible project meeting the regular standards of the Reclamation Project Act of 1939 and its amendments?

Mr. DOMINY. That is correct. It would be paid out of the sale of the water to irrigation and municipal users and by the power prepayment plan.

Mr. SAYLOR. The tunneling which has been referred to was suggested at the time that the Upper Colorado River project was considered before this committee. Now, if the tunnels are to be built, it is my understanding that they would be built and they would take water out of Lake Powell—Is this correct?

Mr. DOMINY. That is one possibility. As a matter of fact, in the very early days of planning for this central Arizona project, which go clear back to the 1920's and the 1930's, the studies did include detailed examination of gravity diversion from either the Bridge Canyon Dam site location or by a large tunnel route from the vicinity of the Glen or the Marble Canyon locations, and it has been possible for us to update those to the present day costs and to keep currently informed as to the economics. Comparing those routes involving tunnels and the aqueduct pumping routes it has been decided that the aqueduct pumping route is the most optimum way to get the water into the central Arizona project area.

Mr. SAYLOR. If water were taken from Lake Powell, this would necessitate a change in the Upper Colorado River Authorization Act; is that not correct?

Mr. DOMINY. There would have to be a recognition that the water pulled out of there could not be delivered at Lee Ferry. That is where the compact measurement is made. It would involve a consideration of evaporation and power losses, and it would be complicated but that is not the main reason that we abandoned the tunnel plans. It was on the basis of cost when the lost power head and other things were taken into account.

Mr. SAYLOR. What is the present storage capacity, the percentage of storage capacity in Hoover Dam and in Glen Canyon Dam?

Mr. DOMINY. The Hoover Dam has a maximum capacity of about 29,000,000 acre-feet, and it is right in the 15,500,000 acre-foot level now.

Glen Canyon-Lake Powell has a maximum capacity of about 27 million acre-feet, and we have about 7.5 million acre-feet in Lake Powell now.

Mr. SAYLOR. So that if those two dams are ever filled to capacity, Mother Nature would have to give you a full year's supply to fill Hoover Dam and would have to give you, basically, 2 full years' supply to fill Lake Powell.

Mr. DOMINY. We need, of course, a repetition of the runoff back in the 1920's. Whenever we get a period of years like that, we will have both reservoirs full, but we have ample prospects of sufficient water to meet all of the needs of the river and to keep both projects at reasonable heads for power.

As a matter of fact, Hoover is at rated head. With the spring floods coming, the snowmelts, we have a March 1 forecast, based on the precipitation to date of a normal runoff on the Colorado River that assumed, of course, normal precipitation for March, April, and May. This will bring us up to the rated head at Lake Powell. We did not quite make it last year. We have had to pull it down some this winter, because last year was a very poor runoff year. With an average runoff this year we will get up to rated head this year, and we hope, of course, to hold both projects at rated head from now on, depending on what nature gives us in the way of runoff.

Mr. SAYLOR. I just want to say to you, Mr. Dominy, that the things, the figures, that you have relied upon since 1920, are figures when the methods of measuring the flow were very inadequate, and to develop the original compact those figures were used, and that great engineers and other people certainly relied on those facts which have not been duplicated from that time down until now.

Thank you.

I want to say this, Mr. Dominy, off the record.

Mr. JOHNSON. Off the record.

(Discussion was had outside the record.)

Mr. JOHNSON. Back on the record.

Let me say that the reference maps entitled "Colorado River Basin Project" to which reference has been made will be placed in the files of the committee.

The subcommittee will recess until 2 o'clock this afternoon; so, therefore will you gentlemen be so kind as to return, and we will start at that time, with the questioning by Mr. Udall of Arizona.

(Whereupon, at 12:15 p.m., a recess was taken until 2 p.m. this same day.)

AFTERNOON SESSION

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation will come to order.

The Secretary and his group have arrived now and the gentleman from Arizona, Mr. Morris K. Udall.

STATEMENT OF HON. STEWART L. UDALL, SECRETARY, U.S. DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY ASSISTANT SECRETARY KENNETH HOLM; COMMISSIONER FLOYD E. DOMINY, BUREAU OF RECLAMATION; ASSISTANT COMMISSIONER N. B. BENNETT, JR., BUREAU OF RECLAMATION; EDWARD WEINBERG, DEPUTY SOLICITOR; DANIEL MCCARTHY, BUREAU OF RECLAMATION; AND C. A. PUGH, BUREAU OF RECLAMATION—Resumed

Mr. UDALL. Thank you, Mr. Chairman. So that the Secretary and his defensive array alined in the new 3-5-4 formation can relax during this penetrating inquisition, I will advise him in advance that they will not be required to undergo visual tests, knee bends, deep breathing exercises or any other medical procedures.

I just want to get some facts clear. For the record, first, Mr. Chairman, in the light of Mr. Hosmer's remarks about the Department not giving a "dam" for Ronald Reagan, is it not true, Mr. Secretary, that in this year of our Lord 1967 you and your Department do not give a "dam" for "Mo" Udall.

Secretary UDALL. We are trying to be impartial, Congressman. [Laughter.]

Mr. UDALL. On page 4 of your statement, if I may be forgiven for reverting back to the subject of your testimony here, for a moment, in the first paragraph you say, "I am confident that once established, a National Water Commission will of necessity give urgent attention to

the problems of the Colorado River Basin." One of the things that Arizona and California and the basin States agreed upon that really made possible this historic compromise and partnership that we had last year was that, if Arizona was to go ahead with the central Arizona project, we would do two things: first getting a bank account, a basin fund, which we no longer have under the plan the Department proposes, and second, that we would begin really meaningful studies about augmenting what all now agree is a short river, a fact you emphasized this morning.

One of the things that disturbs some of our water leaders in Arizona is the real question of whether the National Water Commission—which is included in my bill—will really get on with the problem of determining these two things that we are concerned about, whether it is really feasible to move water a thousand miles or 1,500 miles, whether the Engineers can come up with the answers to do it, and secondly, whether we can pay for it, whether we can deliver it down there at a cost that we can afford to pay. I guess the question I want to ask is: Do you really sincerely feel that the National Water Commission will be a step in that direction to getting answers to those questions or whether it will simply be as so many fear, another 5 or 6 years of delay?

Secretary UDALL. Well, there are many who feel that, for example, we have not done nearly as much work as we should in the past in terms of the economics of water and the different alternatives of water resource development. I think, I say this to the Commissioner Dominy and his people, that they have learned a lot in the last 6 months and are much more sophisticated about water economics than was previously the case as a result of the very exhaustive studies that we carried out. I believe that a National Water Commission properly staffed would certainly look at all of the alternatives that have been talked about and maybe some we have not talked about. I do not know any that have not been discussed. They would look at them from the economic point of view. They would not make the type of engineering studies that the Bureau of Reclamation would make. That would be at a later stage.

But I think they would give the Nation some guidelines that we do not have at the present time and that this would be certainly a step in the right direction.

The other point I would underscore, the one that I insisted on making to Congressman Hosmer this morning, is that I think fortunately we do have enough time so that 5 years is not a crucial time period, providing we begin now and move aggressively on it. I am confident that any National Water Commission, worthy of the name, is certainly going to give urgent attention to the needs of the driest and most water-short area in the country.

Mr. UDALL. Well, let me come to that point as my next question. Some of our people, some of the people I have talked to say, "All right, the practical situation is such that we are not going to have a beginning of these meaningful studies of augmenting the river from outside the basin unless the National Water Commission does the job." And they say, "Then what is wrong with language such as the language in my bill which says that this Commission shall give a priority to the Southwest?"

You are going to call in a management expert to look at your farm and he is going to talk about crop patterns and long-term needs and conditions of soil but the first thing you would want him to do is give you some advice on the barn that leaks and the cow in the bog.

What is wrong with language directing the National Water Commission to give some priority to its study of this most urgently short area?

Secretary UDALL. I do not think that we consider this a point of great importance. I think if you appointed a National Commission to look at the Nation's health, it would necessarily concentrate a great deal of its attention on cancer and heart disease and things of that kind. In other words, it would concentrate on the main problems.

I think this has been really more an exercise in semantics than reality because I think any National Water Commission worthy of the name is going to have to give paramount attention to the main problems of the country. I think that these are pretty well understood by everyone who is familiar with national water needs.

Mr. UDALL. The gentleman from Colorado this morning made a point that I thought might have considerable merit. You have national commissions and study groups—this has become a very popular device. One of the things he has pioneered in the Public Land Law Review Commission and in ORRC is that on such a commission you place at least a few Members of the Congress, so that when the recommendations come back to Congress for action you have sitting right in the room with the people who make the decisions some people who participated in the studies.

Secretary UDALL. I cannot very well argue with this point because I think one of the most successful national commissions that we have had since I came to town 12 years ago, is the Outdoor Recreation Review Commission. In effect, a consensus.

The reason why quite frankly I do not think this would work in terms of the water problem, is that we have for the first time the possibility of studying or of analyzing the possibility of moving water between regions. If you were to have that type of commission you would probably have people from the Northwest, and from the Southwest clamoring to get on it, and you would carry your argument that you have right here on to the Commission.

I think that is the reason that a dispassionate study is needed. From my point of view—I say this as Secretary of the Interior, but looking from the part of the country I am from—since Senator Jackson and the people from the Northwest have said that they think the way to begin studying these larger problems is to have a National Water Commission, this offers an opportunity for the people in the Southwest to say, well, all right, if that is the way you think it should be done rather than sit and argue for 5 years, let us get started. This, I think, is again a sound argument for using this approach to what is a new and cannot help but be a controversial problem.

Mr. UDALL. I testified with my Arizona colleagues yesterday that because we felt our bill was a little bit too big last year we had tried to cut the bill down this year. You and the Department have been criticized for supposedly abandoning a regional plan, abandoning the regional features that were part of last year's bill. And the reason

we eliminated such things as the feasibility studies of the Northwest importations, and so on, from this bill was to avoid opposition and controversy.

But it seems to me that we ought to include in any legislation those intrabasin things, those things right in the Colorado, States that look to the future and that can be done now: things like water salvage, things like a basin fund, things like weather modification studies in the basin, such things as desalting techniques, studies of augmentation from northern California, and how these could help alleviate shortages in the basin.

Does the administration object to going in this legislation as far as we can practically go now, having as many of these things as possible in the legislation?

Secretary UDALL. I have already made it clear as far as the basin fund including Hoover and Parker-Davis, we have no objection to that as one step. As far as weather modification is concerned, we have a vigorous research program going. We are probably 10 years away, perhaps, our people tell us, from really large-scale applications.

I think the most important thing there is to support the research.

As far as water salvage, I think again here are things as you point out that we can do right now that we do not need to wait on, and the committees might very well want to direct us to move on some of these fronts.

As far as northern California studies are concerned these really are matters up to the committee's judgment, whatever you can work out. Certainly we would not have any serious argument with moving forward action that is underway right now to improve water conservation and water management practices.

Mr. ASPINALL. Will the gentleman yield?

Mr. UDALL. I yield to the gentleman.

Mr. ASPINALL. In fact, with the exception of the weather modification program and the Office of Saline Water program you would have that authority presently, in all of your authority up and down the river, would you not?

Secretary UDALL. Yes.

Mr. ASPINALL. All right. Now, with the Water Resources Planning Act that I referred to this morning, you have got the authority to make that study right in your own Department, have you not? Or right within the people that are involved in resources on the Colorado River Basin, have you not?

Secretary UDALL. We have, as the chairman points out, ongoing authority to do certain things. The limit on most of these things is a question of how much money we have to carry out particular programs, but I do not want to give the committee the impression that we are not concerned about and we are not active right today in terms of improving water conservation, in terms of improving water management.

We have made big strides toward licking the saline water problem that bothered Mexico. I want to commend the Imperial Irrigation District for its actions as a result of the water shortage problem we had 2 years ago. They are using less water. They are using better water conservation practices. So, we are conserving water and improving our programs right now and I think we must continue.

Mr. UDALL. Well, to close this particular discussion, Mr. Ely said yesterday, and it has always been California's position that reasonable studies even in the feasibility grade of bringing northern California water into the Colorado River Basin could go forward, you would have no objections if the committee wanted you to include in this year's legislation this and other things to which there is no great opposition at this time.

Secretary UDALL. I think the one caveat I would certainly have relates to the one very large problem involved when you start moving water from one river basin or one region to another. This is where the National Water Commission study should be most useful, and most vital. Whether you want to have some kind of studies going forward in these other areas, frankly, we have not given this too much thought up to this point. I would simply say we are discussing what might move forward in an orderly way so that we do not just sit back and do nothing for the 5-year period but that we are ready as part of our planning process to sit down and lay out alternatives, look at the economics, and know what answers are best.

Mr. UDALL. The point I was making was that in last year's bill we had a six- or seven-pronged attack on the water problems of the region, and we have had to retreat on this one point. Feasibility, reconnaissance grade studies as far as my bill is concerned in the Northwest would be taken out but it seems to me, we could still go ahead with the five or six prongs that are left. This was what I wanted to get the Department's thinking on.

I have just a couple of inquiries for Mr. Dominy here and then I will be done. Mr. Dominy, it was called to my attention the other day, and I was surprised and wanted to confirm this because I have not seen any full-page ads attacking it at any time—that there is now and has been for 30 years in Grand Canyon National Park a hydroelectric plant at Roaring Springs that serves the north Rio Grande Canyon?

Mr. DOMINY. Yes, sir.

Mr. UDALL. Operated by the National Park Service, of all things?

Mr. DOMINY. Yes, sir. There is a small teakettle there that does that job.

Mr. UDALL. I wanted the record to show that.

Next, in response to some questions this morning, you projected potential water supply or probable water supply for the central Arizona project into the 21st century, talking about 50 years and then beyond that. Those figures I want to make it clear were based upon the existence of the 4.4 guarantee to California of the type we had last year?

Mr. DOMINY. That is correct. To make it abundantly clear to the committee, those figures are based on the 4.4 guarantee, a 2,500-second-foot aqueduct as the available conveyance channel as far as capacity is concerned, and average runoff over the hydroelectric cycle that we are discussing.

Mr. UDALL. And, if similar computations were made without a 4.4 guarantee or presuming some other kind of allocation in times of shortage, central Arizona aqueduct might have even more water than that, all without taking additional water from the upper basin.

Mr. DOMINY. That is correct.

Mr. UDALL. Now, I want to make this abundantly clear, too, particularly for any new members of the committee who were not with us last year. Even if we had a 4.4 priority for California, even assuming we do not augment the river with a drop of water, even assuming that the upper basin puts to use its full entitlement under the compact, even assuming river runoff of the kind we have had in the last 20 or 30 years, the central Arizona project is feasible.

Mr. ASPINALL. If my colleague will yield—

Mr. UDALL. And will pay out and has a favorable cost-benefit ratio.

Mr. DOMINY. That is correct; it would be an economically justified project.

Mr. ASPINALL. I think your assumptions should be that the lower basin would be willing to abide by its entitlement under the Colorado River compact rather than any assumption about what is going to happen in the upper basin.

Mr. UDALL. Mr. Chairman, we have always made that assumption and plugging that assumption, that further assumption into my question, it is still feasible, still pays out.

Mr. DOMINY. That is correct.

Mr. UDALL. Still has a good cost-benefit ratio?

Mr. DOMINY. We have certainly in all of our calculations assumed the full development of the upper basin in accordance with the compact commitments.

Mr. ASPINALL. If my colleague will yield again, this does not assume, however, that the facility or facilities would be permitted to make full use of all of their benefits and infinitum into the future for the benefit of Arizona. In other words, there is a stopping place—some place where the benefits to Arizona are going to be limited.

Mr. DOMINY. Well, this is correct. As the upper basin States put their water to work there is going to be less water available to the central Arizona project and we have assumed this.

Mr. ASPINALL. This does not assume any additional burdens upon the value and the benefits to be derived from Lake Powell and Lake Mead, other than those that would be guaranteed under the filling criteria that is proposed in the legislation.

Mr. DOMINY. That is correct.

Mr. UDALL. Mr. Dominy, while I have not embraced the Department's prepayment plan as has the acting pro tem Johnson administration majority leader [Mr. Saylor], as he indicated this morning, I wanted to correct what may have been a false impression left this morning when we were discussing prepayment planning. Under last year's bill, for example, with the two dams or under my bill with one dam, was it ever contemplated that this high-cost, high-value, hydro-power would be used for the pumping?

Mr. DOMINY. Only to a degree, sir.

Mr. UDALL. You were going to trade that off somehow?

Mr. DOMINY. That is possible. We would use the peaking power for pumping during onpeak periods and we would, of course, sell the remaining peaking power to the interconnected power grid at peaking rates. We would buy offpeak baseload power at baseload rates for offpeak pumping or even trade onpeak for offpeak.

Mr. UDALL. Could you trade these high value hydrokilowatts for two or three steam kilowatts if you were using off pumping?

Mr. DOMINY. Maybe not quite that much but certainly at a distinct advantage.

Mr. UDALL. Right.

Mr. ASPINALL. Do you see, at any time in the future—1975, 1980, or beyond that—that you will have an oversupply of this kind of power, hydroelectric power, as far as the whole region is concerned? Would this give you any additional problem because of too much of this kind of power?

Mr. DOMINY. No, sir. In all of the projects that the Bonneville Power Administration administers, the Central Valley project, the Missouri River Basin project and all of the interconnected systems, peaking power is a marketable commodity. We do not think we will ever have too much of it.

Mr. ASPINALL. It will not work to the disadvantage of the power generation at Glen Canyon or power generation at Hoover, Parker-Davis, or anything like that? This would economically fit in to the needs of the region.

Mr. DOMINY. That is our judgment, based on the forecasts that we have.

Mr. UDALL. One final subject, Mr. Dominy. There is an Arizonan here who has contacted me and perhaps other members of the committee. His subject came up this morning, about digging a gravity tunnel from Glen Canyon Dam and dumping the water into the Verde River as an alternate means of getting the water into central Arizona. This on the face of it, has great advantages. You do not have evaporation. Once the tunnel is dug the water flows by gravity.

What is your answer to the suggestion that we ought to go in that direction?

Mr. DOMINY. I think I have very little more to add to what I covered this morning, Congressman Udall, except to point out this involves some 145 miles of tunnel, some of which would be 5,000 feet below the surface elevation, and that obviously it is impossible for any geologist or engineer to predict with any kind of certainty what you would encounter within the length of 145 miles under unknown terrain in an area known to have faults and known to have volcanic activity as a history. We obviously have to weigh our estimates with a great deal of contingency factor because we could very well run into the very problems that some other tunneling efforts of much shorter range have run into such as tremendous voids in the earth, tremendous quantities of hot water, for example, to treat with, and caverns that take great quantities of water or concrete to fill as you line the tunnel, and all that sort of thing.

Mr. UDALL. Is there anything of this magnitude—

Mr. HOSMER. Will the gentleman yield?

Mr. UDALL. Just a moment. Is there anything of this magnitude anywhere in the world, a tunnel of this kind?

Mr. DOMINY. Not to my knowledge; no, sir.

Mr. HOSMER. I think there are 90 miles of tunnel over on the other side of the river in the Los Angeles aqueduct.

Mr. UDALL. Is this continuous tunnel?

Mr. DOMINY. No. There are tunnel sections in the aqueduct. There are tunnel sections on our aqueduct, too.

Mr. HOSMER. All of these horrors that you conjured up, you do not know whether they exist or not, these voids and steam and all that?

Mr. DOMINY. No, sir. We just recognize that in 145 miles of tunnel as much as 5,000 feet below the surface that there are unknown circumstances that we cannot predict with accuracy, and we do know of some tunneling efforts in this general vicinity that ran into problems and had to be abandoned, for example, because of these very things.

Mr. HOSMER. Is it not a fact that some of the mines in Arizona are operating below the 5,000-foot level?

Mr. DOMINY. Certainly. I assume——

Mr. UDALL. Oh, yes.

Mr. DOMINY. I assume there are some. But they do not stretch for 145 miles into unknown territory.

Mr. HOSMER. Is it not a fact that the geological exploration techniques by airplane, seismic means, and so forth, have been vastly improved in the last decade?

Mr. DOMINY. All this is true.

Mr. HOSMER. Is it not a fact that I used to get after the geology at Glen Canyon and you used to say it was good? Now we are just in reverse positions.

Mr. DOMINY. Well, as a matter of fact, I remember the first time you walked out on Glen Canyon Dam and I was surprised that you felt safe when you did so, based on your previous testimony, but——

Mr. HOSMER. After seeing the Secretary drinking that chinle shale, I had my confidence restored. I do not know how he felt.

Mr. DOMINY. No. I do not mean to say that if the Congress decided that the proper way to proceed would be to go the tunnel route, we certainly would be happy to undertake it. We are not recommending it because all of our judgment indicates that the pumping out of Havasu——

Mr. HOSMER. You have not spent any money on it in the last 10 years, do not intend to spend any. You want to build an aqueduct and do not want to have anything to do with a tunnel. We understand that. Thank you.

Mr. DOMINY. Well, I do not believe I want to let it rest just there, Congressman Hosmer.

Mr. HOSMER. Do you want to bury it deeper?

Mr. UDALL. I yield to the administration's leader pro tem.

Mr. SAYLOR. I just want to say to my colleague from Arizona that you said you were going to put a tunnel underground. My first question to you was, Is there any place to put a tunnel but underground? But this colloquy reminds me of debate which I understand is taking place at the present time between France and England trying to determine whether or not there should be a tunnel placed under the channel that goes between those two countries. And they had bids submitted and most of them were in astronomical figures, in the billions.

But it seems that Alphonse and Gaston, two brothers, submitted a bid of \$200,000 and they were called in by the people because it was

such a low bid and they wanted to know how it was done and they said, very easily, Alphonse started on the French side and Gaston started on the English side, and they drove toward the center. And the question was asked, What would happen if you missed? And he said, "Very simple, you would then have two tunnels." [Laughter.]

Now, we might have the same thing happen. You are going to take twice that amount of water out of Lake Mead, with two tunnels, and then Arizona would be getting its full share of 2.8 and maybe California would have something to worry about in that 4.4 guarantee.

Mr. UDALL. Mr. Dominy, I want to close out this discussion, but I want to have something on the record. What you are saying is, it is the known versus the unknown. You know what you can do with aqueducts and what your costs are if everything worked just lovely. But with this tunnel project it might be very good but the risks of going that route are such that you would not want to gamble a half billion dollars on this.

Mr. DOMINY. I would agree with that and add one thing more. Even though you assumed everything favorable on the tunnel, it still would not be as economic a means as to divert from Lake Havasu and go by—

Mr. UDALL. I want you to know that the Phelps-Dodge Co. gave up on a tunnel in this same area of northern Arizona just off the Verde River because of troubles they ran into in tunneling just a very few miles.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. Thank you, Mr. Chairman. Last summer Commissioner Dominy and I dedicated a dam at Joe's Valley, Utah, which leads me to think maybe I am the only man on the committee the Secretary does give a "dam" for.

Mr. Dominy, in your statement a year and a half ago before the committee, you pointed out the Dixie project in Utah was included for participation in the Lower Colorado River Basin fund.

Now, in H.R. 3300 and H.R. 9 there is no section similar to 309. Would the Department have any objection to, at the appropriate time, us putting that back in the legislation?

Mr. UDALL. Will the gentleman yield?

Mr. BURTON of Utah. I would be happy to.

Mr. UDALL. That section is in my bill H.R. 9. I think I gave instructions to my lawyers to put it in there. If it is not, heads will roll.

Mr. BURTON of Utah. There is no reason the—

Secretary UDALL. Congressman, let me explain it this way. We had no objection to this last year. The only thing is, of course, you need a basin account to tie it to, and, therefore, if the committee decides to go ahead and create a contingent basin account out of Hoover, Parker-Davis revenues then this language could be written in and you have your project tied to that basin account for pay out purposes.

Mr. UDALL. Will the gentleman yield? Page 23, line 21, it is in there and I will fight to keep it in there.

Mr. BURTON of Utah. Well, I am just going to switch right off H.R. 3300 and get over on H.R. 9 then.

Mr. DOMINY. If you look at H.R. 3300 you will find the same language.

Mr. BURTON of Utah. I thank the gentleman.

Mr. Secretary, as a fine lawyer and legislator, now administrator, is there anything in your judgment, in any of these bills, that in any way disturbs the allocation under the Colorado River compact between any of the States separately, or between the two basins?

Secretary UDALL. I think I would have to answer categorically, no, that I do not think there is anything that disturbs the compact between the States and the allocation.

Mr. BURTON of Utah. The rights of each State individually and in both basins remain intact and we are not basically altering the compact?

Secretary UDALL. I think this had to be a very basic considering in all of our planning and I think that you will find that there is nothing in the plan that does disturb those relationships.

Mr. BURTON of Utah. Thank you. I would like to ask Mr. Dominy a question. A year or two ago the Bureau testified to this committee that the most economical powerplants that could be put on the river for this project would be the hydroplants. You gave us a number of reasons as to why they would be better than steamplants. First, hydro you said generally, was more economical. Hydroelectricity lends itself more to peaking uses than steam because you can turn off a hydro generator and turn it on again. Steam, if you are going to maintain it, has to be heated all the time, causes more fuel consumption and you cannot keep turning them off and on all the time.

There has not been anything happen in the last couple of years to change those basic engineering facts, has there?

Mr. DOMINY. No. That is correct, and the Secretary pointed that out in his statement, that we have turned to the prepayment plan and recommended that Hualapai be deferred because of the fact that under the prepayment plan the central Arizona project can be financed with less capital investment now and that the Congress would have the authority to reserve Hualapai for later addition if it saw fit after the National Water Commission had reported. But there is no difference as far as the economics of the power at Hualapai as a peaking endeavor, it is still a very economic purpose and could compete with any other possible peaking source of power.

Mr. BURTON of Utah. Thank you. It is nice to have you gentlemen before us again.

Mr. JOHNSON. The gentleman from California, Mr. Tunney.

Mr. TUNNEY. Thank you, Mr. Chairman.

Mr. Secretary, I would like to address myself to the 4.4 guarantee to California for a moment.

Does the Department recognize a contract between the Federal Government and the State of California as a result of the Boulder Canyon Project Act and the resultant California Limitation Act to guarantee California 4.4 million acre-feet of water from the Colorado River every year? Do you feel that there is an agreement, contract—

Secretary UDALL. Congressman, when you are getting into the intricate legal matter, I would like to have the Deputy Solicitor, Mr. Weinberg, answer that question. Briefly.

Mr. WEINBERG. The contract, Congressman Tunney, as construed by the Supreme Court in *Arizona v. California* provides for a guar-

anteed delivery to California of 4.4 when there is 7.5 available for consumptive use in the lower basin and that is the contract the Department has entered into and the contract that the Department must honor.

Mr. TUNNEY. But is it not true that the Boulder Canyon Project Act recognized and ratified the Colorado River Compact which was that California would get 4.4 million acre-feet and that the Congress said under the Boulder Canyon Project Act that if five States of the seven approved and if California agreed to limit itself to 4.4 million acre-feet, that then the compact would be ratified by the Congress? Is that not true?

Mr. WEINBERG. That is correct.

Mr. TUNNEY. And is it not then true that California under the California Limitation Act limited itself to protection of 4.4 million acre-feet, is that not right?

Mr. WEINBERG. Yes. California was required to limit its demands on the Colorado River to not to exceed 4.4 million acre-feet plus one-half of any surplus unapportioned by the compact. This is not a guarantee from the United States that she would, under all circumstances, receive that much water.

Mr. TUNNEY. And—

Mr. HOSMER. Will the gentleman yield right there?

Mr. TUNNEY. Yes.

Mr. HOSMER. That was in terms of prior appropriated rights.

Mr. WEINBERG. No. The act says that this is in satisfaction of all rights of California, including present perfected rights.

Mr. HOSMER. But the difference between present perfected rights at that time and 4.4 was subject to appropriation in the law of the river. You could not go above 4.4 in perfecting these rights.

Mr. WEINBERG. California could not go above 4.4 but the Supreme Court in construing the act and the contracts concluded that what California attained under the Boulder Canyon Project Act and by the contracts was contracts calling for 4.4 in the event 7.5 were available for consumptive use in the lower basin and in the event there is less than 7.5 available for consumptive use in the lower basin, the court construed the contract and the act as leaving the determination of the allocation of shortages to the Secretary, subject to the requirement that present perfected rights be met in the order of their priority and that any other applicable requirements of the Boulder Canyon Project Act be complied with.

Mr. TUNNEY. Well, two points there. One, did not the Court say that it was up to the Congress to make the decision initially and if the Congress did not, then it would be up to the Secretary?

Mr. WEINBERG. At this time, as we now testify here, Congress has not made such a decision.

Mr. TUNNEY. No, Congress has not yet made such a decision. And I am right, am I not, that the Court did not address itself to the problem of whether or not California would be entitled to some form of compensation if their water was reduced below the 4.4 million acre-feet level by the Secretary of the Interior at some future time?

Mr. WEINBERG. The Court did not say anything specific on that point. The Court did say, Congressman Tunney, that it refused to

adopt the pro rata apportionment proposed by the master and the Court added that it refused to find in the governing law and contracts either the doctrine of equitable apportionment or prior appropriation for which California had contended in the lawsuit. It said as to all these matters, until and unless Congress lays down a shortage apportionment formula, it leaves them to the Secretary, subject to the requirements that I mentioned.

Mr. TUNNEY. Right, but the point that I am trying to make is that the Supreme Court did not decide specifically whether or not there was a contract existing between the Federal Government and the State of California guaranteeing California 4.4 million acre-feet or in the eventuality it was less than 4.4 million acre-feet, granting California compensation.

Mr. WEINBERG. I would agree that the Supreme Court did not find the latter. I would not agree that the Supreme Court did not find the former.

Mr. TUNNEY. You feel that they found that there was not a contract right existing between California and——

Mr. WEINBERG. To the 4.4 under any circumstances, no, I do not believe that the Court held that.

Mr. TUNNEY. Do you feel that they addressed themselves to that point?

Mr. WEINBERG. Yes.

Mr. TUNNEY. Well, on all fours? Did they address themselves to that specific point and come up with the conclusion?

Mr. WEINBERG. Yes, I think they did.

Mr. TUNNEY. Well, we had testimony here yesterday by Northcutt Ely which I think would disagree with your interpretation.

Mr. WEINBERG. I have a very high regard for Mr. Ely. However, I noticed that Mr. Ely in his testimony raised the questions but he did not purport to give an opinion as to the answers.

Mr. UDALL. Will the gentleman yield for a friendly comment? Mr. Weinberg has the same crazy idea that some of us in Arizona have, that we won the lawsuit.

Mr. TUNNEY. I certainly hope that Mr. Weinberg is not an attorney for Arizona.

Mr. WEINBERG. No. My State of Washington is not a contender before the committee today, Mr. Tunney.

Mr. SAYLOR. Mr. Tunney, will you yield to me for an observation?

Mr. TUNNEY. Certainly.

Mr. SAYLOR. I would just like to say this is the first time I have ever heard in this committee or anywhere else that a State which passed a limitation act because they wanted to take more water out than the compact provided suddenly got a right to reimbursement. This is a new theory in the law and I am sure that it comes with shocking news not only to Arizona but to anybody else who has ever studied the theory of contract law.

Mr. HOSMER. Will the gentleman yield? I am shocked, too, because I never heard anything like that in my life before, and it is not California's position. California limited itself to 4.4 and said it was not going to get any right to any more water than that. As long as there is water coming down the stream, it could use more than that, and it

did not say that it was going to take any less than that. And that is the thing at issue right now. It is not going to take any less than that because in cooperating with Arizona, to forward the project for the benefit of Arizona, California is going to have to stop using over 600,000 acre-feet, which is an awful lot of water.

We have had bandied around here the desalting plant business—but does anybody know how much water that plant produces? It is 168,000 only, acre-feet a year. If it runs night and day 365 days a year, a mere drop in the bucket compared to the quantities of water we are talking about in connection with the provisions of the bill.

Thank you.

Mr. TUNNEY. Thank you, Mr. Hosmer.

Well, Mr. Secretary, as I recall in January of 1965, you had a meeting here in Washington with the Governors of Arizona and California, with the Senators, and it was agreed upon that we would move forward with the Colorado River Project Act providing for the central Arizona project, providing also for the guarantee to California of 4.4 million acre-feet, and as I recall, when you testified before this committee in 1965, you took legitimate pride in being able to bring together these two States which had had such animosity in the past with respect to Colorado River waters.

Now, the thing that I do not understand is what has made you change your mind in the past 2 years with regard to the 4.4-million-acre-foot guarantee to California when you know that this certainly is charged with as much emotion as far as California is concerned as it is the right to additional Colorado River waters in Arizona.

Secretary UDALL. Well, Congressman, I am glad you gave me an opportunity to clarify this point because I think that there have been some things I have seen in print that I consider unfair to me in regard to this.

I did undertake and I spent many months as a mediator, working not only with Governor Brown but with Governor Goddard and Governor Fannin at that time, to bring the two States together to see the identity of interests they had in augmenting the river, and to see the importance of a compromise. I do not think I quite achieved the thing that you are referring to, a bringing of everyone together. I know that Senator Hayden for one, who was involved in this as well as some of the Congressmen, never agreed to the type of permanent 4.4 guarantee. I was never successful in achieving that result. But the function that I was trying to perform was as a mediator between the States to bring them together. Subsequently, when it came to the administration, the administration chose to take a position and it is the only position we have ever taken, that this was a matter between the States, and that if the States wanted to enter into an agreement, that we had no objection, we thought that was fine. That is all the further that I was able to go as a spokesman for the administration in terms of bringing the States together and I think it is this kind of slightly ambiguous situation that has caused some of the misunderstanding on this.

So, I take the view that as far as the administration's position, as far as the position I took before the committee, I have not changed my position at all because we still have no objection. We think this is primarily a matter between the States.

Mr. TUNNEY. You have no objection to the 4.4-million-acre-foot guarantee?

Secretary UDALL. That is right. That is our view and if the committee wants to write it that way, we feel that this does not cause us any problem.

Mr. TUNNEY. Mr. Secretary, to move on to another point, and that is with respect to possible feasibility studies or constant studies of feasibility studies, I can recall last year your testifying in general that the time had come to think on a regional basis and not on a piecemeal basis, and I thought that this was one of the great strengths of the bill that we had before the committee last year and I thought that was one of the great strengths of your testimony. It seems to be that we have backtracked considerably in your recommendation in that we no longer are thinking in terms of regional water development. We are thinking in terms of piecemeal development. And I would like to know, I know you made a statement today which touches on this generally, but I would like to know as a matter of fact, why you felt it was necessary to go back from this regional development to a piecemeal development and why you took out the idea of having an importation study, feasibility study?

Secretary UDALL. Well, Congressman, I touched on this considerably this morning. I think the appearances are deceptive here because we are still for moving forward. As part of our plan last year, we recommended establishing a basin account because we proposed to authorize Marble Canyon Dam and include it in such an account. We now say if Congress wants to establish a basin account to include Hoover, Parker-Davis revenues after payout this would be fine and would be a first step toward the regional approach looking on down the road toward augmentation. The only reason that we dropped the basin account is that we have no new dam that we recommend be authorized.

We still have taken the position, however, and I do not think this is any retreat at all, that if the Congress wants to set up an after payout basin account with Hoover-Parker-Davis revenues and direct us to go ahead and set this up, that we have no objection. So, I do not think there has been any retreat with regard to the river basin approach or to the regional approach.

We are as enthusiastic as we were before in terms of this. It is, I think, clearer, though, after the failure of the 89th Congress to act, that the way to really begin moving down the road to make big decisions is to get a National Water Commission study going. I think we have lost 2 years on that already and I think that the sooner we take Senator Jackson and the Northwest people at their word, that they are ready to go with the National Water Commission study and begin it, that the sooner we can begin to move on down the road where decisions of some kind can be made.

Mr. TUNNEY. Would you like to see some language in the National Water Commission Act, directing the National Water Commission to give priority consideration to the problems of the Southwest as is contained in Congressman Udall's bill?

Secretary UDALL. As I indicated, Congressman, I do not think it is necessary. I think it is sort of superfluous in a way. I know it causes

some uneasiness among some members of the committee but I do not think this is really an important point. I think this is really up to the committee to work its own will on it.

I think the National Water Commission of the type that we envision is going to set up its work program and its own order of priorities. I would assume it will go right to work and I would be surprised if it did not give the driest part of the country attention along with any other major problems that we have.

Mr. TUNNEY. Well, certainly the problems of the Southwest, for those of us who live in the Southwest, are perhaps the most critical of any area in the country and I can recall, if I am right, your testifying to that exact fact last year. And so I do not see why there would be a reluctance on the part of the administration perhaps to encourage the inclusion of this language giving priority to the Southwest in any law that authorizes a National Water Commission just so that we could be sure. As a civilian council it will not be under your direction, will not be under the specific direction of the Congress once it is formed. So, what is wrong with having a specific direction in the authorizing legislation that they give priority to the Southwest?

Secretary UDALL. Well, Congressman, I think this is really a matter for the committee to decide. I do feel that it is urgent one way or the other to give the commission direction of this kind.

Mr. TUNNEY. Mr. Secretary, the Water Resources Council, of which you are the Chairman, is supposed to study, I understand, the various problems that exist in river basins as to supply and as to need, and I understand that it is pretty well funded. I understand that in one case under one basin it has already had the machinery set up, that they have received a grant of something like \$5 million; is that correct?

Secretary UDALL. We are setting up under the River Basin Planning Act of 1965 different river basin commissions. One was approved the other day for the Northwest, for the Columbia. We are considering others—one for the Great Lakes, one for New England, and these will be moving forward.

Mr. TUNNEY. And do you not feel, for instance, the Water Resources Council would be able to decide whether or not there is a sufficiency of water in the Columbia River or northern California not only to take care of the needs of northern California or the Northwest but also, perhaps, for areas of deficiency and that perhaps when we talk about the National Water Commission being needed to make the study, we are really talking about something that is superfluous?

We could do it with the Water Resources Council; could we not?

Secretary UDALL. In my own judgment, and I act as Chairman of the Council, it would not be a good vehicle, and let me tell you why. We have just created a Columbia-North Pacific Planning Commission. It is charged with planning the long-term water future of that region. It is just beginning to act.

Now, if you were suddenly to have the Water Resources Council, which is an agency that has several different functions, move in before they have really made studies of their own and tried to make judgments as to whether the region has or does not have surpluses, and what the various means might be of moving surpluses into other regions, that we would quite rightly stir up some controversies and

raise some arguments that could be very serious. This is the reason, really the basic reason, it seems to me, why a National Water Commission that is national in scope, that has a staff of its own, that could direct itself toward the big, long-term water future of the country and the big problems that are on the horizon, would be a much superior method and a much less controversial method of approaching the problem.

Mr. TUNNEY. I would assume that the National Water Commission will be using many of the facts and figures developed by the National Water Resources Council in making their determination; will they not?

Secretary UDALL. This brings me to the second phase of this and that is, I would fully anticipate that the National Water Commission will want to use some of the resources of the Water Resources Council. We will want to look over their shoulder and be helpful to them in preparing their report. When their final report comes in, we have provided in the legislation that we would—the Water Resources Council, including all of the water agencies of the Federal Government—append our own comments and attach them as the report went to the President and to the country.

Mr. TUNNEY. Mr. Secretary, assuming that we should authorize a National Water Commission and assuming that it should give priority consideration to the problems of the Southwest, how long do you anticipate it would take, first, for the National Water Commission to complete its study, second, to have a reconnaissance study done by the Department, third, a feasibility study, then having Congress authorize an act to build the importation works and then finally, to construct the importation works so that we would have water coming from areas of surplus to the Colorado River? How long do you feel we have when we talk in terms of all these steps, because it is my understanding that if we do not have water coming in by the mid-nineties, 1990's, we are going to have a shortage in the Southwest.

Secretary UDALL. Well, Congressman, this is a very "iffy" question. It depends upon what the commission recommended, how aggressive the Congress would be, how your feasibility studies would be funded, an probably your answer is somewhere in the vicinity of 8 to 10 years, in that framework.

Mr. DOMINY. I testified last year, Mr. Secretary, that a reconnaissance would take 3 years.

Secretary UDALL. I want to point out one thing here, however, that I think we ought to say to the committee, and I have to say it very gingerly because, again, we are dealing with an "iffy" subject, but the Bureau of Reclamation is also in the business of weather modification. It might very well prove, if our research in weather modification continues to move as rapidly as it is, that the cheapest and earliest water that the region could get, perhaps even well before 1990, would be significant amounts of water produced by weather modification. The decision we are discussing might thereby be moved off in the distance and be considered along with other alternatives. I do not think, even in terms of the time from here on, that one should prejudge it and say, well, there is only one way to get more water for the region and that is from the Columbia River and how long will it

take it, even assuming we go for a National Water Commission Study.

Mr. TUNNEY. Well, I think this is a fair question because we know from all of the testimony I have heard, there is going to be a shortage in the mid-1990's. We are here sitting as a body trying to determine which is the best way to proceed, so I think we must have some time schedule in mind. I mean, certainly the Department, if you are proposing a National Water Commission to do this preliminary study, surely you must have some time schedule in mind.

Do you feel this National Water Commission and the various studies that go on afterwards and the authorization and construction period, that it is going to be completed in the year 2010 or in 1990 or the year 2000? I mean, what time schedule do you have in mind if there is going to be importation?

Secretary UDALL. Congressman, I think I can answer that question very directly. If we are to do proper water planning for the future, I believe the time frame has to be that we are going to move fast enough so that the type of water shortages that we are discussing do not develop. Therefore, whatever the time limit is, whether it is 1990 or 1995, I think we ought to move fast enough so that we can have whatever solution or solutions are selected, developed, and in place, whether it is weather modification or desalination or importation. This should be done in time so that the shortage does not develop.

Now, that is about as clear cut as I can be, which means that I think we have to take the 1990 date or the 1995 date seriously and we have to move in that direction.

I would add one other point. If, in April of 1965, the Congress had quickly picked up the administration's idea of a National Water Commission and passed it, we would already be 2 years down the road. Therefore, the longer Congress sits and argues about it, the more we are losing valuable years and this is all the more reason to me why we ought to resolve this issue this year and move on it.

Mr. TUNNEY. But in all fairness, you also recommended last year a reconnaissance study coupled with a feasibility study if the Congress felt this would be appropriate, because you testified in favor of Congressman Udall's bill, which originally contained that language.

Secretary UDALL. Congressman, I have to dispute you on that because we did not support separate studies. We were for the National Water Commission study straight out. We did not support in either the House or the Senate the feasibility study by the Bureau of Reclamation as the first step.

Mr. TUNNEY. I recall reading your testimony of April 9, 1964, in which you said before the Senate that the Colorado River Basin, and I am quoting now, "is moving rapidly toward a water shortage crisis," and the only thing that I would like to say is that I think you were right at that time. I think that the crisis is more acute now than it was then, because of inaction, and it seems to me, the fact that we do not have a time schedule at the Department, when you consider what the proportions of this crisis could be, we do not have a time schedule for actually constructing importation works, assuming that the National Water Commission conducts the first study, gives me some apprehension.

Secretary UDALL. Congressman, the more I think about this, the real answer, in my judgment, is that if we move now this year and get

our National Water Commission busy we have adequate time to meet the time limitations that exist. I think there is still that much leeway. We still have a little elbow room because even assuming a 10-year or 12-year leadtime on projects, we still have a little elbow room if we will get busy.

If we sit for another 5 years and argue, that margin shrinks.

Mr. TUNNEY. Thank you, Mr. Secretary.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman. Mr. Secretary, I know you have received one previous compliment and I want you to know that I appreciate yourself and your people giving one tiny dam for a minority Congressman from Oregon in 1966.

I have just one question, Mr. Secretary, and that is caused by the confusion in your statement on page 9 in which you state that:

Nevertheless, the project has a benefit-cost ratio of 2.5 to 1 on both a 50- and a 100-year basis, considering total benefits and a 1.5 to 1 benefit cost ratio on both a 100- and 50-year basis if only the direct benefits are considered.

Now, I have studied your formula that I used for determining the benefit-to-cost ratio and I am at a loss to really understand the explanation of why the ratio would be the same for both the 50-year period and the 100-year period.

Mr. DOMINY. We have an expert here, Dan McCarthy, who is Chief of our Project Development Division. We would like to have him explain it.

Mr. WYATT. I think it would be a good idea to have it in the record.

Mr. MCCARTHY. Mr. Wyatt, in a normal project where you have a full water supply the 50-year benefit-cost ratio is less than the 100-year ratio. For this particular project in the second 50 years you have much less water supply than you have during the first 50 years, so that over the 100-year period the average benefits are less than they are over the 50-year period. Even though your costs are less over a 100-year period than they are over a 50-year period, it came out coincidentally that the one adjusted for the other.

Mr. WYATT. Practically on the nose—

Mr. MCCARTHY. That is correct. It is just coincidence, but if you had a constant water supply over the 100 years, then the 50-year ratio would be less than on the basis of 100 years.

Mr. WYATT. But what kind of water supply are you contemplating in the 100-year period just as a matter of curiosity? Are you contemplating the present water available without any augmentation of any kind?

Mr. MCCARTHY. We estimate by the year 2030 the upper basin would be using its full allotment and from then on the water supply to the central Arizona project would be leveled off. The central Arizona project in the second 50 years would only be getting about an average of about 675,000 acre-feet annually, as compared with an average of around 1,100,000 acre-feet over the first 50 years.

Mr. WYATT. Thank you. Mr. Secretary, in the questioning you had on the establishment of the National Water Commission, is it not really true that if you attempt to put high priorities on a study for a particular section, whether it be the Southwest or Northeast or any other particular section, that you more or less defeat the very purpose of having a national water study made?

Secretary UDALL. You all have me on a tightrope here and I will try to stay on it. There is a logic to what you say and it is our feeling that the type of act that we have proposed for a national water commission makes it plain what the task of the Commission would be. I have the feeling that it is somewhat superfluous to go further than the legislation goes, but this is something that if the committee wants to amend the language, I do not think we would have much objection one way or the other.

Mr. SAYLOR. Will you yield?

Mr. WYATT. Yes.

Mr. SAYLOR. I just want to say, Mr. Secretary, that you know this is a rather loaded committee. We have got a few people on this committee from east of the Mississippi River, but most of the members of this committee are from west of the Mississippi River, and most of them are worried about water in their own backyard. And they are being very provincial as far as I can see in trying to make sure that each one of the seven basin States gets everything that they are entitled to out of that overworked Colorado River.

Even if they have a national commission set up, they want to direct its attention to the Southwest where they use water very recklessly. And even your Department has found that out. I just want to say that if you are really going to look for a water-short area, just start looking in the area in the eastern part of the United States from Boston to Norfolk, Va., where water restrictions such as the West, which is supposed to be a water-short area, have never heard tell of were imposed last year and the last couple of years.

And, if we are going to have a national water commission, and ask them to do a job, you cannot ask them to close their eyes toward the greatest concentration of population in the United States and the greatest water-short area in this country.

Now, for that reason I heartily agree with your approach, that if we appoint a commission, we ask them to do a job looking at this Nation as a nation and let the chips fall where they will. And, if the Pacific Southwest is as short as they say it is, they will have no difficulty in making out their case to be the first ones to be taken care of and if they are as most of us believe, not a water-short area at all, because all the spigots are still turning on water out there, the grass is awful green, and if you fly over it you will see more swimming pools in those areas than anywhere else in the country.

Mr. HOSMER. Storage pools. [Laughter.]

Mr. SAYLOR. Storage pools, they may be storage pools, over consumption, used to freeze or to cool off the highballs that are used out there, whatever purpose you want. We do not care. But I am not in favor of limiting any National Water Commission or trying to tell them that they have to look first at the Pacific Southwest.

Thank you.

Mr. WYATT. Mr. Secretary, just one closing thought. It has always been my feeling that if you attempted to focus the attention of a National Water Commission upon a particular section, that you might thereby be creating more problems than you are solving in doing so, and that first we must have a general overview of the entire problem of the country. I think this was probably more

eloquently expressed by Senator Jackson and some of his work in this connection but this is my feeling and I think you are on the right track and I hope we have not embarrassed you by asking a question from both sides.

Mr. UDALL. Will the gentleman yield? I have tried to meet the reasonable objections of my friends from the Northwest and the gentleman from Oregon is one of the most constructive members that ever came to this committee on either side of the aisle, and my difference with him is very narrow. I hope this does not bog us down. I agree that you cannot decide the water problems of the country until you get all the information on all the areas of the country because you might want to move water from one place to another place. You cannot just pick out the Southwest and study it first and then say we are going to study the rest of the country.

The limited kind of priority which I am talking about and when I intend by the language in my bill is that when you have decided these broad policy questions and when you have decided how much water there is in all the different areas of the country, and then you have a stack of folders on your desk at the National Water Commission and you are going to start working on remedies, on solutions, that you pick up the Southwest folder first. That is all that I am interested in.

Mr. WYATT. Our area of difference is narrowed considerably. I thank my colleague.

Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Secretary, I would like to address some questions on the same general subject, a National Water Commission.

In your experience do commissions like the Outdoor Recreation Resource Review Commission and the present Land Law Review Commission and other very successful commissions address themselves primarily to problems that are within the internal discretion of the executive branch or are questions of policy and programs and planning better left to the discretion of Congress?

Secretary UDALL. Well, the—

Mr. FOLEY. They naturally have an effect in both areas.

Secretary UDALL. That is right.

Mr. FOLEY. The major problem—

Secretary UDALL. The National Water Commission would look at national problems and study national needs. The real value of the Outdoor Recreation Commission, as I say, was of having congressional Members on it. You had a consensus. It was by its nature not a controversial commission. Its report came out and things began to happen immediately and it was highly successful.

But the more I think about it, the more I believe that because water is the subject and because of the inherent problems and controversies that are present, that this type of commission is not workable.

Mr. FOLEY. Well, I agree with you, but what I am trying to elicit here is whether you would agree that the major problems that lie behind creation of a national commission of any kind are in large part, at least, if not in majority part, the responsibility of the Congress to eventually resolve.

Secretary UDALL. Yes, that is true.

Mr. FOLEY. Is that not particularly true in the matter of water?

Secretary UDALL. That is true. Your water policy is going to be molded, in the main, by the legislation that ultimately will be passed. Therefore, what you really would get is an evaluation of the basic problem, of basic alternatives, and of economics. When this is all laid out the Congress would pick it up from there.

Mr. FOLEY. Your job would be much simpler in one way, if you could merely assemble all the information that was available to you and reach a decision on all these questions and complicated problems on water resources and policy. But that is not within your power and I know you do not seek it.

Secretary UDALL. That is right.

Mr. FOLEY. It is a matter you quite rightly said for the Congress to decide.

What I am coming to is this. Is it not true that one of the great values of a national water commission would be to help this body, which is the focus, after all, of the judgment of the people of the United States, to reach some conclusions on the very pressing series of problems affecting our water resources?

Secretary UDALL. This is a good statement of it. I know that most of us in the last few years have been thinking on the importance of water, water conservation, and of the various methods of the developing technologies. There is a lot more change afoot right now as a result of advances in desalination and weather modification techniques and of the new water quality standards that are coming out of the national water pollution program. There is more ferment in water matters than a few years ago, more things taking place that might change or bring new alternatives into being, that might change or make other decisions possible in the future.

Mr. FOLEY. In listening to some of the questions asked by my colleagues in California, it seems to me that they are constantly coming back to questioning you as to how the National Water Commission will really implement an importation plan from the Pacific Northwest to the Southwest at the earliest possible time. And it always seems to me that that misses the point, and what you have said in effect is this, is it not: that we have some new technology, we are learning very much more than we ever knew before about various means of augmenting water in water shortage areas, about improving the quality of water into areas that have quantities of water but poor quality, and the National Water Commission might well point directions to the Congress that will present some new alternatives that this committee with its 1,800 pages of testimony that the gentleman from Arizona referred to, has not really validly considered carefully.

Secretary UDALL. A very good statement of the situation, Congressman.

Mr. FOLEY. Now, this morning the distinguished chairman of the full committee discussed in questions to you the possible cost of a National Water Commission. I certainly agree with him that this body had been very careful and this committee very careful about the costs of any administrative programs under its jurisdiction. But I want to ask you in general—I know you cannot give precise figures

here—the range of some of the proposals that have been made to provide water to areas of the United States or to improve the quality of water. Are you familiar with the general proposal of the so-called North American plan?

Secretary UDALL. Just in a general way, Congressman.

Mr. FOLEY. Have you ever heard of any tentative price put on that proposal, to bring water down from Canada through the Great Lakes and Missouri basin?

Secretary UDALL. Well, I know it is several billions.

Mr. FOLEY. As a matter of fact, Mr. Dominy might correct me, it is several tens of billions.

Mr. DOMINY. Yes; up in the \$75, \$80 billion category, probably.

Mr. FOLEY. Now, this is just one proposal—Mr. Dominy can answer this question, too, if he wishes—this is just one proposal to take care of one portion of the United States in terms of water quality and water quantity problems, is it not?

Mr. DOMINY. That is correct, except that the visionary and far-reaching and imaginative NAWAPA project could very logically be the basic project that would solve the Great Lakes problem as well as Western States problems.

Mr. FOLEY. I question this, Commissioner. Even with this immensity of potential costs, \$75 or \$80 billion, the North American or Parsons plan does not pretend to be the ultimate answer for all the water problems of the United States.

Mr. DOMINY. Not for all time; no, sir.

Mr. FOLEY. Not for all time.

And if a fair assessment of the costs of cleaning up our rivers and providing the answers to some of our pressing pollution problems of the United States were developed on a national scale it would run into many tens of billions of dollars. would it not?

Secretary UDALL. I would say so.

Mr. FOLEY. In view of these potentially staggering costs to do the job in water in this country, the cost of \$1 or \$2 million is frankly insignificant, is it not?

Secretary UDALL. I would certainly think so; yes.

Mr. FOLEY. Now, I want to ask you, in view of the suggestion that you have just about totally changed your testimony from last year, that it has been the consistent position of your Department and the administration in your testimony both last year and this year, that we should proceed with a National Water Commission as a means of resolving the questions of how augmentation of the Colorado River should be accomplished?

Secretary UDALL. That was our position in both sessions of the 89th Congress.

Mr. FOLEY. The position of your Department and of the administration is that the National Water Commission could offer a new dimension to the consideration of these water problems that presently plague this committee.

Secretary UDALL. I think it could make a real contribution; I do.

Mr. FOLEY. Do you see in any way, and I ask you to say this candidly, do you see this in any way as, on the part of any of the members of the Northwest that you know, as a delaying tactic?

Secretary UDALL. I have not thought of it as that. I think it could very well lay the foundation for the action that should help a great deal to solve the long-term water problems of the country, and I have never thought of it as a western-oriented commission. I think as Congressman Saylor said, if it does its job right it is going to make a contribution to the whole country.

Mr. SAYLOR. Mr. Chairman, I would hope that the gentleman from Washington would not leave that question in the same manner that he presented it to the Secretary, asking him to answer the question candidly, leaving the impression that other answers that the Secretary has given, not only to him, but to other members, have not been candid answers.

Mr. FOLEY. No. I thank the gentleman for his advice. I wasn't in any way suggesting that any of the answers of the Secretary were not candid, but I wanted him, in answer to this question, not to consider the amenities that might be made to the section of the country I represent.

Secretary UDALL. I try to give ambiguous answers sometimes. [Laughter.]

Mr. FOLEY. Isn't it true, Mr. Secretary, that the legislation which has been introduced in the other body and in this body, many such bills, provide specifically that the National Water Commission shall have the authority to study, among other things, interbasin transfers of water?

Secretary UDALL. Yes, indeed. I think without that, you would seriously cripple it.

Mr. FOLEY. And is there any language in the authorizing legislation as presented to this committee in these bills, or in the other body, which limits the authority or power of the National Water Commission to recommend interbasin transfers of water?

Secretary UDALL. The answer is no.

Mr. FOLEY. So that, from the standpoint of the Northwest in supporting this legislation, we are in effect presenting a body to study the national problems of this country and in the water resources area which might well, or could well come forward in a few years with a recommendation for major interbasin transfers of water.

Secretary UDALL. This is I think a very good statement of the situation.

Mr. FOLEY. And I would only then, Mr. Chairman, close with a comment. I feel that the Northwest is willing to place before a National Water Commission this kind of authority, that we will have to face the possibility that the recommendations may not be recommendations that would please us, and we would only hope that other regions of the country will do the same.

Thank you.

Mr. JOHNSON. The gentleman from Idaho, Mr. Hansen.

Mr. HANSEN. Thank you, Mr. Chairman.

It is always a pleasure to have you, Mr. Secretary, and your staff here, and since everyone has had so much "dam" fun with you so far. I won't belabor this. But I would like to ask in light of what was stated before, in answer to questions by the gentleman from Arizona. Mr. Udall, about priorities, would the National Water Commission

not be likely to concentrate early efforts on problems of urgency or major significance.

Secretary UDALL. I believe it is going to have to have two broad functions. One is to in effect make a national appraisal and a national inventory, and it will have to also, as perhaps the second stage of that, focus on particular problems.

I noticed in the papers the last few days there is a drought, temporary drought developing in the State of Kansas in the Winter Wheat Belt. This might very well be something, if it continues 2 or 3 years from now, that would be the water problem that the country is most interested in.

Mr. SKUBITZ. Glad to hear you say it.

Secretary UDALL. And whether you can do anything about it.

Mr. HANSEN. You don't think, then, it is necessary to tie the Board's hands or to stipulate priorities in the legislation? You believe they would be responsive enough to the problems at hand throughout the land that they would be willing to take the necessary initiative in their considerations without it being spelled out in legislation?

Secretary UDALL. I think the charter in the legislation as given, the charge and charter are adequate.

Mr. HANSEN. Well, now, it would be a pretty poor board, then, that wouldn't be sensitive to these needs?

Secretary UDALL. Yes.

Mr. HANSEN. Would you not think, having been a member of this body, that the Congress could take priority action if the urgency presented itself or if it was necessary to supplement or preclude some action of the board?

Secretary UDALL. The Congress could always take whatever action it felt was appropriate at any future time, of course.

Mr. HANSEN. Would you not then say that the Commission should make broad enough studies to include the whole Nation and all pertinent areas affecting this Nation, not just regions?

Secretary UDALL. I think that should be the scope of the study and this should be understood.

Mr. HANSEN. And further, should not the study also include every feasible problem, assets and possible corrective measures, the latter to include such things as weather modification, desalination, reuse and conservation of water, equally as emphatically as such possible things as interbasin or interregion transfers of the water?

Secretary UDALL. Yes, I would think so.

Mr. HANSEN. In the last Congress we saw an effort to push a multi-step program to solve the stated water shortage in the Southwest. This to many of us seemed to include a series of actions presuming a series of successes that might not have materialized.

Because of this and other factors, ultimate success was not possible in either the House or Senate. As a realist, and based on your broad experience, don't you think that the broad approach we have just discussed is better than predirected, or might I say prejudged approach, if we are going to get a correct overall appraisal of our water assets and problems?

Secretary UDALL. I think as I have indicated earlier that the approach envisioned in the National Water Commission is the best first step to tackle the problem.

Mr. HANSEN. And as to your assessment of the central Arizona project itself, do you feel that this project which has been hanging around some 20 years will have its best chance to get going by divorcing it from many of the other considerations it has been coupled with in the past and let it be considered on its own merits?

Secretary UDALL. I don't want to go too far with you in my answer on that, Congressman, because as I tried to make it clear to the members of the committee here today, I think the entire basin is in trouble, and we are certainly in favor of some steps being taken to indicate to the people of this region who have big problems that they are going to work together, and that they are ready to lay some of the groundwork now for working together.

But, in terms of the augmentation problem, I think that the National Water Commission is the right approach.

Mr. HANSEN. Mr. Secretary, your about-face or at least change in position on this legislation may be viewed with some dismay on the part of some people who were supporting the previous type of legislation, but I can say that I think it is a healthy sign as far as some of us are concerned that it is possible to change minds in the departments and bureaus and that if a given set of facts be shown to mean something different than earlier conclusions indicate, that changes can be made.

I think it is healthy, not only on this particular proposal, but for any other on any subject and I commend you for your testimony and appearance here today.

Secretary UDALL. Thank you, Congressman.

Mr. JOHNSON. The gentleman from West Virginia, Mr. Kee.

Mr. KEE. Mr. Secretary, we have had the second national disaster flood in southern West Virginia. I went home for several days and I regret the fact that due to the work we were doing yesterday with Federal agencies in making a recommendation to present to the President, to help our national disaster area, it prevented me from having the benefit of the testimony that was presented yesterday and I intend to read it.

Mr. Secretary, the fact is that Arizona needs water; is that not correct?

Secretary UDALL. I think that is the big fact written on the wall here, yes.

Mr. KEE. Mr. Secretary, you need the flexibility in payments, as you outlined this morning, which will ultimately be determined by the residents of Arizona; is that not correct?

Secretary UDALL. Yes. We think that there should be as much flexibility as possible in terms of any water project of the type we do in the West of letting the people decide how they pay. The Federal Government has to be interested in its bookkeeping and be sure that the water is paid for and that the projects pay out, but I think that there can always be and should be some flexibility in letting the farmers, the city people, and others, decide how they are going to pay for it.

Mr. KEE. Thank you very much, Mr. Secretary. I want to state

now that you have one member of this committee that is with you 1,000 percent on that point.

Secretary UDALL. Thank you.

Mr. KEE. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. Thank you, Mr. Chairman.

Mr. Secretary, you praised the Commission pretty highly here. In the event this committee does not include the Commission in the bill, would you undertake to do much of this work in your own Department?

Secretary UDALL. No. I think the committee should understand, and this is another reason that a National Water Commission is a step forward, that we are limited now by law as a result of the Water Planning Act of 1965 on what feasibility studies we can undertake. We can't just take our men and get some money somewhere and start making studies.

Our studies have to be authorized and, therefore, I think the basic decision on this is not some decision we are going to make, but what Congress directs us to do.

Mr. REINECKE. On page 4, also, you mentioned one of the responsibilities of the Commission would be to discourage marginal uses of water. Would you define "marginal uses" for us, please?

Secretary UDALL. I wouldn't want to give you a specification because I think this would cause me to have to form a judgment which would be their job to form judgments. I think that they would lay out the current alternative uses and the economics of water and that they might very well recommend that with water, as with land, there is a highest and best use with graduations down the line. We ought to be cognizant of this as we move forward, in terms of our ongoing water policy.

Mr. REINECKE. Your concern here is more or less of the economic value of water and its highest uses.

Secretary UDALL. That is right, and I think it is primarily a matter of economics.

Mr. REINECKE. Does the Bureau of Reclamation undertake any conservation practices of this type, or do you in any way restrict the uses of reclamation of water in the highest and economic uses?

Secretary UDALL. Of course, the economics of the marketplace dictate many decisions with regard to water in the West. For example, as some of our cities grow and need more water, if water is short, then it is quite logical, and this happens many times, for water to be taken from agricultural uses to municipal and industrial uses. This is precisely what has happened in Arizona.

As the water table dwindles and water becomes more dear, agriculture goes out of production and the water is used for municipal and industrial purposes.

Mr. REINECKE. I am not familiar with the power rates in Arizona. Roughly, what is the cost to pump water from a 400-foot water table, say—any rough figure?

Secretary UDALL. Cost of pumping underground 400 feet.

Mr. REINECKE. Pulling it up.

Mr. DOMINY. Mr. Pugh has some figures on the pumping costs in Arizona.

Mr. PUGH. About $2\frac{1}{2}$ cents per acre-foot per foot of lift, and higher.

Mr. REINECKE. So we are talking—

Mr. BURTON of Utah. $2\frac{1}{2}$ cents?

Mr. DOMINY. An acre-foot per foot of lift; $2\frac{1}{2}$ cents per acre-foot for a foot of lift. That is a rule of thumb. As it goes deeper, costs get higher.

Mr. REINECKE. What is the productivity of the typical—I realize that cannot be uniquely answered—typical agricultural situation in Arizona?

Secretary UDALL. Congressman, I think I can say to you that most of the deep water that is being pulled out today is going to cotton. It has to, because you have to have a crop that is a good money crop.

Mr. REINECKE. On page 14, you talk about pumping energy from this prepurchased arrangement of 3 mills for irrigation water, 5 mills for municipal and industrial and the surplus water would have an average value of 5 mills. When you say "average value," would you explain that.

Mr. DOMINY. I would like to have Assistant Commissioner Bennett comment on that, Congressman Reinecke.

Mr. BENNETT. This is the same problem we got into a little bit last year. We actually would sell any commercial power available at the customary practice of a capacity charge and an energy charge. When that type of power is taken at a specific load factor, it can be reduced to an average rate per kilowatt-hour and this is what we are talking about here.

Whatever capacity and energy charge we finally made would be reduced to about 5 mills per kilowatt-hour.

Mr. REINECKE. Do you feel that is as much as the market will stand?

Mr. BENNETT. We think this is about as much as could be returned to the project.

Mr. REINECKE. Then what if Hualapai Dam were constructed? Are we going to be limited to 5 mill revenues?

Mr. BENNETT. No, sir. Hualapai Dam would produce a different kind of power. It would be marketed as peaking capacity, while this steam power would be marketed either as energy alone or as energy, supporting peaking capacity from other plants.

Mr. REINECKE. Have you signed any more power contracts from the Glen Canyon?

Mr. BENNETT. Yes. We have 94 contracts now signed for the sale of firm power from the storage projects.

Mr. REINECKE. What is the capacity of what has been sold?

Mr. BENNETT. The total under contract for 1967 summer use is now in the order of 700,000 kilowatts measured at plant, and the amount increases annually for a time.

Mr. REINECKE. And the capacity there was what?

Mr. BENNETT. The available capacity at that time should be about 760,000 kilowatts.

Mr. REINECKE. Thank you.

Commissioner Dominy, we have said here that we are going to get \$10 an acre-foot for irrigation water and approximately \$50 municipal and industrial. Does this mean \$10 gross revenue to the development funds?

Mr. DOMINY. Not to the development fund, because this charge would go to paying off the cost of the project and, of course, would not even be sufficient to pay off the cost of the allocation to irrigation. You still would have to have assistance from the municipal and industrial water payments.

Mr. REINECKE. Don't all revenues go into the funds and then all payments to the program come out of the funds?

Mr. DOMINY. For the first 50 years all revenues go to pay off the cost of the project and there is no contribution to the developments funds until after that has occurred.

Mr. REINECKE. Prime water contracts pay \$10 an acre-foot.

Mr. DOMINY. At canal side, and this, of course, covers operation and replacement charges. For example, of that \$10 figure, \$2.70 goes for the operation and maintenance of the system, to keep the canal in shape; \$4.94 of it goes for the pumping energy, to lift the water. And \$2.36 of it is all that is applied on the construction component. Of course, that repayment is only a part of the amount allocated to irrigation. We have to rely upon the overrun of charges to the municipalities and industrial water users.

Mr. REINECKE. Do the people who you have contracted with in the Department, will they pay then \$10 rate as their total cost of water?

Mr. DOMINY. That is correct. At canal side, and then they have the cost of picking it up at the canal and distributing it to the farmer.

Mr. REINECKE. Fine. I have a couple of other questions in this—Mr. Chairman, was this report included in the record?

Mr. JOHNSON. Yes. That report is in the record.

Mr. REINECKE. Fine. Then I will not dwell on that.

On page 21 of the summary report, you showed the flow of water in the river, virgin flow at Lee Ferry, regardless of year at the same figure, namely, 15,063,000 acre-feet. I have been led to believe that that flow will diminish as the upper basin takes more of its entitlement.

Mr. DOMINY. The virgin flow, of course, is a computed figure. This is what would have been yielded at Lee Ferry absent to the diversions upstream which, of course have to be taken into account—

Mr. REINECKE. Is this—

Mr. DOMINY (continuing). In the water budgets on the river.

Mr. REINECKE. This is just the average, you say, above, from 1906 to 1965.

Mr. DOMINY. That is correct.

Mr. REINECKE. In just pure mathematical—

Mr. DOMINY. Mathematical calculation based on average yield of the river. That is correct.

Mr. REINECKE. On page 26, showing the cost and interest calculations, you indicate an interest percentage of 3%. Was there some particular reason why you did not use the same as on the other pages, 3.225?

Mr. DOMINY. Yes. Mr. McCarthy can answer that.

Mr. REINECKE. Right at the top of the page.

Mr. MCCARTHY. For our planning studies we have a rate determined which we use throughout the whole planning studies and this 3%

percent is the rate we use for our planning studies. Each year we get a new rate for application in our repayment studies, and——

Mr. REINECKE. On the payout sheet you indicated a rate of 3.225.

Mr. McCARTHY. Yes 3.225. That is correct.

Mr. REINECKE. Is it not resonable to use that same interest rate on the construction interest, then?

Mr. McCARTHY. It is a matter of simplifying our planning studies really because if we had to change our rate every year, we would be forever changing our studies and never getting them done. When we come to our repayment studies and wrap them up, then we use the current rate. Very often when we send a project report up to the Congress and it is a year or so later when you consider it. In our legislative report of the bill we bring the repayment analysis up to date with the current interest rate.

Mr. DOMINY. In other words, it was $3\frac{1}{8}$ at the time these studies were made. Now we know it is higher based on the current cost of interest in the Treasury.

Mr. REINECKE. I was checking out some figures here and perhaps I do not quite understand your table of operation and expenses on page 31. Comparing that to the payout with no ad valorem tax, and trying to calculate the amount of water sold for both municipal and industrial aid irrigation, and I came up with a figure of about 950,000 acre-feet for irrigation, 200,000 for municipal and industrial to justify the income figures you show for 1980. I just picked that as an example.

Does this sound about right, that you have got 1.1, a little over 1.1 million acre-feet being delivered?

Mr. DOMINY. I would like to have Mr. Pugh respond to that. As you well know, in the early years there is a higher proportion of it for irrigation and a smaller proportion for municipal and industrial and this gradually shifts over the repayment period.

Mr. PUGH?

Mr. PUGH. It is based on the average quantity of water delivered at any particular time.

Mr. REINECKE. Well, my question, then, comes to this. Why should we build the aqueduct to 1.6 or 1.8 million acre-feet capacity if we are not going to deliver more than 1.1?

Mr. PUGH. That is the average quantity over the long period of time. At some times the canal would run full, at other times partly full.

Mr. REINECKE. Will we not find that we will be able to get the best price from this power combination on a baseload approach to power?

Mr. DOMINY. That is not the way the water supply will be available in the river. In order for this plan to work, we have to have a pumping capacity and an aqueduct capacity that will pick up surplus waters when they are available in the river.

Mr. REINECKE. You mean the river will actually be peaking?

Mr. DOMINY. There are some years when there will be much more water available in the river for central Arizona than others because of the vagaries of the Colorado River, and this is why in our plan, we are talking in terms of averages rather than any specific year.

Mr. REINECKE. It seems to me like you average out an awful lot of problems when you do that, but I will not dwell on that.

Mr. HOLUM. Congressman Reinecke, our approach to the power too, is baseload. The United States will prepay for all the capacity and energy associated with the capacity necessary to operate the project. So it is a baseload approach.

Mr. REINECKE. In the event that you divert more than what you are able to sell, what will you do with that excess water?

Mr. DOMINY. Put it underground by exchange.

Mr. REINECKE. In other words, you will spread it on the ground.

Mr. DOMINY. Not directly, but we will sell it.

Mr. REINECKE. Wait a minute.

Mr. DOMINY. This is right. The customers are there to take it and in effect put it underground by using surface water in lieu of ground water.

Mr. REINECKE. Your customers will distribute it on——

Mr. DOMINY. They are anxious to.

Mr. REINECKE. Will the Bureau do any spreading?

Mr. DOMINY. No, sir; we will deliver only at the canal side and sell it to anxiously awaiting customers.

Mr. REINECKE. And they will pay that same price, \$10, to distribute it on the ground for spreading purposes.

Mr. DOMINY. That is correct.

Mr. REINECKE. Have you had any further studies on the possibilities of an offshore conduit for bringing water down from northern California and the Oregon coast?

Mr. DOMINY. I did not understand.

Mr. REINECKE. Several years ago we had a proposal of an under-sea conduit.

Mr. DOMINY. That has been suggested from time to time by various people.

Mr. REINECKE. Has your department looked into that any further?

Mr. DOMINY. To the extent that we can. It is a nebulous thing at this time in many ways. Our engineers have considered all of the various plans that have been suggested to us from time to time, including floating conveyance as well as offshore pipelines that would lie on the bottom of the sea just offshore. We have not been able to determine feasibility and costs that would be better than the conventional canal conveyance that we have normally practiced. More research is needed to prove the feasibility of underwater conduits.

Mr. REINECKE. One final question. Soon, I believe, or by 1970, the high tension direct current line will be coming in from the northwest with some 1,350 megawatts of power. Has any of this been contracted for yet?

Mr. DOMINY. Mr. Bennett? No; we are not to the contract stage as I understand it.

Mr. REINECKE. Have you had any requests for contracts?

Mr. BENNETT. No, sir; we have not yet, but this is not a sale of power as such. The capacity of the d.c. transmission line will be used to exchange power, generally summer power and winter power. In other words, the northwest surplus capacity will go south in the summer and the surplus capacity from the south will go north in the winter and they will pay for use of the line.

Mr. REINECKE. I did not realize that we get any surplus capacity. I thought we were short of capacity.

Mr. BENNETT. You have a surplus of capacity in the winter time in the Southwest.

Mr. REINECKE. That is very interesting. Are you aware that the city of Los Angeles has developed its own peaking capacity in the Castaic pump storage reservoir?

Mr. BENNETT. I am generally familiar with it.

Mr. REINECKE. I have talked with their engineers and they advise me they see no possibility of buying any power from the Colorado, any additional power, in the foreseeable future up to 1990 or more.

Mr. BENNETT. We had not considered Los Angeles as a market for this.

Mr. REINECKE. Thank you. No further questions, Mr. Chairman.

Mr. JOHNSON. The gentleman from Texas, Mr. Kazen.

Mr. KAZEN. No questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Thank you, Mr. Chairman.

Mr. Secretary, much has been said about the reversal of position of your Department. Is it not basically true that this was a political consideration—and I do not say that in a negative sense—or a practical consideration in that the things that were attempted in H.R. 4671, while possibly very desirable, each unto themselves, are left out of this, both Congressman Udall's bill and your bill?

It simply failed last year and it would seem a little ludicrous to beat a dead horse.

Secretary UDALL. Well, Congressman, changes were developed out of this restudy that we made, as you may recall. When the Congress threw in the towel in September, I announced immediately that we were going to study the legislation, and quite frankly, as I indicated earlier today, we had two objectives: (1) of trying to see if the cost could be reduced; (2) we were frankly interested in eliminating controversy where that was possible. And if those two elements constitute good politics, as you say, these were considerations, yes.

Mr. STEIGER. All right. My only point is that there did not suddenly develop an antipathy to hydroelectric projects per se, or there was not a violent reaction to—

Secretary UDALL. No indeed. I expect to be here at this table testifying along with these other people for many hydro projects in the future, and our basic view on hydroelectric power and its future has not changed.

Mr. STEIGER. Mr. Secretary, in the letter from Mr. Lucking with regard to the interest expressed in the West, in the thermal plants, it is a very explicit letter, and I get the distinct impression that the West would be just as interested in it as in the purchase or cooperation with any hydroelectric project as well as any thermal project. That is a fair analysis?

Secretary UDALL. The WEST organization, in fact the three entities included in this letter—Southern California Edison, Arizona Public Service, two private and one public—the Salt River project—are all large, fast-growing companies. They need additional power. However, the two private companies normally, in terms of the operation of the power preference clause, are second-class customers in effect, and they normally are not our market for this power.

The city of Los Angeles would be a preference customer and the Salt River projects as well as other agencies. The WEST organization primarily has been set up so that practically all of their work and all of their planning is directed toward thermal generation and the three plants that we have put together with them as well as the Page plant and the Southern Utah plant that we are looking to in the future are all thermal plants.

Mr. STEIGER. My only point in bringing it up was that in the event that Hualapai will not be constructed, it would likely be a market for the energy produced, and I think that would be—

Secretary UDALL. I think when one looks down the road in this whole region one finds that the Southern California Edison, California, for example, is the fastest growing electric utility in the country. It will soon be No. 1, I am told, and therefore you are going to need all the electric power you can get from all sources. There is no question about that.

Mr. STEIGER. With regard to your own plan, Mr. Secretary, and the mention of the possible use of ad valorem tax, is it not mathematically correct to say that if we use the revenues from Hoover, Parker-Davis after amortization, that we would need no ad valorem tax? Is that a fair—

Secretary UDALL. Yes, that is right. It could be done that way.

Mr. STEIGER. This would be another alternative.

Secretary UDALL. That is another alternative. There are three alternatives really whereby it might be done, and I think some of the people in Arizona have not thoroughly understood what some of the considerations are that might be evaluated. For example, in terms of industrial use of water particularly, having a \$50 rate or \$60 rate might make a difference over the long haul in terms of attractiveness of water costs to industry locating in the region. So this is what I meant when I said I thought a mix for payment was better rather than putting it all on the water users necessarily.

Mr. STEIGER. Mr. Secretary, yesterday we heard that the reason for the failure of H.R. 4671 was that Arizona left the sinking ship. We heard that several times. You were in the midst of the battle. You heard the sound of the shot. Did you notice which bank of the river the shot came from? [Laughter.]

Secretary UDALL. Congressman, I think this is a discussion I had better stay out of.

Mr. ASPINALL. If my colleague will yield to me, I do not know what was said yesterday, but the reason the bill did not get on the floor was because the chairman of the full committee did not call it up. So we might as well have that cleared up.

Mr. STEIGER. Thank you.

Mr. REINECKE. Will you yield?

In view of the fact of the question regarding Mr. Lucking's letter more or less implied that Southern Edison was in favor of the hydroelectric dam, I would just like to refer to the point that we should allow Southern California Edison to answer for herself in this case. The differences between a thermal plant and hydroelectric plant are quite significant when it comes to a private power company, and I would not want the record to leave the implication in anybody's mind that Edison is for it without their so sponsoring it.

Secretary UDALL. I think you are correct, Congressman. The private companies quite naturally, for the reason that I explained, are not as enthusiastic about hydroplants—

Mr. REINECKE. Thank you. I have one—

Secretary UDALL (continuing). As the public entity.

Mr. REINECKE. I have one further question.

Last year a very close friend of yours offered an amendment suggesting certain benefits for the Hualapai Indians with reference to the reservoir created in back of the dam, and I believe that amendment was offered subsequent to your report on the bill.

Would you offer your comments on that as to whether you favor this approach and in what quantities or what amounts?

Secretary UDALL. Congressman, as the administration bill does not include Hualapai, our report is not directed toward this matter. If it reaches the point where the committee must have the answer to this question, I think that we have views that we can develop and furnish to the committee as to what would be the right kind of solution. But I think we need to talk about the alternatives because the Indian interest is present and we are charged with protecting the Indian interest, and maximizing it, as a matter of fact. Therefore we have to be very intimately involved in that part of the problem at such time as it is reached.

Mr. REINECKE. Mr. Secretary, in view of the fact that that particular amendment is in several of the bills being discussed, inasmuch as we may get to mark it up within the next week or two, I would ask unanimous consent that you prepare those remarks and address them to the committee so that we would have the benefit of your views.

Secretary UDALL. We can furnish that.

Mr. JOHNSON. You heard the unanimous-consent request of the gentleman from California. Is there objection? Hearing none, will the Secretary prepare it and the remarks will be placed at this point in the record.

(The material referred to follows:)

Section 303 of H.R. 3300 provides for payment to the Hualapai Indian Tribe for use by the United States of 25,000 acres of land for the construction, operation, and maintenance of the Hualapai Dam and Reservoir. The Administration has recommended that action on the Hualapai Dam be deferred at this time. The following comments on the proposed payments to the Hualapai Tribe are offered at the committee's request.

The sum of \$16,398,000 to be credited to the Tribe is commensurate with present value of the compensation which would be due the Tribe under its agreement of August 30, 1960, with the Arizona Power Authority if the Authority were to construct a dam at the Bridge Canyon site. Considering the size of the installation and annual generation contemplated, the compensation proposed is closely in line with the compensation provided to the Crow Tribe in relation to the Yellowtail Unit of the Missouri River Project, with that provided to the Flathead Tribe in connection with Montana Power Company's Kerr Dam and Powerplant on the Flathead River and with that extended to the Warm Springs Tribe in connection with the Pelton and Round Butte developments on the Deschutes River in Oregon constructed by the Portland General Electric Company. It should be noted, however, that in each of these cases the reservations had been established by Treaty, whereas the Hualapai Reservation was created by executive order.

As we testified in hearings before the committee in May of 1960, the access road which is provided in Section 303(b)(1), based on reconnaissance level estimates, would cost \$12,260,000. An access road from the construction town-

site to the reservoir would likely be included in any recreation plan for Hualapai Reservoir if it were built. The costs for recreation would be nonreimbursable, as costs of a national recreation area, under the terms of the Federal Water Projects Recreation Act (79 Stat. 213) as provided in Section 401 of the bill in any event.

We note that the provisions of subsections (c) and (e), dealing with reservation by the Hualapai Tribe of certain mineral rights, refer to the disposition of such rights by the tribe. The law generally applicable to the leasing of minerals on Indian lands provides either for leasing by the Secretary or, in those instances where an Indian tribe itself is authorized to make leases, such leases require approval of the Secretary. Similar provisions should be included here. Subject to the foregoing comment, the provisions of Section 303 respecting minerals are similar to those included in the legislation by which Navajo reservation lands were obtained for the Glen Canyon unit of the Colorado River Storage Project. (Act of September 2, 1958; 72 Stat. 1686.)

The provisions of Section 303 respecting hunting and fishing and reservation of a block of power do not present any particular problem, although it might be desirable to make clear that the reference to hunting and fishing, while relieving the Indians from any necessity to pay a fee does not exempt them from compliance with any otherwise applicable matters such as conservation regulations and restrictions required by reason of project operations. In respect of recreation, the act of October 8, 1964, established the Lake Mead National Recreation Area, the boundaries of which encompass the Bridge Canyon dam-site and surrounding lands owned by the Hualapai Indians. Section 3(a) of that act provides that inclusion of the Indian lands shall not be effective until approved by the Hualapai Tribal Council. The Council has not approved inclusion of the Indian lands within the national recreation area. If, in the future they give their approval, there would exist a conflict between the provisions of the Lake Mead Act and H.R. 3300, if enacted. To preserve this option, the following might be substituted for the present language on page 16, line 8 of H.R. 3300:

(d) Unless the inclusion of Indian lands within the exterior boundaries of Lake Mead National Recreation Area has been agreed to by the Hualapai Tribal Council pursuant to section 3(a) of the act of October 8, 1964 (78 Stat. 1040), the Hualapai Tribe shall have the exclusive right.

The above is furnished at the committee's request since the Administration has recommended that action on Hualapai Dam be deferred.

Mr. STEIGER. I yield to the gentleman from Pennsylvania.

Mr. SAYLOR. Thank you, Congressman Steiger.

I have always been shy about claiming credit for anything, and I do not want the chairman of the full committee to assume all the responsibility for executing the bill last year. It is true he did not call it up, but he did not call it up, and I think one of the reasons it was not called up was there was an undercurrent on the floor of the House that a substitute which I had offered before this committee and had been turned down might have met with very prompt and courteous attention on the floor, and there was a distinct possibility it would have passed. And for that reason, among others, the chairman did not call it up. But I would like to direct a question to the good Secretary of the Interior.

Mr. Secretary, on the 9th of March you sent up here a proposal to revise the boundaries of Grand Canyon National Park, and you recommended a draft of the bill be referred to the appropriate committee for consideration, and you recommended its enactment.

In view of the fact that the chairman of the full committee, Mr. Aspinall, has introduced a bill calling for the expansion of the boundaries of Grand Canyon National Park going up along the upper reaches of Grand Canyon, up toward Lee Ferry, and in view of the fact that I have introduced a bill which goes up in that same general direction,

since we are all together, some people are worried about whether or not the Federal Power Commission might grant a license to some people in Arizona to issue a permit for construction of a dam at Marble Canyon. Do you not think it might be wise for you to advise the Chief Executive of this country that here would be an excellent place for him to exercise his power of issuing an Executive order and just putting this whole business right into the Grand Canyon National Monument and telling the Federal Power Commission that they have no such authority. Then, when the committees of Congress got around to it, we could include it all in the Grand Canyon National Park? I mean, this would be a nice solution, an easy solution, and help everybody out in that area over a very difficult situation.

Secretary UDALL. Congressman, I am not sure about the legalities of the situation. This is not as easy as it sounds, however, because we have an understanding with this committee on such actions. There is no way we can painlessly do it without involving the committee in it. That is the one thing I want to say.

Mr. ASPINALL. If the gentleman from California will yield to me, what the Secretary is saying is that there might not be any money forthcoming to administer the area; is that correct?

Secretary UDALL. That is one of the consequences I had in mind, Mr. Chairman. [Laughter.]

Mr. SAYLOR. Of course, I might say, Mr. Chairman, that the area is mostly now under the jurisdiction of the Department of the Interior and the Department of Agriculture. From all I can gather there is not going to be too much to administer, because while the gentleman from Colorado has taken in Vermillion Cliffs, and it is a very beautiful place, I had not thought of it—I noticed that the Secretary of the Interior and the President have not recommended it, but I am perfectly willing to go along agreeably and go before the Appropriations Committee and see that any money you need, Mr. Secretary, you might get.

Secretary UDALL. Let me strike a positive note at the end of the day here, Congressman. Despite all of the cross currents that we have had going, I think we are making some real headway. I think the fact that the two gentlemen here and many others on this committee and on the other side, in the other body, are in pretty broad agreement on Marble Canyon and its disposition, which means that we are approaching these things in a balanced, sober way and are making our judgments as we go along and that we are not just operating from the type of judgments that could lead us into further controversy. We are trying to resolve things as we go along, and I think everyone deserves to be commended for this.

Mr. SAYLOR. I just offered my suggestion in an effort to resolve another problem and get it beyond us.

Secretary UDALL. I will take it under advisement.

Mr. JOHNSON. I will recognize the chairman of the full committee, Mr. Aspinall of Colorado, for one further question here.

Mr. ASPINALL. Mr. Chairman, I would like to ask Mr. Dominy if he can furnish for this committee figures to show how much it costs the Metropolitan Water District to lift 100,000 acre-feet of water 1,000 feet. If he can do that, can he furnish also how much it costs

to lift 50,000 acre-feet of water 500 feet on the Wellton-Mohawk or 250, whatever the figure is?

Mr. DOMINY. Yes, sir; we will be glad to supply that for the record.

Mr. ASPINALL. I will ask that the information be made a part of the record.

Mr. JOHNSON. Without objection, so will be the order. Hearing no objection, you will prepare and furnish the necessary material for the record at this point.

(The material referred to follows:)

The Metropolitan Water District of Southern California has supplied the following data on power costs only, which do not include any operation, maintenance, and replacement of the pumps:

	Calendar year		
	1964	1965	1966
Acre-feet pumped.....	1, 112, 074	1, 141, 875	1, 114, 445
Total cost of power.....	\$6, 396, 938	\$6, 555, 249	\$6, 439, 410
Head in feet.....	1, 635	1, 635	1, 635
Cost of pumping 100,000 acre-feet for 1,000 feet.....	\$351, 270	\$351, 118	\$353, 403
Cost in mills of pumping 1 acre-foot for 1 foot.....	3. 5	3. 5	3. 5

Similar data for pumping plant No. 1 of Wellton-Mohawk division of Gila project is as follows:

	Calendar year		
	1964	1965	1966
Acre-feet pumped.....	481, 489	464, 836	493, 544
Total cost of power.....	\$52, 546	\$51, 802	\$53, 362
Head in feet.....	30. 7	30. 7	30. 7
Cost in mills of pumping 1 acre-foot for 1 foot.....	3. 6	3. 6	3. 6

Mr. JOHNSON. Now, as chairman of the subcommittee and being from California, I have a very keen interest in this Colorado River development. I have heard everyone ask questions from all sides of the aisles here. I have heard many witnesses, last year and the year before, and my first year on the committee.

At the present time California is only trying to protect its interest in the 4.4 million acre-feet. Mr. Secretary, is it not a proper position to take if we take this stand? We have been on that river now since the late 1870's and all of the works necessary to bring California's water into our State are built and in operation at the present time.

Secretary UDALL. Congressman, I think the position that California has taken is understandable. I have thought all along that this is an issue that should not be a big sticking point between Arizona and California but should be compromised in some way and worked out. This is, I think, one of the reasons why we have not taken a hard position on this one way or the other. We have said this is a matter between the States, and we hope they can work it out in essence.

Mr. JOHNSON. We at the present time are putting more than that to beneficial use in California, somewhere in the neighborhood of 5.1 or 5.2 million acre-feet. Certainly we are interested in maintaining the

4.4 for the simple reason that we have that need. We are using the water. And we will have further need for it, even though we are importing water from northern California. The State project will be delivering some 2 million acre-feet of water into the southern part of the State very soon and with the proposed desalinization plant which, as the gentleman from California, Mr. Hosmer, stated, would only produce somewhere around 160,000 acre-feet of water, which is not too much.

Now, I think that every engineer who has studied this, at least since I can remember, and since I have been in Congress, has stated that the river is deficient and there must be an augmentation. Now, certainly, California is very much interested in that, too, and the bill last year called for certain considerations. No telling what the bill might call for this year, but I think all of those people who have studied this river, and some of them the best engineers in the country today, they are the people that are trying to project the facilities that will be necessary to have a supply of water to meet the needs come 1990 or the year 2000 or beyond. They are experts in the field.

Would you not say that this is a fact?

Secretary UDALL. Well, I do not know that I could argue with the statement that you have made, Congressman.

Mr. JOHNSON. Now, is it not true that the engineers in the Bureau of Reclamation and those representing many other interests have studied the proposed damsite at Bridge Canyon and Hualapai?

Secretary UDALL. Oh, yes, this has been thoroughly studied.

Mr. JOHNSON. Now, have they not stated that this is an excellent damsite?

Secretary UDALL. I do not think there is any question about that. I said so myself earlier today, Congressman, that the question that we are addressing ourselves to is the time when a decision should be made on this.

Mr. JOHNSON. Now, what capacity could be built in that particular facility in the way of power facilities?

Mr. DOMINY. It is a 1,500-megawatt powerplant that is proposed there at the Hualapai site. This dam would be about 740 feet high from bedrock if built and would provide the best head on the river as far as power production is concerned as long as Glen Canyon is there to regulate the flows of the river.

Mr. JOHNSON. At what estimated figure per kilowatt?

Mr. BENNETT. We had proposed to market the peaking capacity for \$10 per kilowatt and 3 mills for the energy which produces an average return of about 6 mills.

Mr. JOHNSON. Well, now, that would be the cost per mill of generated power at that time?

Mr. BENNETT. Yes, sir; approximately.

Mr. DOMINY. At that figure we would pay it out with interest within 50 years, yes, sir.

Mr. JOHNSON. I am wondering if there isn't some new technology available to you people whereby you could increase the capacity at that particular damsite with the water that will be available.

Mr. DOMINY. Of course, we would take an up-to-date look at all of the power marketing and see if we could get the maximum amount

of peaking energy from it just like we are doing now at the third powerhouse at Grand Coulee, but it was figured on about a 38-percent load factor in our original studies.

In other words, it was a peaking facility to maximize its utilization on the river.

Mr. JOHNSON. How much power will be needed in the central Arizona project?

Mr. DOMINY. The 400 megawatts is the requirement for the pumping power on the central Arizona project in the early years.

Now, as the amount of water available in the river for the central Arizona project declines, the requirement for pumping power would also decline.

Mr. JOHNSON. Now, in your proposed thermal plan there, what capacity is proposed there?

Mr. DOMINY. 400 megawatts would be the—

Mr. JOHNSON. No. In the total.

Mr. DOMINY. Oh, the initial installation would be a million kilowatt plant, a thousand megawatt plant, in order to get the efficiency of large steam units, and the Government would prepay 40 percent of that to get the benefit of 400 megawatts.

Mr. JOHNSON. Why wouldn't the Government buy a piece of the plant?

Mr. DOMINY. I think the Secretary has covered that quite explicitly in his testimony this morning.

Secretary UDALL. Congressman, it is just as though there were a single company or, in this instance, it will be a group of companies because that is the way WEST operates. They make one basic decision. No. 1, they are going to get the economies of scale. Therefore they are going to build the biggest, most modern plant. At the two Mojave units just across the river in Nevada where they are going to have a coal slurry pipeline with Navajo-Hopi coal going into Nevada, they will build two 750-megawatt units.

These are the largest that it is capable to build today. Then the different companies, depending on their growth needs, will own 10 percent, 20 percent, 32 percent, whatever it is. And we own nothing.

Mr. JOHNSON. Why doesn't the Government—

Secretary UDALL. We sit down with them as you can see from the Lucking letter in the planning stages and we say to them we have a need for power and therefore what we would like to participate, because they are building a new modern unit with cheap power, our objective is to buy over a long term what we need from them, keyed into the life of the plant, and we simply advance money by stages as it is built and we prepay by investing in the construction, but we own nothing. We do not own any part of the plant.

Mr. JOHNSON. The thing that disturbs me is why don't you buy a piece of the plant?

Secretary UDALL. That would be another way to do it, Congressman. If you did this, I think you might find that this is where the power companies draw the line. I think that they would say the Federal Government is building and owning steamplants and that is the answer.

Mr. JOHNSON. Well, I was wondering because if we are going to make a prepayment for the construction of a plant and take so much

power, it would be very easy for us to participate along with the other public agencies interested in it with the WEST Co. as a full partner and take over 400 megawatts of the plant. Now, what is the life of one of these steamplants?

Mr. DOMINY. Thirty-five years normally. They run at such high speeds and high temperature that they usually have to be replaced every 35 years.

Mr. JOHNSON. And what would be the life of a hydroplant in the river?

Mr. DOMINY. The hydro runs just the opposite, relatively low speeds and low temperatures, and they last a good bit longer.

Mr. JOHNSON. What is the proposed life, 100 years?

Mr. DOMINY. Yes. They are more expensive to build per kilowatt of capacity but the operation and maintenance is less and the durability is greater.

Mr. HOLUM. It ought to be clear on the record, though, Mr. Chairman, that our economic analysis of the thermal prepay is based on maintaining the depreciation account so that when the facilities need replacement, the funds are available to replace them as they are on the hydroelectric facilities.

Mr. JOHNSON. That is true on either one.

Mr. HOLUM. That is correct.

Mr. JOHNSON. I can't understand why the Government, if they are going into this, doesn't actually buy into the plant itself.

Secretary UDALL. Congressman, this would be another alternative. I think the simple answer is, and I ought to be very candid about it, that this would stir up a bigger fight than anything we are trying to resolve here in that the private segment of the utility industry would say the Federal Government is going into the business of building steamplants.

Mr. JOHNSON. I don't think there is a bit of difference in what you are doing really because you are providing funds on a prepaid basis to this organization of WEST to construct this plant.

Secretary UDALL. I would argue the point with you, Mr. Chairman, because in effect what you are doing is making a very prudent long-term purchase of power in bulk. This can be done. If you will look at our economic analysis you will find that the net result of this when you prepay, and this is the reason we hit upon this idea, is that you get power much cheaper than if you were making a yearly contract and buying it as you go along. You buy in at the beginning. You get tremendous economies out of it, and therefore you get much cheaper power.

Mr. JOHNSON. Well, the central Arizona project I presume is going to be there for here and ever after, pretty much so, that is, for a long period of time.

Secretary UDALL. I hope so.

Mr. JOHNSON. And you people are going to have to buy a source of power for many, many years, and if, as you say, the steamplant is replaced, it is amortized, kept in operation as far as the plant is concerned, and all of this financing is taken into consideration, I would think it would just be a good thing for the Government to buy into the plant because you are going to operate there longer than 35 years, the life of the plant, and you are going to have to renegotiate your power

cost probably with the WEST Co. I don't know what length of contract you are going into. And when you don't own the facility and you are stuck to buy power and you don't own the transmission facilities to get it to your pumps, you are pretty much up against a stone wall when it comes to negotiating.

I have watched the intertie and now our desalinization plant, the Hanford operation in the Northwest, and the operation in the Northwest itself. The way they pool their facilities up there, private, public, and Bonneville all seem to get along very well. Bonneville operates the backbone of the transmission, and they are there in a bargaining position to take care of the pumping needs and their requirements.

Now, I think that instead of going into this type proposition, to fore-going Hualapai, and the powerplant there for this other type of project where you enter into a contract for a prepayment, it would be much better that you buy into the plant, that the Federal Government own a piece of the plant. I think you are in a much better position based on my observation of these other projects where public and private have been involved, with the Federal agency.

Secretary UDALL. Congressman, let me point out one special circumstance that gives us leverage that you don't even have in the Northwest that we have. At this Page plant we would have complete control over the coal source. This is Indian coal. They have to have a contract with us for the quantities of coal needed over the life span of the plant. We have complete control over the water because they have to sign a contract with us for water. In respect to the rights-of-way, again here we have control. So that this is quite a special situation that we have and really if the WEST thing develops the way we want it to develop, the Federal Government will ultimately in effect be a part of it and we will wheel power in the manner that is most economical. We will achieve the most economical result for the entire region, whether it is public or private. We will just simply do it in the most efficient, economical way and we will get benefits for everyone.

Mr. JOHNSON. Now, the sale of coal from these Indian lands, who has jurisdiction, the tribal council? The Navajo Reservation is pretty well organized and Congress has granted them a good many rights that other Indians do not have. Who has the say as to the leasing or the—

Secretary UDALL. Congressman, this particular coal resource is located in an area that belongs to both the Navajos and the Hopis. Quite naturally they are interested in developing it and moving it along as fast as possible. Under the current situation, we, of course, have the final say on these contracts. They do the initial negotiating, working with us, but we have to give it the final approval in the end.

Mr. JOHNSON. The ideal situation probably would have been for the Government to build the plant and utilize their own resources, but as you say, that would cause more confusion and talk about the dam in the river or the 4.4 for California.

But I do think, and just as one person here speaking for myself, that there is precedent for the Government buying into it, having a real right.

Now, as far as Hualapai Dam is concerned, and the powerhouse, that would be located much closer to the central Arizona project than would the powerplant at Page, wouldn't it?

Secretary UDALL. There would be some advantages in transmission, yes, in cost.

Mr. JOHNSON. The Government there would own all of the facilities in the river and it would own the transmission grid, and they would deliver the power to the central Arizona project. Is that not right? If Hualapai Dam is built?

Secretary UDALL. That is the way it would work; yes, that is correct.

Mr. JOHNSON. Now, there is a market for the power if it is built in the 1,800 megawatt or larger facility at Hualapai.

Secretary UDALL. I would assume there is. I think this is something that the power companies in the region undoubtedly will address themselves to in their statements they present to the committee.

Mr. JOHNSON. Well, as the thermal baseload builds up around the country, the hydro is getting more valuable and important every day, isn't it?

Secretary UDALL. Of course, this would mean the walls are breaking down between public and private. If you are going to design Bridge as a peaking plant, large quantities of peaking hydro are going to have to go to Southern California Edison and Arizona Public Service and private companies because there isn't that large a market for peaking power as far as the public utilities are concerned, particularly if they are also buying peaking power over the intertie from the Bonneville system and the Pacific Northwest, but I am getting in over my head and I don't want to pretend to know the answers.

Mr. JOHNSON. I am in over my head, too, on this, but with the intertie I think we are able to use the hydro more efficiently every day. With the increase in baseload building up which it is in the West, these people are out there in this area because they probably no longer can receive a license in the area of southern California either for gas or a coal-fired plant. So they either have to go to nuclear or they do it with hydro, and they are seeking hydro yet, I am sure.

Now, we heard the figures this morning that the chairman developed whereby there would be a greater accumulation of funds in the development fund if Hualapai were to be built at your rated capacity. Your figures showed that the funds would—at the year 2025 and the year 2047, I think it was, there would be a considerable amount of revenue in the development fund which would be much greater, somewhere around \$600 million, if the Hualapai Dam were built.

Secretary UDALL. Congressman, that is—

Mr. JOHNSON. That is taking into consideration Hoover, Parker, and Davis.

Secretary UDALL. Yes. We discussed this during the noon hour, and there are some factors that I was not aware of. I would like Secretary Holum to touch on this point because just the opposite is the result with other combinations.

Mr. HOLUM. I think understanding the administration—

Mr. JOHNSON. Now, wait a minute, because they were very careful this morning.

Secretary UDALL. The development fund saving is greater.

Mr. ASPINALL. If you had Hualapai.

Secretary UDALL. If you have the prepayment plus Hualapai.

Mr. ASPINALL. Then somebody in your office down there——

Mr. HOLUM. I think the Secretary is saying, that the information I have available for the members of this committee is on the assumption of a study by the National Water Commission as recommended by Secretary Udall of the question of whether or not Hualapai should be built. As a maximum, a decision on that question shouldn't result in a delay of over 10 years. What Commissioner Dominy told you this morning was that if Hualapai were built in 1972 and there were no prepayments, that the development fund in 2047 would have approximately \$1,850 million in it. If the prepayment plan for the central Arizona project is enacted by this Congress and built immediately so that service is available in 1972, and a decision is made later to build High Hualapai and it isn't put in service until 1982, the development fund in 2047, according to the calculations made by the Bureau of Reclamation, will exceed \$2 billion. In other words, the development fund in 2047 will be greater because of this delay, for two reasons. The prepaid power, of course, makes a contribution to the development fund in itself and this is a factor that will be available if that decision is made now.

The High Hualapai built in 1982 will come on the line at a time when Hoover and Parker-Davis are essentially paid out, so that the interest-bearing costs allocated to commercial power can be paid out quickly. The results are a greater development fund accumulation on this basis.

Mr. JOHNSON. Well, that is quite a turnabout from this morning's testimony.

Mr. DOMINY. No, sir.

Mr. HOLUM. No, it is not.

Secretary UDALL. It is on a different assumption. We are not changing our position.

Mr. JOHNSON. Well, you must be doing something because this morning——

Mr. DOMINY. Mr. Chairman——

Mr. HOLUM. There is no conflict between what was said this morning and now. What was said this morning is that if High Hualapai were built now and no prepayment plan so it came in service in 1972, the Commissioner said he believed the development fund would be \$1,850 million.

Mr. ASPINALL. That is all right figuring just day-by-day conclusions, but if you have Hualapai built in 1972 and you start the same kind of figuring from 1982, you still have the same answer.

Mr. HOLUM. Yes, except, Mr. Chairman, the point I am making is that there is a contribution to the development fund from the 400 megawatts of prepayment and after 2025 that is a substantial figure. There is also a greater burden during the early years if High Hualapai is built now in paying off the interest-bearing portion quickly. You can pay it off faster if it is built a little later.

Mr. JOHNSON. Now, wait just a minute. You say with both prepayment and Hualapai.

Mr. HOLUM. That is correct.

Mr. JOHNSON. You were thinking this morning's questions were asked if one were built.

Mr. HOLUM. That is right.

Mr. JOHNSON. And the other not.

Mr. HOLUM. There is no contradiction between what was said this morning and what I say now.

Mr. JOHNSON. We are talking about here and our questions are directed to you people on the basis that the prepayment in the thermal power would not be made available and the central Arizona project would have been authorized with Hualapai in it. A comparison was made on Hualapai or the prepayment—

Mr. HOLUM. Those are the figures that Commissioner Dominy gave you this morning.

Mr. JOHNSON. After that I think that Hualapai and Parker-Davis and Hoover would create more in the development fund than the other if Hualapai was never built.

Mr. HOLUM. That is correct, and those are the figures that Commissioner Dominy gave you this morning. The figures I am giving you now are if both were built.

Mr. JOHNSON. You are talking about building one, not both.

Mr. HOLUM. That is correct, as related to this morning's testimony.

Mr. JOHNSON. Now, as far as Hualapai is concerned, and you heard the statement this morning the record, that this would encroach upon the Grand Canyon National Monument lands and also on the Grand Canyon National Parks, I would like to know just how much of the monument lands are going to be affected.

Secretary UDALL. You want the number of miles along the river?

Mr. JOHNSON. Yes, and how much do we inundate if you would just come up along the side of it.

Mr. DOMINY. Well, actually, Mr. Chairman, the reservoir would back clear through the existing monument.

Mr. ASPINALL. On one side.

Mr. DOMINY. On both sides of the existing monument. The existing monument starts on the north bank at Kanab Creek and runs down to Lake Mead National Recreation Area.

Mr. ASPINALL. The water up the river would not be through the monument but it has to go part way up before it gets to the monument.

Mr. DOMINY. That is correct. I say it backs water all the way through the existing monument, however. The first part of it is in the Lake Mead National Recreation Area. Then when it hits the monument boundary just below Lava Falls, or just above Lava Falls, then it does occupy the river section all the way through the monument to the corner of the park.

Mr. JOHNSON. Now, in the monument itself, what is that—that particular area is in a canyon.

Mr. DOMINY. Yes. It is in the inner gorge of the canyon.

Mr. JOHNSON. In the inner gorge, and it does not come out on the lands of the table above.

Mr. DOMINY. No, sir. It doesn't do that even down at the dam itself. That gorge runs roughly 700 feet from the lip of the inner gorge down to the river and this is a fairly consistent all the way up and down the canyon.

Mr. JOHNSON. In the Grand Canyon National Park it just borders on one side of the park.

Mr. DOMINY. That is correct.

Secretary UDALL. Fifteen miles.

Mr. DOMINY. Thirteen miles is the exact distance. The southwest corner of the park is at the mouth of the Havasu Creek, and then it runs 23—the river runs 23 miles. Where the river is the boundary of the park, it is approximately 13 miles up to Kanab Creek and 10 up to Tapeats and then the park boundary crosses.

Mr. JOHNSON. How far up on the canyon wall does it come?

Mr. DOMINY. At the mouth of Havasu Creek, roughly 85 feet above the normal river level and, of course at Kanab Creek it becomes zero because it levels out there. Now, if you were to take, and we did some calculations on this while the Secretary was considering all of these problems, if you took all of the inner gorge out from the river up to the rim of the inner gorge and computed the acreage involved, this would be roughly 1,200 acres where the park is the boundary, where the river is the boundary with the park, and about 1,900 acres of monument lands or a total of 3,200 acres that you would take out and place into a recreation area in lieu of monument and park.

Mr. JOHNSON. That would be about 5,000 acres.

Mr. DOMINY. A little less than that; yes, sir. We don't inundate that much land because it is a sheer canyon and we are covering only a very small portion of it in that area.

Mr. JOHNSON. Now, I would like to ask you, Mr. Dominy—you are a person I have known since before I arrived here—you have been responsible for building dams all over and I am one of the fortunate Congressmen who has a dam under construction on the American River by your Bureau of Reclamation people.

Haven't you people studied this and you as the Commissioner in your own opinion would state that this is a good damsite, a feasible project, and one that should be built?

Mr. DOMINY. Let me put it this way. The Bureau of Reclamation's studies prove that the Hualapai damsite is the best one remaining on the Colorado River and the construction of the dam and powerplant and the creation of a great new recreational lake would be highly feasible. It would, of course, change the character of the 93 miles of the inner gorge in the lower Canyon of the Colorado River as it now exists. I take my job quite seriously. I think I have taken extraordinary efforts to acquaint myself with the 254-river miles that we are discussing in order to arrive at an opinion on the highest and best use of it. I arrived at the conclusion last summer that from an overall resource development standpoint considering the two remaining damsites on this stretch of the river, Marble Canyon Dam is of much lesser importance than Hualapai and could well be given up because of its disruption of a wild river scenic trip that logically starts at Lee Ferry which is the only access on the river that isn't in sheer canyon walls. It has been the historical access point for all time, since man came into the area. A white water trip on the Colorado starting from this point is a tremendous experience.

With Glen Canyon Dam on the river, of course, this exciting trip can be run now for several more months of the year than it could before. Consequently many more people will be realizing this great experience than ever before.

It is a 9- to 12-day trip from Lee Ferry down river into Lake Mead and once you start, there is no turning back. It can't be done, as Congressman Tunney discovered, by going out and renting a canoe. It takes special equipment, real competent guide service and specialized services to accomplish it.

Therefore, there never will be hundreds of thousands of people experiencing it, but 2,000 people took the trip this year which is by far the largest number that ever ran the river in one season because of the fact that Glen Canyon regulates the river and thus spreads the season much longer than previously.

Now, if Hualapai were built, this trip would only be reduced from a 9- to 12-day trip down to a 6- to 9-day trip and the exit point out of the canyon would be at Peach Springs Wash or at the Hualapai Dam site.

Now, how much disruption Hualapai Dam is to scenic values and to the wild river trip is something for the committee to decide. I have my own views and I have expressed them in council within the Interior Department. The administration has made its recommendation, and, as Commissioner, I support the administration's position on this legislation.

Mr. UDALL. Mr. Chairman, he doesn't seem very happy about it. [Laughter.]

Mr. JOHNSON. I have watched with a great deal of interest in my short time on this committee in which these dams have been eliminated. The people downtown once made just as good a case for these in previous years as they make to eliminate them.

Secretary UDALL. Congressman, let me comment here. We are now suggesting that the decision be deferred. I think when you get into the subject of water conservation and the alternatives that we are all going to look at in the region, that you really have a very good argument for it. If this dam is built, and I made one decision this fall as part of this whole analysis, it should be built because it is a very excellent hydroelectric damsite and primarily for that reason. A secondary consideration is the type of outdoor recreation that would be provided.

On the other side, the one argument that the antidam people have had that seems to me cannot be dismissed is the conservation argument. This has to be weighed along with the argument that it should be left in its natural condition and put in the park. But we don't need it now. If we absolutely needed it, if the Arizona water project had to have a dam to make it fly, then I think we would have to decide on it now one way or the other. We do not need it and therefore why not defer decision? Why not wait and in light of the water studies and a further analysis of the whole problem, then make a decision later. But we don't need it, so why decide it now? That is essentially the administration's position.

Mr. JOHNSON. I think a good case has been made here that it is necessary. Economically it means more to the central Arizona project and development along the river than anything we talked about.

Secretary UDALL. The central Arizona doesn't need it at all.

Mr. JOHNSON. Well, it certainly does because your central Arizona project is going to have to pay for your power I think at a higher rate and I think it is going to cost you more for power than it would if

Hualapai were built. I think the development fund for the greater augmentation of the river is much more advantageous under Hualapai than without it. And I think the future of the river would be benefited more by Hualapai.

Secretary UDALL. Congressman, I have come to my conclusion very sincerely, after looking at the whole thing, and I would make this argument to all of the Colorado River Basin people. I think when you are ready to make the big decision and when you know what the alternatives are and the economics are with regard to the future of the river, and how you are going to make up the deficiency, then I think this is the time to make the decision on this last damsite on the river. I don't know which way it would go, I don't think we can say at this time. I don't think we have to make a decision here on an issue that has inflamed the whole country, involved the country in argument. I think we can make it in a more rational way at a later point.

I want the committee to understand that I am not just going along with the Bureau of the Budget. I sincerely believe this is the best decision in terms of where we are. I believe further that this is, as I have said today, a first rate dam site. It is one of the best that remains in the west. It is the best that remains on the river. It is the only big damsite that remains on the river, but I don't think you have to decide the issue now.

That is my point.

Mr. JOHNSON. Well, some members of this committee I think—I won't say how many, because you never know—but last year we passed a bill with the dam in it.

I can go along with the elimination of Marble Dam and I can go along with making that portion of the river a part of the national park. I think there has been a good case made for the Hualapai Dam and I for one would support the bill with Hualapai in it. I think it is best for everybody concerned at the present time.

I don't think a National Water Commission is going to resolve this because I think there is enough known now. You say that this is a necessary facility as far as benefits are concerned in the overall, and I think that a dam, a well-constructed dam with a good-looking powerhouse adds more to that area than anything I know you can do to it. And at the same time this would develop more use and more recreation values in that area than anything I know you can do at this particular time, too.

After one experience on Lake Powell, I think it is one of the finest developments other than from the standpoint of generation of power. I think in time probably the recreation will mean more to the area than the power generated from it. I have never seen one of these hydroelectric dams yet that hasn't drawn as many people as any national park. As long as our national parks—and I am a strong supporter of national parks, too; I have a few in my own district, but I know the dams that have been built, there is a great deal of interest on the part of people to go there and get something out of a visit to the project when it is under construction. And I am amazed how many come back after it is completed to make that same trip. I just can't see the Congress foregoing building Hualapai or Bridge Dam at this time.

I don't know what a National Water Commission is going to develop. I don't know, as you say, you shouldn't abandon it completely. We should set it aside and study it at a later date. Personally I don't think there is a better time than right now to build it.

Secretary UDALL. Congressman, you have stated very, very eloquently and convincingly the argument on one side of this. The only response that I can give to you is that I think it is premature because we do not know what the long-term solution is for the Colorado River Basin. The Columbia River or northern California could be involved or weather modification might play a significant role. We will know, I think 5 years from now, but right now Hualapai Dam is not needed. So why do we want to stir up a big argument, plunge into a big controversy when it is not necessary because the project is not needed to make the central Arizona go. It is not needed.

Mr. JOHNSON. If we passed over everything because of the big argument we wouldn't do much in Congress. Everything we do has two sides to it. You have to face up and do what you think is right when you are preparing or offering or passing a piece of legislation.

Mr. BURTON of Utah. Will you yield, Mr. Chairman?

Mr. Secretary, isn't it true that the Hualapai Indians have a reservation down in this area?

Secretary UDALL. Half of the damsite is in the reservation. They own one side of it. Like the Navajo Reservation at Glen Canyon.

Mr. BURTON of Utah. It is my understanding that they own a damsite. Am I wrong on that?

Secretary UDALL. They own one side of it.

Mr. BURTON of Utah. In our last bill we put in some money to buy out their interest, which they didn't have?

Mr. DOMINY. Their reservation comes down to the river all along there, including the access to the dam.

Secretary UDALL. They have a very legitimate interest in it.

Mr. BURTON of Utah. Counsel just explained to me this isn't a treaty reservation and I was interested in the point that the gentleman from Pennsylvania raised about taking that whole area into a national park by Executive order or national monument by Executive order. I wondered if you could do that with an Indian reservation. But if it's an "Executive" and not a "treaty" reservation, I suppose you could.

Mr. JOHNSON. That is all the questions I have, Mr. Secretary.

Mr. SAYLOR. Will the gentleman yield to me?

Mr. JOHNSON. Yes.

Mr. SAYLOR. I just want to say that I felt this was going along too smoothly. I felt it was about time that somebody would get into this business.

I just want to tell you that, as near as my memory serves me, figures 4 years ago called for the expenditure of \$512 million for construction of Hualapai Dam. Those figures are about correct, Mr. Dominy?

Mr. DOMINY. Yes; in that neighborhood.

Mr. SAYLOR. Now we have had 1 years' escalation from that point and I think that has gone up about 2 or 3 percent a year and I notice we are using 3½-percent interest, and since Uncle Sam is out borrowing money right now—I think that the Tuesday, March 14 issue of

the Wall Street Journal indicated that Treasury notes are selling right now, those that are selling close to par and bearing $5\frac{3}{8}$, $4\frac{7}{8}$, $5\frac{3}{8}$, $5\frac{1}{4}$, 5 percent, and figuring 2 percent straight interest on \$512 million for 80 years, which is the figure which I think somebody ought to realize is what Treasury is going to have to pay for this amount, comes to a mere bagatelle of about \$819 million. If you subtract \$819 million from anything that is going to be put in, or any benefit that you are going to get out of this, the central Arizona project, we certainly find out that the figures the Secretary gave this morning are awfully close to just being exact and the best deal for everyone.

Now, if you get into a project and the people in California don't want this project built, one of the best ways I know to keep it from being built is to get into a hassle as to whether or not you are going to invade the Grand Canyon National Park or Monument. The American public let it be known last year that they didn't like it, and I think if you will ask the average Member of Congress who doesn't come from one of those seven basin States, he will tell you he got more mail on this than anything else. And that Grand Canyon doesn't belong to the seven basin States. It belongs to the United States. It belongs to the world.

I am not one of those that is about to see this committee go out and ruin something that it took the Almighty several hundred million years to build.

The Secretary and the Commissioner of the Bureau of the Reclamation have come up here and given you a feasible project, one that can see to it that Arizona, having won the lawsuit, is entitled to put some water to beneficial consumptive use. If this committee is interested in putting water to beneficial consumptive use, then you will take the advice of the Secretary of the Interior and the bill he brought up here and report it out. If you have anything that you want to add to it to see that California gets that 4.4, which seemed to be the big point that was made yesterday by the representatives of that State, and some others, will have trouble getting a bill passed.

I am not worried about carrying the administration's responsibility. The administration, if they said they don't want this, they don't want it. It meets with my approval and I am willing to carry that battle, too. I just hope that we would get a bill out and the bill will follow very closely what the Secretary of the Interior and the Commissioner of Reclamation and the Assistant Secretary have recommended to this committee.

Thank you, Mr. Chairman.

Mr. JOHNSON. I want to say to the gentleman from Pennsylvania that I don't think the Hualapai Dam will damage the Grand Canyon nor the Grand Canyon National Park or Monument. And I think that we all have differences of opinion and I have just as much interest in the Grand Canyon as he does, I think, but we look at it a little differently. And I think that California as a whole has just as much interest in the Grand Canyon as any State in the Union. It doesn't mean that we are out to spoil things or deface the countryside, but I do think that we have a perfect right to consider legislation and pass on that legislation, and whoever is successful in the final end, we will go along with it. The majority will have spoken, I think, whether it is

built or not built or modified. And I think that is the position I would take as chairman of this subcommittee. In the days ahead if we can come up with a bill, I want to see a bill passed, too.

Mr. SAYLOR. Mr. Chairman, if you will yield for just an observation, out in your State they have a great industry known as the olive industry and one of the things that that olive industry does is that they are able to get into a bottle of olives more olives than a normal person thinks it is at all possible to get in.

You know, when you take the lid off of that bottle of olives and turn it upside down, you can't get any olives out, and you have to reach in and you have to get your fingers in and sometimes you have to get a sharp instrument to reach in and pull the first one out. And it is a strange thing that once you get that first one out, all the rest of them roll out, too.

While we haven't invaded any national park, so far, I don't propose to see that this national park is invaded by the waters of any dam whether you call it the Hualapai, Havasupai, Bridge Canyon or any other name that anybody wants to give it.

Mr. ASPINALL. Mr. Chairman, I just wish to be recognized to state that I don't want to take any definite position on this legislation at this time.

Mr. JOHNSON. It is the opinion of all of us that each person has spoken for themselves. I think their testimony pretty much points out what they were thinking.

Mr. UDALL. I have just one technical question, no philosophy, no olives. Last year when we had Marble Dam in my bill we had Paria silt control to protect that and we had Coconino silt control to protect Hualapai. We have now taken Marble out. I don't know whether to leave both Paria and Coconino in. If we should run over you, if the committee should run over you, should we put both Coconino and Paria in?

Mr. DOMINY. Yes. Put them both in because this would block the silt. A major portion of the silt below Glen Canyon Dam comes into the river from Paria and the Little Colorado River tributaries.

Mr. UDALL. I hope the Chair will excuse me for getting back to some of the details of the subject.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. Mr. Chairman, when you said the Hualapai site was the last "good site" or "major" site along the river, you had not excluded what the chairman called Echo Park, had you?

Secretary UDALL. I am talking about a site outside of a national park or national monument.

Mr. BURTON of Utah. Well, I have told the gentleman from Pennsylvania we in Utah have quit calling it Echo Park. It is Chief Washiki Damsite. [Laughter.]

Mr. SAYLOR. Off the record.

(Discussion off the record.)

Mr. BURTON of Utah. When we get that bill passed we are going to name the lake, "Saylor Lake."

Mr. SAYLOR. All I can tell you is that in the words of my Indian brother in the Seneca Nation, I think it would be much better named Lady Bird Dam.

Mr. STEIGER. Mr. Chairman—

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Mr. Chairman, on the advice of my colleague from Arizona I wasn't about to get into the Grand Canyon situation but since my colleague from Pennsylvania has brought the subject up in descriptive if completely inaccurate terms, I felt that I would be less than honest with myself if I didn't go on record since the canyon and park are in my district. I have spent most of my adult life within 100 miles of it and I don't think anything has offended me as much as the lack of factual basis for the emotional wave that we are destroying the Grand Canyon.

I would like to direct one question to Commissioner Dominy with the Chair's permission, since this gentleman probably has spent as much time up and down the river recently as anybody I know of, and is familiar with the boundaries of the proposed lake at Hualapai Dam. I realize it is very difficult for the Commissioner to be any more objective about this than I am. But I wish to ask him to very briefly and factually tell us the extent to which the Grand Canyon will be violated by a proposed Hualapai Dam.

Mr. DOMINY. Personally I don't think it will be violated. Hualapai Dam would back water for 13 miles along the river where the river is the boundary of the park. I do not believe minor water storage in the river in the deep inaccessible minor gorge at a remote corner of the park to be an invasion of the park. And I would point out the Sierra Club itself in 1949 characterized this as only a minor peripheral invasion and approved such a minor invasion clear back to Tapeats Creek, which incidentally is 10 miles farther upstream than would be involved if Hualapai Dam were to be constructed.

Mr. ASPINALL. If my colleague will yield, I think what my colleague is saying, to make it descriptive, is: If there were a dam built at Bridge Canyon clear to the rim of the canyon, clear up to the top, the Grand Canyon itself would never be filled.

Mr. STEIGER. I am certain of it.

Mr. JOHNSON. Are there any further questions?

Mr. REINECKE. Mr. Chairman—

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. Mr. Dominy, do you know whether the WEST group or your own Department considered the feasibility of a nuclear plant as opposed to a steam plant?

Mr. HOLUM. Yes; we certainly did consider both nuclear and coal-fired steam.

Mr. REINECKE. Located at Page or downriver?

Mr. HOLUM. The nuclear plant locations considered were at Pendleton and near Mojave. But with the facts at hand, of course, you have to think in terms of our prepayment arrangement of the type of facilities that are apt to be constructed in the region. All indications are that coal-fired plants are what the utilities are going to be building, in the immediate future at least.

Mr. REINECKE. Did the figures come out, or was there just a decision on your part, because coal was in the area, coal would be the type to build?

Mr. HOLUM. Was there a substantial difference between coal and nuclear?

Mr. REINECKE. Yes.

Mr. HOLUM. There seemed to be—we didn't perfect these studies to the ultimate. There seemed to be because of Federal financing and the advantage that that brings to high initial capital cost investment. There seems to be a slight advantage to nuclear as far as the Federal Government was concerned under a prepaid arrangement. The studies were not perfected because of the actualities of the case. You would have to do business recognizing the kind of facilities that are being built in the region.

Mr. REINECKE. Would it be possible to see those studies?

Mr. HOLUM. I beg your pardon?

Mr. REINECKE. Would it be possible to see the studies?

Mr. HOLUM. Yes.

Secretary UDALL. Yes; they are available.

Mr. JOHNSON. Are there any further questions of the Secretary and his group? If not, we want to thank you for coming here and giving us the benefit of your views.

Secretary UDALL. Thank you, Mr. Chairman.

Mr. JOHNSON. The next witness to come before the committee here will be Mr. James G. Watt, secretary to the U.S. Chamber of Commerce National Resources Committee. Mr. Watt.

STATEMENT OF JAMES G. WATT, SECRETARY, NATIONAL RESOURCES COMMITTEE, U.S. CHAMBER OF COMMERCE; ACCOMPANIED BY RICHARD L. BREAUT, MANAGER, COMMUNITY AND REGIONAL RESOURCES DEVELOPMENT, U.S. CHAMBER OF COMMERCE

Mr. WATT. Mr. Chairman and members of the committee, thank you for the opportunity of appearing at this late date, and in light of that, I will make this brief and with your permission ask that the statement be printed in the record as if read and just brief it for the committee.

Mr. JOHNSON. Your statement will be placed in the record in full. You may summarize your statement.

Mr. WATT. Thank you. I am James Watt and I am responsible for coordinating the interests and activities of the Chamber of Commerce of the United States in natural resource matters.

I have with me Mr. Richard L. Breault, manager of the chamber's community and regional resources development group. He is responsible for bringing together the various chamber programs, including our national resource programs, for the proper development and growth of American communities and regions.

We are here to support on behalf of the national chamber the creation of a National Water Commission as proposed in the several bills that are before the committee today. We would urge that this legislation be considered on its own merits and not be incorporated in any other legislation.

We are pleased that you are holding these hearings and considering this specific bill, and would hope that the committee would give it quick and favorable action as a separate piece of legislation.

The rest of the statement goes on, Mr. Chairman, to give some of our reasonings. You have discussed those in great detail here.

We will be glad to go through those with you if you care, or answer any questions at this time.

Mr. JOHNSON. The chairman of the full committee, Mr. Aspinall.

Mr. ASPINALL. I have only the one question. Will you enumerate for me the benefits to be derived out of the National Water Commission that cannot be secured out of proper administration of existing law?

Mr. WATT. Yes, Congressman Aspinall. We feel that the problems of managing our water have grown to the point where there is need today for bringing in outside interests; that is, outside the Federal Government. We think we must approach water conservation, water problems, on a larger scale and bring about the management of our total environment for the greatest benefit to man in his total community.

I think the problem is larger than just river basins. We must consider the ecological problems, population changes, and all these other factors that might have and should have a significant bearing upon an inner basin transfer of water, for example, or the upper development of water resources.

I think private citizens can pump into this library of information additional materials that need to be considered by Congress before decisions are made.

Mr. ASPINALL. Have you attempted to get in touch with the Chairman of the Water Resources Council established by the Water Resources Planning Act, and have you been refused an audience?

Mr. WATT. Excuse me. Refused a what?

Mr. ASPINALL. An audience.

Mr. WATT. No; we have not.

Mr. ASPINALL. Well, that is all.

Mr. JOHNSON. The gentleman from Utah.

Mr. BURTON of Utah. No questions.

Mr. UDALL. No questions.

Mr. STEIGER. No questions.

Mr. WATT. Thank you for your time.

Mr. JOHNSON. We want to thank you, Mr. Watt. Your statement will appear in the record.

(The statement referred to follows:)

STATEMENT FOR THE CHAMBER OF COMMERCE OF THE UNITED STATES BY JAMES G. WATT

My name is James G. Watt. I am responsible for coordinating the interests and activities of the Chamber of Commerce of the United States in natural resource matters. I have with me Mr. Richard L. Breault, Manager of the Chamber's Community and Regional Resource Development Group. He is responsible for bringing together the various Chamber programs—including our Natural Resource programs—for the proper development and growth of American Communities and Regions. We are here to support on behalf of the National Chamber, the creation of a National Water Commission, as proposed in the several bills that are before the Committee today. We urge that the legislation be considered on its own merits and not be incorporated in any other legislation. We are pleased to see that this proposal received the quick action of the Senate earlier this year and are hopeful that this Committee will be able to give it favorable consideration.

On several different occasions, the National Chamber has reaffirmed its support of the concept and approach embodied in S. 20 and the related House bills. Our support for the proposed National Water Commission results from a series of studies made by the National Chamber's Natural Resources Committee and a number of ad hoc advisory panels.

The seriousness of the multitude of situations concerning management of water resources across the nation requires the most careful appraisal of what the nation can and should do to solve the varying problems.

A new, positive attitude must evolve to provide optimum use of water in individual watersheds and throughout the country. This, in turn, requires new knowledge and broadened comprehension of the economic meaning of water to the wealth, as well as to the health, of a region.

We, therefore, endorse the scope of duties of the proposed National Water Commission. These duties would include reviewing present and anticipated national water resource problem, making such projections of water requirements as may be necessary, and identifying alternate ways of meeting these requirements.

We are pleased with the requirements of Section 3 that the Commission must give consideration to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, and innovations to encourage the highest economic use of water and waste water purification and reuse.

It is our contention that these objectives will properly assess common aspects of water problems of the nation and provide a basis for outlining courses of action to achieve efficient utilization of water resources.

We agree with the provisions of the bill that state that the Commission should consist of seven members appointed by the President and that no member of the Commission hold any other position as an officer or employee of the federal government.

It is also necessary that the Commission have a competent staff independent of federal, state and local governmental water agencies.

The fact that this commission will not continue indefinitely is important. Termination of its work no later than five years from the effective date is most appropriate.

We are pleased to note that Section 6 provides a degree of interrelations with river basin commissions created pursuant to Title II of the Water Resources Planning Act. This provision should help insure an adequate flow of information from actual river basin planning groups. We would suggest, however, that this same relationship be extended to river basin planning and operating agencies authorized by interstate compacts or international agreements.

Our endorsement of this legislation in no way argues for delay of current programs or projects, be they federal, state, local or private. Rather, our support of this legislation argues for the utilization of a mechanism designed to help solve the complicated planning and financing of the development of our future water resources.

Our very lives, our economic well being on this continent, are at stake. We need the best possible studies, analyses, and evaluations to be able to determine what our future course should be. With this in mind, we urge immediate and favorable action on this legislation.

Mr. JOHNSON. The next witness will be Mr. Juel Rodack of Arizonans for Water Without Waste.

STATEMENT OF JUEL RODACK, CHAIRMAN, ARIZONANS FOR WATER WITHOUT WASTE

Mr. RODACK. Mr. Chairman, I would like to make three small corrections to my statement before asking that it be entered into the record. They all appear on page 2. In the last paragraph where it says "\$92 million" on the first line, it should read "\$82 million."

The second line, delete "all nonreimbursable" and insert instead, "all but \$2 million nonreimbursable." And on the last line, change "\$92 million" to read "\$80 million."

Mr. Chairman, I should like to request that my statement be entered in the record as if read and I would appreciate the opportunity to make a few additional remarks.

Mr. JOHNSON. Your statement will appear in the record at this point and you may summarize your statement.

(The statement referred to follows:)

STATEMENT OF JUEL RODACK, CHAIRMAN, ARIZONANS FOR WATER WITHOUT WASTE

My name is Juel Rodack. I am a resident of Tucson, Arizona. I appear before you as a private citizen and as Chairman of an Arizona-based organization known as Arizonans for Water Without Waste.

I should like to preface my remarks by stating that I personally am a layman and do not presume to be an expert on the subjects here under discussion, but I and my colleagues (many of whom are learned professional men) have investigated the matters that pertain here insofar as the need for construction of dams in the Grand Canyon is concerned. We have consulted with many experts and the conclusions we offer here are a result of our studies and express our convictions.

On AWWW.—Arizonans for Water Without Waste was the natural outgrowth of the hearings on HR 4671 in the last Congress. We organized to counteract the common misconception that Arizonans all want these dams and to tell the other side of the story omitted by the generally slanted reportage in the news media of our State. The righteous indignation of the people should be heard.

A major activity of AWWW is dissemination of information. Regrettably the average Arizonan is either uninformed, ill-informed or misinformed on the issues. A great many of our citizens are unaware that the water for C.A.P. is to come from Lake Havasu. They have come to believe that C.A.P. is physically impossible without dams in the Grand Canyon. Most of these good people oppose the dams once they become cognizant of the facts. A test poll shows that some 70% of the informed segment of our population oppose the dams.

We respect the sincerity of those reclamationists who firmly believe that the only way to pay for reclamation is to build hydroelectric dams, and of other proponents of dams who are honestly convinced that they best serve the public good when they pay service to the complexities of the legislative process. But AWWW is concerned that in Arizona—as elsewhere—we also have opportunists interested only in expediency, political advantage or private profit. There are, for instance, land speculators selling the dream of instant riches, advertising cheap land that will be worth fortunes once the President signs the "two billion dollar C.A.P. bill". These people are natural proponents of dams regardless of the public good.

These, among other considerations, brought AWWW into being last August. Our opposition to dams in the Grand Canyon is based on waste:

Waste of the tax dollar.

Waste of water.

Waste of our National heritage.

On taxes.—Hydropower is no longer the most economical source of electricity. Equivalent thermal plants can be constructed for a fraction of the cost. In a competitive market the dams will produce no revenue without Federal book-keeping magic. The taxpayer will foot the bill to provide low interest rates, non-reimbursable expenditures and eventually lowered hydropower revenues.

\$92,000,000 was allocated in last year's HR 4671 to Recreation, Fish and Wildlife—all non-reimbursable. Consider that the overall expenditure of the Arizona State Parks Board from 1956 to 1965 totalled only \$842,000. Does this indicate that Arizona feels the need for large expenditures along these lines? Certainly, these United States can always use more recreation areas. But where? The recreational potential of Lakes Mead and Powell will not be used to capacity in the foreseeable future. Are additional similar facilities between—and immediately adjacent to already existing ones worth \$92,000,000?

HR 4671, were it undertaken as a commercial venture, borrowing at the lowest conceivable interest rates, would be unable to repay nearly one half of the project cost. In fact, these hundreds of millions of dollars would come out of the taxpayers pocket.

On water.—The Colorado River is already bankrupt. Seven states divided up more water than exists. Worse, the river is overdeveloped. Present reservoirs have a capacity exceeding 4 years virgin flow with an annual loss through evaporation sufficient to handle the municipal and industrial needs of a city of more than 5 millions. Additional dams will compound this tragic waste.

On national heritage.—The scenic splendor of the Grand Canyon cannot be too greatly extolled. But its value to present and future generations goes far beyond this. For one thing it is a living scientific laboratory. Dams would modify its glory and irreparably damage its scientific values. To protect the Canyon from this threat Congress should act now to include both of the proposed dam sites within an enlarged Grand Canyon National Park.

Congressman Udall has stated that population control is one of our most urgent questions. It is not within the scope of these hearings to determine what should be done about the problems of our expanding population. But the issues debated in the Grand Canyon controversy are merely early symptoms of the dilemma.

Privacy, solitude and quiet contemplation are absolutely vital to inner peace and individual dignity. Faced with a constantly increasing populace, privacy is becoming a rare commodity. Wilderness such as the Grand Canyon should be preserved for future human needs. It will be far more valuably used in this way than for any power it can produce. It will be small improvement to have the roar of motor boats shatter its ageless peace.

On alternatives.—Many alternatives to the construction of these dams have been presented. AWWW does not specifically support any one of these to the exclusion of the others. Thermal plants, either fossil fuel or nuclear, can certainly provide equivalent power. Other means of financing the project are too numerous to mention here, but we were most impressed by the revised analysis by Jeffrey Ingram showing how C.A.P. can be financed through water revenues alone. All of these excellent alternatives should be given equivalent study to that which the Bureau of Reclamation has given on the dams.

On CAP.—I should like to make clear that AWWW is not opposed to the Central Arizona Project. Our campaign has been to demonstrate that C.A.P. is practical without unnecessary and undesirable dams in the Grand Canyon. However, there are two points that should be discussed in connection with C.A.P.:

1. AWWW is puzzled by certain small peripheral reclamation projects that have been tacked onto C.A.P. We see little value in Buttes, Hooker and Charleston Dams. Last year, when HR 4671 failed to pass, Lawrence Mehren, then President and Chairman of the Central Arizona Project Association, in his statement "The Central Arizona Project Alternates" showed that C.A.P. can be built without these and certain other miscellaneous items at a savings of \$124,290,000. Divorced from C.A.P. the Charleston Dam and its aqueduct to Tucson would probably deliver extremely expensive water. Separate benefit-cost ratios should be provided to justify construction of these three dams.

2. We are impressed by the reports of Dr. Robert A. Young and Dr. William E. Martin, both Professors of the Department of Agricultural Economics, University of Arizona, which indicate that the water problem of our State can be solved without C.A.P. or other unnecessary reclamation projects by the simple process of wiser water usage. We respectfully suggest, in the public interest, that Congress make a careful study of this matter before passing legislation for a project that conceivably is unnecessary and would require the expenditure of half a billion dollars.

What is the answer?—Arizona, along with other southwestern states is facing a water shortage. But this is not peculiar to the southwest. All 48 of the contiguous states are moving inexorably in one degree or another toward a water crisis. We can take comfort, however, that we are faced with this situation at a time in our history when our advanced technology, given the proper stimulus, is prepared to present us with practical solutions. Arizona needs C.A.P. now only because nothing else has been developed. But C.A.P. is a partial, short-term answer to our problem. Not only in Arizona but throughout these United States we need better long-range planning. This cannot be done on a local or regional basis. That is why we support a National Water Commission that is unfettered by regional ties. We do not believe that the massive interbasin transfer of water is the best or most economical solution to our problem. Here again the many sound alternatives should first be fully investigated. That is why we oppose

wasting tax money on funding a feasibility study for importation. We are convinced that the answer to the water problem, local, regional and national, is to be found best through a select National Water Commission such as would be created by S 20 already passed in the Senate.

On compromise.—We appreciate the spirit in which certain parties have offered to build only one instead of two dams. And we are acutely conscious that, refusing this compromise, we have been placed in the invidious position of appearing unreasonable and stubborn. But we ask you to consider this—there are in the world some things on which it is impossible to compromise. You would not ask us to compromise on liberty. There is a saying in my business that half-clean is still dirty. The essence of this principle applies here. One cannot say "We won't paint a beard on the Mona Lisa—just a moustache"—"We won't scratch the Star of India twice—just once". We cannot be expected to agree to only half-damage the Grand Canyon.

In conclusion.—We know for a fact that the dams are not necessary for C.A.P. We realize that the complexities of the legislative process must be served but we are convinced that there are other means of achieving the same ends. We know that our leaders are sincere, but we also are aware that some may be mistaking the pork barrel for a water barrel. In so doing they may sincerely feel they are representing their constituents. But let them reconsider. Are they really representing them? Do the residents of Arizona really want to let their tax dollars evaporate with the water in unnecessary lakes behind unnecessary dams that deface their own Grand Canyon? Do the people of the United States really want to mar the beauty of any part of internationally famous Grand Canyon on the pretext of bringing water to arid states that can obtain it by other means? Are the representatives of the *informed* people of this country really representing them in this? Think about it long and hard before making such an irrevocable decision.

Arizona is the Grand Canyon State. The USA is the Grand Canyon country. This Canyon is among our most treasured and remarkable possessions. It should be preserved—in its entirety—without further modification—now and for all time.

Mr. RODACK. For the record, Mr. Chairman, my name is Juel Rodack. I am a resident of Tucson, Ariz. I appear before you as a private citizen and as chairman of an Arizona-based organization known as Arizonans for Water Without Waste.

I feel it is fitting that I appear so soon after the Secretary of the Interior because my organization does support the administration bill with one small amendment. We ask that the national park be extended in both directions to enclose not only Marble Canyon but also the Bridge Canyon Dam site.

If there is any importance, Mr. Chairman, to my presence here today and what I have to say, it is that I am an Arizonan, sent here by Arizonans.

The total expense of my trip here has been financed through numerous small private donations, contributions from Arizona citizens, all of whom are without hope of any material gain or increased prestige or power. I wish one could say as much for all of those Arizonans who are so eager to build dams in the Grand Canyon.

Mr. ASPINALL. Mr. Chairman, we will make this evaluation. You do not need to pick on somebody else. We do the picking up here. You just state your position.

Mr. RODACK. Yes, sir. I would like to say for the record that Congressman Udall at the beginning of the hearings this afternoon entered into the record that a hydroplant exists at Roaring Springs in the Grand Canyon National Park and I feel for the record it should be qualified that Roaring Springs has a constant flow and there is no dam at that site and that the miniscule installation which was characterized by Commissioner Dominy could be walked past and almost not noticed.

I think that Congressman Udall knows that I have great admiration and respect for him. He has earned my confidence, and I might say my vote. But I feel that on the subject of dams in the Grand Canyon he does not represent the informed Arizonans nor does his distinguished colleagues, Congressmen Rhodes and Steiger.

I believe yesterday Congressman Wyatt questioned Congressman Steiger on Arizona's go-it-alone CAP. I believe that some members of this committee might be interested in some aspects of the bill that was recently passed in our legislature. When the public hearings were first announced on this bill I made a request for a hearing to our State senator, Senator Ray Goetze, chairman of the national resources committee of our State senate. I made my request first by telegram, second by telephone, third by letter, and I was refused a hearing.

In the great State of Arizona the democratic process broke down and on the subject of CAP the voice of the taxpayer is muffled. They listened to Arizona's version of the Bureau of Reclamation, namely, the Arizona Power Authority and the Interstate Stream Commission. I don't think that they are the only people who should be heard on a matter which greatly concerns the taxpayers' pocket and when they are passing an authority for open-ending bonding.

In my statement, in supporting the National Water Commission the key words in my statement are unfettered by regional ties. It may seem strange that as an Arizonan I do seek priority for the Southwest. Quite the contrary. I am convinced that a select National Water Commission be free to make its own decisions will give priority to the Southwest and its decision would withstand the heat of intensive scrutiny.

Incidentally, I believe that later in this week a proposal will be made that the National Water Commission be a permanent body instead of just a temporary organ empowered to make a single final report.

A permanent National Water Commission would be able to deal with the ever-changing conditions and provide necessary flexibility and alternates to our problems and I should like to associate with this proposal, and I am sure that my entire organization will endorse it.

Yesterday we heard much discussion in this room on the subject of prior use. Now, should not the principle of prior use not also apply to the Grand Canyon? Build dams in the Grand Canyon and you will be taking it away from us who now use the Grand Canyon quite extensively.

You might as well take away a part of California's 4.4 or drain the Northwest to slake the Southwest.

Finally, Mr. Chairman, in my closing remarks, and without expanding on this, I would like to quote from "Alternatives in Water Management" which is a report of the Committee on Water, Division of Earth Sciences, National Academy of Sciences, National Research Council.

On page 18 of this report, just one sentence:

With planning oriented towards the project rather than the purpose, planners tend to concern themselves more with benefits that will justify the project than with alternatives that will solve the problem.

Today there are many more economical means of generating power than hydrodams.

We Arizonans for Water Without Waste ask you to please not saddle us now or in the future with what has already become obsolete engineering. To roughly quote my statement, Arizonans do not want to see their tax dollars evaporate with the water in unnecessary lakes behind unnecessary dams that deface their most precious possession, the Grand Canyon.

I thank you.

Mr. JOHNSON. The gentleman from Colorado.

Mr. ASPINALL. How many people do you represent, Mr. Rodack?

Mr. RODACK. I do not have a formal membership. We do not—there are no dues or anything else.

Mr. ASPINALL. I did not ask you that. I asked you how many people you represent? You said, "We, the people of Arizona, want this." How many of them do you represent?

Mr. RODACK. I have no means of really knowing, sir.

Mr. ASPINALL. Do you believe in the representative form of government?

Mr. RODACK. Yes, sir.

Mr. ASPINALL. In other words, what you have to say about the government of Arizona—the Governor and Senators and Congressmen—is in accordance with your idea of government, is that right?

Mr. RODACK. Yes, sir.

Mr. ASPINALL. That is all.

Mr. RODACK. Congressman Aspinall, may I expand on that?

Mr. ASPINALL. If you think you have to, to make your position known. I just wanted to get it in the record. That is all I was after. I am not arguing with you. I would like to meet you and talk with you some time.

Mr. RODACK. I would like to do that, sir.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. It was nice of you to come so far to express your views and I appreciate your doing so.

When was this organization formed?

Mr. RODACK. This is a new organization and my statement stated that it was formed last August. It was a natural outgrowth of the hearings on H.R. 4671.

Mr. BURTON of Utah. One of the things that you said that perked up my ears was there were many forms of generating power that are more economical than hydro. It is not steam. It is not atomic energy. Can you tell me one or two ways? I am not the world's greatest power expert, but it seems to me hydro has always been the one that was most economical and as a matter of fact in August of 1965 the Commissioner of Reclamation said, "Studies by utilities show that hydro-electric sources generally are more economical."

Mr. RODACK. Congressman, I am not always in total agreement with the Commissioner of Reclamation. I am merely an informed layman. I do not pretend to be an expert, but I have read and I have listened to the experts, and I am informed that steam, that thermal plants in many instances, both fossil fuel and nuclear power, will be, by the time these dams will be built, particularly, far more economical to build and operate than hydro plants.

Mr. BURTON of Utah. That is one of the tales that is circulated all the time but nobody has even been able to prove it. And in the last 2 or 3 years we have had the world's greatest power experts up here, but I cannot get any solid proof that you are going to have atomic energy power in the immediate future that will be cheaper. All the utility companies seem to think that hydropower is still the cheapest form. The Commissioner of Reclamation admitted that to me this afternoon. I am not trying to shoot you down, but I think it is important that you folks should know that the best experts from in and out of the Government have said the same thing.

Mr. RODACK. Congressman, I believe I have a clipping with me, if I could find it, that I would be happy to insert in the record from the Wall Street Journal. I hope it is in here. This is taken from the Wall Street Journal of Thursday, September 1, 1966, and the headline reads "Ontario Hydroelectric Commission Plans \$200 Million Coal-Fired Plant on Lake Erie." Down in the middle of the report there is a statement here from the Ontario Hydroelectric Commission stating:

Our decision to proceed with an additional fossil fuel station was made in the light of this large planned nuclear program. Such plants enable us (the Ontario Hydroelectric Commission) to achieve the maximum of nuclear base load and coal-fired peaking that is most economical for our system.

I would be happy if you wish to have this.

Mr. BURTON of Utah. I know there are some private companies and agencies that are building reactors for the purpose of generating power. But this is merely a long-range effort to make this power available, as it will be someday.

Now, we have had people from California power companies come and testify in the saline water hearings that they have actually retired coal-fired plants but never retired a hydroplant. These are people who are actually in the business of making power. It seems to me that the overwhelming preponderance of evidence is that hydropower is probably the cheapest source we can get.

Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Arizona.

Mr. UDALL. I appreciate you sincerely for coming in and I am grateful about your kind words about your Congressman. I regret that we have a disagreement on this particular issue, this very important issue.

You told Chairman Aspinall that you are not a corporation and you do not have dues and so forth. This is an informal organization of people who barely are intellectual people concerned with the university and others who have made some studies.

Mr. RODACK. That's correct.

Mr. UDALL. You do not have any office?

Mr. RODACK. That's right.

Mr. UDALL. Do you have a mailing list so we would know approximately how many people you get mail from?

Mr. RODACK. Our present mailing list—a few of these pieces—I don't know exactly how many go outside of Arizona. But our total mailing list is in the area at the moment of about 800, and I believe by the time I get back it is going to be in the neighborhood of 1,000.

Mr. UDALL. Does your organization ever hold meetings? Do you have a board of directors?

Mr. RODACK. We have appointed three officers: myself, Dr. Roy Emmerich is vice chairman, and Dr. Bob Rawson is treasurer. We have been bouncing the job of secretary among anybody who wants to take it.

Mr. UDALL. Did you have election and ballots and nominating committee and all that sort of thing?

Mr. RODACK. No; we had—this was done—to clarify this we just discussed whether this was worthy of organization. We had two meetings before we did appoint the so-called officers and this was done in order to get the thing rolling, and it was done by general consent. Somebody said, "Well, Juel, you ought to do this," and I said, "I am only going to do it if I get a satisfactory vice chairman," and we saddled this on Dr. Emmerich and Bob Rawson and we said, "Who is going to handle the money?" and Bob volunteered.

Mr. UDALL. I am not going to try to criticize this or run the organization down. I have been in a couple of organizations like that myself. What is the largest number of people you have ever had at any one meeting, at any one time of your group?

Mr. RODACK. We have had a public meeting, you know. You are talking about that type of thing as well?

Mr. UDALL. I assume that your organization has called meetings and people come. Some of you showed up at the meeting I called.

Mr. RODACK. Yes. I would say that the largest number of people at any given meeting was close to 30. It was over 20 and probably—I think it was 27, if I remember the figure correctly. These are meetings to discuss the business of the organization.

Mr. UDALL. I am afraid I must quarrel on one joint which touches a point close to my legislative function. You said the "informed people" were against CAP with dams. Was this based on a Gallup or Harris poll or something else?

Mr. RODACK. Not only are we an informal organization, we have an informal treasury. It consists of something like \$80 at the moment.

Mr. UDALL. I congratulate you. You are solvent.

Mr. RODACK. We have spent considerable amounts of money, but we do not have the means to run a high scientific poll. However, we have taken the trouble to try to determine certain things and if you care at any time, I think it would take a little too long here to describe it.

Mr. UDALL. I do not want to take too much time. Your statement is in the record as though it were read in full. You did not pay for an official scientific poll. You talked to a number of people and concluded that informed people as distinguished from people who are not informed are against these.

Mr. RODACK. May I express how we determined informed against uninformed? We asked the question, "Do you know anything about the CAP?" If they said, "What is CAP?" which many people did, surprisingly enough, in our own State, this was uninformed.

The second question that we asked was, "Where will the water for CAP come from?" If they were unable to say Havasu, they were uninformed. This was the basis. You will be surprised that more than 50 percent of the people that we spoke to thought that the water for CAP was to come out of one of these two Grand Canyon Dams and

possibly from both and this was the basis of an uninformed and informed statement.

Mr. UDALL. How many responses altogether went into this poll, 10, 1,000?

Mr. RODACK. Several hundreds, and it is a continuing process.

Mr. UDALL. For the record, I want to say that last year I sent a questionnaire to every mailbox in the Second Congressional District asking them to respond to certain questions and one of those questions was: "Certain conservation groups oppose central Arizona project because its financing is based upon the construction of two dams on the Colorado River, one 80 miles downstream, the other 13 miles upstream of Grand Canyon National Park. Do you favor the CAP with the dams?" We got responses of over 22,000 people, which is unusually high for questionnaires. Eighty-two percent, yes; 18 percent, no. I was told that the dam opponents made a special effort to return the questionnaires, and I honestly believe the 18 percent greatly exaggerates the opposition.

I do not want to quarrel with you about my sampling or my poll techniques, but, since you had put it in the record, I will put in the record my poll.

I believe that is about all I have.

Mr. JOHNSON. The gentleman from Arizona?

Mr. STEIGER. I also would like to congratulate you on being interested enough to go to the effort of coming here and testifying and wish more of our citizens would be that concerned. I think you are aware that our views are quite different and I respect yours.

I note on page 2 of your report that you submitted for the record, you discussed the 92 million that was allocated in H.R. 4671 of last year and then you referred to the \$842,000 that was referred over a 9-year period in the State park board and used that as a comparison.

Like my colleagues and your Congressman, Mr. Udall, I would like for the purpose of the record to advise you that in this same period, 1956 to 1967 the State of Arizona budgeted for their fish and wildlife operation some \$19,499,010. Again, I do that in the same spirit that Congressman Udall did in that record, our recreation effort in Arizona is not limited to the State parks board and I think it is an unfair analogy to compare it.

Mr. RODACK. I appreciate, Congressman, this was not left out intentionally.

Mr. STEIGER. I am certain of that.

The other point that was mentioned and is mentioned in your statement is that 70 percent of the informed segment of our population and so on—is this result based on the poll as you described it?

Mr. RODACK. Yes, sir?

Mr. STEIGER. You recognize the conflict coming from Congressman Udall's point?

Mr. RODACK. Yes, sir.

Mr. UDALL. Will the gentleman yield?

Mr. STEIGER. Yes.

Mr. UDALL. I just wanted to tell the chairman of the subcommittee that Drs. Martin and Young, professors at the University of Arizona, whose work is referred to in the statement now in the record here, who

suggest that the central Arizona project is uneconomic and should not be built and so forth, that I am advised that both of them received a portion of their education in California and that using this method of analysis used on CAP we would have to conclude that and the California State water plan is also unfeasible.

Mr. STEIGER. I have one more question, Mr. Chairman.

Are you a member of the Sierra Club?

Mr. RODACK. No, sir.

Mr. BURTON of Utah. You gave us your criteria for determining "informed and uninformed" opinion. Would you say it is really "informed" opinion when there are some extremists who go around and represent this project as being something that is going to destroy the Grand Canyon? Or would you say that the inferences that have appeared saying we are going to fill the Grand Canyon with water is informed opinion in your judgment?

Mr. RODACK. I personally have never seen anything that I have inferred to mean that the Grand Canyon would be filled from rim to rim.

Mr. STEIGER. Would the gentleman yield at this point?

For your information, Mr. Rodack, there is a dramatic advertisement sponsored by the Sierra Club in which they have a very graphic drawing of the Sistine Chapel being filled in order that the tourists may better observe the ceiling. I think this particular graphic demonstration complies with what my colleague from Utah is referring to.

Mr. BURTON of Utah. If you are going to be around later this week you will hear some of that.

Mr. RODACK. I'm afraid that I am unable to stay and will be leaving this evening to go back to my job.

Mr. JOHNSON. Any further questions?

Mr. Rodack, we thank you for coming here and giving us your testimony.

Mr. RODACK. Thank you.

Mr. JOHNSON. The chairman will ask for unanimous consent to place in the record a statement by Congressman Lloyd, of Utah. Is there objection? Hearing none, it is so ordered.

(The statement of Congressman Lloyd follows:)

STATEMENT OF HON. SHERMAN P. LLOYD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF UTAH

Mr. Chairman and distinguished committee members, I wish to place into the record current supporting testimony relating to certain water projects in Utah affected by the Lower Colorado River Basin legislation now being considered by this subcommittee.

I am keenly aware and sincerely concerned with the growing thirst of our neighbor states in the Basin, but feel that any legislation pertaining to the use of the water should contain certain safeguards to protect our own established entitlement to the River's resources.

It is my understanding that details of Utah's position on this matter will be spelled out by other spokesmen in later testimony. For the record, however, I would like to give a brief review of what safeguards I feel must be included in this legislation for the best interests of the citizens of Utah, including judgments of Utah authority.

It is essential that ways be explored to meet the inevitable water deficiencies of the Colorado River, including authorization of studies to augment the supply by importing water from outside sources.

It seems logical to request that a feasibility study be authorized for the import of water from other areas with provision for designated uses enroute and additional water allocated to satisfaction of the Mexican Treaty obligation and water losses in the lower Colorado River Basin.

A source of revenue must be provided to pay for the importation of this water. The revenue derived from sale of power produced by hydro-electric dams would appear to be a necessity.

Personally, I feel that any departure from this basic practice at this time would be a serious blow to the efforts and good faith of states in the Colorado River Basin.

Therefore, construction of the Hualapai Dam is essential to provide a source of revenue for a lower Colorado River Basin Development Fund, which would assist in financing an augmenting of the water supply of the river and assist smaller, but vitally needed reclamation projects which are justified and essential in the large public interest.

It is also essential that the legislation include equitable criteria for coordinated long-range operation of storage reservoirs along the Colorado River. It is important that in this legislation recognition be given to the provisions of the Colorado River Compact and the Colorado River Storage Project Pact.

It is important that the Ute Indian Unit of the ultimate phase of the Central Utah Project be given a priority in planning. The planning report on this unit must be completed prior to 1972 in order for the state of Utah and the Secretary of the Interior to fulfill commitments established by agreement with the Ute Indian Tribe of the Uinta and Ouray Indian Reservations.

The Upper Colorado River Basin Fund should be reimbursed for all expenditures made to meet generation deficiencies at Hoover Dam during the filling period of Glen Canyon Reservoir.

May I make special reference in support of the Dixie Project which is authorized in some bills before this subcommittee. To preserve the Dixie Project which was previously authorized by the 88th Congress, Lower Colorado River Basin Development is vital. A definite plan report on the Dixie Project will be forthcoming from the Bureau of Reclamation before the end of the current fiscal year.

I will not go into full detail of the Dixie Project because the record is on file. However, I would like to review some of its aims and legislative history for the benefit of some of the new Members of this Committee.

We in Utah, and particularly the citizens of Washington County, which lies in my Congressional District, have spent many years in untiring effort in an attempt to secure authorization of the Dixie Project.

Although comparatively small as far as reclamation projects go, the capacity of the Virgin River Reservoir being 246,000 acre feet under the 1963 legislation, it is nonetheless vital to the agricultural and economic growth of a great area of Southern Utah.

The Dixie Project area is located in the Virgin River Basin in Washington County, southwestern Utah. The Virgin River originates in Utah and joins the Colorado River at Lake Mead, and the Virgin River Basin is a part of the Lower Colorado River Basin as defined by the Colorado River Compact.

The Dixie Project receives its name from the Washington County area which is known as the "Dixie of Utah" because of its mild semi-tropical climate and because cotton was grown there when it was first settled by Mormon pioneers who were sent from Salt Lake City to the area by Brigham Young.

Agriculture is the basic industry in the valley, but the climate is arid with rainfall averaging only about 8.42 inches a year. The available water supply is inadequate and undependable, and vast amounts are wasted in spring floods. The plan for the project was a culmination of over 60 years of local, state and federal investigations. Area residents have assessed themselves 5 mills on property tax and have agreed to purchase water for agricultural and culinary use at higher than normal rates.

The Dixie Project was finally authorized by the 88th Congress, thanks in large part to the efforts of my colleague, Rep. Laurence J. Burton of Utah, who sits as a Member of this Committee and who represented the area before Utah's Congressional Districts were re-districted in 1965. Members of this subcommittee during the 88th Congress made on-the-spot investigation and conducted a hearing in St. George, Utah.

Following passage of the Dixie Authorization, the Bureau of Reclamation found that the proposed site of the Virgin City Dam was impractical due to a geological formation which would have effected the water-tightness of the reservoir. Because of ensuing problems, the entire project was declared economically infeasible, and the Bureau of Reclamation had to take the entire package back to the drawing board.

The Bureau has since found an alternative site for the reservoir, once again giving the project engineering feasibility. A definite plan report on the revised project is due from the Bureau of Reclamation before the end of the present fiscal year.

What is of pressing concern to Utah today, however, is the fact that financing the project has been made largely impossible without a lower basin fund because of the elimination of power stations as a source of revenue. However, that fact does not make the need of the project any less vital.

The lands to which the project will bring water are fertile. Up to 11,000 acres of arable lands may be made available for development, plus more than 9,000 acres which would receive supplemental water. These new and developed lands in a semi-tropical climate will help feed the exploding populations of Nevada and Southern California to which this area is very near. And very significant to me, we will be creating new and permanent wealth . . . new and permanent jobs, basic to a truly health economy and certainly preferable to artificial make-work and temporary employment which government hand-out represents in so many other areas of Federal expenditure. This all hinges on having a predictable and regulated water supply.

Aside from the irrigation benefits, the project would provide :

(1) Adequate drainage on land with too high a water table and with an excessive collection of surface water, thus saving valuable water that is now being wasted ;

(2) Control floods and give protection against drought ;

(3) Provide a substantial increase in fisheries benefits and some increase in wildlife benefits, together with an unlimited potential in the field of recreation.

The taxpayers of southern Utah have demonstrated they are willing to accept heavy responsibility in contributing maximum, and indeed, above maximum local effort in assuming extra property tax levies up to five mills, and paying higher than normal rates for water in their effort to justify construction of the Dixie Project economically. We therefore feel that recreation and fish and wildlife benefits which all of American's Southwest, and actually all of America, will enjoy should be non-reimbursable.

The public benefits and desirability of the Dixie Project have already passed the careful scrutiny of this Committee and the Legislative safeguards of both Houses of Congress. Some of you even made on-the-spot investigation when the subcommittee held its hearings in St. George in 1963. The need for the Dixie Project was realized then, and that need is no less today. Therefore, I urge that this important project be included in new legislation, and that it be given pay-back assistance through the Lower Colorado River Basin Development Fund. *Let me emphasize to you who represent the water starved states of California and Arizona that the Dixie Project will take from the Colorado River less than one-tenth of one percent of the water supply of Lake Mead.*

I am pleased to note that many of the bills before this body, including H.R. 3300, already contain most of the basic safeguards which I have outlined here.

Mr. JOHNSON. The committee stands adjourned.

(Whereupon, at 5:30 p.m., the subcommittee recessed, to reconvene tomorrow, Thursday, March 16, 1967, at 9:45 a.m.)

H.R. 3300 AND SIMILAR BILLS TO AUTHORIZE THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE COLORADO RIVER BASIN PROJECT, AND FOR OTHER PURPOSES

S. 20 AND SIMILAR BILLS TO PROVIDE FOR A COMPREHENSIVE REVIEW OF NATIONAL WATER RESOURCE PROBLEMS AND PROGRAMS, AND FOR OTHER PURPOSES

THURSDAY, MARCH 16, 1967

**HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
*Washington, D.C.***

The subcommittee met, pursuant to recess, at 9:47 a.m., in room 1324, Longworth House Office Building, the Honorable Harold T. Johnson (chairman of the subcommittee) presiding.

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation will come to order and continue its hearings on the Colorado River bills and the National Water Commission bills.

At this time I would like to ask unanimous consent that the statements from the gentlemen from the Pacific Northwest be included in the record at this point. Director H. Maurice Ahlquist, Washington State Department of Conservation; Mr. LaSelle E. Coles, chairman, Oregon State Water Resources Board.

(The statements referred to follows:)

STATEMENT BY H. MAURICE AHLQUIST, DIRECTOR OF CONSERVATION FROM THE STATE OF WASHINGTON

My name is H. Maurice Ahlquist of Olympia, Washington. It is my pleasure to appear before you and to present testimony on behalf of the Honorable Daniel J. Evans, Governor of the State of Washington and for the Department of Conservation, of which I am the Director.

The prosperity of this nation and of each of its citizens is intimately associated with the development of the water resources of the country for greatest economic and social benefits to regional and interregional areas.

Careful planning and proper management of this resource are essential for unhindered economic growth of the nation, and the enhancement of our environment and the full enjoyment of water related activities by the citizens of our nation.

To assure adequate long range planning and effective management of this resource we must identify all the problems and problem areas on a nation wide basis, both qualitatively and quantitatively.

It is the position of the State of Washington that the provisions of Section 3 of the National Water Commission legislation provide the means toward this objective. Carried further, the mandate of this section will supply the answers to many questions, and give much needed direction and impetus to solve those problems that remain.

The Pacific Northwest River Basin Commission was officially established by presidential proclamation on Wednesday, March 8, under the provisions of public law 89-80, the Water Resources Planning Act. This River Basin Commission should be given the opportunity and time, as provided in Section 204(3), to analyze the water resources in its area and to formulate river basin plans for submission to the Council and to the National Water Commission for inclusion in the National Water Resources Program. With this cooperation the National Water Commission then can offer policies, criteria and programs properly evaluated as to regional and national benefits.

The economic and social consequences of water augmentation between major river basins will be studied by the National Water Commission. Only if the commission is formed as a separate entity and not related to any specific project that has been or is being formulated can it accomplish the results Congress intends.

The State of Washington assisted by the efforts of the Washington State Research Center is making an analysis of the water resources and needs of the State of Washington projected through the year 2020 and beyond.

In addition, we are cooperating with the Columbia Basin Interagency Committee making a Type II study of the Puget Sound Basin, and a Type I study of the Columbia North Pacific Region. On these studies a considerable amount of time and money is being expended to obtain background information which will be available to the National Water Commission for its analysis.

In reviewing plans for all major river basins, the National Water Commission may discover alternatives which would provide benefits of greater scope on an interregional or national scale than the original basin plan by itself would derive.

The independent judgment of the members of the Commission, chosen with diverse backgrounds and with a broad range of professional experience, is essential to an unbiased evaluation of the nation's water problems and policies.

We recommend for your consideration that the legislation before you to establish a National Water Commission be passed as a separate and individual Act of Congress.

On behalf of the Governor and the people of our state, I wish to thank you for your consideration of this testimony having to do with our greatest natural asset . . . water.

STATEMENT BY LaSELLE E. COLES, CHAIRMAN, STATE WATER RESOURCES BOARD,
STATE OF OREGON

Mr. Chairman and Members of the Committee: My name is LaSelle E. Coles of Prineville, Oregon. I am Chairman of the State Water Resources Board of Oregon and appear before you on behalf of the Honorable Tom McCall, Governor of Oregon, and that Board.

The State of Oregon has supported the concept of a National Water Commission since it was proposed by the Bureau of the Budget in May of 1965. We support S. 20. We believe such a commission should be authorized as a separate entity and not an appendage to a project authorization bill. The type of study to be undertaken by the National Water Commission is long overdue.

The proposal before you is a recognition of the change of thinking that has developed over the years with respect to water resource problems. The initial approach was directed toward the project concept wherein determinations were made for the purpose of developing the project that would meet the need that was evident at that time. More recently the concept of comprehensive river basin planning and development has replaced the individual project phase. We are now aware that many of our water resource problems are national in scope and the solution to these problems must be developed with a great deal of objectivity from the national standpoint. A significant contribution to development of national policies could be made by such a commission.

Before decisions are made to authorize either reconnaissance or feasibility studies of projects involving transmission of major quantities of water from one region to another, thorough exploration of alternatives must be undertaken. We are aware of the technological advances that have been made in

recent years, particularly in the field of desalting and waste water reclamation, that result in substantial cost reductions. The feasibility of utilizing the latest technological knowledge should be thoroughly explored before decisions are made to resolve problems through conventional methods.

We question whether the current concepts of the economic feasibility of projects are applicable when you consider the magnitude, the complexity and far-reaching consequences of interregional and international development proposals now being discussed. The requirement in S. 20 that the commission shall consider the economic and social consequences of water development is a highly significant item that should be thoroughly studied before the nation is committed to decisions based upon current procedures of project economics.

We believe that timing of activities is important in seeking resolution to national water problems. For this reason we request that authorization of studies directed towards importation of water into the Colorado River system be deferred until the National Water Commission has had an opportunity to render its report concerning alternate methods of meeting water requirements and developing means and methods of evaluating the economic and social consequences of water resource development.

While the commission is undertaking its assignment, we believe there is a concurrent responsibility on the part of the states and the Federal Government to complete, at the earliest opportunity, studies directed towards determining long-range future water requirements. The State of Oregon is doing its part in carrying out responsibilities relating to regional, interregional and national water requirements. As reported to you at the hearings last year, the 1965 Oregon Legislature appropriated \$330,000 to initiate studies to determine the state's long-term water requirements for all purposes including domestic, municipal, irrigation, industrial, power, mining, recreation, fish, wildlife, water quality, and navigation. The 1967 session of our Legislature now has before it a budget proposal in the amount of \$506,000 to complete these studies directed toward identifying the state's future water requirements. The appropriation bill containing these funds has unanimously passed the House of Representatives and is now before the State Senate for consideration. These funds will enable the state to complete its projections of future water requirements and issue its report in June of 1969. It is our understanding that similar studies are underway in other Pacific Northwest states.

We strongly urge the deferral of any reconnaissance or feasibility studies directed towards diversion of waters from the Pacific Northwest to areas outside the Pacific Northwest until these state studies have been completed and knowledge is available as to how much, if any, water is surplus to the needs of the Pacific Northwest.

The President on March 7, 1967 announced the formation of the Pacific Northwest River Basins Commission authorized by the Water Resources Planning Act of 1965. This commission, among other duties, will have the responsibility of coordinating and completing the Type I reconnaissance studies currently underway in the Pacific Northwest at an estimated Federal expenditure of five million dollars. This framework study is to identify water resource needs to the year 2020 and recommend methods of meeting these needs. The report containing the results of this study is scheduled for publication in 1970. It is our understanding that similar studies are being initiated in the Pacific Southwest at an estimated Federal cost exceeding 12 million dollars.

We believe the information from both the state and federal studies should be made available before any engineering investigations to determine feasibility of major interregional movements of water are authorized.

Mr. JOHNSON. There will be a place reserved for the representative of the State of Idaho and a place reserved for the representative of the State of Montana.

(The statements referred to follow:)

STATEMENT OF WILLIAM S. HOLDEN, CONSULTANT TO THE HONORABLE
DON SAMUELSON, GOVERNOR OF THE STATE OF IDAHO

In compliance with the Chairman's announcement that the Committee will hear only new matter on the bills under consideration, this statement will be brief and not restate the position taken in behalf of the State of Idaho at hearings before the Committee last year.

S. 20, which has passed the Senate and is now being considered by the House Committee, provides for the creation of a National Water Commission and this, it seems, is the principal new element being considered by the Committee at this hearing.

Idaho is moving forward with an energetic water study and development program. She is working in cooperation with her neighboring states and with agencies of the Federal Government. Idaho is in the water business in dead earnest and has budgeted the money required to get her water planning and development program into high gear. Preliminary studies indicate that the irrigated acreage of the Snake River Plain in Idaho can be increased from its present three million acres to a total of nine and one-half million acres. Water required for this additional six and one-half million acres of land will exceed the average annual flow of the Snake River.

Idaho has availed herself of the opportunities provided under the Water Resources Planning Act of 1965 (P.L. 89-80) in joining with the states of Oregon, Washington, Montana, and Wyoming requesting the creation of a Pacific Northwest River Basin Commission. On March 8, the President signed the order creating the Commission, and it has the distinction of being the first such organization created under the Water Resources Planning Act. We suggest that other areas avail themselves of the opportunity of forming a river basin commission to carry on similar studies.

The hearing seems replete with expert testimony that there is no critical water shortage in the Southwest that must be remedied overnight, and we suggest that the National Water Commission that would be created by the enactment of S. 20 or similar broad-study legislation is the proper agency to study that and other critical overall water problems. In the meantime, Idaho and the Pacific Northwest will have an opportunity to complete, in an orderly manner, their own planning of current and future water needs.

Currently, we are in the process of evaluating our own water resources and needs—both within the State of Idaho and within the Pacific Northwest. If, however, it is thought that the national interest requires that a nationwide review be undertaken to provide planning in areas where no planning has been undertaken and to coordinate state and regional planning, then we believe the National Water Commission is the better approach.

The studies contemplated in the bills being considered by the Committee that would authorize the Central Arizona Project would be made by existing government agencies whose functions also include building projects. It is Idaho's position that any studies looking to sources of water that could be used for importation into the Colorado River System should be made by a completely impartial agency whose functions do not include the building of projects.

The proposed National Water Commission would be an entirely new agency composed of knowledgeable water experts whose primary responsibility would be to study, evaluate, and review the water problems of the entire Nation from a completely impartial point of view. A study by such a Commission should be free from any unconsciously pre-conceived idea or notion that one area has water to spare and that another area has a natural entitlement to some of that water for any type of use because its supply seems to be less plentiful.

STATEMENT OF ALEX D. McDERMOTT, DIRECTOR, MONTANA WATER CONSERVATION BOARD

My name is Alex D. McDermott. I am the Director of the Montana Water Conservation Board, residing in Helena, Montana.

The State of Montana, by legislative enactment in 1934, created the State Water Conservation Board and empowered the Board to issue revenue bonds and build water conservation projects in the State of Montana. The Montana legislation creating this Board has been a model used in several states.

The Montana Water Conservation Board has constructed 181 projects since it was founded. Of these, 141 were dams and reservoirs built to store 438,000 acre-feet of water. Some of these storage projects also have diversion structures and canals. Including these, 45 projects with 815 miles of canals have been built permitting the use of 260,000 acre-feet of water diverted directly from streams. The Board projects have furnished water supplies for 405,000 acres of land in Montana.

Montana is the state of origin of two of our great United States river systems, the Columbia and the Missouri. We also are the state of origin for the Belly and St. Mary Rivers which flow north into the Saskatchewan River and ultimately into Hudson Bay. I believe we are the only state in the United States which has its water flowing in three directions.

Montana depends very heavily on its water resources. It is a state with an average annual precipitation of from 10 to 18 in. Montana is also primarily an agriculture state, depending upon livestock and crops for a substantial share of its economy.

Because of this, we in Montana are extremely jealous of our waters and likewise conscious of our water needs. Without sufficient waters to irrigate our farm and ranch lands, it would be a serious economic blow to our State and its economy. The continuous and orderly development of our waters for irrigation and other purposes in the future is a most important and essential factor in our economic development.

It is understandable, therefore, why we in the State of Montana are most interested in preserving for our future use the waters which arise and flow within our borders. We are a state which has considerable future development in the irrigation and water-use field. We are presently irrigating 2,440,000 acres of land. Due to the fact that we have been in the irrigation development business for over 30 years we have made some very detailed studies of certain areas. In some drainages the information is not so complete.

As an example in 1962, the Water Board made preliminary examination of 98 irrigation projects in Montana providing a full water supply for some 537,000 acres of land and supplemental water for 195,000 acres of land. Plans are now under way to update and review this report, as well as Montana's total future water needs. This will be in the form of an ultimate-needs study to include 50-year projections and which we hope to complete by 1971. There is no doubt that there will be great expansion of irrigation in Montana. We feel from present information that our studies, which incidentally do not cover the entire state, show a potential of approximately 3,750,000 additional acres that could be brought under irrigation. These lands would require a diversion of 11,250,000 acre-feet of water for irrigation alone.

It is for these reasons that the Water Conservation Board of the State of Montana must protest any diversions of water out of the Columbia River Basin or the Missouri River Basin which would in any way jeopardize the future use and needs of the State of Montana for the waters arising therein from either of these two great water networks.

We in Montana know that we are on the threshold of great future economic development. Water will play a most important part in that development, and if it is not available, we stand to be left as a hinterland, supplying our water to other areas.

We have particular objection to those portions of the various bills submitted on development of the Colorado River system which authorize the Secretary of Interior to study the transfer of water into the Colorado River basin from the outside and to leaving with the Secretary of Interior the determination of what the ultimate requirements of our water within the State of Montana may be.

Most states surrounding us are further ahead in their economic development and, as such, are ahead of us in the use of their waters. This does not mean to say that we will not develop our waters as we expand economically. We are, as I have indicated, making a complete review of our needs, and it is our opinion that Montana needs should be established by Montana and not by the Secretary of Interior.

Further, the provision declaring the requirements of the Mexican Water Treaty to be a national obligation would seem to us to require the Federal Government to bring water into the Colorado River Basin from outside the Basin to fulfill that obligation if it is not fulfilled in accordance with the Colorado River Compact.

The United States has many international agreements with respect to the division of international waters. One of such treaties is the Waterways Treaty of the St. Mary and Milk Rivers in northern Montana and southern Canada, signed in 1900, whereby the waters of the St. Mary and Milk Rivers and the international tributaries of the Milk River are divided equally between the United States and Canada. If the philosophy embodied in this bill with respect to the Colorado River commitment under the Mexican Water Treaty were ap-

plied to the Waterway Treaty above described, the Federal Government would have the obligation to furnish the State of Montana the water commitments made to Canada under this treaty from sources outside of the State of Montana if Montana should use sufficient water to deplete the share due Canada. I am sure there are many other similar situations which show the unsoundness of such a proposal.

I wish to commend Chairman Aspinall for some of the provisions in H.R. 3300 which attempt to provide some security to states of origin in his Section 207(a) and (b). These sections require the Secretary of Interior to make adequate and equitable protection of the interests of the states and areas of origin and to declare that all requirements, present or future, for water within any state from which water is exported shall have a priority of right in perpetuity to the use of the waters of that river basin as against uses of the water delivered by exportation unless otherwise provided by interstate agreement.

It has been our experience that water when once committed to an economic use is, in fact, committed pretty much in perpetuity to that use. Certainly, that is the history of the water uses in Montana under our appropriation system of water law. Such being the case, the economic pressures to keep water flowing, once the same is diverted, from a river basin into the Colorado River will be such that the provision of Section 207(b) will have, in my judgment, little meaning or give any comfort to the exporting state or basin.

I suggest that if a water transfer from one basin to another is to be effected, it should be done by interstate compact in which the rights of the exporting states are spelled out and the conditions for reclaiming the exported water are clearly defined. In my judgment, that is the only way the priority of use by the states of origin can effectively be protected.

I suggest that before any of these bills be enacted that we proceed with Senate Bill 20, creating a National Water Commission to review U.S. water resources programs as a whole and to suggest solutions to our water management problems. Technology is moving rapidly enough these days in such matters as desalination, weather modification, etc., that this study may show us ways to conserve and use our great water resources without conflict arising between our various river basins. Certainly until we have such a study and recommendations on an over-all national policy, it is premature to be study diversions from the Northwest into the Colorado River.

I thank you for your indulgence in allowing me to present this statement for the record.

Mr. JOHNSON. This morning our first witness will be introduced by our former colleague on this committee, representing the State of Wyoming, Congressman Harrison.

Mr. HARRISON. Thank you, Mr. Chairman.

I appreciate very much the opportunity of being here and your courtesy in allowing me to introduce to you and to this committee, where I served for so many years, two distinguished Wyoming citizens.

We have here this morning Wyoming's Governor, the Honorable Stanley Hathaway, and we also have our U.S. Senator, the Honorable Clifford Hansen, a former Governor of the State of Wyoming, who will testify on Wyoming's position in the legislation before this committee.

I am particularly proud to introduce these gentlemen, who both have made an outstanding record in public service and I am sure that they will adequately represent my State with their statements before this committee this morning.

I appreciate very much this opportunity of introducing our Governor, Stanley Hathaway, and our Senator, the Honorable Clifford Hansen.

Mr. HALEY. Mr. Chairman.

Mr. JOHNSON. The gentleman from Florida, Mr. Haley.

Mr. HALEY. May I say that I am glad to see our former member of this committee back with us again. He was a very able and outstanding member, not only of the Congress but of the committees on which he served.

Mr. JOHNSON. Governor Hathaway and Senator Hansen, come right up to the witness table and we will be glad to have you give us the benefit of your statement here. Your statements can be printed in the record and then you can summarize them as you see fit. Go right ahead.

Governor HATHAWAY. Senator Hansen will give the first statement, I believe.

Mr. JOHNSON. All right.

**STATEMENT OF HON. CLIFFORD P. HANSEN, A U.S. SENATOR FROM
THE STATE OF WYOMING**

Senator HANSEN. Mr. Chairman and members of the committee, thank you for this opportunity to present testimony with respect to the proposed authorization of a Colorado River Basin project. We are fortunate to have Wyoming's Governor, Stanley K. Hathaway, here in Washington today to testify before the House Interior Committee, Mr. Chairman. Governor Hathaway will be accompanied by Wyoming's State water engineer, Floyd Bishop, and his staff. I believe that Governor Hathaway intends to discuss Wyoming's position concerning this proposed legislation in some detail.

Wyoming's position concerning this legislation remains essentially unchanged from that which was set forth by me before this committee on August 26, 1965, while I was Governor of Wyoming. At that time, I set forth five principles which Wyoming felt should be incorporated in the proposed legislation. These principles are a matter of record with the committee and, following the instructions of this committee's chairman, I will not repeat them here. The ensuing negotiations between the seven States of the Colorado River Basin modified and eroded these principles to the point that I was eventually compelled to withdraw Wyoming's support from the revised version of the legislation which resulted from these negotiations.

While some of the other principles which were basic to Wyoming were incorporated into subsequent legislation in varying degrees, many of the most important requirements completely disappeared in the negotiating processes. The primary source of my concern last year over the course of events on H.R. 4671 was this process of slow erosion of the fundamental principles which we have felt to be important from Wyoming's viewpoint. Consequently, on August 2, 1966, I wrote to President Johnson and officially withdrew Wyoming's support from this legislation. Copies of my letter were sent to the Governors of each of the States of the Colorado River Basin.

Mr. Chairman, there are certain typographical changes from my prepared statement as originally submitted to the committee in the paragraph I will read next and the record should reflect these changes.

I am vitally concerned that passage of this bill should not interfere with Wyoming's right to the use of water allocated to her under the

terms of the Colorado River compacts. The legislative record should make absolutely clear the fact that nothing in the proposed legislation being considered by this committee will be permitted to do violence to either of the Colorado River compacts. The integrity of these compacts as they apply to the allocation of water between basins and among the upper basin States must not be abridged or abrogated in any way.

Water supply studies on the Colorado River indicate that there will not be sufficient water in the natural drainage area of the Colorado River to permit fulfillment of all of the commitments under the various compacts now in effect. Consequently, it seems obvious that there must be an augmentation of the water supply of the Colorado River system if all States are to be permitted the use of waters to which they are rightfully entitled.

All of the assurances in the world concerning the validity of compact allocations to Wyoming will be rendered ineffective if there is not sufficient water to meet these commitments. The cornerstone of our original position was that concurrently with any congressional authorization of the Lower Colorado River Basin project, or any of its component parts, there also be authorized a project or projects to import water into the Colorado River Basin from sources outside the natural drainage area of the Colorado River system. This requirement, which was initially supported by all four of the upper basin States, has been eroded to the point where the several bills now before this committee would require only various types of studies of the importation question, and in some of the bills no mention whatsoever is made of the augmentation of the water supply of the Colorado River drainage. The supplementation of the water supply of the Colorado River is of such vital importance in this matter that no bill should be passed without adequate provision for a supplemental water supply.

The Nation must be made to see that the situation in the Colorado River Basin is unique. With the possible exception of areas of western Texas and Oklahoma, there is no other part of the Nation that so clearly faces an inadequate water supply, combined with an ever-expanding population. Traditionally, this Nation has solved its unique and staggering problems with bold endeavors, and not by exploiting the frailties of those States which are in a weaker position politically. We only ask that you face up to this challenge with perceptive, long-range thinking, and legislation that does not create new and perhaps greater problems than the ones it solves. And, in case anyone mistakenly thinks that Wyoming has not earned the right to this consideration from a national viewpoint, let me remind him that 52½ percent of all mineral revenues from Federal lands are placed in the Federal Reclamation Fund. Wyoming's Federal land revenues have provided approximately 40 percent of all such moneys going into the reclamation fund in the United States since the time these funds were allocated for that purpose.

In addition, as I have indicated in a speech on the Senate floor on February 2, 1967, and in remarks before the Senate Interior Committee on February 21, 1967, I believe that Wyoming, along with Colorado and Utah, now stands on the threshold of the development of a regional oil shale industry. That developing industry will be a

thirsty one. Secretary of the Interior Udall, in response to my direct questions on January 27, 1967, testified before the Senate Interior Committee on February 21 to the effect that it was estimated that "a 50,000-barrel-a-day shale operation would require 950 acre-feet of water per year for all industrial process through refining. At a million barrels a day, the annual water requirement rises to 20,000 acre-feet. Community requirements would be additional."

I respectfully suggest to you, Mr. Chairman, that the estimates provided by the Secretary of the Interior are dangerously below what the actual water requirements for a full-scale oil shale industry will prove to be. Mr. Russell Cameron of Cameron & Jones, consulting engineers, Denver, Colo., in his testimony before the Senate Interior Committee, estimated water needs at approximately 10 times the amount stated by Secretary Udall. It is obvious folly to estimate only industrial needs while failing to take into account concomitant municipal needs. A study of the "Regional Economic Impact of a United States Oil Shale Industry" conducted by J. J. Ryan and J. G. Wells of the Denver Research Institute estimates that municipal water needs alone would rise to approximately 39,000 acre-feet per year in the final stages of the industry's development. A further estimate prepared by Raymond D. Sloan and presented to the annual meeting of the Colorado River Water Users Association on December 2, 1965, indicates that a 2-million-barrel-a-day oil shale industry would require a net consumptive use of 112,000 to 200,000 acre-feet of water per year. This would be in addition to urban requirements.

I cite these figures, Mr. Chairman, to give some indication of the potential magnitude of our future water needs. Wyoming, of course, is dedicated to a maximum effort in the development of its oil shale and related mineral resources. We wish to make clear for the record our desire that there be an adequate water supply within our State for such future development.

For all these reasons, it is incumbent upon those of us here in Congress to see to it that Wyoming is not sold down the river.

Thank you.

Mr. JOHNSON. Thank you, Senator Hansen.

We will now hear from Governor Hathaway.

**STATEMENT OF HON. STANLEY K. HATHAWAY, GOVERNOR OF
THE STATE OF WYOMING; ACCOMPANIED BY FLOYD BISHOP,
STATE ENGINEER**

Governor HATHAWAY. Mr. Chairman, members of the committee, I appreciate very much this opportunity to testify with respect to the proposed authorization of the Colorado River Basin project. Wyoming is concerned about the plight of Arizona. We realize that her struggle to have this project approved has been long and arduous. We recognize the demonstrated need for the central Arizona project and the intimate connection between this project and Arizona's future growth and prosperity. Nevertheless, our present position is fundamentally the same as it has always been and our concern continues to center around the need for more water in the Colorado River. We believe that the bills concerning this proposal which have been in-

troduced to date in the 90th Congress do not adequately protect Wyoming's interests and, therefore, we reluctantly oppose these bills.

If the central Arizona project is built, it will be dependent upon water which is apportioned to the upper basin but is surplus to present day needs in the upper basin. The lower basin will be developing a reliance upon a water supply that will diminish as the upper basin develops. This being the case, Wyoming fears that future pressures arising from the developed economies in the lower basin will be muscled with sufficient political strength to effectively inhibit the future development of Wyoming. Arizona's past and present difficulties in getting the central Arizona project approved are related to exactly that kind of situation in the lower basin. For this reason, it is imperative that any Colorado River Basin project act contain strong assurances that water from outside the natural drainage area of the Colorado River will be available to meet the future needs of projects which are already built and which may be built in the future to fulfill compact allocations.

In an attempt to arrive at some acceptable compromise, Wyoming has modified some of her requests in regard to this legislation. Even so there are a number of fundamental provisions which should be incorporated into this legislation before Wyoming could seriously consider any modification of our present position, including the following:

1. There should be authorized, concurrently with the central Arizona project, a project which will import sufficient water into the Colorado River drainage or its service area to relieve the Colorado River States of any obligation to deliver water to the Republic of Mexico pursuant to the terms of the Mexican Water Treaty of 1944. The cost of this importation project should be a nonreimbursable obligation of the United States.

2. As an integral part of the Colorado River Basin project there should be sufficient revenue-producing features to assure adequate financing of an importation project.

3. Provision should be made for at least a reconnaissance study of all possible sources of supplemental supply for the Colorado River.

4. If a priority to the consumptive use of 4.4 million acre-feet annually is granted to California by Arizona, it should be clearly stated that such priority involves only those two States and does not involve any granting of priority to California by the upper basin. In addition, we feel there should be a limitation of 30 years' time during which this priority will be operative.

5. The authorization of the San Miguel project, West Divide project, and the Dallas Creek project should be conditioned upon completion of the importation project to relieve the Colorado River Basin of the Mexican Treaty burden.

The first of the foregoing suggestions concerns authorization of an importation project. Since the Northwest States are not ready to accept the possibility of a diversion from that area, we believe that the source of water for this project should be from the surplus of northern California streams. The availability of this surplus is borne out by several authoritative studies. We further believe that the unique situation on the Colorado River amply justifies the unusual procedure of

authorizing such a project prior to further studies thereof. If the Mexican Treaty burden is made a national obligation, the traditional analysis of the economic aspects of such a project on a benefit-cost basis are nullified. Then the only thing that remains uncertain is physical feasibility. We feel confident that means can be found to make such a project physically feasible.

The second suggestion is adopted because of the need to build up a fund for the financing of works to import additional water into the Colorado River Basin from some outside source. While Wyoming would prefer to see both Hualapai and Marble Canyon Dams included in this project, we recognize the difficulties involved, particularly with Marble Canyon Dam.

The precedent-setting new proposal to provide pumping power for the central Arizona project by prepurchase from a thermal generating plant is not seen as a satisfactory substitute for the power dams. The purpose of the dams was only partly to provide pumping power. More importantly, their purpose was to provide enough revenue to pay for themselves and other parts of the project, in addition to building up a fund to pay for a later importation project. The new proposal would produce insufficient revenue for these purposes.

In regard to the third suggestion concerning an immediate reconnaissance study of all possible sources of augmentation for the Colorado River, the ultimate solution to the problems of the Colorado River depends on developing a substantial additional amount of water to supplement the historic supply. The proposed importation of water from northern California in sufficient quantities to satisfy the Mexican Treaty burden will not be the final solution to the water supply problem in the Colorado River Basin. Consequently, it is imperative that studies be undertaken to determine the most feasible source of supplementing Colorado River water supplies so that future shortages of water are not allowed to develop.

Several of the bills which have been introduced in the 90th Congress concerning the proposed Colorado River Basin project have provided that the augmentation studies should be accomplished by a National Water Commission. Wyoming's feelings about the creation of a National Water Commission are ambivalent. We see the value of such a Commission being created to review existing national policy on water resource development and to suggest needed changes in that policy. We do not agree that such a Commission should undertake the augmentation study or other studies of the specific water problems of the Western States. While we recognize that the national interest is involved in the solution of these problems, we also recognize that the water problems of the remainder of the United States are fundamentally different than those of the arid West.

If such a Commission is so created as to undertake studies of the entire Nation, the majority of its members will likely be individuals whose orientation in water matters is slanted toward typical problems of the Eastern United States, including the riparian doctrine, humid climate, and advanced water pollution type of problems. In the West, our orientation is in the appropriative doctrine, arid climate, and interstate compact or court decreed apportionment of short water resources.

The States of the Pacific Northwest feel that the augmentation studies should not be undertaken by the existing Federal water resource development agencies. We are willing to accept that viewpoint, but if the matter is to be taken out of the hands of these agencies then we would favor seeing the responsibility in the hands of a Western Water Commission, perhaps appointed by the President and reporting to him and to Congress, but made up of representatives from those States lying west of the 100th meridian, rather than by a National Water Commission.

In regard to suggestion No. 4, involving the California priority, we have had some concern that the language used in some of the bills concerning this proposal could be interpreted to mean that California was being granted a priority which could be effective against the upper basin. We suggest—and Mr. Chairman, I have an amendment to my prepared statement here at the bottom of page 4—we suggest that the following sentence be added to section 305 (a) of H.R. 3300:

Nothing in this section shall be construed as creating a priority for California as against the states of the Upper Division.

The suggested termination of this priority at the end of 30 years is based upon a dual desire: First, to allow ample time for the study and development of an importation project which will provide an adequate water supply for the entire Colorado River drainage and its service area; and second, a determination to assure that the priority does not become a substitute for the importation.

The fifth suggestion concerning the proposed authorization of three projects in Colorado is included because of our concern over the present shortage of water in the Colorado River as compared to the demands which are being placed upon it. Several authoritative studies have been made which indicate that these proposed authorizations may exceed Colorado's apportionments of Colorado River water if the upper basin is required to bear a portion of the Mexican Treaty burden. We cannot be reconciled to the propriety of authorizing Federal projects in excess of apportionments under the Colorado River compacts.

In addition to the foregoing fundamentals, there are a number of other provisions which we favor for inclusion in this legislation, many of which have been included in one or more of the bills introduced in the Congress to date. These include the following:

A. The provisions included in title VI of H.R. 3300 have our general endorsement. However, the operating criteria outlined in section 602 of this bill implies that the upper basin may have an obligation for delivery of water to the lower basin under article III(c) of the Colorado River Compact. We do not accept such an interpretation of the compact and would prefer that paragraph 602(a) (1) be deleted from the criteria as stated in the bill.

B. Section 502 of H.R. 3300, providing for reimbursement of the Upper Colorado River Basin Fund from the Colorado River Development Fund for all expenditures heretofore or hereafter made to meet deficiencies in generation at Hoover Dam, also has our support.

C. We would favor the inclusion of an amendment of section 2 of the Colorado River Storage Project Act (70 Stat. 105; 43 U.S.C. 620), wherein reference is made to the Sublette project, to insert after the word "Sublette" the words "(including a diversion of water to the

North Platte River Basin in Wyoming)." It is our desire that this proposal be investigated as rapidly as possible so that Wyoming will have reliable information upon which to base a decision as to our next logical step in the development and utilization of our Colorado River Compact apportionment. At present, it appears that the Sublette project, along with the diversion of water from the Green River to the North Platte is probably the most feasible proposal for us to pursue in the near future and consequently we are desirous of expediting this study and report.

D. Wyoming supports the inclusion of a provision such as appears in H.R. 3300, section 501(c) to modify the unit size on the Seedskadee project in Wyoming which is an authorized participating project of the Colorado River Storage Project Act. Climate and elevation are vital factors which must be taken into account when classifying land and establishing farm unit size and the present Seedskadee formula does not make adequate provision for these factors. Our basic concern is to create opportunities for a stable and adequate family living and for community growth through irrigation development. Size of farms must be large enough to attain this objective.

Wyoming has continually faced a difficult choice on this Colorado River Basin legislation. We are reluctant to oppose a project which makes it possible for Arizona to utilize her apportionment of Colorado River Basin water; however, as a fundamental precept we think it is unwise to authorize Federal projects which require a greater amount of water than is apportioned to the various entities by these compacts. We believe that the compacts state the supreme and only method of allocating the waters of the Colorado River. Mr. Ely's testimony on Monday pertaining to the appropriative doctrine superseding compact allocations is alarming to Wyoming. We cannot accept California's contention that existing uses should be protected even though they may exceed compact allocations. We think it is wrong to authorize Federal projects which will utilize in the lower basin a greater apportionment of water than the lower basin entitlement, and we have the same reservation as it pertains to the authorization of Federal projects in the upper basin for any State in excess of its apportionment.

We must emphasize again our regret that we cannot support Arizona in her project as matters now stand. However, the authorization of a Colorado River Basin project without the inclusion of the basic provisions which have been outlined herein to protect the interests of all the Colorado River Basin States poses a serious jeopardy to Wyoming's future. We seek to eliminate this threat so we can support the legislation.

Thank you very much.

Mr. JOHNSON. Thank you, Governor, for that very fine statement stating Wyoming's position. I presume it will be agreeable to both of you if you will both remain there for questions concerning the position of Wyoming.

Governor HATHAWAY. Yes, sir, we will be happy to.

Mr. JOHNSON. The gentleman from Florida, Mr. Haley.

Mr. HALEY. Thank you, Mr. Chairman.

Governor, you pretty well cover the waterfront on this proposed legislation, do you not? You do not leave much out.

Let me ask you this. Did Wyoming join in the agreement and go into court when the courts apportioned this water?

Governor HATHAWAY. We joined in the Colorado River compacts, yes, sir.

Mr. HALEY. Well, you went to the courts and the courts finally apportioned this water by general agreement, did they not?

Governor HATHAWAY. That is my understanding; yes, sir.

Mr. HALEY. Well, of course, at that time, Governor, certainly your State and the courts really looked into this matter as they should have, and realized that the apportionment that they had made of 15 million acre-feet flowing past Lee Ferry would use all of the waters that were flowing by there and not considering the Mexican Treaty at all. Is that not about the situation?

Governor HATHAWAY. Congressman, the courts did not decree the upper basin water, just the lower basin water.

Mr. HALEY. Yes; but you knew how much water you had there, did you not? The determination—certainly you realized that you were going to not have enough water to take care of the obligations of the Colorado River Basin, did you not?

Governor HATHAWAY. Well, Wyoming was not a party to the court proceedings, sir. That was determined as between Arizona and California.

Mr. HALEY. Well, now, you make another statement here on page 4, Governor. You say, "The majority"—talking about the water board to be created—"the majority of its members will likely be individuals whose orientation in water matters is slanted toward typical problems of the Eastern United States."

Why do you assume that, Governor?

Governor HATHAWAY. We just think we have an entirely—water is tremendously short in the western area States, sir, and we think the thinking is different out there and we would like to have this matter considered, if there is a commission, by western people.

Mr. HALEY. Well, do you have any indication if the commission is created that it would not be like a lot of these things—I realize your problem—would there not be a majority of westerners on this board where the water situation is very critical?

Governor HATHAWAY. Well, if they were studying particularly importation of water into the Colorado River Basin, we think that it should be people from the western area making these decisions. Perhaps there could be a subcommittee under a national water commission that was composed of people in that area that could deal with the problem. I do not know.

Mr. HALEY. Governor, I would assume that the appointment of a committee of this kind, that certain of the Western States who have probably a greater problem than the Eastern or Southern States, it seems to me like if I were to appoint a commission of that kind I would kind of lean that way a little bit to see that we did have people who thoroughly understand the problems of the West.

Governor HATHAWAY. That might be, sir. I agree with you. But water is so vitally important to us in the West that we just do not like to speculate on things. We would like to be sure that we will be considered by western people.

Mr. HALEY. I am sympathetic with that.

Governor, where in your opinion—you are pretty knowledgeable on this matter and you probably have given a lot of thought to it—where would this additional water come from? Where would you divert it from? What would be the most logical source?

Governor HATHAWAY. Well, I am not very knowledgeable on that. We think from northern California. If I may, I would like to have my State engineer answer that question. I think he has given it some thought. Is that permissible? Mr. Bishop.

Mr. JOHNSON. Let us have your name.

Governor HATHAWAY. Mr. Floyd Bishop, State engineer of Wyoming.

Mr. BISHOP. Mr. Haley, we have given that some study and thought. We feel there is a surplus of water in northern California streams which would be available to partially satisfy some of the shortages in the Colorado River Basin, but we feel that there should be a broad look taken at the overall picture to determine where is the most feasible source of surplus water to augment that supply. We feel that there is a possibility of additional water being available from the Pacific Northwest streams in addition to those in northern California.

We also feel that there is a possibility of augmentation through weather modification and desalinization and things of that sort.

Mr. HALEY. What about the Columbia River?

Mr. BISHOP. The Columbia River would seem to be a very logical possibility.

Mr. HALEY. I will ask both of the witnesses this question, if I may, Mr. Chairman. Governor, you—and I believe your distinguished Senator agrees with this—you think that the water under the treaty rights belong to Mexico. Why do you seem to think that this should not be an obligation of the river and should be more or less pushed off on the backs of the American taxpayers? That is quite an expense for the general taxpayers of this country to assume, is it not? And why do you think that the taxpayers of the United States should be saddled with a burden here to forever furnish Mexico with the water under that treaty? I cannot—I just do not—understand your thinking on this problem.

Governor HATHAWAY. May I defer that question to Senator Hansen, who is more familiar with the Mexican Treaty than I am, sir.

Senator HANSEN. Mr. Haley, I am not certain that I know all of the facts that constitute the background of your question, but I would like to make a couple of observations that are pertinent.

No. 1, it is my understanding that the treaty with Mexico was negotiated during the war under times of considerable stress. It was presumed to be in the interests of our country, of the Nation, that we negotiate that compact so as further to solidify friendly relations between the two countries.

In this context, I think that it does allow that the obligation becomes nationwide rather than an obligation of a particular region in the country.

Second, I think that, at the time of the treaty, the use in Mexico was perhaps only half of what is now the situation. So that, with that treaty, I understand that there was some American capital that

went down into Lower California in Mexico and developed agriculture down there and the use of water was expanded considerably.

And then, third, I do not believe there is any reference at all in the compact to the quality of water.

Now, this constitutes a further assumption upon the part of the United States to act as a good neighbor. Recognizing that water that is so laden with salts and other minerals may indeed be detrimental to plant growth as to make it unusable, we seem to have assumed certain responsibilities for the quality of that water, which I understand was not part of the treaty.

For these reasons I do think there is some justification in assuming that these become not regional but rather national responsibilities.

Mr. BURTON of Utah. Will the gentleman yield to me at that point?

Mr. HALEY. I yield.

Mr. BURTON of Utah. I think our position in the Colorado River Basin, Mr. Haley, in taking the position that it is a national burden, is based on the fact that this was not a treaty between the Colorado River Basin and the Republic of Mexico but this was a treaty negotiated by the President of the United States, speaking for all the States, and the Republic of Mexico.

Mr. HALEY. May I say to my dear friend a treaty made by the United States is just as binding on California or any of the rest of the States. I mean—

Mr. BURTON of Utah. And upon Florida, and this is why we feel that it is a national burden, not a regional burden.

Mr. HALEY. Well, now, it seems to me that in the first place there should be priority of uses of water and apparently what has happened here in—and agriculture has a pretty high priority, I guess in the Western States—what we are faced with, I think, we might as well face up to, is the rapid growth in southern California and Arizona and other parts of that beautiful dry land out there which you have. You get a situation here where subdivisions, and so forth—the farmers probably had to go to Mexico in order to get off the pavement, so to speak, in some of these States out there.

Do you not think, Governor, that before you begin to saddle on the American taxpayers, and nobody knows what the cost of it will be, do you not think that there should be some priority of usage of water out there so that the Congress and the people could determine what they really want to do? We do not want to continue in our part of the Nation, continue to build these huge multiple-use projects to furnish water for irrigation purposes if—we have done pretty well for you out in the Western States and do you not think that we are entitled to take this water and apportion it out on a priority basis?

Governor HATHAWAY. Congressman, that is what we want to do. We have a priority of use in our State. Certain uses of water are classified as preferred uses, the first of which is domestic, then municipal, then industrial. The thing that disturbs us most is we are about to get into the industrial development, as Senator Hansen mentions, with the oil shale and this takes a tremendous amount of water. We have great coal-producing areas here and we will be getting near to the point where we will be making gasoline out of coal and this takes a lot of water, and Wyoming is going to be sitting here when this starts

to develop without any water unless there is some provision to bring this water back into the Colorado River Basin and we cannot have this great mineral wealth go to waste because we do not have the water to develop it.

Mr. HALEY. Well, of course, Governor, I do not blame you for protecting your own bivouac out there. You are perfectly right in doing that. But, I still do not think that we have got to have—we must have coal. The gentleman from Pennsylvania has got a lot of idle coal mines, I understand, and he must be able to help you out in that respect.

Governor HATHAWAY. We are fortunate in having ours easily strip-able. It is right close to the surface.

Mr. HALEY. I know. You have strip mining out there.

Mr. Chairman, I reserve the balance of my time.

Mr. JOHNSON. The gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Thank you, Mr. Chairman.

Governor, let me welcome you and Senator Hansen before this committee. You have been here before, Senator, when you were Governor and we are delighted to have you over here on our side of the Capitol now as the Senator from Wyoming.

Senator HANSEN. Thank you, sir.

Mr. SAYLOR. Governor, we are happy to have you here.

Governor HATHAWAY. Thank you.

Mr. SAYLOR. Now, just for the record, I would like to see whether or not my memory serves me correctly: In the Colorado River compact there was an agreement between the upper and lower basin States, that the upper basin States would deliver, every 10 years, 75 million acre-feet to the lower basin at Lee Ferry.

Governor HATHAWAY. That is correct, sir. An average delivery of seven and a half million acre-feet a year.

Mr. SAYLOR. At the time the compact was entered into in 1922, it was the belief of the people who met representing the seven basin States that there was a virgin flow of approximately 20 million acre-feet in the River. Unfortunately this assumption has never occurred or at least not too often since 1922. The Department of the Interior people in the Bureau of Reclamation, say that we are in a dry cycle but the cycle continues to go on year after year and I am afraid the people who met with all good intentions just did not realize what the riverflow was.

Now, then, sometime afterward the upper basin States got together. They were the States of Colorado, New Mexico, Utah, and Wyoming. And you divided the waters to which these four upper basin States were entitled basically; Colorado was to get 51.75 percent of the water, New Mexico was to get 11.25 percent of the water, Utah was to get 23 percent and your State was to get 14 percent of the water in the Colorado River.

Governor HATHAWAY. That is correct.

Mr. SAYLOR. Is that about correct, sir?

Governor HATHAWAY. That is correct, sir.

Mr. SAYLOR. Now, if we assume that there is $7\frac{1}{2}$ million feet for use in the upper basin, 14 percent of that flow amounts to about 1,050,000 acre-feet. Is that about correct?

Governor HATHAWAY. About right.

Mr. SAYLOR. Approximately how much water has the State of Wyoming put to beneficial consumptive use on an annual basis?

Governor HATHAWAY. Could I ask my State engineer. Floyd, will you answer that question?

Mr. BISHOP. I would have to, Congressman Saylor, answer that in terms of generalities. We do not know exactly how much water we have put to consumptive use, but something in the neighborhood of 300,000 acre-feet per year is consumptively used in Wyoming in the Green River Basin.

Mr. SAYLOR. Now, is that basically all in the so-called Eden project?

Mr. BISHOP. No, sir. Not by a long ways.

Mr. SAYLOR. What are the projects in Wyoming that put these waters to beneficial consumptive use?

Mr. BISHOP. The large part of that water is utilized through private development, individual ditches and diversions from the Green River and its various tributaries. The Federal projects—does your question involve just the Federal projects?

Mr. SAYLOR. The Federal project is Eden. I think that is the only one that is built.

Mr. BISHOP. That is the only one that is completely constructed and in operation; yes, sir.

Mr. SAYLOR. Now, some years ago when we had before this committee the bill to authorize the Upper Colorado River Basin project, there were three projects authorized if my memory serves me correctly. The Seedskaadee project which you have referred to, Governor, the Lyman project, and the Savery-Pot Hook project. These are the three projects, I believe, that were authorized in that legislation back in 1956.

Governor HATHAWAY. That is correct. That Seedskaadee, the dam is built but the project has not been completed and the units have not been established and this is something we would like to have done as soon as possible.

Mr. SAYLOR. Now, of those three projects, the Seedskaadee is the only one that has been even partially completed, is that correct? On the other two, construction has not started.

Governor HATHAWAY. We started the Lyman project.

Mr. BISHOP. They have started construction on the Lyman project.

Governor HATHAWAY. The Lyman is underway.

Mr. SAYLOR. Is this just for the dam or is it for the lateral and diversion works up there?

Mr. BISHOP. If I may answer that, fundamentally the Lyman project involves construction of two dams. The diversion facilities will utilize existing canal systems so there is no plan for additional ditches or canals. Just the two dams are the major features of that project.

Mr. SAYLOR. It was my recollection that when these three projects, together with the Eden project, were authorized and constructed, it would put to beneficial consumptive use most of the water to which your State was entitled. Is my recollection correct?

Mr. BISHOP. No, sir; it is not.

Mr. SAYLOR. All right. How much, then, are you going to put to beneficial consumptive use in these three projects?

Mr. BISHOP. Would you like to have figures on the particular projects or—

Mr. SAYLOR. What I am trying to do is establish the record of your State with regard to the upper basin at the present time in your allocations.

Mr. BISHOP. The Lyman project is fundamentally a supplemental supply project. There is not a whole lot of additional consumptive use involved in the Lyman project. Something on the order of 10,000 or 12,000 acre-feet a year, as I recall, additional consumptive use involved when the Lyman project is completed. The Savery-Pot Hook is somewhat similar. Not a very great deal of consumptive use added through that project when it has been completed. Along the same magnitude, 10,000 or 12,000 acre-feet per year.

Seedskaadee project is something else. There is about—I think the Bureau of Reclamation estimates 165,000 acre-feet per year which would be consumptively used if Seedskaadee is developed to its full potential.

Mr. SAYLOR. This does not take into consideration return flows, if my memory serves me correctly.

Mr. BISHOP. Correct. These figures reflect consumptive use.

Mr. SAYLOR. Now, I am very much interested in your mineral development because this also comes under the jurisdiction of this committee. Governor, has your State taken any steps at all or has industry moved into your State and begun any work at all on the oil shale process or the development of oil from oil shale?

Governor HATHAWAY. Very little on the oil shale, Mr. Saylor, because as you know, just recently have we got into the field of examining the future of the role of private industry in oil shale development on Federal lands. This is all under Federal land, the oil shale in this area.

There has been some work done on the coal by Union Pacific Railroad Co., by Humble Oil Co., and other private companies.

This area happens to be very rich in trona. As a matter of fact, we had a tremendous debate in our legislature on a subsurface easement permitting cross section mining of the trona. This does not particularly involve water but it shows you that this entire area is being industrially developed and it happens to be right on the Green River. This development is occurring right in this area.

Mr. SAYLOR. Is it your belief, Governor, that if the mineral industry of your State is developed, that you will be able to put to beneficial consumptive use in your State all of the water which your State has been allocated under the Colorado River compact and the Upper Colorado River Basin compact?

Governor HATHAWAY. If we cannot use it there, we certainly can use it—this is talked a lot about in my State. We would like to divert some of this water to the North Platte River Basin. We think it is feasible. It is going to be rather expensive but there is a shortage of water in the eastern part of Wyoming and if we could get the water into the North Platte River Basin, it could be used agriculturally and industrially.

Mr. SAYLOR. I just want to say that your neighbor, Colorado, out there decided some years ago they would like to divert some of the

water out of the Colorado. They had some figures that the Bureau gave them and after a real go-around in the House and Senate, they finally got a bill through. It is rather amusing that just in the past week we have had submitted to the House and the Senate Committees on Interior and Insular Affairs a report from the Department that they are very sorry but their costs were quite low and apparently it is going to exceed their costs that they had disrupted this rosy picture they painted for us a few years ago.

Now, in your statement, Governor, you want to saddle this project with the importation studies. Now, when we discussed the upper Colorado River project, we did not saddle your State with any worry about importation. Your State came in and gave us the picture that you had water, that you were the State or origin of most of the water for the Colorado River and that because of that you were entitled to have the Government step in and pick up the tab and help you develop your area.

Now, if this is true, why should Arizona, a sister State in the basin, and its project be saddled with the importation study?

Governor HATHAWAY. Sir, I think because in our case we were not committing water that was not there. I think we are in the Arizona case. I think we are talking about water that is not in the river.

Mr. SAYLOR. Well, the Bureau of Reclamation sat there and the Secretary sat in that chair and the Commissioner of Reclamation sat where Senator Hansen is just 2 days ago and told us that until the year 1990 there is sufficient water in the river to take care of this project.

Now, 1990, of course, is only 23 years away, but it has been 20 years since we built or authorized the construction of the Glen Canyon Dam and it is only about 25 percent full. If that amount, and some of us predicted that it would not fill then and if you would have kept Hoover Dam to the capacity that it should have been, you would not have 25 percent of the river in that dam now.

Now, it seems rather strange to me as an easterner that you would ask of a sister State something that historically was not asked of your State. That is one of the problems that I have as a member of this committee considering this legislation.

I want to tell you that I have checked the record and the two Senators from the State of Wyoming in 1944 voted for the Mexican Water Treaty and at that time there was quite a discussion as to whether or not just the Colorado River should be called upon to deliver water to Mexico or whether the Rio Grande should also be called upon. After a full debate it was determined that the only river to bear the burden was the Colorado. And since this is the case, it seems a little strange that 20-odd years, 30-odd years later you are now going to try to attempt to saddle the 50 States of the Union with an obligation that Congress said in 1944 was an obligation of the seven States.

Governor HATHAWAY. Well, may I say, sir, that Wyoming is saddled with the rivers and harbor costs of the Eastern States; and may I say also and repeat what Senator Hansen said. Our State is one of the greatest contributors to the reclamation fund. Forty percent from the mineral lands of Wyoming go into the reclamation, into this reclamation fund and we are not getting our share frankly, of reclamation projects in Wyoming.

Mr. SAYLOR. The thing you have to remember, and this is hard for some of the people who live in the West to realize, that even though those lands are within your State, they do not belong to your State. They belong to all the people of the United States. And the people in the West in the reclamation States in a sense, are very, very selfish because they want money paid into the reclamation fund which comes out of property that is owned by all of the people but they do not want all the people to share in it. They only want 17 Western States to share in this fund. And we folks who come from the East, who own as much of that land in a sense as you do, it sort of rankles us sometimes when we hear people come before this committee and tell us that they think they ought to get all of the benefits from that reclamation fund.

Now, sitting in that same chair a short time ago on another bill was the Assistant Secretary for Water in the Department of the Interior who told us that California is already having problems with regard to salinity and that what has heretofore been considered as an extra source of supply for southern California may not exist. So, that, very frankly, if I were you, I would not look with too jaundiced an eye to northern California to get any supplemental water for the Colorado River.

Then on Tuesday we had the Commissioner of Reclamation tell us that they have changed the plans for Grand Coulee powerplant on the Columbia and that instead of building 12,300,000 units of power in the third unit in Grand Coulee, they are only going to build six and they are going to build them of 600,000 kilovolt capacity. But those six will take all of the water that the original 12 would take and they are putting in forebays to take six more. The engineers have given me figures to indicate that if Congress authorizes the installation of those additional six units on the Columbia, it will take two-thirds of the flow of the greatest flood they ever had in the Columbia to run those at capacity, so that there is not any surplus water in the Pacific Northwest. It may be that there is no implementation that you folks can get unless you start looking to the Mississippi.

So your idea of just having westerners look at this, Governor, if I were you, I would go back and take another look at my position. Maybe the easterners and midwesterners might be a lot better at looking into this problem than some of your people in the West.

The people in the Pacific Northwest told us last year they were quite concerned.

Now, Governor and Senator, when Mr. Ely testified here on Monday pertaining to supplementing the allocation, which has taken place, he scared some of the rest of us on this committee who are concerned about the river, too.

I have one or two questions here that I want to ask our good Senator. Senator, from your statement, I judge that you feel that if the development of the oil shale industry and the coal industry in your State takes place to its full potential, you will be able to put to beneficial consumptive use all of the water in your State of Wyoming to which Wyoming is entitled according to the upper basin compact; is that correct?

Senator HANSEN. That is correct. If I could add an addendum to that, it would be to observe that I do not think that the assumption

that we can put all of the water to which we have been entitled under the terms of the compacts is dependent upon the full development of the coal and the oil shale either. We have a number of uses that will be beneficial uses in the broad national interest that will account for every bit of our allocation of water. I simply called attention to two uses that are very much in the public eye at the present moment, very much in the national interest because we are an energy-deficient nation at this time. We are importing great quantities of oil.

There are good reasons for getting ourselves in a position of independence insofar as energy requirements are concerned and certainly there is nothing to equal the oil shale deposits in this tristate area.

Mr. SAYLOR. Well, I want to commend you, Senator, and you, too, Governor. If there is anything I admire it is people who have the courage to come before any committee of Congress and stand up and fight for their people in their own area and you have both done an excellent job. I disagree with you in some of your conclusions, but I cannot do anything but admire you for having the courage to come before this committee and present your case. I congratulate both of you.

Governor HATHAWAY. Thank you, sir.

Senator HANSEN. Mr. Saylor, if I could, may I just make one further observation. You referred to the testimony given by the Secretary of the Interior and the Commissioner of Reclamation and I think perhaps you may have misunderstood what our Governor was implying when he said that we were talking about water that was not in the river. We do not challenge the statement of the two distinguished witnesses here yesterday that there is presently unused water in the river that could take care of the requirements of the central Arizona project. Our concern is that the water that would be required now to implement those projects in Arizona is partly unused Wyoming water: that is our concern.

It is our concern that if in 30 years, or whenever the time may come, that we have developed our State to the degree that we require all of the water that was reserved to us under the terms of the compact, then we will not be talking about that water any more. It is already going down the stream, down to Arizona and down to southern California, and that is why we are concerned now about trying to get something done to resolve this knotty problem of imports.

I wanted to say that because I think you may have misunderstood the Governor.

Mr. SAYLOR. In other words, I gather that your feeling on the law of the river is still prior appropriate rights, at least as far as each individual State is concerned.

Senator HANSEN. Well, the law of the river basically, if I could interrupt, sir, is that insofar as the rights are spelled out in the compact, we hold this to be the governing authority.

Mr. ASPINALL. If my colleague would yield at this point—

Mr. SAYLOR. Just one question and then I will yield. Is it your belief that if the water to which you are entitled under the compact and under the upper basin compact, is put to beneficial consumptive use downstream, be it by California, by Arizona or anybody else, that you do not want that use now or at any time in the future to interfere

with the right of your State to put that water to beneficial consumptive use in your own State and have a first call on that water?

Senator HANSEN. That is essentially right. However, I would go just a little beyond what you imply in your statement, Congressman Saylor, to add this, that simply to assert that this shall be Wyoming's right in my mind does not go far enough because I think that there is a practical matter involved. If the Congress now authorizes the central Arizona project and if, indeed, all of the waters in the river are being put to beneficial use, then I say, despite what assurances this act may contain, that nothing herein shall undermine Wyoming's right. Congress would not, as a practical matter, authorize additional projects in Wyoming which would permit us to use all of our water if all of the water in the river was already being used.

I think it becomes a practical matter and certainly the Congress is not going to build dams and reservoirs in Wyoming that would make mud flats out of those downstream.

Mr. SAYLOR. Now I yield to my colleague.

Mr. ASPINALL. I just wanted the record to show that what the Colorado compact and subsequent acts have done is that they have stopped the law of appropriation, as such, on the river as between the various States. The only question of the priority rights on the river are those rights that were in existence in the various States at the time the compact was entered into. Outside of that, the compact and the subsequent acts concerning the river determine how much water shall be placed where. Then it is up to the States to either go ahead and apportion it according to their priority systems or their combination of priorities and civil law systems; is that not correct?

Senator HANSEN. Well, certainly there is not a better authority on the river than the distinguished Congressman from Colorado, and I must say that I am a great admirer of his as I suspect he already knows. The point is, of course, that at the time these compacts were negotiated it was believed that there were some at least 20 million acre-feet of water per year in the river. Now, the Tipton report indicates that there is much less than that, that there may be in the neighborhood of 13.6 million or 13.5 million acre-feet per year to say nothing of the treaty obligations to Mexico, and this becomes our concern.

If the central Arizona project or any other projects to be authorized on the river would take into consideration what is actually in the river now as compared to what was presumed to be in the river and scale down their requirements to fit within that revised formula, we would have no objection at all. Or at least I would have none.

Mr. ASPINALL. The compact stopped the operation of the appropriation system of water rights as far as the division between States or individual uses. So what the upper basin is alarmed about is that some place along the line in the future, some court or some legislative body might come along and say: We will reestablish this appropriation theory—that the first to divert and to put to beneficial and continuing use will hold. If that is true and Arizona has the water in the meantime, then the upper basin will have difficulty of recalling it. All the upper basin wants to do is recall its share when it can put it to use. Is that right?

Senator HANSEN. I thank the gentleman from Colorado for explaining very clearly what our concern is. I agree completely with you, sir.

Mr. SAYLOR. I might say to the Governor and Senator and my colleague from Colorado that I think there might be some cause for that concern following the testimony of Mr. Ely the other day when he said that he thought that this theory of prior appropriation might now be the position of California.

Mr. HOSMER. Will the gentleman yield?

Mr. SAYLOR. No. I want a further question, and then I am through. Governor, the other day Congressman Edmondson and I introduced the bill which the administration has sent up with regard to this project. This eliminates both dams in the river, provides for a National Water Commission, and postpones some of these other problems. Would you or the Senator or people from your State support that bill?

Governor HATHAWAY. Sir, I have not read the bill. I would ask our State engineer to comment on it. He could probably express Wyoming's position. He has studied it.

Mr. SAYLOR. If you have not studied it, it is an unfair question and I would not ask you to comment. If you want to, Mr. Chairman, I would ask unanimous consent that, if they want to comment on the bill or that question, they be permitted to insert the remarks at this point in the record.

Governor HATHAWAY. Thank you.

Mr. JOHNSON. You have heard the request of the gentleman from Pennsylvania. Is there objection? Hearing none, so will be the order.

(The statement referred to follows:)

MARCH 27, 1967.

HON. HAROLD T. JOHNSON,
Chairman, Subcommittee on Irrigation and Reclamation, House Interior and Insular Affairs Committee, House Office Building, Washington, D.C.

DEAR CHAIRMAN JOHNSON: At the recent hearing before your Subcommittee concerning the proposed Colorado River Basin Project legislation, Congressman Saylor asked whether or not Wyoming would support the Administration Bill on this subject. Unanimous consent was granted by the Subcommittee for the State of Wyoming to submit written comments on this subject, and in response to Congressman Saylor's question the following statement is submitted:

Wyoming's overall position regarding the proposed authorization of the Colorado River Basin Project has been explained in some detail in the hearings before this Subcommittee in both the 89th and 90th Congress.

With specific reference to the Administration Bill, S. 1013, it is our reaction that this bill fails to provide a solution to the broad problems of the Colorado River, most of which center around the fact that the water supply in this river drainage is not sufficient to meet the needs of the area. Wyoming could not support any bill proposing to authorize a Central Arizona Project unless it contained some definite provision for an augmentation of the water supply of the Colorado River System.

We feel that Section 9 of S. 1013 gives adequate protection to our legal right to the use of Colorado River water, but assert that the only practical guarantee which has real validity to Wyoming would be an augmentation of the Colorado River water supply from sources outside its natural drainage area. The Administration Bill contains no mention of importation or of any other practical method of augmentation of the Colorado. Therefore, we feel that the State of Wyoming might be faced with difficult problems in attempting to utilize its allocated water as future needs develop. This failure of the Administration Bill to face the question of the need for augmentation of the water supply of the Colorado River is the most serious shortcoming of the bill in our opinion.

There are some features of S. 1013 which are desirable and should be included in any Colorado River legislation. Section 10 provides for operating criteria for the reservoirs on the Colorado River. These are similar to those included in H.R. 4671 last year, and similar bills introduced this year, and we feel that they are desirable. However, we feel that this section should include a consent to suit by the federal government, its officers and agencies. (See Section 601(c), H.R. 3300.) Section 10(a)(1) has some implication that there may be a burden upon the Upper Basin to deliver an amount in excess of 75,000,000 acre-feet in any ten year period to supply the Mexican Treaty Burden without accounting for Lower Basin tributary uses. We strongly take issue with this and feel that Section 10(a)(1) should be deleted.

Section B provides that the Upper Colorado River Basin should be reimbursed for power deficiency payments to Hoover Dam. We support the inclusion of this provision.

In summary it could be said that Wyoming's previous testimony before this Subcommittee accurately reflects our position.

Respectfully submitted,

STANLEY K. HATHAWAY, *Governor.*

Governor HATHAWAY. May Mr. Bishop answer that?

Mr. BISHOP. As far as the administration bill is concerned, Congressman Saylor, I do not feel Wyoming could support it for several reasons, the most important of which is the lack of revenue producing features to provide for augmentation of the water supply from the Colorado River without at least one of the major dams on the Colorado River to produce the revenue. We are fearful that there might not be an importation or augmentation of the water supply which we feel is so important to the State of Wyoming.

Mr. SAYLOR. I just want to say that you do not seem to hesitate to be willing to make the 50 States responsible for the Mexican Water Treaty or the general U.S. Treasury responsible for that. I do not know why you are so hesitant in trying to make the U.S. Treasury responsible for any augmentation studies that may go on. It is rather an inconsistent position, it seems to me.

Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall.

Mr. UDALL. Governor, I do not want to take too much time here but I am saddened and troubled by the position taken by my sister State of Wyoming. You say to us, in effect, you are totally against the central Arizona project, you will do everything you can to defeat it unless the legislation authorizing it includes about four or five or six things, at least half of which in my judgment are simply not possible.

For example, you do not seriously contend—maybe Senator Hansen can answer this—that the Senate of the United States or the House is going to pass the central Arizona project bill and include in that legislation the authorization of a project to cost an untold number of billion dollars to bring in water from an unnamed source at a cost-benefit ratio yet to be determined through works and dams and canals and aqueducts that no one has yet devised. You do not seriously contend that the No. 1 condition you lay down for supporting the central Arizona project is about to be fulfilled in the House or Senate at any time.

Governor HATHAWAY. We have asked for a reconnaissance study on the importation.

Mr. UDALL. On page 2, item No. 1, you say that there should be authorized concurrently with the central Arizona project a project to import such water to relieve the Mexican Treaty burden; namely, two and a half million acre-feet. You do not know where that would come from, what it would cost, how it would be paid for or anything else, and yet that is your No. 1 condition as I read your statement. My question is, without arguing with you, do you seriously believe that the Senate and House are going to pass such provisions?

Governor HATHAWAY. Well, we think it is right to the nub of the problem, sir, because we do not think there is enough water to support these projects and if we do not look far enough ahead to determine where the water is coming from we are all in trouble, and may I say these States were agreed but we have started to depart from our original agreement and the Senator can explain this better than I, because he was Governor then.

Mr. UDALL. We have gone into this.

Governor HATHAWAY. We have fragmented what the States originally agreed on, which included an import of water, study of water.

Mr. UDALL. Wyoming withdrew its support for the bill last summer before we could even get it out of committee. I do not want to cover matters that have been covered previously or take time away from my colleagues but let me go to the point you made now and previously. That is, you say the reason you take this position now is that there is not enough water in the river. I did not notice that Wyoming opposed the southern Nevada project or Dixie project or San Juan-Chama 4 or 5 years ago, projects I supported and the whole basin supported on the grounds these were taking water out of a water-short river. Why do you bring it up now? Why do you point the finger at Arizona and say it is your project and we will not support it, unless it includes taking in all these impossible things?

Governor HATHAWAY. Because we think it becomes more critical every time another project is authorized. We are not getting—

Mr. UDALL. The Secretary of the Interior and Mr. Dominy have told this committee—if there is one thing in this 1,800 pages of testimony, it is this, and let me make it clear, that even if you assume the Tipton figures on the river, even if you assume the river is not augmented, even if you assume continued years of the kind we have had in the past, even if you assume full use in the upper basin, full use in Wyoming of their share of the compact the central Arizona project is feasible, will pay out, will have a favorable cost-benefit ratio and at least will do something to alleviate our shortages in Arizona. You understand that?

Governor HATHAWAY. We would be with you if we could have some assurances that when everybody had used their water and we had not used ours that you would join with us in making some use of some reclamation projects that would permit us to use our water.

Mr. UDALL. Does Wyoming seriously expect that you can work against, defeat the central Arizona project and then as Senator Hayden and Senator Fannin and Mr. Rhodes and Congressman Steiger ask me to support projects in Wyoming for it to take water out of a water-short river? Is not the out for all of us to go ahead and do the things that need to be done now and start this great program of augmentation?

through the feasible practical things that we can pass through the Congress now. You ask me, like the old fairy tales, to slay the dragon, remove three mountains, and do a lot of the impossible things, and then you will support the central Arizona project? Why cannot you support the steps that need to be taken now, the modest reasonable steps that we can get through the Congress now and count on our help down the road a little way?

Governor HATHAWAY. If we could have assurance, sir, that some of these things would be done, I am sure that we would like to support Arizona in this project.

Mr. HOSMER. Will the gentleman yield?

Mr. UDALL. Yes, I yield.

Mr. HOSMER. Governor, I think it should be thoroughly understood that the situation which you fear does not exist for this reason: California is now using water that is under these allocations due other States. As a matter of fact, about 700,000 acre-feet of it equal to 70 percent of the entire amount your State is entitled to under its 1944 agreement with the other upper basin States. We are supporting the central Arizona project which will cut us out entirely from using that water, but we recognize that under the law, under the compact, Arizona is entitled to use it. We have had use of it while they have not been able to use it. But here and now we are supporting a project in central Arizona which will deny us that vast amount of water.

If there is ever any indication of good faith, ever any evidence that the fears that you have are unfounded, I think this must be it.

Governor HATHAWAY. Mr. Hosmer, I do not think our fears are unfounded if Mr. Ely's statements represent the philosophy of California.

Mr. HOSMER. You do not understand Mr. Ely's statement and that understanding certainly was not contributed to by what the gentleman from Pennsylvania just said. I want to make this certain. Mr. Ely was talking about these entitlements under the compact. For instance, the 2.8 to Arizona and the 4.4 to California. It came up as a matter of law that as of the time California passed its Self-Limitation Act in 1929, that the then present perfected rights for use of water by Arizona users and California users, had first priority. That had to be protected and the Supreme Court has determined who those are and how much water is involved.

Now, insofar as California is concerned, between 4.4 and the actual prior perfected rights of about 3.1 million acre-feet that were determined, it amounts to a little over a million acre-feet. We will call that x amount. I do not know what it is in Arizona, but there is a y amount, difference between the Court determined rights and the 2.8.

Now, what Mr. Ely was pointing out is that, as between these States in the lower basin only, there is a legal question as to this x amount of water, y amount of water that has been put to beneficial consumptive use, within this 2.8 and 4.4 limitation, since 1929. The question is: Who has the priorities with respect to x and y . It certainly goes no further than that.

It is a legitimate legal question. It has confined itself to the three States in the lower basin. It has nothing to do with the upper basin

and it is certainly no reason to be a cause of concern on the part of the State of Wyoming.

I thank the gentleman.

Mr. UDALL. Mr. Chairman, I have said probably all that I should. Thank you.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. I have nothing further.

Mr. JOHNSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Governor, not to belabor the point, but I do want to follow a moment the line of questioning of the gentleman from Arizona.

Is it not true that not only within the Colorado Basin but throughout the West and indeed including the Missouri Basin, that there is a possibility that by the time that any water shortage is developed on the Colorado, assuming the central Arizona project is authorized, that proposals might be made for diversion of importation of water from outside the basin which would affect the rights of States outside the basin?

Governor HATHAWAY. Yes, sir; very possible.

Mr. FOLEY. Now, I do not know another State, frankly, here before this committee that has insisted as Wyoming has insisted, that there be such water in the Colorado Basin, in the Colorado River, to take care of contingencies beyond 1990 before we will consider the authorization of the central Arizona project.

It could be the position of the State of Washington or the Northwestern States that because importation from our area has been suggested we would first want to see all the possible means of resolving water shortage problems before we would support the central Arizona project, but I suggest to you as California supports it, so does, at least speaking for this member, the State of Washington, and I wonder if you would not consider whether your position in demanding complete solution to all the river's problems is not the harshest position that has been taken by any State that is testifying here.

Governor HATHAWAY. Perhaps it is. I have not heard the other States testify. I think our position is not too much different from the State of Utah. I think all of the upper basin States, particularly Utah and Wyoming, are fearful of the eventuality of there not being enough water in this river to deliver the compact allotments.

Mr. FOLEY. Well, I might ask this question of either you or the Senator or your State water engineer. Are you confident that you know all the possible means of augmenting the Colorado River that might be available at the time of shortage in 1990?

Mr. BISHOP. I would like to respond to that, if I may. Most certainly not. We are not at all confident. That is one of the reasons that we have suggested a complete study of the possibilities for augmentation of the water supplies and, Mr. Foley, I think perhaps you are misunderstanding our proposal here. We have proposed the authorization of a project to import enough water to satisfy the Mexican Treaty burden only. Then in addition to that, we have proposed reconnaissance studies of the overall picture to determine where the best source of augmentation for the water supply might be found.

Mr. FOLEY. Well, would you agree that there will not be any pressing problem as far as Wyoming is concerned, until and unless in 1990

there is insufficient water to meet the authorized magnitude of the central Arizona project?

Mr. BISHOP. I would have to agree that we probably will not be short of water until sometime about 1990. This is correct. However, I think we do have to look carefully at our future needs.

Mr. FOLEY. Do you know, sir, what is the best means of providing sufficient water to the Colorado River to meet the Mexican water obligations or any other supplemental needs as of 1990?

Mr. BISHOP. We think that the proposal we have submitted and suggested here is a good logical source of satisfying the Mexican Treaty burden.

Mr. FOLEY. Are you satisfied it is necessarily the best one?

Mr. BISHOP. Not necessarily the best one, but we have also suggested an overall study of the water picture in the Western United States so that the best alternative can be selected. All we have suggested here is that there be a definite provision for enough water into the basin at this time to satisfy the Mexican Treaty burden with the study of the overall picture. Now, these two can be incorporated.

Mr. FOLEY. Well, my query arises out of this, and I find myself in the unusual position of seeming to defend the rights of the State of California, but if assuming we are going to provide additional water, and that is assumption, but assuming we are, to meet the Mexican water obligation by some, it seems to me you are returning rather quickly to the judgment that northern California coastal streams are the logical area to find this water. We do not, in fact, know whether that is so.

Mr. BISHOP. There have been some reconnaissance studies that I think indicate that this is a good possibility.

Mr. FOLEY. A good possibility does not necessarily mean the best alternative, does it?

Mr. BISHOP. No, not necessarily; that is correct.

Mr. FOLEY. It seems to me that as an engineer it would be logical to assume that in the next 10 or 15 years or much shorter time we are going to know a great deal more about the possible means of augmenting water into any water shortage area like the Colorado; is that not true?

Mr. BISHOP. Very possible; yes, sir.

Mr. FOLEY. And that might change our whole system of priorities and alternatives in engineering and hydrology, might it not?

Mr. BISHOP. Yes, sir.

Mr. FOLEY. And that to suggest at this time a specific means of augmenting water before those facts are known is really asking this body and the Congress to engage in a rather unbusinesslike approach to the problems of this water shortage area.

Mr. BISHOP. My concept, sir, would be the authorization of 2½ million acre-feet importation at this time, not necessarily to be constructed immediately, with the overall study of the importation to be coordinated and the selection of the source of the importation even for the 2½ million acre-foot importation to be selected at such time as the best alternative has been decided upon.

Mr. SKUBITZ. Will my colleague yield? Are you suggesting that we wait until 1990 before we do anything about this situation?

Mr. FOLEY. No, indeed.

Mr. SKUBITZ. What are you suggesting?

Mr. FOLEY. I am suggesting that we go forward and establish a National Water Commission to report to the Congress and to the President on means of resolving national water problems including this one. But what I am suggesting is; the testimony of these gentlemen is that they are either asking for a state of technical knowledge, that by their own admission does not presently exist, or they are asking this body to do something that is absolutely, it seems to me, beyond reason: that is, authorize a project to import water from some place at a cost of something to go somewhere by some means. And that, to me, seems to be beyond any reasonable expectation. The very problems we grapple with here are the problems of these question marks that are involved in that sort of authorization.

Now, I suggest to you one other thing. I ask this question: Is it not a responsibility of all the States in the West and indeed all the United States, to try and come to equitable solutions to problems such as are presented here and do not they all involve some risk to all users?

Mr. BISHOP. Certainly.

Mr. FOLEY. Do not the solutions of any such problems offer some risks—do not we have to go down the line a little bit, all of us, to try and reach some solution and will be taking calculated risks in doing so?

Mr. BISHOP. But obviously, sir, these problems must be considered, there must be some long-range planning and this is all Wyoming really wants, is some assurances that some of these problems will be handled.

Mr. FOLEY. Are there any assurances, I might ask, in your judgment, Governor—are there any assurances the Pacific Northwest or National Water Commission will not suggest an interbasin transfer of water from Oregon?

Governor HATHAWAY. I suppose not; no.

Mr. FOLEY. And yet I think you know that we are supporting—

Governor HATHAWAY. But your own State has been, if I understand Senator Jackson's position, very much opposed to even a study of any transfer of water from the Columbia River Basin. Your position in that regard is much like ours. You want to preserve your water and we want to preserve ours.

Mr. FOLEY. And yet we are willing to support legislation which authorizes the National Water Commission to study alternative means of solving water problems of the United States specifically including interbasin transfers and that is written in Senator Jackson's bill and in mine.

Thank you.

Mr. JOHNSON. The gentleman from Kansas, Mr. Skubitz.

Mr. SKUBITZ. I have no questions.

Mr. JOHNSON. The gentleman from West Virginia, Mr. Kee.

Mr. KEE. No questions, Mr. Chairman.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Governor and Senator Hansen, I welcome you both here, too. I must confess that I cannot really understand your urging that concurrently with the authorization of the central Arizona project that we authorize augmentation before there is any reconnaissance study and before there is any feasibility study. I think really, that

you on careful thought, would have to agree that this would be indeed very, very poor business and really without any precedent that I know of in the Congress.

Perhaps you may or may not realize that most of us in the Northwest have gone on record here as supporting the central Arizona project. We also have gone on record, I think, to a man, in support of the legislation to create the National Water Commission, and as my colleague from the State of Washington has indicated, this specifically authorizes among other things, that the National Water Commission study the subject of interbasin transfers. So to this extent, we are making this offer of support on both pieces of legislation with the full realization that the studies ultimately could involve our own water and at a time when we are hastening in every way we can the studies of our own needs.

We have a very elaborate study underway which probably you are familiar with, all our States do, and the Federal Government also has a \$5 million study underway. We cannot say for certain what our water needs or requirements will be during the next hundred years and I would just like to point out to you that we are supporting both of these projects in full knowledge of the fact that interbasin transfers are among things to be considered by the National Water Commission.

I would just suggest to you that your position is pretty hard compared to the other States. Thank you, gentlemen.

Mr. JOHNSON. The gentleman from Washington, Mr. Meeds.

Mr. MEEDS. Thank you, Mr. Chairman.

Governor and Senator, I welcome you here and want to compliment you on the vigor with which you defend your position.

I, too, am somewhat alarmed, however, that your position is rather provincial and feel that in your efforts to make sure that you are protected, you may be jeopardizing what ultimately can be a great benefit not only to you but to some of your sister States. And I would like to suggest that this entire problem of water resources is something that is going to have to be studied on a long-range basis and as an entire nation, perhaps with special interests or special emphasis in the western areas where the water is needed worse.

But by the same token, water has to come from someplace, and so the problems of those areas have to be studied, too. And we just urge you hopefully to take a longer range look at this thing and see if you could not give it some support.

Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. Thank you, Mr. Chairman.

Governor, I guess we are all a little concerned about this. In summary, may I say that your concern stems primarily from the fact, one, you see many diversion projects either built or pending on the river now; and that further you do not trust the courts in the future.

Governor HATHAWAY. That is about it, sir.

Mr. REINECKE. That pretty well sums it up. I do not think that is the case. As Mr. Hosmer pointed out, California has indicated willingness to drop back to 4.4 and all we were talking about was within that 4.4.

One other thing. With regard to the 4.4 you indicate there should be a limitation of 30 years on the 4.4 guarantee if it is granted at all.

Do you feel that after that time there should be no guarantee or throw the whole thing open to where California might get more than 4.4?

Governor HATHAWAY. We think that the 30 years would allow time to solve some of these importation problems.

Mr. REINECKE. What if they are not solved and then California comes back on the river without restrictions or guarantees and we have prior diversion and prior rights. We are then apt to be in a position to take more than 4.4, and I am speaking of California now.

Governor HATHAWAY. That is possible, although the compact apportionments would still govern after the priority had expired.

Mr. REINECKE. So that your position has a degree of risk in it as well, if I might say so.

One further question here. Regarding the statement on page 3 you mentioned, talking about the Mexican Treaty burden; have you had any apprehension in this regard, that if the Mexican Treaty burden does become a national obligation that this would remove it from the obligations under the compact?

Governor HATHAWAY. I would prefer to have Mr. Bishop answer that question, because I am not again very familiar with the Mexican Treaty.

Mr. BISHOP. Congressman, I am not really sure I understand the question.

Mr. REINECKE. Well, taking both the compact and treaty together, if the obligation, financial obligation becomes national, are you afraid that perhaps this will override the compact to the effect that more of that water might have to be drawn from the upper basin for prior uses and rights in the lower basin?

Mr. BISHOP. I am sorry. I did not hear part of that.

Mr. REINECKE. I am just asking, if the Mexican Treaty burden becomes a national financial obligation, that it may in turn reflect a greater water obligation in the upper basin than exists at the present time?

Mr. BISHOP. I would not contemplate that possibility. I do not see why it should be involved.

Mr. REINECKE. I do not see why a lot of these positions should be involved either.

Mr. BISHOP. We feel that the solution of the Mexican Treaty burden, if we can import enough water to solve that problem, that it will resolve many of the problems on the river today. We think this is really important to get away from the possibility of future litigation between the upper and lower basins.

Mr. REINECKE. If the importation does not become a reality I am wondering if you are thinking that this would then throw the water obligation over and above the restrictions of the compact that may reflect harder on the upper basin because there will be less diversion up there than below.

Mr. BISHOP. I do not see why that would have any effect on the compact provision. I think the compact requirements would govern.

Mr. REINECKE. No further questions, Mr. Chairman.

Mr. JOHNSON. The gentleman from Texas, Mr. Kazen.

Mr. KAZEN. Thank you, Mr. Chairman.

Governor, my understanding is that you are not using all the water that you are entitled to under the compact now.

Governor HATHAWAY. That is correct, sir.

Mr. KAZEN. And your fear is that somewhere down the line this water that is passing you by is going to be put to prior beneficial use and then comes a day when you need that water and you will not be able to claim it because of this prior beneficial use that has been placed down below. Is this your position?

Governor HATHAWAY. That is essentially it. Wyoming is a young State. We are just starting to develop industrially. We have many more acres of land to put under irrigational use. We have had some unfortunate experiences in the past in losing water. We are on the Continental Divide. We generate a lot of this water. We have lost water through the North Platte River that should have been preserved a long time ago. We do not want it to happen again.

Mr. KAZEN. Let me ask you this question. How long do you anticipate that it will be before you do use all of the water?

Governor HATHAWAY. Well——

Mr. KAZEN. How many years?

Governor HATHAWAY. That is speculation but if we could divert part of this water into the North Platte Basin, I would say we could do it within 20 years.

Mr. KAZEN. Use all of it?

Governor HATHAWAY. All of it.

Mr. KAZEN. Thank you. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from New York, Mr. Kupferman.

Mr. KUPFERMAN. Governor, a good deal of the water involved winds up in swimming pools in California and Arizona. Could you tell me the swimming pool situation in Wyoming?

Governor HATHAWAY. Pardon? It is a little cold for swimming there most of the time.

Mr. KUPFERMAN. I will pass.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Thank you, Mr. Chairman.

Gentlemen, does Wyoming have a water shortage at this time?

Governor HATHAWAY. In some areas, yes.

Mr. STEIGER. In some areas, yes.

Governor HATHAWAY. The shortage—many rivers are over appropriated. The North Platte, for instance. We could use more water in this basin very easily. I understand the State of Utah wants to transfer water into another river basin.

Mr. STEIGER. Your water shortage is then intrastate streams rather than as a result of any interstate stream—any compact agreement, is that correct; an internal problem?

Governor HATHAWAY. The North Platte River was decided by court decree and we are pretty low on this stream.

Mr. STEIGER. In other words, you have a shortage which exists now which could not be solved by an intrastate exchange?

Governor HATHAWAY. It could be solved by transmountain diversion.

Mr. STEIGER. It could. Are you overdrawing on your water resources at this time?

Governor HATHAWAY. In some areas of the State, yes; in others, no.

Mr. STEIGER. Is the net utilization of your water—I am talking about both surface water and subsurface water—is the net balance an overdraft or surplus?

Governor HATHAWAY. I would have to say as of now, it is a surplus.

Mr. STEIGER. Do you know of any lands that are being taken out of production because of, specifically because of a water shortage at this time?

Governor HATHAWAY. Yes.

Mr. STEIGER. There are lands that are, that prior to this time have been in production and are now out of production because of water shortage?

Governor HATHAWAY. In the eastern part of the State under the North Platte Basin project; yes, sir.

Mr. STEIGER. Apparently, then, your water-short area is limited to one area, the North Platte region; is that correct?

Governor HATHAWAY. No. There are other areas. I think of this one particularly but there are areas on—where we have small streams, where there is a shortage of water. Frankly, we are not getting as much moisture in Wyoming as we used to. Our average rainfall is about 12 inches and a lot of these streams are not generating as much water as they did 10 or 15 years ago. We do not have as much snow-fall as we did 10 years ago. I do not know why but it is a fact.

Mr. STEIGER. Maybe it is retribution for a selfish attitude. [Laughter.]

Governor HATHAWAY. Somebody else is going to suffer if it is.

Mr. ASPINALL. If the gentleman from Arizona would yield to me, I would have to say that I think that comes from a rather poor source. [Laughter.]

Mr. STEIGER. Appropriate, Mr. Chairman.

Governor and Senator Hansen, I want you to know that I am sure Congressman Udall and I both recognize your concern over a potentially serious water-shortage condition. I am sure you realize that the answer for our State is—all three of my questions to you—is yes, sir; we are now undergoing a net water shortage, we are now over-drawing our water balance. We have many lands going out of production because of water shortage.

I would not want to see any other State be placed in our position. You could use us as an example of what can happen to a State that is overdrawing.

On the other hand, to deny us the right to solve our problem based on what has to be supposition on your part does seem to me—and I admit I am not objective about it—but it does seem to me to be a particularly parochial attitude and one that is not going to solve any problem, including your own. If we are not able to exert pressure for augmentation as a result of being able to utilize these waters, this is going to be one less voice that is going to be crying for augmentation.

Everybody recognizes the shortages and potential shortages on the river can only be solved by a joint effort and I must say I do not feel at this point you are participating in this joint effort.

Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Colorado, chairman of the full committee, Mr. Aspinall.

Mr. ASPINALL. Mr. Chairman, I am glad to have our colleague, the junior Senator from Wyoming, and the new Governor of Wyoming with us. I hope that before we get through with all of the troubles and controversies that we have in this matter that we will be able to come out with some kind of a working statute that will benefit all of us.

I might say that no one is more desirous than I am of seeing that each State in the entire Colorado River Basin—that is in the lower basin as well as in the upper basin—has an opportunity to put its share of its entitlement to Colorado River water to use as soon as possible. That not only includes Colorado, but all of the other States and certainly the State of Wyoming, which produces far more water for this watershed than it can—under the compact and the law of the river—ever be expected to use.

I think what has bothered so many of us, under existing circumstances, is that you are thinking in terms of development. The way that all of our basic law has been written, that has to do with the development of the West as well as the development of the Colorado River Basin itself, we are dependent upon two different factors. We could not put a drop of this water to use in the upper basin and I doubt if the States in the lower basin, other than California, could if it were not for the financial help that we get from the Federal Government. We have to realize that. That is a fact of life. We must have help from the Federal Government, otherwise we could not put this water to use.

The gentlemen from Arizona would argue with me a little about what their Arizona Power Authority can do if something is not done, but that is neither here nor there. The desire to have Federal participation—Federal money which carries with it supervision—calls for this kind of legislation. Being bound by the law that we now have, which has to do with the division of the water as well as the division of the basin fund in the upper basin, we must always keep in mind that we cannot authorize a project under the policy of Congress at the present time, which I hope will not change, unless that project can pay out within a 50-year period. This is absolutely necessary.

Now, the position that Wyoming finds itself in at the present time, and the position that the State of Utah finds itself in at the present time, is that they cannot have any additional projects authorized, other than those which are presently authorized, until it is possible to see that there is going to be a sufficient amount of money from the basin fund to pay off that part that the users cannot pay within the 50-year period after the development period is allowed and after construction is finished. Is that right, Governor?

Governor HATHAWAY. That is right, sir.

Mr. ASPINALL. Is that right, Senator?

Senator HANSEN. Yes.

Mr. ASPINALL. Of course, that is what is holding up some of these projects in these two States. Now, it so happens that our sister State, New Mexico, has been able, with the work that it has done and within

its entitlement—not only of water but also of moneys from the basin fund—to practically use all of its share of water from the upper basin by its present development as far as presently anticipated flows are concerned. Will you agree with that?

Governor HATHAWAY. I believe that is right. New Mexico is close to that point.

Mr. ASPINALL. And is it not also true, when you consider La Barge and Seedskadee and Lyman and Wyoming's share of the Savery-Pot Hook, that Wyoming has used its share of revenues in the basin account for the next 50 years or more, as far as that is concerned, because the construction period has not yet taken place. Wyoming cannot look, under the present situation, for any additional authorizations for construction, or lease for construction, for a few years hence. Is that not true?

Governor HATHAWAY. I cannot answer that, sir; I do not know.

Mr. ASPINALL. Well, if somebody wants to argue with me, I would like to hear it, because I spent about 3 years trying to get Colorado into the position that we would share in our revenues with the State of Wyoming on the Savery-Pot Hook so that we could go ahead and authorize the Savery-Pot Hook for construction. I think if you examine this you will find that you are not in position—if you have Lyman and La Barge, which are presently authorized, and Seedskadee which is under construction, and Savery-Pot Hook which is authorized and ready for construction—to use your share of the revenues which are accumulating and which can be changed at any time, if you wish to go out from under one or the other of your projects like Colorado went out from under the Pine River.

Now, Senator, I know you want to talk. You want to answer. I am leading up, of course, to your opposition to this legislation without a study or without the fact of importation being written into the bill. What I am trying to show is that, if we provide for the National Water Commission or if we provide for a study which is to be completed within 15 years, then we will know where we are. Sometime after that will be the first opportunity that we can expect to have any opportunity to consider authorizing projects for Wyoming. Now, Senator?

Senator HANSEN. Well, with what you have added, Mr. Aspinall, I do not have too much more to say. I could observe that there are a number of projects in Wyoming, in other parts of the State, as you know, of course, that are built not primarily for the benefit of Wyoming but for other States, because we are right on the backbone of the Continental Divide. Water flows both north, south, east, and west. We contribute 5 million acre-feet to the Columbia.

Mr. ASPINALL. You cannot go east with your water without Federal participation, because you are like Colorado—you are not in a position to take care of a transmountain diversion unless it is authorized as a part of a national operation.

Now, nobody is trying harder than I am to write the legislative history that the fine State of Arizona will have to depend upon the upper basin's water for at least 30 or 40 years in order to make its project feasible. Nobody is trying harder than I am to write the record that

we have the right to the return of our share of the water, whatever it may be, at the time we can use it.

With that in mind, could you folks in Wyoming retract just a little bit from this hard position that you take—it is not quite as hard, may I say, in your statements today as it has been heretofore—to say that we will provide for the study and that we will then trust, because we have to trust the future, that the Congress of the United States will see to it that we, in the upper basin, are permitted to go ahead and develop our own projects as the States desire in the priority to be given them.

Senator HANSEN. If I could respond to that, sir, let me say this. We, too, appreciate the value of legislative history. That is precisely one of the reasons we are here today, so that everyone might understand, including our friends from California and from Arizona, how deeply concerned we are about this situation.

If I could refer just a moment to what the gentleman from California said, I gathered that he spoke about California's support of the central Arizona project as a magnanimous act. As a matter of fact, the court said—it was no one else but the courts that said you will not be able to use over 4.4 million acre-feet of water as I understand it. So were I in the position that California is now in, I certainly would do everything I could to encourage the support of all of the States because California has been using water that was not allocated to it and if you contemplate the full development of all of these State needs, then California would be without that water and in that position, it makes good sense to me that California should take the position it has.

Mr. HOSMER. Will the gentleman yield?

Mr. ASPINALL. Just a minute. But really, that is a matter between the lower basin States as far as we are concerned.

Senator HANSEN. I agree with you.

Mr. ASPINALL. So we will have to trust that they can get in on that one.

Now, you state your opposition to three of Colorado's projects. Under the compact, Colorado is entitled to 51.25 percent of the water that is apportioned to the upper basin and, under Colorado River Storage Act, Colorado is also entitled to 46 percent of the funds from the basin fund.

Now, have your folks made a sufficient study so that you can come before this committee and tell us that if Colorado gets the authorization for the five projects that are included in this legislation, the State of Colorado is not within its 51.25 percent entitlement or that it is not within its 46 percent which will be used to permit it to pay out within the 50-year period after the development period or after construction is finished, whichever it may be?

Senator HANSEN. Certainly everyone recognizes that there is no more eminent authority on waters of the West than you, sir, and I do not presume at all to say I have even part of your knowledge but I would make this one observation, and that is when we think of the 51.25 percent of the water in the upper basin being allocated to Colorado, our only concern is this: Are we talking about seven and a half

million acre-feet or are we talking about the proportion of seven and a half million acre-feet that 13.6 bears to 15 million acre-feet?

Now, if we are talking about that—a scaled-down percentage—then we certainly have no argument with Colorado nor with Arizona nor with any other State.

Mr. ASPINALL. Of course, I prefaced by question and by statement upon the latter. It is 51.25 percent of whatever water we are entitled to.

Senator HANSEN. If it is the 13.6 I have no argument, sir.

Mr. ASPINALL. I would pray that we might get a storm sometime in the next 2 or 3 weeks like California just recently got, where 5 feet of snow was dumped on the Cascades and the Sierras. That would take care of us for a few months and we might be able to look for something better in the future, but we have to accept this situation as it is.

I am advised that, under the present water situation—that is 13 million plus whatever it may be—keeping in mind whatever our entitlement and whatever our burden of the Mexican Treaty is, we can come in with the authorization of these five projects. Keep in mind, also, that two or three of these projects will not be constructed for several years, because they depend upon the use of municipal water to a great extent—at least two of them do. So what the upper basin is trying to do—you folks and the other three States—I hope, is to write the record so clearly that when we need the water that we can use and that we have a right to under our entitlement, that it will come back to us. My friend from Arizona, Mr. Udall, and my other Arizona friends, Mr. Steiger and Mr. Rhodes, have told me time and time again they are for this.

Senator HANSEN. Well, I share your hope. I agree with what you say. I hope that the all-forgiving Lord will let a little snow fall on the selfish people of Wyoming, as Congressman Steiger describes us, the selfish folks in our State, when he takes care of the good people in Arizona.

Mr. ASPINALL. With that I yield back my time.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. Mr. Chairman, I would just like to compliment the Senator and Governor both on excellent statements and under nearly 2 hours of questioning, I think they have held up very well. Obviously they have done their homework. Nice to have you here.

Senator HANSEN. Thank you.

Mr. JOHNSON. The gentleman from Idaho, Mr. Hansen.

Mr. HANSEN. I think the gentlemen have done an excellent job. I have not been here to hear all of your testimony, but I do want you to know that it is a pleasure to have my good neighbors from Wyoming here. I might add that I think that you, as the gentleman from Utah said, have held up well under a pretty constant stream of fire.

Mr. JOHNSON. Governor, Senator, I just want to say for at least one member from California, that we are exporting water now from the northern part of our State, or soon will be, to the arid area of southern

California, and before the project is over we will be delivering approximately 2 million acre-feet of water. That water is going to be fairly costly water, somewhere around \$50 to \$60 an acre-foot.

Now, there are other waters on the north coastal areas of California that are under study by our State people as well as from other areas of the United States. This, too, will be very costly water. So, I think that studies do have to be made and certainly water for domestic use at \$50 or \$60 or even \$75 is not too bad. We have some of that now.

But I think that while northern California still does have surplus waters, if all our waters are properly conserved for distribution, they will be costly and studies are going to take some time.

Now, we were blessed just this last weekend out there with a storm that deposited snow from the 1,800-foot level up to the top and range from 5 inches to 5 feet in depth. So, our water supply in northern California this year is going to be very good. Our lakes will be full and we are dumping water now preparing for the spring runoff. So, there is water available, I presume, for the further distribution in our State and our State is growing so fast that we are interested in the same thing you are, augmentation of the Colorado, because we know we are going to have to use that Colorado water that we are entitled to. That is our interest in this Colorado bill. For the most part, it is to protect our uses in the amounts of water that we are now using from the Colorado.

I think you gentlemen did a very fine job here this morning, Governor and Senator, and I want to commend both of you for fielding the questions here and stating your position.

Governor HATHAWAY. Thank you.

Senator HANSEN. Thank you, Mr. Chairman.

(Subsequent to completion of the hearing the following additional information was furnished the committee.)

STATE OF WYOMING,
Cheyenne, March 24, 1967.

SUBCOMMITTEE ON IRRIGATION AND RECLAMATION,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Longworth House Office Building, Washington, D.C.
(Attention: Hon. Harold T. Johnson, Chairman).

DEAR CHAIRMAN JOHNSON: In testimony before your Subcommittee on March 16, 1967, Governor Hathaway of Wyoming expressed concern over the proposed authorization of the San Miguel Project, West Divide Project, and Dallas Creek Project in Colorado. Our analysis of the available water supply indicates that Colorado may be in excess of her Compact apportionment of Colorado River water if these three projects are constructed. In an effort to provide your Subcommittee with the facts which are the basis for Wyoming's concern in this regard, we are submitting herewith a detailed analysis of the situation. The figures used in this analysis are taken from a letter dated March 11, 1966, from Mr. Ival Goslin, Executive Director of the Upper Colorado River Commission, to Mr. Floyd Bishop, Wyoming State Engineer. Appropriate modifications have been made in Mr. Goslin's figures to reflect changes suggested by Mr. Felix L. Sparks, Director of the Colorado Water Conservation Board, in a letter to Mr. Jay Bingham dated March 15, 1966. Copies of each of the above-mentioned letters are attached hereto and made a part hereof.

In view of the fact that the information which we are submitting herewith appears to be pertinent to the subject at hand, request is hereby made that all of this information be included in the hearing record.

The analysis referred to above follows:

	1,000 acre-feet
1. Present Colorado depletions :	
Yampa and Green Rivers.....	65
Hayden steamplant.....	4
White River.....	34
Gunnison River.....	407
Smith Fork project.....	6
Paonia project.....	19
Colorado River—Mainstream.....	451
Collbran project.....	7
Pueblo-Eagle River division.....	8
Colorado-Big Thompson project.....	200
Small ditches.....	1
Colorado Springs-Blue River.....	45
Denver-Blue River.....	15
Denver-Moffat Tunnel.....	65
Denver-Williams Fork.....	10
Busk-Ivanhoe Tunnel.....	5
Independence Pass Tunnel.....	36
Grand River ditch.....	20
San Juan and Dolores Rivers.....	289
Florida project.....	16
Total present depletions.....	1,786
2. Estimated depletions of Federal projects already authorized in Colorado :	
Savery-Pot Hook.....	26
Bostwick Park.....	4
Fruitland Mesa.....	28
Fryingpan-Arkansas.....	70
Ruedi Reservoir, municipal and industrial.....	6
Silt.....	6
Total depletions from presently authorized Federal projects.....	140
3. Probable future depletions :	
Hayden steamplant.....	12
Homestake Creek diversion.....	74
Pueblo-Eagle River.....	3
Denver-Blue River.....	
Denver-Moffat Tunnel.....	215
Denver-William Fork.....	
Denver-Eagle and Piney Rivers.....	
Englewood-Moffat Tunnel.....	10
Independence Pass Tunnel.....	14
Colorado Springs-Blue River.....	6
Municipal and Industrial from Green Mountain Reservoir.....	12
Total probable future depletions.....	346
4. Proposed authorizations by H.R. 3300 :	
Animas-LaPlata.....	106
Dolores.....	74
Dallas Creek.....	37
West Divide.....	76
San Miguel.....	85
Total depletions due to projects proposed to be authorized by H.R. 3300.....	378
5. Recapitulation of total Colorado depletions of Colorado River water :	
Present depletions.....	1,786
Depletions due to presently authorized federal projects.....	140
Probable future depletions.....	346
Depletions due to projects proposed to be authorized by H.R. 3300.....	378
Total Colorado depletions.....	2,650

The concurrence of Mr. Sparks to the foregoing figures as indicated in his letter of March 15, 1966, referred to previously, lends special credence to these figures. It should also be noted that for several of the federal projects involved, the depletions shown herein are less than those cited by the Chairman of the full Committee in testimony before the Subcommittee on March 17, 1967.

The engineering study of the water supply of the Colorado River prepared by Tipton & Kalmbach, Inc., was filed with your Committee at the time of the hearings pertaining to H.R. 4671 during the 89th Congress. This study was undertaken at the request of the Upper Colorado River Commission to determine on an independent and unbiased basis what the expected yield of the Colorado River system might be, based upon current technology.

While we do not concur in the theory that the Upper Basin is required to deliver an additional 750,000 acre-feet per year to defray a portion of the Mexican Treaty burden nor in the theory that the Upper Basin must deliver an average flow of $7\frac{1}{2}$ million acre-feet per year at Lee Ferry, as advocated by some, we do recognize that these are matters of differing opinion which will probably have to be litigated ultimately unless they are settled in some other manner acceptable to both the Upper and Lower Divisions. Until such a settlement is definite, there appears to be no prudent course to follow in evaluating obligations on the available water supply except to assume that the Upper Division may have to deliver three-fourths of a million acre-feet of water per year in satisfaction of the Mexican Treaty burden, in addition to an average of $7\frac{1}{2}$ million acre-feet per year under Article III (d) of the 1922 Compact.

The Tipton & Kalmbach study concludes that if it is assumed that all reservoirs authorized by the Upper Colorado River Storage Project are constructed and operating with a combined capacity of 29 million acre-feet, and if the delivery made at Lee Ferry amounts to 8.25 million acre-feet per year, for satisfaction of the Compact and the Mexican Treaty burden, then the limit of the depletions in the states of the Upper Division would be 5.6 million acre-feet per year including reservoir evaporation, or an available 4.7 million acre-feet per annum after reservoir evaporation losses. (See page 21 of Part I, Text, Tipton & Kalmbach Report of July, 1965.)

Under the Compact, Colorado's share of the Upper Basin apportionment amounts to 51.75% of the total amount which is available to the Upper Basin, or 2.43 million acre-feet per year based upon the Tipton & Kalmbach study.

Comparing the estimates of total future Colorado depletions of the Colorado River, amounting to 2.85 million acre-feet per annum, with the figure of 2.43 million acre-feet per year to which Colorado is entitled under the Compact on the basis of the previously cited figures from the Tipton & Kalmbach Report, it can be seen that Colorado will be exceeding her apportionment by about 220,000 acre-feet per year. Deferral of the Dallas Creek Project, West Divide Project, and San Miguel Project would reduce this excess to about 22,000 acre-feet per year.

The key question involved here is whether or not the Upper Basin will be required to deliver water to fulfill the Mexican Treaty burden, and if so, how much. Emphasis should be placed on the fact that we do not agree that the Upper Basin has any obligation to deliver water to fulfill the Mexican Treaty burden, but until this question is resolved, it seems logical that we should assume that such a burden may ultimately be thrust upon us. If we could assume there was no obligation on the Upper Basin to deliver Mexican Treaty water, these three Colorado projects would probably not exceed Colorado's apportionment under the Compacts.

The realities of the yield of this river and the obligations which have been placed upon it cannot be ignored. The original negotiators of the Compact used what have proven to be incorrect figures in dividing the waters of the river. We simply cannot go on using incorrect figures in analyzing additional projects which place a burden on the river. We believe it is unrealistic to be talking about an available water supply to the Upper Basin of anything like 7,500,000 acre-feet per year. The Tipton & Kalmbach figures show nearly two million acre-feet less than this to be available on a long term average. We cannot be reconciled to the propriety of authorizing federal projects in excess of the water supply available to fulfill apportionments made under the Colorado River Compacts. The foregoing analysis shows clearly the reasons for our concern over authorization of the three Colorado projects mentioned.

We appreciate the opportunity of presenting this additional information to the Subcommittee.

Respectfully submitted.

FLOYD A. BISHOP, *State Engineer.*

COLORADO WATER CONSERVATION BOARD.
Denver, Colo., March 15, 1966.

Mr. JAY R. BINGHAM,
*Director, Utah Power & Water Board,
 425 State Capitol, Salt Lake City, Utah.*

DEAR JAY: I have not been able to find the memorandum which you said you addressed to me after the Cheyenne meeting. However, we recently received a copy of a water supply study from the Upper Colorado River Commission which is directed to Floyd Bishop. It may be that that memorandum will answer your purposes.

I think we are at substantial concurrence with the Colorado portion of the Upper Colorado River Commission memorandum with three exceptions. In paragraph 2 with the heading "Authorized Federal Projects" the memorandum shows 40,000 acre-feet of water from Ruedi Reservoir for municipal and industrial purposes. The only information we have at this time is that 6,000 acre-feet has been allocated for M & I purposes. I have no idea where the figure 40,000 acre-feet came from. Under paragraph 3 entitled "Probable Future Depletions" we take exception to the inclusion of the item of 40,000 acre-feet for the Four Counties water project. Such a project is not now in existence or under construction and we have some doubt that it ever will be. It occupies a last priority under our depletion tables and should be omitted from the Upper Colorado River Commission memorandum. Under paragraph 4 entitled "Proposed Authorization—H.R. 4671" the depletion for the Dolores Project is shown at 87,000 feet. We do not agree with this depletion figure as we believe the Bureau made some error in their studies. The depletion figure which we are using for that project is 74,000 acre-feet.

If there is further information I can furnish, please advise.

Sincerely,

FELIX L. SPARKS, *Director.*

UPPER COLORADO RIVER COMMISSION,
Salt Lake City, Utah, March 11, 1966.

Mr. FLOYD A. BISHOP,
*State Engineer,
 State Capitol Building,
 Cheyenne, Wyo.*

DEAR FLOYD: In your letter of February 24, 1966, you requested a determination for each of the Upper Division States of the following items:

1. Quantities of water currently being used.
2. Quantities of water which will be used under projects which are currently authorized.
3. Any other commitments of water use for the future.
4. Quantities of water which would be used under projects proposed to be authorized in H.R. 4671.

We have compiled the attached tables in response to your request. The sources of the various figures are indicated.

In order to make the figures more meaningful the following explanation is offered:

1. There is some degree of opinion involved in the compilations. For instance, you will note that we purposely avoided using the term "committed uses" because that term is often interpreted as having an element of legality and finality from which there is little possibility of deviation. Instead, we have used the term "probable future depletions." This term is to be construed as meaning that at this time in our opinion the projects or uses itemized under it are the most likely ones to occur out of a universe of probabilities. If there were sufficient water many more projects and water uses could and would be materialized, some of which are even now being contemplated and studied, and some of which may not even be presently named.

2. Although we have attempted to list the most probable future depletions, we must admit that some of those on our list are a considerable time in the future either because (a) they will not be needed for an indefinite period, or (b) financial and economic conditions may preclude their development, or (c) changes of use of water (such as, change from agriculture to municipal and industrial, etc.) may be made to fulfill some of the depletions that we have listed as "probable future," or (d) other uses may develop ahead of those listed.

3. In our figures we have not included a factor for "salvage" of water by use. A "salvage" factor averaging about 4% of the uses, as found in the 1948 Final Report of the Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, would increase the computed compact allotment to each State, except Arizona, of Table II of the Summary. We have not used a "salvage" factor because many of the depletion figures themselves may not be within the limits of the above percentages (witness the changes in estimated depletions on the same project from one report to another of the USBR), and because there is no real agreement with regard to the amount of water salvaged by use.

4. A copy of this letter with the attached tables is being transmitted to each of the parties to whom you sent a copy of your letter of February 24th. We hope that you and each party will examine the tables closely and let us have the benefit of any of your criticisms, suggestions, or comments.

Sincerely yours,

IVAL V. GOSLIN, *Executive Director.*

Mr. JOHNSON. I have a statement here from the senior Senator from the State of Wyoming that I would ask permission to have placed in the record at this point. Hearing no objection, so will be the order.

(Senator McGee's statement follows:)

STATEMENT OF HON. GALE MCGEE, A U.S. SENATOR FROM THE STATE OF WYOMING

Mr. Chairman and members of the Committee, I want to express my appreciation for the opportunity to present my views on the legislation now pending before this Committee to authorize construction of the Central Arizona Project. This is legislation which has been pending in Congress in one form or another for quite some time. During all of this time it has been the subject of extreme concern in my own State of Wyoming, and it certainly remains so today.

Wyoming is a state that has benefited greatly by reclamation projects and reclamation activity down through the years. Water which has been stored in reclamation dams has allowed irrigation that has converted comparatively unproductive rangelands to rich and productive agricultural lands. Power generated at reclamation facilities provides the badly needed electricity for our municipalities and industry. The surface of the great reclamation reservoirs provides recreational opportunities for not only our Wyoming people, but also for our visitors from throughout the country and the world. I point out these facts to indicate that we in Wyoming, perhaps as much or more than any other people in the United States, realize and appreciate the need for worthwhile and meritorious reclamation projects. We have gained much from them and can certainly understand why other states desire to develop additional projects and to more fully develop existing projects.

With this background it is with some reluctance that I feel constrained to appear in strong opposition to any and all of the bills I have seen to date to authorize the Central Arizona Project. During the time which I have served in the United States Senate, it has been my pleasure and privilege to have had the opportunity to support many reclamation projects in all of the reclamation states. In the Central Arizona legislation, however, I can see definite threats to the future development of the State of Wyoming and in the interests of protecting my State, I must oppose these bills and this project.

It is generally conceded, I believe, that if the Central Arizona Project were authorized and constructed today, it would require for that operation the use of water supplies which are allocated to Wyoming and other Upper Basin states by interstate compacts. At the present time this water is not committed to beneficial use and to that extent is considered surplus to Wyoming's *present* needs; and here, I most emphatically point out the word "present," for indeed that situation might well change in the near future. It is the feeling of many people and a viewpoint which I share that once this water, to which Wyoming is legally entitled, is put to beneficial use in the operation of a billion dollar reclamation facility somewhere downstream, it might prove to be a most difficult, if not impossible, task for the State of Wyoming to regain this water or its use for the benefit of our State or our people.

In taking this position I am not unmindful of the efforts of the sponsors of the legislation to provide some degree of protection to the Upper Basin states by

including specific language that the bill would not prejudice or reduce the water apportioned to those states by interstate compact. Regardless of this language, I fear that as a practical matter the construction and operation of this project might well jeopardize and threaten the beneficial use of water legally apportioned to Wyoming at some time in the future. This is particularly a threat in Wyoming since we do not have projects authorized at the present time which would put this present water entitlement to beneficial use. To obtain these additional authorizations after passage of a bill such as the ones to authorize the Central Arizona Project might prove to be most difficult. For example, I can foresee the reluctance of the Congress to authorize a project in Wyoming if the water which would be necessary to operate that project was already being put to beneficial use in a downstream project and if the withdrawal of that water from that latter project might jeopardize a billion dollar Federal investment.

I am confident that the authors of these bills made every possible effort to see that the legal rights of Wyoming and the other Upper Basin states were protected in these bills. Those of us who are charged with the responsibility of protecting Wyoming's interest must look to the practicalities in addition to the legalities, and it is on this basis that I find these bills most unacceptable to me. The right to the use of the water will be of little practical value if indeed the water itself is gone. This is the situation we are trying to avoid.

At one time it was hoped that the matters which I have raised might be resolved through the importation of water from outside sources into the Colorado River drainage. It was proposed through this means that ample water could be obtained to satisfy the needs and entitlements of all of the states and at the same time allow operation of the Central Arizona Project. This, perhaps, would be an ideal solution if that outside source of water could be identified, located and confirmed. To date, however, this has not been done nor does there appear that there is any real likelihood that it will be done in the near future. Those states or areas with apparent surplus of water in sufficient quantities to make importation projects feasible are most reluctant to allow these surplus waters to be committed to exportation and use elsewhere. While all of us in the Colorado River system would certainly welcome the importation of water from almost any source, I can understand the extreme reluctance of those officials representing the states from which this water might be acquired in allowing this to happen. They, undoubtedly, remain jealous guardians of their water, and for this reason I cannot foresee any real possibility of obtaining any significant sources of additional water from the Basin states through this means. If and when this situation should change, however, it could significantly alter the entire picture. Unless or until the State of Wyoming receives some definite and meaningful assurances that adequate supplies of additional water through importation are available to the State, I find that I have no alternative but to oppose these bills.

Mr. Chairman, much has been said and written in reference to Wyoming's position on this legislation, and I am certain that this Committee will hear further from representatives and spokesmen from the State discussing the Wyoming point of view in opposition to this project. The Chairman of this full Committee, Mr. Aspinall, in hearings conducted on similar legislation during the last session of Congress paraphrased our position quite well when he stated in an exchange he had with H. T. Person at that time, "Wyoming's particular position is that Wyoming does not want somebody else to get the waters to which she is entitled under the Colorado River Compact and the Upper Colorado River Compact." Mr. Chairman, that in a nutshell is the basis of our opposition, and I submit to you that it is a most reasonable and valid basis on which we must oppose this legislation. It is not fair to the people of the State of Wyoming; it is not fair to the Federal Government; and indeed, it might not be fair to the people of Arizona and the other Lower Basin States involved if a project of this magnitude were to be authorized and constructed with the clear understanding that the water which is required for its operation would have to be acquired from sources and supplies legally committed to use by other States.

Again, Mr. Chairman, I want to thank you for the opportunity to make my views known to this Committee.

Mr. JOHNSON. The committee will now recess until 2 o'clock this afternoon when Senator Moss will present the Governor of Utah's statement.

(Whereupon, at 11:45 a.m., the hearing was recessed to reconvene at 2 p.m. this day.)

AFTERNOON SESSION

Mr. JOHNSON. The Committee on Irrigation and Reclamation will resume its hearing on the Colorado River bills and the National Water Commission.

I now recognize the gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Chairman, I would like to ask unanimous consent to introduce into the record at an appropriate place a statement of Mr. Brock Evans, Northwest representative of the Federation of Western Outdoor Clubs, with regard to legislation pending before the subcommittee at this time.

Mr. JOHNSON. You have heard the request of the gentleman from Washington. Is there objection? If not, the statement will be placed in the record.

(The document referred to follows:)

STATEMENT OF BROCK EVANS, NORTHWEST REPRESENTATIVE, FEDERATION OF WESTERN OUTDOOR CLUBS

My name is Brock Evans. I am the Northwest Representative of the Federation of Western Outdoor Clubs. What I will deal with here are those features of the legislation being considered by this committee which deal with the establishment of a National Water Commission and with the importation of water into the Colorado Basin from other areas.

Those conservation organizations which I represent in the Northwest support in general the concept of a National Water Commission composed of distinguished persons outside the government which would consider and investigate our water needs and problems on a nationwide scale, from the standpoint of the national interest, and report or recommend legislation to the President. Insofar as the subject of interbasin water transfers would be investigated and considered by such an impartial and nonpartisan body on a professional basis, we would have no objection. Such a study would presumably be only one of many conducted by the Commission in the course of its consideration of *all* the alternatives and varied uses of water available to the nation.

What we are concerned with here today and cannot support, however, are certain features of the legislation under consideration which, while commendably providing for the establishment of a National Water Commission, then go on and commit it too much in advance to a regionally partisan, importation-oriented point of view. In each of the four bills considered here (HB 9, 3300, 6822, and S. 861) there are specific provisions directing the National Water Commission to give highest priority to the preparation of plans and a program for the relief of water shortages in the Southwest. The mandate to the Commission does not stop there. In each of the bills there is a further section outlining in some detail the procedures for preparation and investigation of such a program which the Commission is directed to undertake. Each of the bills directs the Commission to investigate methods of supplying sufficient water to the Colorado Basin from other regions. Three of the bills contain provisions requiring the Commission to have completed reconnaissance reports within three years, proposing a first stage plan of development of projects for the Southwest, and deals with various aspects of preparation of water import works in some detail. The thrust of all of this, we believe, is not only to orient the Commission in advance to a regional, as distinguished from a national, outlook, but also to point it in advance in the direction of water imports from elsewhere into the Colorado. We believe that if what we are setting up here is a National Water Commission to consider the very weighty and difficult questions of water use, shortages, and quality which plague the whole nation, then such a Commission must not be committed in advance either to any particular section of the country nor to any particular solution to water problems. Rather than being directed to come up with detailed first stage plans for relieving the problems of one region within three years, possible at the expense of another, we believe that the Commission should be free initially to consider our water resource problems on the broadest possible basis. It should not be committed to a regional approach; it should not be burdened by the need to prepare detailed engineering plans before it has had an adequate opportunity to investigate the whole problem on a more theoretical

basis; and it should not be committed to a timetable of such a short duration. As we understand it, there will not be a water shortage in the Southwest for some 25 years, so there is no need to rush the Commission into any particular solutions before it has had an adequate chance to consider all the facts and alternatives. Let's let it conduct its own investigation in its own way; it will have a difficult enough job to do in any event without being precommitted to any particular approaches before it even gets started. Such a body with such an important function should not be frozen into a pattern of thinking by the act which gave it birth; the effects of what it does may be around with us for a long time to come.

What also concerns us is that the intent of this legislation seems to be so plainly directed at obtaining what are alleged to be surplus supplies of water in the Northwest and transferring them to the Southwest. If a normal marketing approach is used, "surplus" should be defined to include only those waters which will bring the nation a higher return from transfer than from uses in the Northwest. This is a most difficult problem which will have to be investigated by the Commission, along with others of a similar nature, such as whether it would be advisable to charge the users a unit fee for the water, the proceeds to go to the exporting states. The Commission needs time to consider such problems in depth, and should not have to incur engineering outlays from the very beginning which mold its thinking too soon.

At the very least, Congress should be fully aware of the impact of diversion on the Northwest if it chooses to go ahead and commit the Commission to such a regional, single-shot approach. Let us examine this now, for it is already possible to predict some of the effects of diversion on the future development and potential of the Northwest. As the Committee knows, the states of Washington and Oregon have begun or are planning studies of their water resources and water needs far into the future. Recently, the state of Washington completed a first stage analysis of its water supplies and the projected future demands upon them. This is a 4-volume study entitled "An Initial Study of the Water Resources of the State of Washington," published in February of 1967. Since it represents new material not available to the committee at last year's hearings, much of what follows will be drawn from it in an effort to give some indication of the future of the Northwest water resource from a Northwest standpoint.

First, a few basic facts about the state of Washington which are relevant to the use of its water resources: Despite the fact that Washington is the smallest of the 17 western states, it ranks 3rd in population after California and Texas, with about 3.2 million persons now, and one of the fastest rates of immigration in the country. The population is expected to be about 4 million in 1980, 6.5 million in 2020, and 15 million by 2065. The state is an urban, industrial state, with about 70% of its population living in urban areas. Future heavy concentrations of industry are expected in the near future; for example, employment at the Boeing Aircraft Company, the state's largest employer, now about 100,000, is expected to rise to 154,000 by 1980, and to 275,000 by 2020. However, despite its heavy urban concentrations, the state right now supports a substantial agriculture in proportion to its size. Presently, there are about 1.2 million acres under irrigation, which is expected to double to 2.4 million by 1980, and triple again by 2065 to 9 million acres.

With this background, it can be seen that already there are heavy demands made within the state for use of its water resources. The drain has been such that in periods of relatively low water, such as 1966, there has been publicly expressed concern on the part of officials of the Bonneville Power Administration that they might be unable to meet all their power commitments due to low water in the reservoirs late in the year. The state study projects that by 2065, there will be insufficient runoff in the state to meet all consumption demands, and shortages will have to be made up from elsewhere. Many users will have to turn to the Columbia River for their future supply, or ration the demand in some way. The question then becomes one of whether or not the Columbia itself will prove sufficient to meet the demand. On this, the report has the following comments:

"The depletion of the Columbia River by irrigation and domestic use has been projected to rise to 16.5 million acre feet per year by 1965. This depletion of the Columbia and Snake River flows for uses within Washington, when added to depletion by other Pacific Northwest states (which have not been determined at this time but may reach twice that of Washington) may cut the annual runoff in the Lower Columbia to less than half of its virgin flow during a moderate drought, with considerable loss of hydropower, an increased pollution concentration, and a rise in temperature with detrimental effects to the preservation

of fish and wildlife, recreational uses, salt water intrusion, and perhaps to navigation in the estuary."¹

What is important to remember here is that diversion, if it comes, would probably have to come from above the Dalles. There is probably too much salt water ebb and flow in the estuary below Portland, and it would be prohibitively expensive to transport water back over the Cascades. Now, if what was read from the report just now is any kind of accurate indication of what the local demand for Columbia River water will be in the next century, then we can see what sort of problems the Commission will have to face. Diversion must come from the Columbia; only this river has water in large enough volumes to be considered as a possible source of the 8.5 million acre feet mentioned in the legislation under consideration. But this river will experience increasing demands on its water from an expanding population and agriculture.

There has been much talk of the necessity of providing for the future potential water needs of the Southwest. We have heard many projections of an inevitable population growth there, which is the justification of the need to import water from other places; and much talk of a surplus of Northwest water flowing into the sea. There has been little talk, however, of the population growth of the Northwest, or of its own demands for its water. There has been little talk of what will probably be the necessity of robbing Peter to pay Paul, of depriving one area to aid another. That is what it seems will be the inevitable result if these water projects are constructed, notwithstanding statutory guarantees to the contrary. If the state projections are correct, and if, nevertheless, water diversion works are constructed, then ultimately it will be the Northwest which will be required to curtail its growth and deny its potential. This is something the Southwest apparently has been unwilling to consider.

What we would hope for from this legislation is a truly nationally-oriented water Commission which would be able to consider these problems and all the alternative methods of solving them. As presently drafted, the legislation we are considering seems to limit and restrict the thinking of the Commission and render it unable to perform its duties in the interest of the whole nation, not just one of its parts. We would urge therefore that this problem be seriously considered by the Committee before taking final action on these bills.

Mr. FOLEY. May I ask the chairman if I may introduce Mr. Evans to the committee? He is in the hearing room. Perhaps he would like to stand for a moment. Mr. Brock Evans, Northwest representative of the Western Outdoor Clubs of America.

Mr. JOHNSON. Glad to have you, Mr. Evans.

Mr. FOLEY. Off the record.

(Discussion off the record.)

Mr. JOHNSON. The gentleman from Arizona?

Mr. UDALL. The other day during the testimony of the Secretary of the Interior, Mr. Dominy had a colloquy with one of the members relating—and I think I participated in part—relating to the possibility of a tunnel from Lake Powell to central Arizona, rather than the aqueduct as planned. There is a constituent here from Arizona, by the name of F. C. Ramsing, who came at his own expense hoping to testify. He is a great advocate of the gravity tunnel project and while I don't agree with his conclusions, I think in fairness he ought to have the right to submit a statement for the record and I promised him that I would make this request. So I ask unanimous consent that the statement of Mr. Ramsing be printed in the record at this point.

Mr. JOHNSON. You heard the request of the gentleman from Arizona. Is there objection?

Hearing none, the statement will be placed in the record at the proper place.

(The statement of Mr. Ramsing follows:)

¹ "An Initial Study of the Water Resources of the State of Washington," Pullman, Washington, February 1967, Vol. I, part II, pp. 5-6.

COLORADO RIVER WATER TO CENTRAL ARIZONA

The present plan before Congress is known as the "Central Arizona Project" which proposes to pump Colorado River water from Lake Havasu to Central Arizona.

However, since the permits for power dams have been withdrawn, this project must use purchased power, and which must be paid for by the water users.

The "Gravity Tunnel Project" here proposed is an "alternate" to the "Pump Project" above and seems more permanent for thousands of years a service.

This "gravity project" proposes to:

- (1) gravitate cost-free water, except for amortization, from Glen Canyon in Northern Arizona to the Verde slope of Central Arizona via a tunnel.
- (2) from the latter, falling water will develop over 200,000 kilowatts of power to the Granite Reef area, above Phoenix.
- (3) this water, being free of cost, and the construction of the project being cheapest, and power sales pay a part, therefore the consumer may pay less than \$30.00 per acre-foot during amortization. Thereafter, the power in the backyard of Central Arizona can be used to develop new industries.

Obviously the "pump project" which requires 2,549 billion kilowatt-hours of purchased power, must add that charge to a higher project construction charge. The sum of these costs would be a hardship on the consumer. Then after amortization, the pumping charge would continue forever. Therefore this "pump project" is at a large disadvantage. See example on a separate sheet.

Another argument against the "pump project" is as follows: Arizona is a sovereign desert state, which must depend largely on entering water for the development of its consumer population and their supporting industries. Only 3 percent of its population lives below the 1,000 foot elevation while 75 percent (1,200,000) lives on the upper cooler edge of the lower torrid area and which contains the best sweet land. This area is Central Arizona and lies roughly between 1,000 and 2,500 feet in elevation. Its deep water table now approaches depletion. The question now is, since water is being destroyed in the Colorado River beyond expectation, why remove it from the tail end of power manufacture, a cheap consumer product? Is it not better to remove it from the head of the basin located in Arizona? Certainly Central Arizona's huge population being nearest to this water source can make the greatest beneficial use of it.

Secretary of Interior Udall withdrew the permits for further dams, forming power lakes, located in the most torrid and absorptive canyons of the Colorado River. For example, Lake Mead has lost about 2 million acre-feet of water per year since it was formed. The ratio of evaporation to absorption loss may be as high as 3 to 5. This estimate is supported as follows:

Evaporation.—The ratio of evaporation to precipitation at Davis Dam for a five year average is 39 to 1. The Lake Mead studies show evaporation to be 750,000 acre-feet per year.

Absorption is therefore 1,250,000 acre-feet per year. This is reasonable, since the lake lies over perhaps the most faulted area of the plateau; and it contacts slightly tilted sedimentary formations which soak water into their many bedding planes. The latter aquifer conducts water for many miles before it is largely evaporated.

This is the role of aquifers, such as the Dakota Sandstone in the Missouri Valley. Is this not the reason for the present deficient filling of Lake Powell in Glen Canyon.

Yes, the Secretary is right for conservation of this scarce and valuable resource. The tunnel diameter, if desired, can be increased by three feet to pass water for peak powerloads.

The cost of the Colorado aqueduct tunnel, length 480,980 feet (92 miles), was \$46.00 per foot, area 17.8 feet by 17.8 feet, for a total cost of \$22.5 million. This was made in hard granite and conglomerates. It also included timbering for 55 percent of the tunnel length (see Peele 1941). This tunnel penetrates the San Andreas Fault zone. The proposed tunnel is 160 miles long and a charge for removing rock work alone is \$157.00 per foot while as shown the reinforced concrete lining is additional.

No part of the tunnel is as deep as the Magma Mine, near Superior, Ariz.

The tunnel will intercept two or more cross faults. The ground movement in this area is epoch.

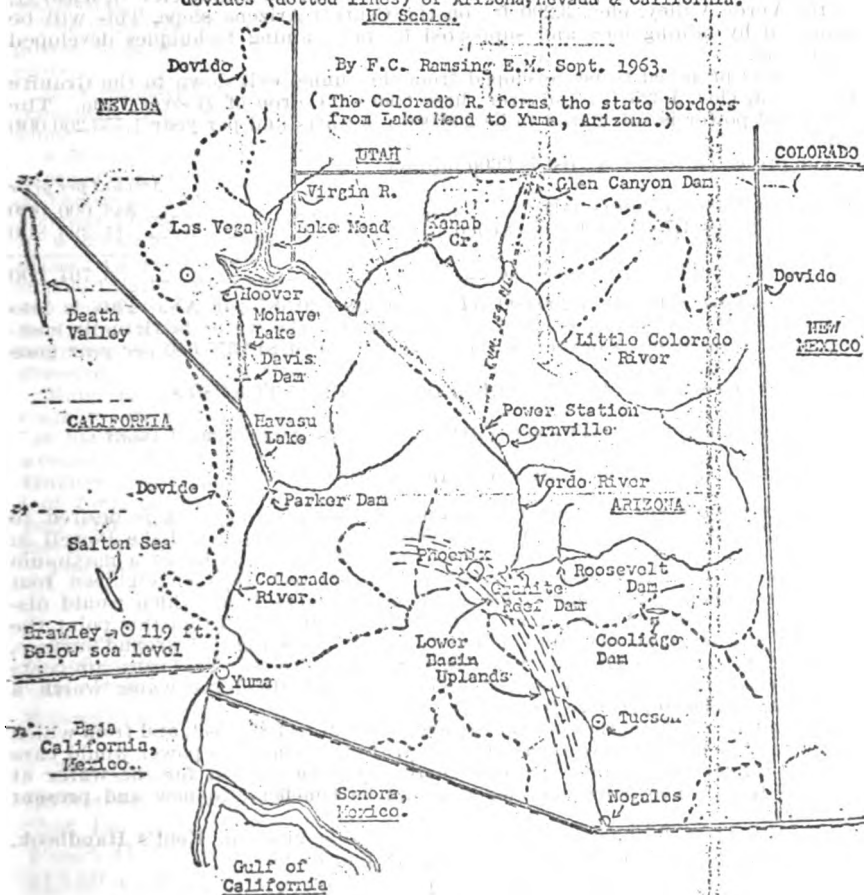
F. C. RAMSING, E.M.

LOWER COLORADO RIVER BASIN

By agreement, the Lower Basin is contained within its divides (dotted lines) of Arizona, Nevada & California.
No Scale.

By F.C. Ramsing E.M. Sept. 1963.

(The Colorado R. forms the state borders from Lake Mead to Yuma, Arizona.)



COLORADO RIVER WATER TO CENTRAL ARIZONA

(By F. C. Ramsing)

Pump water project—Lake Havasu, elev. 450 ft. to Granite Reef elev. 1,325 ft. The estimated power for pumping is 2,549 billion kilowatt hours. Market price for power is 6.5 mills per kwh. The total cost for this power is \$18,575,000.00 per year forever.

The pump project cost is said to be \$838 million. The interest plus sinking fund is 8% over a 50-year period.

	Amount per year
0.06 times \$838,000,000 equals.....	\$50,280,000
Add the power cost.....	18,575,000
Total cost.....	83,615,000

Divide above total by 1,200,000 AFY equals \$69.675 per AF. This is too much for anyone to pay, and there is no income.

Therefore a new approach is needed to get Colorado water.

* * * * *

Gravity water from Lake Powell, elev. 3,600 ft. when full, at the head of the Lower Basin in Arizona.

A gravity tunnel is proposed from Lake Powell, at an intake elev. of 3,640 ft. to the Verde Valley, elev. 3,200 ft., on the Central Arizona slope. This will be approved by mining men and supported by new mining techniques developed since 1946.

Power is proposed to be developed from the tunnel exit down to the Granite Reef area, elev. 1,325 ft., and over three times the drop of Hoover Dam. The developed power is calculated to be 200,000 kilowatts and per year 1,753,200,000 kWh.

The projected tentative cost is \$600 million.

	<i>Amount per year</i>
0.08 times \$600 million equals-----	\$48,000,000
6.5 mills times 1,753,000,000 is earned-----	11,395,800
Total paid by the consumer-----	36,704,200

Divide above total by 1,200,000 AFY equals \$30.587 per AF. This is less than one-half the pump cost, and when amortized the water is virtually costless at Granite Reef. Conversely the pumping cost of \$16.575,000 per year goes on continuously.

We must be either for the PEOPLE or the POWER INTERESTS.

GRAVITY WATER TUNNEL—LAKE POWELL TO THE VERDE VALLEY

(By F. C. Ramsing, E.M.)

This is a proposal that must be engineered for accuracy. It is desired to intake 1,200,000 acre feet per year (1.656 cfs) of water from Lake Powell in Arizona, and at the head of the Lower Colorado River Basin, at a maximum elevation of 3,700 feet and a minimum of 3,640 feet, into an eighteen foot diameter tunnel. The tunnel shall be about 160 miles long, which would discharge in the Verde Valley at an elevation of 3,200 feet. From this point the water would enter about eighty miles of conduit, placed on the ground surface, to conduct it to the Granite Reef or Orme Reservoirs. Enclosure prevents evaporation and seepage losses so severe at Lake Mead for water worth a maximum of \$50.00 per acre foot.

The water drop from the tunnel discharge is equal to 1,875 feet, and from which power may be developed to repay the two projects. Since the power would care for the tunnel and conduit sections, there would be no cost for the water at Granite Reef. The power developed would be beneficial to new and present industry.

The size of the tunnel is based on the formula given in Kent's Handbook, when Kutter's "n" is equal to 0.014. (Try 18 foot diam.)

$$\text{Water discharged} = (ac\sqrt{r}) \times (\sqrt{s})$$

Minimum slope is 2.75 ft. per mile, whence (\sqrt{s}) is 0.022822. From tables the discharge = $72.885 \times 0.022822 = 1.663$ cfs. This 18 foot water diameter therefore agrees very closely with the desired figure above.

Since the radius of the water tunnel is 9 feet, and it is desired to have a reinforced concrete lining of 1.0 foot thickness the rock cut must have a 10 foot radius and 20 foot diameter. $20 \times 20 \times 0.7854 = 314.16$ sq. ft. face area, and for a 1.0 foot advance it would have 314.16 cubic feet. Based on numerous data some of which are given below, I assume that a fair cost per cubic foot of rock removal will be 50 cts. for this tunnel. Each foot advance will then cost \$157.00. Then 160 miles or 845,000 feet will cost \$132,665,000.00 for strictly mining removal.

Reinforced concrete lining 1.0 foot wide and 1.0 foot advance is equal to 60 cubic feet or 2.22 cubic yards. The installed cost including steel and concrete materials etc. is assumed to be \$30.00 per yard or \$66.60 per foot advance. The entire 845,000 feet will cost \$56,277,000.00.

The cost of thirty shafts averaging 2,600 feet in depth is estimated to cost \$60,000,000.00. These include hoist, air for ventilation, rock pockets and a station.

A submerged penstock, top elevation 3,640 feet and gate valve connections to the tunnel in or at Lake Powell. The cost of this is estimated to be \$10,000,000.00.

Eighty miles of water conduit adapted to the surface terrain in the Verde Valley. Estimated cost is \$500,000.00 per mile. The total cost of this is \$40,000,000.00.

The total cost of the above items is \$298,942,000.00 which does not include the power plant, surveys, underground shovels, conveyor belts real estate and minor costs.

It is estimated in this preliminary investigation that the entire project complete will cost about \$600 million, a sum that Arizona may be able to handle alone.

Fifteen tunnels made prior to 1936 are listed in Peele's 1941 Handbook. The average cost of removing rock from these tunnels in addition to a certain amount of timbering was 36 cents per cubic foot. In this Verde Tunnel the reinforced concrete lining is separately charged for. The above tunnels pierced all types of rock, while the Verde tunnel will pierce mostly limestone, shales and sandstone. Of great interest was the Colorado Aqueduct the tunnels of which were driven mostly in granite and conglomerate for a distance of 93 miles (480,980 ft.) and horseshoe type face 17.8 x 17.8 feet. It passes through the San Andreas fault zone which is considered active. The cost per cubic foot of rock removal including a 55% timbering cost is 38.7 cents. Power drills were individually directed. Gang drills are now used by one man.

Many new improvements have been made since World War II. Tungsten Carbide bits with a hardness of 9.2 Mohs scale replaced bits that were less than 7.0 hardness. Rubberized conveyor belts are now sturdy, better shovels are available. Dry fine grained rock can be removed in air pipes if desired. The Hughes Tool Company has an improved boring machine which should be excellent for limerock. It recently bored the 21 foot tunnel at Aztec New Mexico, and which was laser directed. The new laser technique of rock disintegration has not yet been reported in detail, but it may hold possibilities.

The proposed tunnel diameter has been verified by Unwin's formula.

$$\text{Diam.} = 0.239 (1,656 \sqrt{s} \cdot 383 = 18.15 \text{ ft. when } \sqrt{s} = 0.22822$$

Power developed below the Verde tunnel exit. If the flow drop is 40 feet for the 80 miles to the Granite Reef area then the net drop of water is 1,835 feet. $Cfm = 99,360$. Based on an 80% power conversion efficiency, Kent gives this:

$$\begin{aligned} \text{Kilowatts of power} &= .001515 \times cfm \times H \times 0.748 \\ &= .001515 \times 99,360 \times 1,835 \times 0.748 = 206,500 \text{ kilowatts.} \end{aligned}$$

Mr. UDALL. Mr. Chairman, while I have the floor let me add that I do not subscribe to the conclusions in his report and to say specifically that he used tunneling costs, according to my experts, taken from Peel's Handbook of 1940, which gives costs of 1936 of excavation at \$13.50 a cubic yard whereas the most recent bids on San Juan Chama Tunnel ran \$34.25 a cubic yard. I would think this would make many of his conclusions inaccurate at this time.

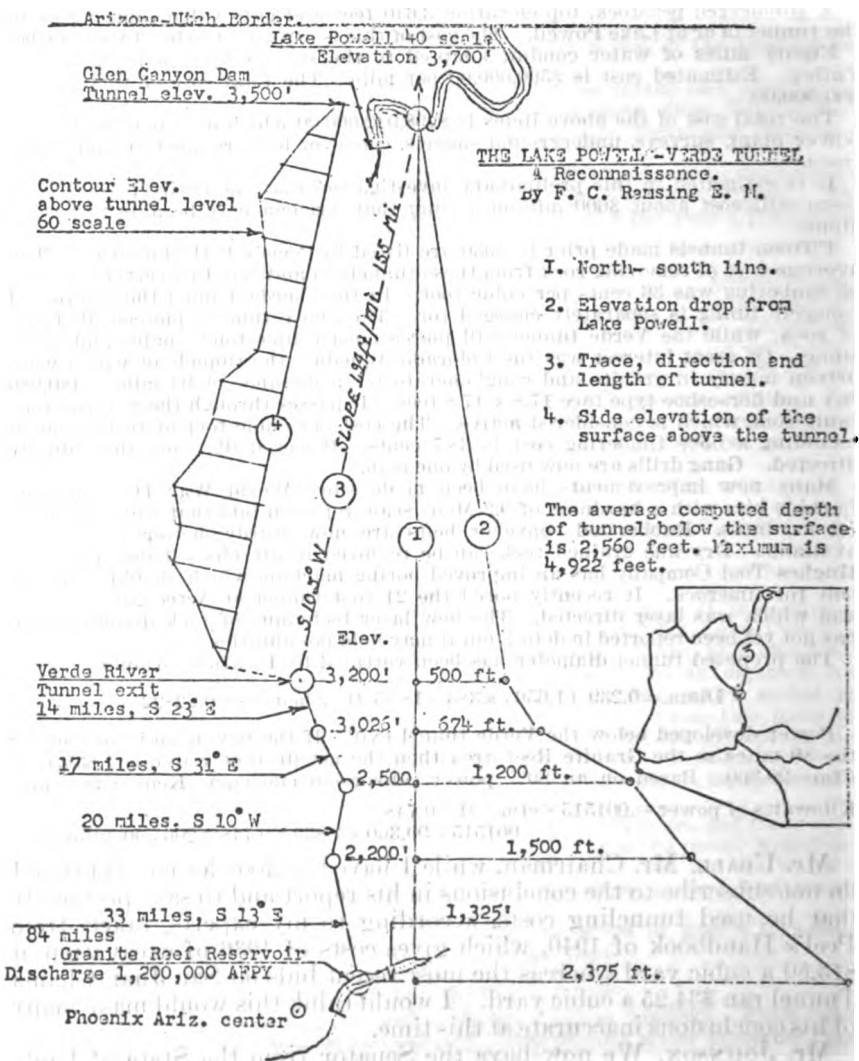
Mr. JOHNSON. We now have the Senator from the State of Utah, Senator Moss, who will give us the benefit of Gov. Calvin L. Rampion's statement representing the State of Utah.

Mr. SAYLOR. Mr. Chairman, before the gentleman begins to testify I would like the record to show that we do not have permission to sit.

Mr. JOHNSON. We realize we do not have permission to sit but in the absence of objections we will continue with Senator Moss and his statement of the Governor. Is there objection?

Mr. SAYLOR. I am not going to object.

Mr. JOHNSON. Hearing none, you may proceed.



STATEMENT OF HON. FRANK E. MOSS, A U.S. SENATOR FROM THE
STATE OF UTAH

Senator Moss. Thank you, Mr. Chairman, and members of the Irrigation and Reclamation Subcommittee. I appreciate your courtesy in permitting me to come and read the statement of the Governor of the State of Utah. He sends his regrets. It was impossible for him to be here personally and he has asked that I read his statement into the record.

He wanted me to do this to underline in part the great importance that he attaches to this hearing and matters being considered by this subcommittee. Therefore, I was anxious to come over and personally

do this, although I might have asked for permission simply to submit the statement, but with the permission of the subcommittee, I will read it now. This is Governor Rampton's statement.

**STATEMENT OF HON. CALVIN L. RAMPTON, GOVERNOR OF THE
STATE OF UTAH (PRESENTED BY SENATOR MOSS)**

Mr. RAMPTON. Since the last session of Congress there has been much discussion as well as several new proposals made with regard to the proposed central Arizona project. This has included, among other things, a modification of position by some of the States with regard to this problem. While I appreciate that the committee does not wish to receive any repetitious material on the proposed project, nevertheless I feel some repetition is necessary to make Utah's position on this matter clear.

The basic problem which has plagued this legislation has not changed since your last hearings, and that is simply that there is not sufficient natural flow in the Colorado River to meet the demands within the basin beyond the year 1990. As we view this matter it still involves balancing the interests of the State of Arizona to meet its critical water needs against the interests of the other States who have rights to the waters of the Colorado River.

It is the desire of the State of Utah to take a constructive approach with regard to this legislation and to support this project provided certain safeguards are in the authorizing legislation to protect Utah's entitlement from the Colorado River.

Since the fundamental problem here revolves around an uncertain water supply I would like to reiterate our belief that there should be a "legislative commitment" for a study of import of water from sources outside the Colorado River Basin. Utah can support this legislation only if there is such a commitment. As has been pointed out in prior testimony, the central Arizona project depends for its water supply, in part at least, upon the unused water from the upper basin States. We are fearful of being put in the position of permanently losing this supply and thereby losing our opportunity for further development. This is why we are so concerned about an import study.

In view of the imminent, critical water shortage in the Colorado, Utah would support any feasible means of augmenting the water supply. At the moment the most promising means of augmentation is the importation of water from areas of surplus. Consistent with the recommendations made by the Secretary of the Interior in the Southwest water plan, Utah believes that it is still logical to look to the north coastal streams of the State of California as the first stage of import. Initially, studies should be made of import from this source with the first 2½ million acre-feet of such import designated as satisfaction of the Mexican Treaty burden and losses in the lower basin above and beyond this amount. Imported water should be credited equally to the upper and lower basins.

Consistent with the previous legislation and the past position of the State of Utah, we recommend that the High Hualapai (Bridge Canyon) Dam be authorized by this legislation. The authorization of

this unit is in the national interest to provide revenues to the development fund as well as providing a sound economic approach for future imports. In this connection we will note that the recent proposal to provide pumping power for the central Arizona project from a thermal plant does not contribute to the regional solution of the pressing problem. This proposal is a suggested solution to the problems of but one State, neither does it provide any realistic accomplishment of import. For this reason the Congress should turn to the construction of High Hualapai Dam as the proper and best means of accomplishing water development for the State of Arizona and for the region.

Utah supports the principle that there should be language in the legislation which would provide equitable criteria for the coordinated long-range operation of Colorado River storage reservoirs. This provision is vital to the State of Utah in that it provides a legislative recognition of our rights under the Colorado River compact and the Colorado River Storage Project Act. Without a recognition of our compact rights on the Colorado River, Utah could not support any legislation to authorize the central Arizona project. These principles were set forth in H.R. 4671 of last session and agreed to by all of the States and the Secretary of the Interior. To our knowledge none of the States have rejected this concept and, therefore, we urge these principles again be incorporated in the pending legislation.

Concerning the proposed 4.4 million acre-foot priority to California, this is included in some of the pending bills and omitted from others. In the past Utah has viewed this as an Arizona-California problem. As we have interpreted this provision the grant of priority by Arizona in no way acts as an obligation against the upper basin States. It is strictly a waiver on the part of the State of Arizona. However, any language granting this priority should be unmistakably clear that it does not modify or repeal the benefits to the remaining States of the Boulder Canyon Project Act and the California Self-Limitation Act.

Utah still supports a provision in this legislation which would provide reimbursement in the Upper Colorado River Basin funds for expenditures which have been made to meet the deficiencies in power generation in Hoover Dam during the filling of the upper basin rivers.

It is Utah's position that the Dixie project should be integrated into the Colorado River Basin project and participate in any development fund that would be established by this legislation. We have noted that the fish and wildlife benefits provided to the Dixie project in the previous legislation has been omitted from H.R. 3300. Utah still takes the position, that all of the separable and joint costs allotted to recreation, fish, and wildlife enhancement at the Dixie project shall be non-reimbursable. H.R. 4671, last year's bill, contained the language, "that all of the separable and joint costs allocated to recreation and fish and wildlife enhancement at the Dixie project * * * shall be non-reimbursable." We suggest a return to this language inasmuch as it is consistent with the original authorizing legislation for the Dixie project and has been relied upon by local interests.

We still urge the priority of planning of certain upper basin projects. In this regard it is Utah's position that the Ute Indian unit be given a priority planning, such planning report on this unit to be com-

pleted by 1972. This will enable the Secretary of the Interior and the State of Utah to fulfill their contractual agreements with the Ute Indian Tribe of the Uinta and Ouray Indian Reservation.

The establishment of a National Water Commission is again a matter to be considered by this committee. There have been many arguments advanced for the creation of such a commission. I will not attempt to go into the individual merits or justifications for the Commission, but I would like to state that the creation of such a commission, National Water Commission, without a directive for it to focus its attention upon the Colorado River system would seem to be inconsistent with many of the arguments advanced for its creation. It would seem to be further justified that the Commission, in addition to being directed to make a study of this problem, should have a time limit within which to make a report of its findings.

That completes the statement of Governor Rampton.

Mr. JOHNSON. Thank you, Senator Moss, for giving us the benefit of the Governor's paper and the position of the State of Utah. I know how interested you are in the water matters, especially those dealing with the West, and looking to areas where there might be some surplus. I know you are very well versed on the subject of water and water law.

The gentleman from Arizona, Mr. Udall.

Mr. UDALL. Mr. Chairman, it is a pleasure to have the distinguished Senator from Utah here. He has been a great leader in the development of the West as well as in many other matters of importance to our country and I think no one in the Senate perhaps is more familiar with the problems in the Colorado River Basin States.

I remember testifying a couple of years ago on this same matter when he was chairing the hearings in the other body.

I have no questions for him at this time, but I do want to congratulate him on his as always constructive approach to our mutual problem.

Senator Moss. I thank you.

Mr. JOHNSON. The gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Mr. Chairman, I want in my questions of my good friend, Senator Moss, to show no animosity between the Senator and myself over the fact that we don't have permission to sit, but my questioning doesn't waive my right to have all of the testimony thrown out because we are violating the rules of the House.

I might say to the Chair I am sick and tired of hearing on one hand we have got to abide by the rules and immediately turn around and ignore a rule when it is to our convenience.

Mr. JOHNSON. The Chair would like to say this. At the time we recessed the gentleman from Pennsylvania was not here and it was decided to accommodate these people who have traveled here at their expense to testify in order of their listing on the witness list and we are trying to take the testimony of these people as well as the questioning of various Members of Congress as to their remarks. I am certain any one Member has a perfect right to raise a point of order which the rules provide for and the hearings will cease as far as the afternoon is concerned and we will start off tomorrow morning with Governor Love, of Colorado, and then we will take those who were left over today.

Mr. SAYLOR. I say to my colleague, that is not my point at all. I went to the leadership on the Republican side, saw to it that had a request been made, that there would have been no objection and the hearings could have proceeded in proper order. It is not up the Members on my side of the aisle to arrange to sit. It is up to the majority to see that we don't violate the rules of the House.

Mr. JOHNSON. Well, I might say that we are not violating the rules of the House. If you raise the objection, then the hearing will cease for the afternoon. Any Member has a right to raise a point of order. Until a point of order is raised, as I understand it, as long as there is representation by Members from both sides of the aisle on the committee, the committee can sit.

Mr. SAYLOR. I am very sorry to disagree with my subcommittee chairman on what the rules of the House are. I think I am a pretty good authority on what the rules of the House are. There are three committees permitted to sit while the House is in session and this isn't one of them.

Now, Senator, since you are here presenting the Governor he has propounded something which, if it doesn't shock you as a Senator from that State, it should because he wants you to have, in a bill covering the central Arizona project, a legislative commitment for the study of importation of water from sources outside the Colorado River Basin.

Now, if that same provision is put into every other piece of legislation, we aren't going to get many more projects out West, are we? You can't ask the Bureau of the Budget, you can't ask the Executive, you can't ask the Interior Department to tell you what to do when you don't know what you are even asking for. You are asking—your Governor and you are asking in this bill for a commitment from Congress that we do something that nobody knows where you are going to get the water from, how much it is going to cost, how you are going to import it, how much you are going to import, or what theory shall be applied to the costs of importation.

I am astounded that you didn't report this on the first page as a recommendation of the Governor and then say as the Senator, you would have nothing to do with it. I mean, that might have been the better part of valor.

Senator Moss. Well, if I may respond to that, I do support the Governor in asking for authorization of a study and I think a study is to accomplish the very thing that the gentleman indicated. We need a study to know in advance about where the water would come from and how much there would be, and how much it would cost. And that is the reason you have the study.

Mr. SAYLOR. Well, you know, this has been the approach some of us have taken in the past with regard to some of those projects in the upper basin. We were told that in asking for that kind of a study and factual presentation before there was any authorization that we were obstructionists and that we stood in the path of the development of the seven basin States.

I recall in particular a bill authorizing the upper Colorado River storage project and participating project. Some of us asked for independent studies to show whether or not the Bureau's report to us if

the amount of water in the Colorado River would ever fill Glen Canyon and the dam in back of it. And we were told that there wasn't any doubt about it. There was sufficient water. We were going to have lots of water in the Colorado and we were going to have Hoover Dam running over all the time. And of course, you know, we proceeded and built Glen Canyon and then you had to make arrangements with Hoover to try and placate it, steal water from it, that should have gone on down the river and you only have a handful of water up there now.

The Secretary sat in that chair the other day and said both reservoirs were about 25 percent filled and you haven't gotten up to the point where it begins to evaporate. But this kind of a study in the past was looked upon as heresy.

Now why do you want it? Just because it is Arizona? Is there one rule in the upper basin and another rule down in Arizona?

Senator Moss. Certainly not. I think the study should be authorized and certainly it is indicated because the Colorado River doesn't have flowing in it on an average enough water to meet all of the obligations that there are against the waters of the river. I think, therefore, it is perfectly clear that additional waters are going to have to be developed.

If we don't begin to study now and if we don't determine where additional waters may come from and secure some authorization to get additional water into the river, then we are going to come into a time of shortage when all of the obligations cannot be satisfied. We then have this difficult problem of how do we share deficiencies.

Mr. SAYLOR. Well, now, you come along here and say that 4.4 million acre-feet for California, that priority is only an Arizona-California problem. Now your Governor is on both sides of this thing. In the one case you say it is a river obligation and in the next place you say it is only between two States. Now, you can't have it both ways.

Senator Moss. No. As far as the upper basin is concerned, our water obligations stem from the Colorado River compact and we are required to let flow past Lee Ferry 75 million acre-feet every 10 years, plus an amount for the Mexican burden. With the history of the river in recent years, there are going to be periods of shortage when we cannot do that and still complete our projects and take our share of the water in the upper basin.

Now, at this particular time because our projects are not built, we cannot claim our share, our 75 million acre-feet over 10 years that are expected to be above Lee Ferry and utilized. We cannot take them now, but the time will come, we hope, when we may be able to claim and use in the upper basin our entitlement and at that point there would not be enough water in the river to go down to satisfy the lower basin.

Now, what the lower basin does with its 75 million acre-feet after they have passed Lee Ferry we believe is a problem for the lower basin to decide.

Mr. SAYLOR. Well, this is a matter of opinion. I think it is wholly a regional problem and you can't treat one State one way and another State another and that is what you are trying to do. In other words, if you are going to adopt a regional approach, then you must look at the region as the entire basin. My recollection is that—I think we

had the figures here this morning—that your State is entitled to 24 percent of the water in the upper basin; is that correct?

Senator Moss. I think it is 21 percent but it is right in that area; yes, sir.

Mr. SAYLOR. How much water have you put to beneficial consumptive use as your share of the river?

Senator Moss. I don't have the exact figure at hand but something less than half of our entitlement.

Mr. SAYLOR. And I think that there is a project known as the central Utah project which is to take up the rest of it; isn't that right?

Senator Moss. It wouldn't take all of the rest of it but it will take a large share of it, yes.

Mr. SAYLOR. Is there any mineral deposit of any proportion of any description in your State that might be included in the development of the oil shale resources? Do you have any oil shale deposits in your State?

Senator Moss. We have a vast amount of oil shale within the State of Utah that we hope will be developed in the not-too-distant future. Already research is going on on this matter. We have vast coal deposits in the State and there are some concrete plans now that have been announced for building thermal generating plants to convey electric power from my State to the west coast market.

Mr. SAYLOR. Well, it is my understanding that oil shale development will take a portion of your water, your thermal plants will take a portion of your water; isn't that right?

Senator Moss. That is correct.

Mr. SAYLOR. Now, then, in view of the fact that you are now asking for the importation and you don't know what it is going to cost or where it is going to be, how can you recommend a High Hualapai Dam or Bridge Canyon Dam that is to be authorized in this legislation?

Senator Moss. Well, we recommend the Hualapai Dam be built in the same context that the Boulder Canyon Project Act authorized the Hoover Dam, the Colorado Storage Project Act authorized the Glen Canyon, the Flaming Gorge, and Curecanti and other dams. These dams generate hydroelectric energy and this is utilized in repaying the costs of the project over a long period of time, and this is a traditional method of building these water storage projects and we think this should be followed in this instance.

Mr. SAYLOR. Well, it is rather strange that the Secretary of the Interior, who happens to belong to the same political party you do, sat in that chair the other day and said that it wasn't at all necessary and if they did build the Hualapai Dam, that those funds were not needed. And that there was enough money in the lower basin funds if they used it from Hoover and Parker and Davis Dams by the year 2047, which seemed to be a figure which somebody liked around here, a figure that somebody asked him, that we were going to have about \$2 billion already in the fund and this wasn't necessary.

Now, if this is the case and if nobody knows what importation is going to cost, where it is going to come from, why do you want to build a dam now? Why don't you follow the recommendation of the Secretary of the Interior? We turn to him when we think he is right and he has now come up here with a recommendation and our President has come up with one.

I hate to have to be on this side of the aisle and have to carry all of his burdens. I thought maybe I could get some of the Congressmen who sit on the other side of the Capitol to support the administration downtown. It is a sorry case for all the Republicans to have to support him and have all the Democrats leave him.

Senator Moss. Well, I support the Secretary of the Interior when I think he is right. In this case I think he is wrong.

Mr. SAYLOR. Well, you think the President is wrong, too?

Senator Moss. Indeed, if this is the administration position, I do think he is wrong.

Mr. SAYLOR. Well, I am sorry to hear that because, you know, with the election coming up next year, and you know, if the President gets involved in a good fight on building a dam in Grand Canyon—you know, we folks think that even though you have it out West that you hold it in trust for all the people, not just those who happen to live in the seven Basin States. I think that. Now you urge priority of planning of upper basin projects. This Ute Indian unit, do you want that included in this bill?

Senator Moss. Yes. I think that should be included in this bill and I think we ought to be moving with the planning on the Ute Indian unit at an early time.

Mr. SAYLOR. Well, I just wondered, you know, this is a new policy, load it down, and it's going to have trouble. I want to say to my colleague from Arizona, I am surprised at your friends out there. It is the same old story, take care of your enemy, God protect you from your friends and with some of those friends you have in the Basin States they sure are not doing anything to help you.

Now, the Senate has already passed and sent over to the House the bill which the President has requested establishing a National Water Commission. That is the information that I have received from the Speaker's office; is that correct?

Senator Moss. That is correct.

Mr. SAYLOR. It is a rather remarkable thing that the bills sent over from the body upon in which you voted didn't have any recommendations to focus attention on the Colorado River. Now, you didn't do anything about it over on your side of the Capitol but when it comes over here you want to saddle that on the bill?

Senator Moss. We didn't have the votes, but I hope you have them over here.

Mr. SAYLOR. Well, I think I have the votes to keep it out. I don't know, Senator, whether or not you have heard tell of the other 43 States in the Union that are not in this Colorado River Basin. There are seven States in the east coast that start up in Massachusetts and come down across Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, and Virginia, and in this area of the country which is supposed to be an area that has a tremendous rainfall every year, and where water is in abundant supply, you don't even get a glass of water served to you in the restaurants in many of the large cities because of the water shortage, let alone have green grass. Recently, all the fountains in New York were shut down. We can't have any fountains up there because of our water shortage. And there is somewhere in the neighborhood of one-third of the people that live in the United States live in this area.

Now, why do you think a National Water Commission should focus their attention on an area that can wantonly squander water on agricultural products throughout the Southwest, sprinkle their lawns 365 days of the year, have more swimming pools per capita than any other area in America? Why do you think that area should be the area that should have the first concentration if we are going to worry about water?

Senator Moss. Well, I think that the first study should focus to begin with on this particular problem because of the shortage in the Colorado River Basin and the necessity for finding out if there is surplus water elsewhere that might possibly be put into the basin to satisfy the overdemand that will be made on the river. I don't think at all we should leave out the northeast section nor indeed any section of this country, and I support the study that is going on now in the Northeast section that was authorized and is presently underway trying to find out means of alleviating some of the water shortages that the gentleman alluded to.

I don't think any of us were happy that the water shortage came to the Northeast, but it indicated——

Mr. SAYLOR. Some of us were.

Senator Moss. To all of us—well, I wasn't happy a bit.

Mr. SAYLOR. I was happy because it awakened many of the people of the East to realize what a raid the 17 Western States have been having on the Treasury over the years and let them realize what is out West doesn't belong to westerners alone and that this water problem has been as serious as some of us have been maintaining for many, many years.

Senator Moss. Well, perhaps there was a little silver lining in that storage in that as you say it awakened some of the people of the Northeast to the fact that water is precious and water must be husbanded and water must be utilized and stored and all of these things that we have been saying for years out West because we live in a perpetually water-short area, and the East just gets it once in a while. They did have a severe shortage 2 years ago. I hope it is past for them now, but I hope that this study of the whole water picture of the Northeast will go forward so that in another time when there happens to be a shortage there will be means of dealing with it in this area.

Mr. SAYLOR. Senator, I am sorry you didn't have the benefit of my erudite statement in the opening of this session on Monday when I called attention to some of the great civilizations who tried to do the things that people in the West are trying to do with their water. Each one of these things that we've tried to do, and are begging the country to do now, have caused these countries to go down the drain and their civilization has long since been lost. The Tiger and the Euphrates Rivers are no longer remembered, and the Hanging Gardens of Babylon have long since fallen into disrepair and the old civilizations of India and China are gone.

Now, do you want this country to go down the same drain merely because we have States out in the West that are trying to drain the Treasury?

Senator Moss. Well, I don't accept your premises. I certainly don't want to go the way of these vanished civilizations. You bring

tears to my eyes. But I think perhaps the best way to assure that we won't be withered up and blown away is to go ahead with water projects such as we are talking about here.

Mr. SAYLOR. Senator, if you must cry, cry in Utah and in the basin so that your tears will be put to some beneficial use. [Laughter.]

Mr. BURTON of Utah. Will the gentleman yield?

Mr. SAYLOR. Sure.

Mr. BURTON of Utah. Senator, you don't agree with the gentleman from Pennsylvania's premise that the reclamation program is a raid on the part of 17 States?

Senator MOSS. No, I certainly do not.

Mr. BURTON of Utah. And you don't believe either that because there are 30 or 35 States without a coastline that the rivers and harbors bill is a raid on us, do you?

Senator MOSS. No. This has been traditional for a long time and these are nonreimbursable funds, I might add, that go into rivers and harbors.

Mr. SAYLOR. By the way, I am glad you brought that up. That is a point the Governor mentioned in here. I am glad to see when he talked about the Dixie project, you will notice that the Governor asked that when we consider the Dixie project, all the joint and separable costs allocated to recreation fish and wildlife in the Dixie project shall be nonreimbursable. I want to tell you please, don't you folks out west, don't carry on this rivers and harbors business because it might have more nonreimbursable features in your projects out there than you would like to have shown to the public.

Mr. BURTON of Utah. When you come out to look at the Grand Canyon, we want you to do something else other than stand there for 15 minutes and look at it.

Mr. SAYLOR. I want to say to you that I have gone down through the Grand Canyon and I want my children and grandchildren to be able to do the same thing.

Senator MOSS. They will.

Mr. SAYLOR. Without running into that placid pool you want to build in the back. Hualapai, or Bridge Canyon.

Senator, it is always good to see you.

Senator MOSS. Good to see you. I was glad to go up to Tocks Island and glad to vote for the authorization of the Delaware Water Gap Recreation Area which is a nonreimbursable water project in the gentleman's district and for which project he testified before our committee in the other body.

Mr. SAYLOR. That is where we hide all the revolutionaries that my ancestor chased out of Philadelphia.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall?

Mr. UDALL. I was recognized previously. I think it is the turn of the gentleman from California, Mr. Tunney. However, I will ask him to yield to me for a couple of things.

Was the project in Pennsylvania that you referred to, was this the one that destroyed 37 miles of living Delaware River? Was that the same one?

Senator MOSS. Indeed, that is the placid pool there that will destroy the greenery in that place. [Laughter.]

Mr. SAYLOR. Now, if my colleague will yield, I would like to get the record straight. The project that the Senator went up on had nothing to do with a placid pool. This is one that the Corps of Engineers built and some of us fought it, and after we got run over because a deal was made between certain people in the West with the Corps of Engineers, who, run as rampant over the rights of people as anybody else, we decided we would have to use something to allow the people in megalopolis that live from Boston to Norfolk to have some place to have a little recreation around that area. That is why we have taken it.

Mr. Chairman, I would hate to end on this note, but for the benefit of members of the committee, I have just received word that Dr. Miller, former chairman of this committee, died this morning and he has been ill for quite some time. He was the chairman of this committee during the 83d Congress.

Mr. JOHNSON. Well, as chairman I am sorry to hear of that. Dr. Miller was a very fine chairman of this committee from the State of Nebraska. He was well aware of the problems of the West. I am sure that under his leadership there was much legislation put through dealing with the water matters in the West in this committee.

The clerk informs me that there is a rollcall on the military appropriations supplemental and I would suggest that we recess for a half hour and come back.

Senator Moss. May I be excused, Mr. Chairman? We are expecting a rollcall, too, over there.

Mr. JOHNSON. Yes. If there are any pertinent questions——

Mr. FOLEY. I don't have a question. But if the gentleman from California would yield, I just wanted to add my greetings to the distinguished Senator from Utah. I had the pleasure not only of knowing him as a member of the committee, know of his great work in the field of water resources development, but I was a staff member of the committee of the other body where the gentleman from Utah was chairman of the Subcommittee on Irrigation and Reclamation before the reorganization over there and I want to say it is a distinct pleasure to see you here, Senator.

Senator Moss. Thank you so much, Tom.

Mr. TUNNEY. Mr. Chairman, I would just like to say to the Senator how terribly sorry I am that I wasn't here for your testimony. You know how much I admire you and the work that you have done and I appreciate so much the help that you have given me. Thank you.

Senator Moss. Thank you, Mr. Tunney.

Mr. SKUBITZ. If we should provide for this sort of a study do you feel that this would bind this Congress or any future Congress to provide or import water into this area?

Senator Moss. No, sir, I do not believe it would. I think obviously any study, any information developed by a study must come back, then, to be examined by the Congress and authorization would have to follow for construction of any project, any importation. So it does not bind us, but it does get the machinery going to learn the facts.

Mr. SKUBITZ. Thank you.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. I just want to welcome my colleague from Utah to this side of the Congress and say it is nice to have you over here, Senator.

Senator MOSS. Thank you, Laurence.

Mr. JOHNSON. Thank you for coming, Senator, and I am sorry we are under this situation but I am sure that you understand our position right now.

Senator MOSS. Yes, I do, and I did appreciate your courtesy, Mr. Chairman, and I have enjoyed it.

Mr. JOHNSON. I want to say to our next witness and his group, Mr. David Brower, that we will return after this rollcall because it is a rollcall and a very important matter before the body and no one wants to miss it. We will return here at about 3:15. I presume you want to go on this afternoon. Your group is here.

(At this point a recess was taken.)

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation will come to order. Our next witness will be Mr. David Brower, executive director of the Sierra Club. He is accompanied by a group.

Mr. Brower, I wish you would introduce your group for the purposes of the record and for the committee.

STATEMENT OF DAVID BROWER, EXECUTIVE DIRECTOR OF THE SIERRA CLUB

Mr. BROWER. Thank you, sir. I would like to introduce the editor of the Sierra Club Bulletin, Mr. Hugh Nash, Mr. Soucie, New York, and Mr. Jeffrey Ingram, Albuquerque, our Southwest representative.

I would like to request, Mr. Chairman, if possible, that each of their statements be inserted into the record as if read. They will summarize and I understand the chairman would like us to make all our presentations before the questioning.

Mr. JOHNSON. That is true. The reporter has your official statement and has the official statement of the other members that are with you?

Mr. BROWER. Yes, she does, I believe, in that one packet.

Mr. JOHNSON. They will appear in the record at this point in their entirety, and you may summarize your statement or make whatever statement you wish, Mr. Brower, and then they will have an opportunity to summarize their statements.

Mr. BROWER. Thank you very much, Mr. Chairman.

Mr. JOHNSON. Then we will ask questions of the group. You field the questions and if you want to answer them, fine. If you want to pass them on to the other members or if any member of the committee would want to ask an individual question, I presume they will be willing to answer and participate.

Mr. BROWER. Thank you very much, Mr. Chairman. I would like if I may to try to highlight my statement by reading from here and there and interpolating a little bit as I go.

My name is David Brower. I am executive director of the Sierra Club. I live in Berkeley, Calif., in one of the upper basin counties of the State of California.

Once again, Mr. Chairman, it is my privilege to appear before this committee on legislation dealing with Colorado River problems, and

especially, with the aid of people conversant with many fields and drawn from our staff or our own committees, to help as we can in providing information to the committee and the Congress about the conservation of water and of scenic resources in the Lower Colorado River Basin, with particular reference to the Grand Canyon.

When I first appeared in this room in 1953 to testify about similar problems in the Upper Colorado River Basin, the Sierra Club had 7,800 members. This year, our 75th, finds us with a membership 40,000 greater than that, distributed in 20 chapters that reach from the Pacific to the Atlantic, with offices on the west coast, in the Northwest and Southwest, and in New York and Washington. Our most rapid growth, consisting of some 10,000 new members, occurred since last June, when the Internal Revenue Service singled out the Sierra Club for special attention owing to its attempt to save the Grand Canyon.

I believe I have a special understanding of the dilemma of several members of the committee in the controversy before you because I was one of the 15 directors of the Sierra Club who in 1949, as Mr. Dominy reminded you on Tuesday, voted unanimously to approve the building of Bridge Canyon Dam—an even higher one than the one now advocated by some members of this committee. We rescinded the vote in 1950. The Bureau of Reclamation has enjoyed taking note of our initial error as if the Bureau had dug it out of secret records. We have published it far and wide, however, and have cited and explained it in our book, "Time and the River Flowing: Grand Canyon," of which there are 48,000 copies in print, one of which went to each Member of Congress last year through the good offices of trustees for conservation—of which I am presently a vice president.

Each time this embarrassing vote has been brought to my attention, as on the occasions of my debating with Mr. Dominy, or his chief information officer, Mr. Ottis Peterson, or with the present very able advocate of Hualapai-Bridge Canyon dam, Congressman Morris Udall, I have explained that we do not believe on our side that because we were wrong once we have to stay wrong. We dug further for the facts, found them, reserved ourselves, and have been reassured of our wisdom, at least on that subject, ever since that reversal.

I know that my own wrong vote—the vote for the dam—was a reluctant one, but was influenced by a quotation from Frederick Law Olmsted, Jr., then one of America's foremost landscape architects. His comment sounded very much like statements you have been hearing—the reservoir would be far down in a deep canyon, would enhance the view, would flood nothing of significance, and would make the canyon more accessible to tourists. We in the Sierra Club should have been alert to this misappraisal, because of the Hetch Hetchy disaster, in which a second Yosemite Valley was ruined by the same kind of rationalization.

Mr. Olmsted had not seen the detail of the part of the Grand Canyon that he thought the reservoir would not harm. Neither had I, nor most of our directors. We had the kind of interpretation the members of this committee have had in Mr. Dominy's photographs. For all his talents, Mr. Dominy failed badly as a photographer in the Grand Canyon. It is almost as if he had flown past the Lincoln Memorial so

fast as to blur the columns, photographing in light so flat as to lose their modeling, too preoccupied with other things even to notice that within the memorial there was a seated figure, exquisitely illuminated—yes, a great sculpture there, and a spirit in the space the columns mark off.

No photographer can succeed in the Grand Canyon. But he can begin to interpret what is there if he concentrates on the effort and has enough time and is artist enough to find out what this place has to say.

Mr. Dominy must know this himself now. After having advocated for so many years that Marble Canyon should be dammed, Mr. Dominy reversed himself after last year's hearings, and has persuaded many others to reverse themselves, and to argue that the Marble Gorge of Grand Canyon should be added to Grand Canyon National Park. With more time to consider the matter, preferably with enough time to go down the canyon themselves, I believe other key people will be changing their opinions, too, and will realize at last, but soon enough to save the day, that 110 miles of Grand Canyon climax would be destroyed by the Hualapai-Bridge Canyon dam. It would destroy not only the full length of what is best in the national monument, but also some 30 miles of river sculpture in the national park, and still more miles below the park. All the canyon has a higher use, which is to be preserved for all time within an extended Grand Canyon National Park. We can all rejoice in Mr. Dominy's change of heart upstream, and be glad there is still an unspoiled Marble Gorge to preserve there. And I myself can be grateful that I found out the truth, and, a year after voting wrong, that I switched in time and could enjoy, last September, the downstream canyon I had so wrongly voted against.

We don't really have the tools yet for measuring some fairly important things, such as love—either for people or for environment. Anthropologists are discovering that man's perspective has developed far more slowly than his ability to use tools. This is what the illustration was about in our Sistine Chapel ad, the gist of which was missed completely in a remark Tuesday by a member of this committee. I submit the advertisement here as part of my testimony. It has run in many newspapers and magazines so far, in several of them free of charge. It has been commented upon in feature articles and in some editorials, and has received a copywriter's award as well. I had a lot of help in writing it.

Our point is that we are changing our environment with unprecedented technological speed and with frightening ecological illiteracy. A form of tool-using primate presumably slightly lower than man existed on this planet for 2 millions years before *Homo sapiens* evolved. For 300,000 years subsequent to that, man himself managed to exist with no tool more advanced than a shaped stone, which he eventually learned to attach to a stick and to decorate.

The Industrial Revolution has been with us only about two centuries, and I don't have to point out to this committee that man has achieved some remarkable engineering victories over the natural environment during that time. We are beginning to sense this as we find less and less natural world around us, and more and more of what the machine has done to that world and to its pure waters and breathable air, as well as what our own ever-increasing numbers are doing to other forms of life.

This is the committee of the House of Representatives of the U.S. Government that, more than any other, is concerned with the blending of machines and of natural world in America's future, and anything we can do to stress the importance of the natural world, in controversies such as this one, we shall try to do. It is out of public concern that man's ability to control tools should catch up with his ability to fashion them that the conservation movement has grown.

Certainly in this country, man should start with the assumption that we are in the dawn of American culture, and not the dusk, and that the resources we have, including the resources of unspoiled and beautiful environment, must last us for centuries to come. The first imperative is that we leave a freedom of choice to those who follow us on down the ages, and that one of those freedoms be the freedom to see unspoiled wilderness, to know that it exists—and of particular relevance to us here today, to know that it exists in the Grand Canyon.

In the course of our doing what we can to serve this imperative, we in the conservation organizations have tried to understand the intangible values in America. It is that effort that brought us to the Grand Canyon controversy. Once in such a controversy, we find that we must cast about for experts in various fields, particularly in the appraising of various kinds of alternatives. We have been successful in the past, occasionally supplying information more accurate than Government agencies themselves had put together. I think we have been equally successful this year in putting together information that is new, and in bringing up to date some of the material we tried to bring to the committee's attention last year to fill in some gaping holes in the record.

I can assure the committee that this effort gains us nothing but a continuing operating deficit in the Sierra Club, the displeasure of the Internal Revenue Service, and the less than total approval of some members of the legislative branch, the only real reward being the hope that if we are successful we shall somehow have served the future.

The material I myself should like to present consists of several parts. The main part I entitle "Sedimental Journal: Grim Prospect for the Colorado." This has been compiled from fragmentary data, because there seem to be no other kind, on a subject vital to long-range planning for the Colorado. It will soon be published, with illustrations, in our bulletin.

I should like also to offer to provide illustrative material to the committee for inclusion in the record, noting the precedent set by use of Mr. Dominy's photographs, and I offer the following:

1. Eight black and white photographs of sediment encroachment on the Lake Mead impoundment area made from the air by Mr. Martin Litton, a director of the Sierra Club. They are especially helpful to an understanding of the part of my testimony relating to sedimentation.

Mr. JOHNSON. Mr. Brower, these will be made a part of the file.

Mr. BROWER. As you wish, sir. What I was offering—I don't know whether you read ahead—was that we could supply them if the committee in looking over the possibilities thought this was desirable, printed according to specifications laid down by the staff so that they may be supplied, printed and folded ready to be gathered into the record of the hearings. This would include 16 black and white photo-

graphs and a signature of color photographs that are to be used in a forthcoming Sierra Club book.

Mr. JOHNSON. As of right now I would have to say that we will take them under consideration and if they meet the approval of the chairman of the full committee and the ranking minority member they will appear.

Mr. BROWER. Thank you very much.

Mr. JOHNSON. Because the record will be held open for 10 days after the hearings close.

Mr. BROWER. Fine. That offer is in greater detail in my statement here, and I would be glad to check further with the committee.

At this time I would like to submit for the committee file the 80-page amendment to our petition to intervene before the FPC in the matter of proposed Marble Canyon Dam, this material constituting further evidence to support our belief that preservation of the canyon represents its highest use. I have this here.

I list three other things in my prepared statement that I foolishly left in the hotel room, but would like to give over to the staff so that the committee may decide whether or not it would like them for the file.

Mr. JOHNSON. They will be received for the file. You will have 10 days to get in any other material that you wish.

Mr. BROWER. Thank you, Mr. Chairman.

To go on rather quickly, I had better summarize this sedimental journey because that is the main thrust, you might say, of what I have to offer that is new.

When the Bureau of Reclamation boasts of turning into sparkling blue lakes and crystal clear streams good for fishing something that had previously been too thick to drink and too thin to plow, there is a tendency to share the Bureau's delight. But there is a good question to ask before we get too ecstatic: What happened to all the sediment and debris, all the silt and sand that gave the Colorado its color?

There is quite a bit of Mark Twain's philosophy in my prepared statement. One of his remarks was that it is an exciting thing about science that "one gets such wholesale returns of conjecture out of a trifling investment of fact," and I hope the members of the committee will have a chance to go through the detailed story on sedimentation. It is rather frightening when you look at it, and has been almost totally ignored in these hearings.

Two statistics I will give and pass briefly over them. At the time of its advocacy of the Upper Colorado storage project, the Bureau of Reclamation pointed out that there are a hundred thousand acre-feet of sediment coming down the Colorado each year. That was enough, combined with what was added downstream, to give only a 37-year silt life for Bridge Canyon Dam were Glen Canyon Dam not built. We have tried to gather and present here some facts on where the other sediment comes from and what the real threat seems to be.

I will skip quickly over what I have here to mention one other figure. In the FPC hearings on Marble Canyon Dam, we had a statistic of 104 years as the silt life of Marble. That assumed, even though it was the same dam, a capacity nearly 120,000 acre-feet greater than the Bureau now thinks it can put behind that dam.

We would say, then, that the silt life of Marble with Glen Canyon Dam built but with no silt-retention dam on the Paria would be about

70 years. The Paria silt-retention dam might extend that life quite a bit, but it might not. Just a few years ago the Bureau of Reclamation and the Corps of Engineers jointly built a sedimentation trap on the Paria which was expected to last for 10- to 20-years, in order to test the silt flow in that river. One single event filled it.

I go to a series of attempts to estimate the lifespan before silting in of the four proposed Grand Canyon dams. If we combine the capacity of the Grand Canyon dams—that is Marble, Paria, Bridge and Coconino—it is a little bit more than six million acre-feet in total. In the worst case, the life of the dam complex might be as little as 62 years.

I have a better case where the dam complex lasts about twice that long, and still other figures have come in showing that it might last even longer. But there isn't too much solace to be taken from various estimates because our knowledge of sedimentation is so poor. For example, the Colorado River records are brief. We have a nice 59-year average, but we don't know about sedimentation for all that period. We have not in those 59 years, so far as I know, yet recorded a once-in-a-century flood. The California redwood country has had a once-in-a-century flood and a once-in-a-millennium flood within a single decade. A U.S. Geological Survey man who was primarily concerned with sedimentation yield told me that up in the redwood country where logging has helped the water flow more freely, a single event in 1964 did more to the watershed in the 36 hours than had been done by all the rains and snows and runoff of several hundred years—perhaps 800 years—previously.

The whole sediment story is something really to worry about. I sum it up this way. Between 60 and 160 years after their construction, the four Grand Canyon dams would be out of action. Long before that they would be uneconomic despite the Bureau of Reclamation's most optimistic dreams about power users' love of the Bureau's high power rates.

If we were to assume a Rip Van Winkle capability and wake up a hundred years or so from now, we would find the reservoirs almost gone, loaded with sediment and nearly out of action. There are no equivalent damsites left in the Colorado because we have used the best. There are far more people needing far more than we do the residue we left them of the earth's treasures, but they will have to do without anything but the dregs of the Colorado damsites.

The best of the scenery is gone, too. It has been replaced in the Grand Canyon area by some 200,000 acres of phreatophyte jungle. You don't like asphalt jungle too well; you will like these less. This is the fate of the whole complex of Grand Canyon dams. Developments the Bureau has built or planned in the Lower Colorado Basin might be evaporating as much as 3 to 4 million acre-feet of water per year from silted-in reservoirs. If you take out Mexico's share of the half that is left for the lower basin, California doesn't even get half its 4.4.

Now, this is explained in my prepared testimony in a way that bears a very close scrutiny. I grant you it must be scrutinized by people who know a great deal more about this than I do. But I do have to say to the chairman and the committee that when we went to the U.S. Geological Survey to ask them about the prediction of sedi-

ment rates last year, they told us, that they were not permitted to predict sedimentation rates. If there is any danger of loss of water of the order suggested here, then this bears the most serious consideration.

I hope that Mr. Udall, the gentleman from Arizona, will have some information on this. I sent him a copy of an earlier draft of my piece long months ago and I believe it was sent to some other people, too. There should be a pretty deep inquiry into this. Perhaps the 5-year period during which the National Water Commission would be studying might be a very good time to make a very careful inquiry.

I add a postscript to all of this because I have not talked about bank storage. We hear that if water is stored in the banks of the reservoirs it fills it will come back when the reservoirs are pulled down.

We are not sure how much will come back out. But we know that as the reservoirs are filled with silt, there will be no recovery of what has been lost there because there will be no further pulling down. The reservoirs it fills, it will come back when the reservoirs are pulled down, permanently lost and it may be an enormous amount.

So I think that with this kind of scrutiny we might find some shocking results. I recommend strongly to the committee that it seek expert testimony from the Government agencies—require them to submit testimony on this—submitting also to very careful questioning. I think that the people as a whole would like to give the whole proposition a harder look, insisting that man's inertia shall be used less and his genius more.

Perhaps there is a moral. Grand Canyon is a place to stop, look and always have a river to listen to—240 miles of river, all of it alive.

That concludes my summary, Mr. Chairman. I would like to pass the baton on to Mr. Nash, our editor.

(The prepared statement of Mr. Brower follows:)

STATEMENT BY DAVID BROWER, EXECUTIVE DIRECTOR, SIERRA CLUB

Mr. Chairman, once again it is my privilege to appear before this committee on legislation dealing with Colorado River problems, and especially, with the aid of people conversant with many fields and drawn from our staff or our own committees, to help as we can in providing information to the Committee and the Congress about the conservation of water and of scenic resources in the Lower Colorado River Basin, with particular reference to the Grand Canyon.

When I first appeared in this room in 1953 to testify about similar problems in the Upper Colorado River Basin, the Sierra Club had 7,800 members. This year, our 75th, finds us with a membership 40,000 greater than that, distributed in 20 chapters that reach from the Pacific to the Atlantic, with offices on the Coast, in the Northwest and Southwest, and in New York and Washington. Our most rapid growth, consisting of some 10,000 members, occurred since last June, when the Internal Revenue Service singled out the Sierra Club for special attention owing to our attempt to save the Grand Canyon.

I believe I have a special understanding of the dilemma of several members of the Committee in the controversy before you because I was one of the fifteen Directors of the Sierra Club who in 1949, as Mr. Dominy reminded you on Tuesday, voted unanimously to approve the building of Bridge Canyon dam—an even higher one than the one now advocated by some members of this committee. We rescinded the vote in 1950. The Bureau of Reclamation has enjoyed making note of our initial error as if the Bureau had dug it out of secret records. We have published it far and wide, however, and have cited and explained it in our book, *Time and the River Flowing: Grand Canyon*, of which there are 48,000 copies in print, one of which went to each Member of the 89th Congress through the good offices of Trustees for Conservation—of which I am presently a vice-president.

Each time this embarrassing vote has been brought again to attention, as on the occasions of my debating with Mr. Dominy, or his Chief Information officer, Mr. Ottis Peterson, or with the present very able advocate of Hualapai-Bridge Canyon dam, Congressman Morris Udall, I have explained that we do not believe on our side that because we were once wrong we have to stay wrong. We dug further for the facts, found them, reversed ourselves, and have been reassured of our wisdom, at least on that subject, ever since that reversal.

I know that my own wrong vote—the vote for the dam—was a reluctant one, but was influenced by a quotation from Frederick Law Olmstead, Jr., then one of America's foremost landscape architects. His comment sounded very much like statements you have been hearing—the reservoir would be far down in a deep canyon, would enhance the view, flood nothing of significance, and would make the canyon more accessible to tourists. We in the Sierra Club should have been alert to this misappraisal, because the Hetch Hetchy disaster, in which a second Yosemite Valley was ruined by the same kind of rationalization, was still fresh in our minds. Happily, we came to the right conclusion in Grand Canyon soon enough to help save Dinosaur National Monument and the National Park System from the likewise unnecessary dams proposed at Echo Park and Split Mountain. We did not know enough about the extraordinary scenic resource in Glen Canyon soon enough to try effectively to save that marvel of the world, and the best of it is now destroyed beyond recall, lost beneath a reservoir that has had its beautiful moments, celebrated by the Bureau of Reclamation's book. That book depicts scenes that will not be visible when the reservoir is full, and that people will wish were not visible when the reservoir is drawn down, as the Bureau will draw it down to produce high-cost power, revealing the truth about the destruction.

Mr. Olmsted had not seen the detail of the part of the Grand Canyon that he thought the reservoir would not harm. Neither had I, nor most of our Directors. We had the kind of interpretation the members of this committee have had in Mr. Dominy's photographs. For all his talents, Mr. Dominy failed badly as a photographer in the Grand Canyon. It is almost as if he had flown past the Lincoln Memorial so fast as to blur the columns, photographing in light so flat as to lose their molding, preoccupied with other things too much to know that within the memorial there was a seated figure, exquisitely illumined—yes, a great sculpture there, and a spirit in the space the columns mark off.

No photographer can succeed in the Grand Canyon. But he can begin to interpret what is there if he concentrates on the effort and has enough time and is artist enough to find what this place has to say.

Mr. Dominy must know this himself now. After having advocated for so many years that Marble Gorge should be dammed, Mr. Dominy reversed himself after last year's hearings, and has persuaded many others to reverse themselves, and to argue that the Marble Gorge of Grand Canyon should be added to Grand Canyon National Park. With more time to consider the matter, preferably with enough time to go down the canyon themselves, I believe other key people will be changing their opinions, too, and will realize at last, but soon enough to save the day, that 110 miles of Grand Canyon climax would be destroyed by the Hualapai-Bridge Canyon dam. It would destroy not only the full length of what is best in the National Monument, but also some 30 miles of river sculpture in the National Park, and still more miles below the park. All the canyon has a higher use, which is to be preserved for all time within an extended Grand Canyon National Park. We can all rejoice in Mr. Dominy's change of heart upstream, and be glad there is still an unspoiled Marble Gorge to preserve there. And I myself can be grateful that I found out the truth, and, a year after voting wrong, that I switched in time and could enjoy, last September, the downstream canyon I had so wrongly voted against.

In the course of the several hearings on the Lower Colorado Basin Project, the Committee has, as the majority report said last year, heard an extraordinary amount of testimony. It is my own conviction that there were major gaps in past testimony, and that had it not been for those gaps the majority of the Committee would have come to a different conclusion about the Grand Canyon. Several agencies which could have supplied expert testimony, and could have been carefully questioned to bring out still more evidence, were not here at all. The overwhelming preponderance of testimony related to the engineering and cost accounting of water development—the tangibles that, though not easy to handle, were at least measurable in the marketplace. The intangibles, such as the meaning and importance of the natural forces that created the Grand

Canyon, and that are still creating it, that are keeping it alive, are hard to talk about but are no less important to America and the world. If anything, they are more important. But the marketplace cannot measure them, unless you seek out and audit carefully the estimates on what it would cost, at current prices, to build a separate but equally unique Grand Canyon of the Colorado.

We don't really have the tools yet for measuring some fairly important things, such as love—either for people or for environment. Anthropologists are discovering that man's perspective has developed far more slowly than his ability to use tools. This is what the illustration was about in our Sistine Chapel ad, the gist of which was missed completely in a remark Tuesday by a member of this committee. I submit the advertisement here as part of my testimony. It has run in several newspapers and magazines so far, in many of them free of charge. It has been commented upon in many feature articles and in some editorials and has received a copywriter's award as well. I had a lot of help in writing it.

Our point is that we are changing our environment with unprecedented technological speed and with frightening ecological illiteracy. A form of tool-using primate presumably slightly lower than man existed on this planet for two million years before *Homo sapiens* evolved. For 300,000 years subsequent to that, man himself managed to exist with no tool more advanced than a shaped stone, which he eventually learned to attach a stick and to decorate. In all this time our attitude toward our environment was evolving too, but it did not have to evolve far because we were unable to do much harm to it, or enough harm that the environment would strike back, so to speak, and eliminate the intrusion that was harming it.

The Industrial Revolution has been with us only about two centuries, and I don't have to point out to this committee that man has achieved some remarkable engineering victories in that time over much of the earth's surface. What the cost of those victories has been is something else, and we're beginning to sense this as we find less and less natural world around us, and more and more of what the machine has done to that world and to its pure waters and breathable air, as well as what our own ever-increasing numbers are doing to other forms of life.

This is the Committee of the House of Representatives of the United States Government that, more than any other, is concerned with the blending of machines and of natural world in America's future, and anything we can do to stress the importance of the natural world, in controversies such as this one, we shall try to do. It is out of public concern that man's ability to control tools should catch up with his ability to fashion them that the conservation movement has grown. If he is to control them, he will find that one of his highest priorities is to keep them out of some places altogether, and to make the best judgment he possibly can about the long-range effects of his tools wherever he does use them. Certainly in this country, he should start with the assumption that we are in the dawn of American culture, not the dusk, and that the resources we have, including the resources of unspoiled and beautiful environment, must last us for centuries to come. The first imperative is that we leave a freedom of choice to those who follow us on down the ages, and that one of those freedoms be the freedom to see unspoiled wilderness, to know that it exists—and for particular relevance to us here today, to know that it exists in the Grand Canyon.

In the course of our doing what we can to serve this imperative, we in the conservation organizations have tried to understand the intangible values in America. It is that effort that brought us to the Grand Canyon controversy. Once in such a controversy, we find that we must cast about for experts in various fields, particularly in the appraising of various kinds of alternatives. We have been successful in the past, occasionally supplying information more accurate than government agencies themselves had put together. I think we have been equally successful this year in putting together information that is new, and in bringing up to date some of the material we tried to bring to the Committee's attention last year to fill in some gaping holes in the record.

I can assure the Committee that this effort gains us nothing but a continuing operating deficit in the Sierra Club, the displeasure of the Internal Revenue Service, the less than total approval of some members of the Legislative Branch, the only real reward being the hope that if we are successful we shall somehow have served the future.

Accordingly, from our membership and staff in various parts of the country, we have put together the presentation that follows. The members of the staff

who participate are either on salary or under separate contract, supported by members' dues, contributions, and an increment of the income that comes from our books and wilderness outings. Those from the membership at large are contributing their time and knowledge—this is the real strength of our organization—at no expense to the club, which has merely picked up their out-of-pocket travel expenses.

The material I myself should like to present consists of several parts:

1. "Sedimental Journey: Grim Prospect for the Colorado." This has been compiled from fragmentary data, because there seems to be no other kind, on a subject vital to long-range planning for the Colorado. It will soon be published, with illustrations, in our bulletin.

2. My letter to the President with reference to the Grand Canyon controversy and the enclosure relating to the National Water Commission.

3. Significant letters addressed to Mr. Felix Sparks, of the Colorado River Water Commission, from Mr. Jeffrey Ingram and from me relating to the possible effects of downstream dams upon Colorado itself.

4. I should like also to offer to provide illustrative material to the committee for inclusion in the record, noting the precedent set by use of Mr. Dominy's photographs, the following:

(a) 8 black and white photographs of sediment encroachment on the Lake Mead impoundment area made from the air by Mr. Martin Litton, a director of the Sierra Club. They are especially helpful to an understanding of the part of my testimony relating to sedimentation.

(b) A further 8 black and white photographs of the scenic and recreational resource at Lake Powell, now that it is 34 feet lower than the maximum surface elevation reached so far.

These 16 photographs listed above can be submitted two weeks from now, printed and folded according to specifications worked out with your staff, at no cost to the government.

(c) A signature of color photographs by Mr. Ernest Braun of the scenic, ecological, and recreational resources that would be obliterated within the Grand Canyon were the proposed Grand Canyon dams built. These can also be provided, printed in color in the format used in the hearings, reduced from color plates made for our forthcoming book, "Grand Canyon of the Living Colorado," itself drawn from an exhibit of the same name about to be shown concurrently in four major cities. We can supply these at no cost to the government in the quantity desired for the hearings, with factual accompanying legends. They should be of particular help to the Congress in determining the highest use of the Grand Canyon.

I should like to submit for the Committee file:

The 80-page amendment to our petition to intervene before the Federal Power Commission in the matter of the proposed Marble Canyon dam, this matter constituting further evidence why, in our belief, the preservation of the canyon represents its highest use.

"Confrontation," the transcript of a program presented over the radio in Albuquerque, New Mexico, November 15, 1966, directly related to the present controversy and giving an important insight into our principal point here—that there are major gaps in the evidence about sedimentation and about the scenic importance of the Grand Canyon. The speakers include Mr. Dominy and myself.

"Water and Esthetics in the Lower Colorado River Basin," my statement in a debate with Commissioner Dominy before the Second Annual American Water Resources Conference, University of Chicago, November 21, 1966.

A series of brief observations and essential questions related particularly to evaporation and resource planning aimed directly at the present controversy and concerning which the Committee may wish to seek further testimony or evidence.

PART 1

Sedimental Journey: Grim Prospect for the Colorado

INTRODUCTION

Somewhere, on the Colorado before it pauses momentarily in the reservoir backed up by Glen Canyon Dam, scoop up a cupful of river, let it settle, and consider the sediment in the bottom of the cup. It has more story to tell than tea leaves ever would. Contemplate what the sand there does if it is free—such creations as the Grand Canyon, for example. And what it will do if man tries to entrap it. Be frightened a little.

PART A

When the Bureau of Reclamation boasts of turning into sparkling blue lakes and crystal clear streams good for fishing something that had previously been too thick to drink and too thin to plow, there is a tendency to share the Bureau's delight. But there is a good question to ask before we get too ecstatic: What happened to all the sediment and debris, all the silt and sand that gave the Colorado its color?

In the first place, for a whole series of reasons, many of them consisting of abusive treatment of the land, the Colorado tributaries are still stripping just as much off the land as ever and starting it all down to the Gulf of California. Sooner or later, it will arrive there. In geological time, all the reservoirs man builds on the river will become filled with sediment, filled to the brim and more. The river will cascade over the dams, finally erode them, and in the end transport the sediment to the sea, cleaning out its channel, revealing once again what was buried there, and resuming the work rivers must always carry on—the constant attempt to level the land.

Long before this, man may have disappeared from the earth. A more discernible perspective is needed. What will be the immediate effect on this civilization, on the generations of people those of us now alive will know and must feel some responsibility for, of the sedimentation of the Colorado River reservoirs now existing? Of immediate importance, how about sediment and the proposed Grand Canyon dams? For the foreseeable future, what kind of storage loss and water loss can be expected? What validity is there to projections of long-range revenues, for example, if there are poor forecasts of sedimentation rates and if it is assumed certain reservoirs will be storing water, conserving water, and producing hydroelectric power for longer periods than they actually will?

There is a lot of Mark Twain's philosophy in what follows. By a simple extrapolation of one known statistic, he showed how the Mississippi must at one time have extended more than a thousand miles into the Gulf, as narrow as a fishing rod. And he commented on "something exciting about science." "One gets such wholesale returns of conjecture out of a trifling investment of fact," he said.

If you will, with pencil and scratch pad handy, let's invest the trifling facts at hand, multiply and divide a little, and conjecture a lot. Try to take all the figures in stride, reading them as if they were poor prose. There will be no final examination—except by posterity if we fail. The figures won't be too dull, silty though they are, and may even stir someone in government into producing better figures in time to save us. Meanwhile, here are some data to work with, and lots of luck! Or you may skip the next several paragraphs, miss some of the fun, and resume reading at Part B, below.

For sedimentation rates on the Colorado, House Document 364 (1954) showed that 100,000 acre-feet of sediment passed the Glen Canyon damsite each year. This, then, is the amount that is now beginning to finish off Lake Powell, with its water capacity of 27,000,000 acre-feet.

Walter Huber, the late former president of the American Society of Civil Engineers, and an expert on dam construction and operation who has well aware of Colorado River hydrological statistics, told me that one-third of the silt that went into Lake Mead came from the Little Colorado River. If you assume, then, that 180,000 acre-feet went into Mead (before Glen Canyon dam), then 60,000 would come from the Little Colorado, 100,000 from the Main Stem above Glen, and 20,000 from all others. One of the siltiest others is the Paria, which flows 22,000 acre-feet per year. Other tributaries would be the Virgin and the host of water tributaries within Grand Canyon's limits—Kanab, Havasu, Tapeats, Spencer, Quartermaster, Separation, and so on.

In the early predictions for Bridge Canyon dam, with no upstream sediment control, a 37-year silt life was predicted. The capacity of Bridge at elevation 1806 is 3.7 million acre-feet (maf henceforth), its surface area 16,700 acres. The capacity of sediment would be perhaps 25 per cent greater than the capacity in water, assuming headward aggradation (the upstream grade a river builds back from the reservoir that stops it) from the dam itself that could produce a grade of 1.5 feet to the mile. This figure must be predictable and the calculation should be checked. If it is correct, 125,000 acre-feet of sediment passes Bridge Canyon site, or enough to render the upper 40 miles of the reservoir recreationally unusable in 3½ years—assuming no upstream control. (There is now major

upstream control, remember, in Glen Canyon, but there is a lot that Glen doesn't control.)

As a cross check, the Southwest Water Plan, 1963 edition, shows 2.1 maf capacity for the Coconino silt-retention reservoir, and the Pacific Southwest Water Plan Supplement on Bridge says this will last 100 years. Add 25 per cent for aggradation, or .5 maf, divided by 100 years and you get 26,000 acre-feet/year Little Colorado sediment. This is less than half what our previous estimate shows. This may be explained if it is really a gross underestimate of the Coconino sediment capacity. Considering the shape of the Coconino impoundment area, the gross underestimate is possible. The area is 76,000 acres when full of water. Bridge Canyon reservoir, for comparison, is 16,700 acres for 3.7 maf capacity, versus Coconino's 76,000 for 2.1 maf capacity and compared with Glen's 176,000 acres for 27. maf capacity. Thus, in acres per maf capacity: Bridge, 4,500; Glen, 6,500; Coconino's 38,000. So gently sloped a basin might aggrade unconscionably. If aggradation doubled Coconino's capacity for sediment, as compared with its water capacity, we'd get our 60,000 acre-feet per year of sediment—and an incredibly big silt trap, of perhaps a 150,000-acre surface.

A 1949 publication of the Bureau of Reclamation (N. H. Daines, *Study of Suspended Sediment in the Colorado River*) may be too old to be of much help. It shows an average of 175,000,000 tons per water year of sediment discharge at Grand Canyon station (probably near Kanab Creek), 1926–1948. At an assumed density of 1.1, this is some 150,000 acre-feet of sediment at almost the Bridge site (albeit, some 120 miles above it, but with little silt entering between). The bedload was not measured, but that could hardly explain the difference.

So we probably shouldn't place much store in the Daines opus. An interesting figure may be worth remembering: 90 per cent of the water and 60 per cent of the sediment of the Colorado comes from above Glen. Reading this backwards, 40 per cent of the sediment comes from below Glen, and it would be easy to estimate that one-third of the sediment in Mead would come from the Little Colorado. Just what Walter Huber said.

In the Pacific Southwest Water Plan Appendix, the Geological Survey lists all kinds of plans for studies, but none for studies of sedimentation. In pursuing sedimentation data at the USGS last August, we were told that the USGS was *"not permitted to make sedimentation projections."*

Now for a couple of flow figures. What's the Little Colorado got? Using the 90–10 ratio above, and taking some flow figures accompanying a letter, August 3, 1966, from the Bureau of Reclamation to Walter Edwards, we find the virgin flow at Lee Ferry, 59-year average, is 15,025,000 af; 90 per cent of that leaves 1,503,000 for the Little Colorado and associated streams below Lee Ferry. The Paria average, 1914–65, was 22,000 acre feet, so we can say the Little Colorado does about 1.6 maf per year. (Note: it's really nearer 300,000; but don't worry because errors of this magnitude are trivial in the league we're playing in.)

One further detail about the Paria and we can close up the data gathering and try predicting.

The Paria silt-detention reservoir holds 98,000 acre-feet of water. It is 13 miles long and has an 8,000-acre surface according to the BuRec map (2,500 on the area-capacity curve in the same supplement!). Note: Although the Southwest Water Plan says 98,000 acre-feet capacity, the Marble Supplement says 235,000 in text, 200,000 being all that shows on the area-capacity curve accompanying the text. The text says there is 5,100 acre-feet of sediment per year between Glen and Marble, with the Paria contributing about 4,475 annually (a nice precise figure, that one). The dam is 18 miles up the Paria, with some 250 square miles of Paria watershed below the dam, so perhaps 4,000 acre-feet per year will end up in Paria until it is full, in its century: the rest ends up in Marble, which has only a 363,000 acre-feet capacity.

PART B

The preceding paragraphs prove that the figures hardly ever check out. If my arithmetic is bad, I've been working too long with Bureau of Reclamation figures. Remember that, depending upon which page you read of their figures that are in the evidence before Congress, the Paria silt trap has an area of either 2,500 or 8,000 acres and a capacity of 98,000 or 200,000 or 235,000 acre-feet. Vote for one—and then move on to something stranger still. The Federal Power Commission has been told that the Marble Canyon reservoir would hold 480,000 acre feet of water

and that without the Paria silt trap, Marble would be silted up in 104 years. The Bureau of Reclamation, with the same dam, would have a reservoir with one-fourth less capacity—so it would silt up in 71 years (assuming Glen Canyon dam still works; otherwise four years' silt would finish Marble). So Marble would be gone in plus or minus 7 decades (i.e., before it is as old as the Sierra Club) unless Paria were built to extend Marble's life 25 or 60 or 70 years, depending upon how you voted on the Bureau's credibility gap.

Or Marble could go sooner. The Sheep Creek test barrier that the Bureau and Corps of Engineers constructed jointly on the Paria was supposed, I am told by an expert sedimentologist, to last from 10–20 years. It was filled by one "event." The Bureau assumed 4475 af of silt per year in the Paria, so this one event would extrapolate to 45,000–90,000 af for the whole Paria-Marble basin below Glen Canyon dam—and half a dozen such events would wipe out Marble and Paria silt-detention capacity and be at work on Hualapai's, aided by other helpful events in the Lower Basin.

If there seem to be too many figures, don't let it bother you. They don't bother the Bureau too much, so why should you worry? Reclamation Commissioner Floyd Dominy told me and a New Mexico radio audience last November that Glen Canyon would never silt up; apparently he doesn't take his own Bureau's figures seriously, even though he does want you and me and 200,000,000 Americans to put up the money for the dams his figures advocate. So in its first century, to go into more figures, Marble would be $\frac{2}{3}$ (or $1\frac{1}{4}$) full of sediment and be having troubles in power generation and with clogging up Glen Canyon's tailwater. Marble would be quickly finished off thereafter if the Paria detention dam were built—and done in by silt. The closer Marble gets to its death, the more the reservoir must fluctuate daily to put its peaking-power water through the turbines. The initial ten-foot fluctuations would get grimmer and grimmer, and would probably exceed 100 feet daily in the vestigial puddle at the lower end of the Marble Canyon sediment flats.

Note in passing that with the Paria averaging 22,600 acre-feet per year flow and 4,475 acre-feet per year of it sediment, a cupful of Paria will not stir easily—it is flowing 20 percent nonwater.

Before we leave the Little Colorado, with the sun setting fierily in the West, we should look at the Southwest Water Plan supplement map of the Little Colorado's Coconino silt-retention reservoir basin. As scaled on the Bureau's map, it has about one-eighth the area of Bridge Canyon reservoir. Yet we know from the text that Coconino's area is 4.5 times that of Bridge. Error factor: 3600 percent! That's what I meant about figures that don't quite check out.

Now let's start a preliminary summing up and assessing of error of a dimension that should produce shock.

1. Nowhere do we have a reliable estimate, or more than detached pieces of estimate so far removed as not to fit together, of what the all-important sedimentation rates really are.

2. The U.S. Geological Survey, one of the few remaining objective agencies that John Wesley Powell hoped to have so many of, is not permitted to make sedimentation predictions. If it is permitted, really, and someone merely mis-spoke, where are their predictions? If they exist, please send a set to Mr. Dominy.

3. The Bureau admits 20 percent sedimentation in the Paria, 0.6 percent in the Colorado above Glen, and an approximate 1.4 per cent in the Little Colorado. The wide range is cause for suspicion.

About that headward aggradation of 1.5 feet: The mechanics of this aggradation will always puzzle me, but if carrying capacity really and truly does vary as the sixth power of velocity, then when a river slows to half its speed, it must dump 98 percent of its load. The slowing happens gradually, not all at once; but in any event the river has to figure out what to do with all the water and silt it has when it must dump the silt but still get the water on toward the sea. In some situations it will cross itself up, dumping the load so fast it has to ride on ridges instead of in gulches. Slow China's Yellow River with dikes and it will ride higher than the land the dikes seek to protect. On a steep alluvial fan, with a flash flood and boulders rolling at an alarming clip, a stream can apparently lose its mind. In a restricted canyon like the Colorado's, where the river builds bars and the side streams tear them apart and build dams, and the river tears those apart when it is up to strength, the things a Colorado River

will do when a 730-foot concrete clot is poured into it are not yet really quite known. Happily, no one has yet tried to dam the Grand Canyon and the Colorado River that runs through it was able, because of the sediment, to carve the canyon. All we can do, until too late, is to postulate.

A point in passing: If the 1.5 feet/mile is too much aggradation, then there will be less immediate damage to Grand Canyon National Park and Monument, et al., but there will be much more immediate damage to the economics of the Lower Colorado Basin Plan because the reservoirs won't last long enough to pretend to pay for it, and pretend they must.

In the worst case, for the economics, we have $6\frac{1}{4}$ maf capacity in the (Grand Canyon; i.e., Marble, Paria, Bridge, Cononino) 4-dam complex, a river than has about 100,000 acre-feet per year to fill it, and a 4-dam silt life of 62.5 years. Looking backward, this takes us just about exactly to the year Theodore Roosevelt said of Grand Canyon, "leave it as it is." If they had paid as much attention to him then as the Bureau of Reclamation fails to pay now, all four dams would be through today. And their revenues would have been diminished to one-half when FDR declared a bank holiday and beer came back.

In the best case, we can add some 25 per cent to the silt capacity, since silt slopes better than water does. We can drop the Colorado's silt habit index to half. That would be about 8 maf silt capacity, 50,000 acre-feet per year of silt doing it in, and 160 years to go. Power revenues would be on a half-life basis.

But don't cheer too fast. The Colorado River flow records are brief. We have a nice 59-year average. But those 59 years have not yet included a once-in-a-century flood. The California redwood country had a once-in-a-century and a once-in-a-millennium flood within a single decade. So don't place your bets yet. Remember that constant: the carrying capacity of the Colorado varies as the sixth power of its velocity. If at 6 miles per hour it can carry 150,000 tons of suspended sediment per year, not to mention bed load, then at twelve miles per hour, for the day the extraordinary flash flood excites the river that much, the Colorado can carry in that single day 21 times as much as the 60-year-average-river carried in its average year.

One U.S.G.S. man who is primarily concerned with prediction of sediment yield told me that up in the redwood country, where logging has helped the water flow more freely, a "single event" in 1964 did more to the watershed in 36 hours than had been done by all the rains and snows and runoff for several hundred years—perhaps 800—previously.

Things like this shake your faith in what engineers are thinking of when they say the Paria carries 4475 af of sediment a year and Marble will last 104 years. This is a little hard to grasp. But grasping it helps you understand how that little stream down there a mile below you, which looks as if it had dried up in the bottom of that incredible canyon, could carve the whole works in just a few minutes, if you use eons for years, or in about 10 million years if you insist upon being conventional.

In any event, with nice columns of figures that don't check out as often as we wish they did, the Bureau of Reclamation has postulated a revenue-producing operation of dams in Grand Canyon that in the course of a century will, they pray, pay for the fraction of their projects that the nation as a whole doesn't have to pay for first. The Bureau counts on that century of operation, and puts all the money from the operation in its cash registers and sounds very cheery about it, without having the slightest assurance that the century will ever leave their dams alone and unsilted up.

In the worst case, their revenues start drying up, giving a half life, about 60 years before their payout tables face the facts of silt life. In the worst case—if you want to bet on it, remembering the odds that a 6th-power calculation force upon you—they fade 10 years ahead of their schedule. And all the while they assume the public will like the Bureau's hydroelectric peaking kilowatts so much better than anyone else's that they will pay the Bureau, for the very same product (to us, one kilowatt hour looks very much like the next one), about \$2 billion more over the 100-year payout period than they would pay investor-owned, tax-paying utilities. Don't believe it.

But let's sum things up.

Between 60 and 160 years the four Grand Canyon dams (let's group them) will be out of action. Long before that, they will be uneconomic—even by the Bureau of Reclamation's most optimistic dreams about how well power users love the Bureau's high power rates.

But let's all assume a Rip van Winkle capability and wake up 100 years or so from today. The Bay Area Rapid Transit System is almost ready to go and New York's has rusted away. We find we have been forgiven for our faults in handling transportation, but not for letting them dam the Grand Canyon.

The reservoirs are almost gone now; they are loaded with sediment and nearly out of action. There are no equivalent damsites left on the Colorado because we have used the best. There are far more people, needing far more than we do the residue we left them of the earth's treasures after we had first grabs. But they will have to do without anything but the dreges of Colorado damsites.

The best of the scenery is gone, too. It has been replaced, in the Grand Canyon area, by some 200,000 acres of phreatophyte jungle. You don't like asphalt jungles too well; these you will like less, and ask the man who bemoans one. Or even ask the Bureau of Reclamation, an agency that hates phreatophytes so much that it had a major program afoot to eradicate 42,000 acres of the jungle so as to save 100,000 acre-feet of water per year. While tooling up to eradicate the 42,000, the Bureau created another 200,000. And still another 200,000 or so up where Lake Powell was, in another century or two.

Remember those figures. 2 plus 2 equals 400,000 acres of wall-to-wall sediment, topped with that jungle. The evaporation index in this country is about 6-8 feet per year, to which the extra efficiency in evapo-transpiration phreatophytes (saltcedar, or tamarisk, for one, add willows, and other pleasant bits of green you find along desert water courses) are capable of. Round it to 10 feet of evaporation per acre per year to help the arithmetic, and you find that the Bureau of Reclamation has planned a river-development scheme, and now wants to round it out, that will evaporate, beyond anyone's use, 3,000,000 acre-feet of water per year (4,000,000 if you include Lake Mead and more if you include its aggraded expanse and throw in Parker and Davis dams, too) on a river that was going to give them only 7.5 million acre feet in the Lower Basin. That doesn't even leave California half of its 4.4. So Arizona gets left out.

Charge it all to river planning, and especially to the idea that if you are to have any water at all, you must dam it and evaporate it so as to produce hydroelectric power. You must, you see, because here, in the year 1967, with the atom and its energy known for a quarter of a century, we have a Bureau that has let itself be tied to hydropower, and has the political power to go on insisting on being tied.

And all this, to add Ossa on Pelion, stemming from the idea that man can do without unspoiled nature, especially such unspoiled nature as remains in the Grand Canyon. He can do without nature so well that he must continue loading more of his kind on this planet. So many more that within the century even his self-impoverished earth won't sustain him.

P.S. There is one minor item not quite to be ignored: bank "storage." This is a bank that issues many deposit slips, but very few for withdrawals.

As Lake Powell began to fill, the Bureau was chagrined to learn that the prediction of 15 per cent loss to bank storage had risen to 33 per cent, with the reservoir only one-third full (and now dropping). Three years, now, Lake Powell has been trying to get full. The maximum capacity reached was about 9,000,000 acre-feet, one-third of the potential. To get that 9,000,000 with a one-third bank-storage loss, 14,000,000 had to flow in, counting the 1,000,000 lost in the interim to evaporation. That makes 5,000,000 acre-feet beyond recall in three years. Don't yet anyone fool you into thinking you can get it back. It's gone, into the wild dark yonder of the desert's understorey, which hasn't given forth much water for a long time.

That's just the beginning at Lake Powell. One wild rumor (we hope it's wild, that is) would have 80,000,000 acre-feet of much-needed water disappearing into the great beyond of bank storage when the lake is full. Some will trickle back as the Reclamation Bureau pulls the reservoir back down, 221 feet from time to time. This the Bureau must do, exposing about 100,000 acres or so of badly damaged lake edge, if the Bureau operates Lake Powell as it said it must. When the reservoir is pulled down that 221 feet, some bank storage will flow back into the Colorado Basin. Much of it, oozing out in seeps on desert-hot rock where once-green shade has long since died, will vaporize; but some will get to Los Angeles. Not much to Tucson.

For a while, that is.

But then the lake will fulfill its destiny. The Colorado will fill it full, that is, with sediment. At that point in time, whatever got away into bank storage

cannot return when the reservoir gets pulled down because there will be no more pulling down. Quite the opposite. Headward aggradation will build the ramps that can spill still more precious waters into that wild, bank-storage beyond.

So much for Lake Powell, a bad enough beginning. When you take what the aggraded Coconino silt-retention reservoir can do, in addition to impairing, unauthorized, a substantial area on the Navajo Reservation, you will find that it is quite possible that the Bureau's Coconino silt trap will be capable of evaporating all the flow of the Little Colorado. Add the gross losses in bank storage as Coconino silts up. Do the same for the Paria silt trap, for the Marble Canyon silt trap, for the Bridge Canyon (Hualapai) silt trap, and then remember that Lake Mead's day will come, with Lakes Havasu and Mojave not far behind.

Add up the acres again: Glen, 200,000; Grand Canyon foursome, another 200,000; Mead, duly aggraded, with Havasu and Mojave similarly favored, and the Bureau's few upstream devices, Flaming Gorge, Curecanti, Granby, Juniper, Navajo, and ancillary attractions. Round those all off at a conservative 100,000. Call it all, for easy rounding, 500,000 acres, all of it quite impressive in its phreatophyte expanse, evaporating that average 10 feet per year, and losing in bank storage, and permanently, something like 40 percent of the total storage capacity.

Multiply this all by the 100 year years of the cost-benefit period the Bureau now likes to use. And see what we have taken away from the generations that will have a harder time making out with the earth than we do—all at a cost to ourselves and them of five to ten billion dollars.

Or perhaps the people would like to give the whole proposition a harder look, insisting that man's inertia be used less and his genius more. Perhaps there's a moral: Grand Canyon is a place to stop, look, and always have a river to listen to—240 miles of river, all of it alive.

PART 2

Lower Colorado Basin Project: Hualapai Dam or a National Water Commission

On January 30 of this year, Mr. Chairman, I wrote the following letter from our Washington office and it was hand-carried to the White House:

Dear Mr. President:

The purpose of this letter is to transmit a documented demonstration that the authorization of the proposed Hualapai Dam in the Grand Canyon is antithetical to the purpose of the National Water Commission that your administration has so wisely proposed. We urge for that reason that your support for the Lower Basin Project be contingent upon establishing a National Water Commission as previously recommended by you and the omission of both proposed Grand Canyon dams—Hualapai and Marble Canyon.

The enclosed statement is by Jeffrey Ingram, whose testimony before the 89th Congress showed that revenue from the Grand Canyon dams is not necessary for Southwest water development, including the Central Arizona Project. His contention was conceded to be right by the Bureau of Reclamation. His present statement has been reviewed by Laurence I. Moss, nuclear engineer with Atomics International, who has extended the reasoning of Dr. Alan Carlin and Dr. William Hoehn of the RAND Corporation, also presented to the 89th Congress, to show that the benefit-cost ratio of the proposed Hualapai Dam is less than unity. Our petition of today before the Federal Power Commission for leave to intervene explains in detail our separate concern about the proposed Marble Canyon Dam.

The Sierra Club, in supporting the National Water Commission, understandably does not commit itself to supporting all the conclusions the commission may reach. We have our own commitment to try to protect the superb living things and places that humanity and other forms of life may enjoy but cannot replace. We know that either of the proposed Grand Canyon dams would irreversibly change the Grand Canyon. The change would be so much to the lasting detriment of the Grand Canyon that an extra-ordinarily greater cost would be justified for an alternate solution to Southwest water development. Actually the alternatives are likely to cost substantially less in dollars, and infinitely less in the cost of mankind were there any further impairment of the Grand Canyon.

We urge you to join Theodore Roosevelt in the admonition, "Leave it as it is," and to continue to support your earlier proposal to establish a National Water Commission and thus bring fresh thinking to the solving of water problems.

The enclosure I sent the President was entitled "The National Water Commission v. Hualapai Dam" and its text follows:

Either the creation of the National Water Commission, or the authorization of Hualapai Dam may be justifiably sought; not both. For they represent contradictory ways of solving the water problems of the future.

The National Water Commission is to take a broad fresh look at the nation's water resources and come up with recommendations which are not biased by prior commitment or predetermined plan (1). Hualapai Dam would be built to provide a development fund for future water projects. This memorandum argues that the existence of such a dam-based development fund is itself a "prior commitment and predetermined plan," and would make unbiased conclusions by the National Water Commission impossible or irrelevant.

Authorization of Hualapai Dam would be a commitment to one particular method of solving the future water problems of the West. This statement might need to be qualified if Hualapai Dam were an integral part of the operation and financing of the Central Arizona Project in the sense that the CAP could not succeed without that dam. The project can succeed, however, without the dam; no proponent of the Colorado River legislation now seriously contends that the Hualapai Dam is necessary in this sense. (2). The dam would provide a convenient way to finance water development because it is the traditional way; but there are other ways. (3). Moreover, it is the very fact that it is the traditional way that makes authorization of Hualapai Dam so dangerous.

What the proponents of Hualapai Dam lay their stress on is the need to accumulate funds to help solve the long-range water problems of the Southwest. They would extend the traditional method of funding reclamation projects far into the future to pay for supplying water for various uses and from various sources. Of the various sources being considered for augmented water supply in the Southwest only large interbasin transfers, to move water from one basin to another for agricultural purposes, need the money from Hualapai Dam (4).

Paradoxically, the dam's contribution will be nowhere near large enough to cover the costs of such interbasin transfers (5) and other subsidies will be needed. In spite of the inadequacy of the Hualapai Dam's revenues, in the final analysis they serve only one purpose: supplying imported water for irrigation.

A further point, subtle but important, is that authorization of Hualapai Dam would be a victory for those who believe with Commissioner Dominy that "The high Hualapai Dam project is much more economically feasible and fits into the operating procedure and revenue requirements much better than any thermogeneration proposal" (6). Without arguing the merits of the statement, we can conclude that what Mr. Dominy is voicing is a self-fulfilling prophecy; i.e., the dam, if built, will be better because the alternative was never tried, except on paper, and concrete is better than paper, and old thinking better than new.

The President and the Senate last year approved a National Water Commission to "study alternative solutions to water problems without prior commitment to any interest group, region, or agency of government" (7). Rept. 1212, 1966, a committee free to survey the field, to search out the best way to supply water needs.

But last year, and now this year, the Bureau of Reclamation urges that a dam be authorized that will give what Senator Anderson has called the "ditch and dam method" of water supply a lead over any other method. If the Bureau now succeeds, then by the early 1970's, when the recommendations of the National Water Commission are being considered, the Bureau can say: "See the dam work. It is the best way."

If accepted as the best way, the ditch and dam method will dominate all others. Commissioner Dominy goes a step further when he says: "Weather modification in the high reaches of the Rockies gives extra-ordinary promise of additional precipitation which will even further justify the proposed hydropower development on the Colorado" (8). Thus, one of the alternatives a National Water Commission might consider is already being used to "justify" the traditional dam and ditch method.

Authorization of the CAP could appropriately close out a period, the Reclamation-for-Agriculture period, the ditch-and-dam period.

Authorization of Hualapai Dam, however, will project that period too far into the future, a future in which the water needs are most likely to be the needs of cities and industries. Authorization of Hualapai will make it exceedingly difficult to consider city-oriented solutions to water problems. Some dams and ditches may still be needed, but for a city they will probably be a small part of an over-all water-supply complex. We cannot predict this, nor can the Bureau of Reclamation. The National Water Commission should be able to make the best predictions. Unbiased analysis of what this water-supply complex should consist of will be precluded in the face of the actual presence of a Hualapai Dam.

The National Water Commission is aimed at the future; it is the President's response, with which we concur, to the need of being responsible to the future. We can do that only with a clean slate. If Hualapai Dam is written in large letters at the top, then the type of solution it represents will most likely fill the rest of the slate in the decades ahead.

In short, the Hualapai Dam, with a purpose of trying to make money the old way to pay for future water projects, and the National Water Commission, with the purpose for searching out the best new way to solve future water problems without commitment to present methods, are contradictory.

If Hualapai Dam is authorized, the Commission's recommendations will either be determined for it or ineffectual against the argument, "We have a dam; it works; our old method works; it is the best way; try no other."

Consequently, if the Hualapai Dam is authorized, the National Water Commission will be a waste of time.

On the other hand, if Hualapai Dam is not authorized, then the National Water Commission can consider all methods, without prejudice, without being faced by a fait accompli. The Commission will be able to weigh all data, to choose freely between alternate methods, and to fit those methods into rational plans which, by bringing out the best in present thinking, can most effectively provide for the future's needs.

NOTES

(The references are abbreviated; correspondence referred to, or appropriate excerpts from documents cited, are available on request to the Sierra Club, Mills Tower, San Francisco, attention: David Brower, Executive Director)

- (1) Letter, Senator Henry M. Jackson to Jeffrey Ingram, Nov. 9, 1966.
- (2) Commissioner Floyd Dominy in House hearings, August 1966. Director Felix L. Sparks, Colorado Water Conservation Board Meeting, December 14, 1966.
- (3) Alan Carlin and William Hoehn, RAND Paper presented in House hearings, 89th Congress.
- William E. Martin and Leonard G. Bower, "Patterns of Water Use in the Arizona Economy," *Arizona Review*, Univ. Arizona, Dec. 1966.
- Jeffrey Ingram, testimony in House hearings, 89th Congress.
- (4) Letter, Jeffrey Ingram to Felix L. Sparks, January 17, 1967. Letter, David Brower to Felix L. Sparks, January 16, 1967.
- (5) Morris K. Udall cited in House hearings, 89th Congress, a capital investment rule-of-thumb of \$1 billion/1 million acre-feet of import capacity. Bureau of Reclamation testimony, *loc. cit.*, shows only \$2 billion earned by both Grand Canyon dams by 2047.
- (6) Grand Junction (Colorado) *Daily Sentinel*, January 22, 1967.
- (7) Senate Report 1212 on National Water Commission, p. 2, 1966.
- (8) Grand Junction (Colorado) *Daily Sentinel*, January 22, 1967.

PART 3

Of particular interest to the Chairman of the full Committee, I would think was some Sierra Club correspondence with Mr. Felix L. Sparks, Director of the Colorado Water Conservation Board in Denver. I wrote him January 16 of this year:

Dear Mr. Sparks:

I have been following your correspondence with Jeff Ingram with a consuming interest owing to our concern over what is happening to the scenic resources of the west—but with a few economic interests too.

Would you care to respond to this hypothesis?

1. If further generating capacity is added on the lower Colorado in order to produce revenue, then the political and financial pressure will be greatly increased to keep a maximum amount of water running down the Colorado and to keep upstream diversions to a minimum.

2. That is, if the Grand Canyon dams are built, then every potential diversion for consumptive use will have to overcome a substantial economic handicap: the deduction from its grown benefits of revenue lost because that water did not flow instead through the generators at Glen, Marble, possibly Kanab, Bridge, Hoover, Parker, and Davis.

3. Therefore the likely prospect is that Upper Basin development would be inhibited or blocked so as to favor the build-up of a still larger development fund, as well as to realize the higher value of the water for agricultural, municipal, and industrial uses downstream, where a concentration of political power already exists and more seems inevitably to be on the way. The "bananas on Pikes Peak" refrain will be heard again, but more loudly than in 1955.

We wonder if the people in the Upper Basin who are so strong for the Grand Canyon dams have thought this point through. They must already be fully mindful of the steadily increasing trouble experienced by areas of origin in recapturing, or even getting, their water, whatever the paper guarantee. The trees go on growing upstream, all right, but the votes grow faster downstream.

The 6.4 billion question is this: Who would want the development fund to grow as big as possible for whom to spend?

The answer: California, southern style.

I have tried this out on several Colorado friends who are unprofessionally concerned with water, and would like to know how it strikes you.

The letter to Mr. Sparks which Mr. Ingram wrote, and which I had thought was especially good in bringing an important issue into focus, was mailed the following day from Albuquerque and stated:

DEAR MR. SPARKS: Your letter of the 3rd raises serious questions about the future of the bills introduced into the 90th Congress by various Colorado Basin Representatives, including Mr. Aspinall.

Your essential point is that the dams are needed to help pay for augmenting the Colorado Basin water supply. You talk of tremendous costs, and the Bureau of Reclamation claims that, with both dams, a development fund will total one billion dollars in 2025, two billion in 2047.

What methods of augmentation are foreseeable that would require such sums of money?

1) *Reallocation of water* from low value, extensive irrigation uses would end the water crisis in large measure, as studies at the University of Arizona show. Such reallocation will not require large sums of money, only the courage to overcome the oft-repeated myth of water shortage.

2) *Weather modification* may increase water yield in certain sections of the West, but again there is no indication this will require large sums of money.

3) *Large dual-purpose nuclear plants* may help localities. Large capital expenditures will be required, but the fact that such plants will themselves generate large amounts of power for commercial sale indicates that the revenue produced by the Grand Canyon dams may not be required. Moreover, the combination of off-peak power for pumping with on-peak power for commercial sale from these dual-purpose plants will compete with the dams, and, according to the work of Carlin, Hoehn, Moss & the Parsons Company, actually undersell the dams' power. More study of this crucial matter is needed, but the dams seem neither economic nor necessary given this third possible method of augmenting the water supply.

4) *Importation of water* from another river basin is most frequently mentioned, in part, of course, because it is the most traditional method. There are three uses for such imported water, and each has a different financial structure.

a) *Importation to relieve the Mexican treaty burden* will not require a development fund, since the legislation proposed would charge this job to the taxpayer in New York, Massachusetts, Florida, Oregon, etc.

b) *Importation for municipal & industrial needs*, over & above what will be satisfied by taking over water supplies used by agriculture, will not need the dams' revenues because municipal & industrial users are charged enough to pay for their share of the capital costs.

c) *Importation to irrigate crops* is traditionally subsidized, and in this brief summary, appears to be the only purpose which needs a development fund which

might require the Grand Canyon dams. The question that faces you, then, is what is the future of any Colorado Basin bill which includes authorization of dams whose only purpose can be to finance bringing irrigation water from the Columbia River, or some other convenient basin?

I find it hard to avoid certain conclusions, and would like your comment:

1. The Grand Canyon dams will be a divisive element among water-users in any attempt at the West-wide water planning that Mr. Aspinall spoke of at the N.R.A. convention in Albuquerque.

2. The conservation organizations will be further stimulated to oppose dams in the Grand Canyon, since they seem unnecessary even in remote prospect.

3. Augmentation can succeed in various ways, if many alternatives are studied imaginatively & pursued diligently. Such study & pursuit will most likely occur if the moratorium on Grand Canyon dams is extended by Congress, thus avoiding temptation to take the old dam-&-ditch way, and if an independent National Water Commission is created, thus allowing conclusions which will be in the national interest, rather than a sectional interest.

And of course, by 1972, everybody might see the value of a Grand Canyon, left as it is.

CONCLUSION

I hope, Mr. Chairman, that the club's testimony will not only point out the obvious, that time exists and moves, but also that it changes man's thoughts, often for the better. The controversy thus far has been uncomfortable, but because of the controversy, such genius as man has been brought to bear from many quarters, and a way out of the controversy has been revealed. The solution does not deny the Southwest its water needs, does not commit the uncounted generations to irreversible schemes growing out of inertia, and saves as much as we can save it the world-renowned greatness of the Grand Canyon, the best of it, the heart of it, its pulsing bloodstream.

This committee can sense and grasp a new opportunity, present a plan that the House and Senate will pass, the President sign, and that the nation's people will celebrate. Then the Interior Committee can move swiftly on to other programs that there is all too little time to consider soon enough. On all of these, I hope, the conservation movement and the committee will be in occasional, stimulating disagreement, but on none of them at cross purposes. If there are to be two sides, good luck to both, but especially to ours, because we need it more!

Mr. JOHNSON. Mr. Nash, you may go ahead and give a summary of your prepared statement.

STATEMENT OF HUGH NASH, EDITOR

Mr. NASH. Thank you, Mr. Chairman. The principal purpose of my testimony is to get some expressions of opinion from the National Park Service into the record. There are two things that I know of that should be a part of the record of these hearings. One is a letter from Theodor Swem, who is Assistant Director of the National Park Service, to Congressman John Dingell. I would like to read several sentences from it. If it sounds a bit jerky, it is because I am skipping.

The park resources of the area between the eastern boundary of Grand Canyon National Park and Glen Canyon Dam include a magnificent portion of the Grand Canyon of the Colorado River.

The value of the Grand Canyon in the vicinity of the proposed Marble Canyon Dam and Reservoir is greatest from the viewpoint of park resources in its present and relatively unaltered condition.

Basic park resources and values are impaired rather than enhanced by the introduction of man-made developments which cannot be considered to be any thing other than damaging intrusions on the natural scene.

There is more here, but I will go on to the other expression of Park Service opinion, this one relative to Hualapai Dam and Reservoir site. This is from an appendix to the Pacific Southwest water plan. As I

understand it, this received very little distribution. I don't believe it is well known even to students of the Grand Canyon dam projects, and I am quite sure it is not in the record. I will again quote only a few sentences:

The proposed Bridge Canyon Reservoir would change the character of a particularly scenic length of wild river to something far less desirable from the National Park standpoint * * * *. The construction of a reservoir in this reach of the Canyon would inevitably result in the loss of park values of national significance * * * *.

The Grand Canyon of the Colorado affords the finest study area available for students of geology.

The most obvious change in recreational use of the canyon brought about by the Bridge Canyon Project would be the limitation of the traditional and exhilarating experience of wild river boating, for which the Grand Canyon is famous.

Undoubtedly, the running of the Grand Canyon would grow in popularity in the years ahead as the quality of such an experience and its safety with proper preparation, equipment, and guidance became more widely known * * *.

That concludes the quotations that I wanted the privilege of reading aloud to the committee. If you will bear with me just 1 minute longer, I would like to read aloud the last paragraph of my prepared testimony:

A Grand Canyon used for commodity purposes and transitory gain would soon be exhausted as a source of power and profit, and would be permanently diminished as a scenic and recreational resource. An undammed and unimpaired Grand Canyon, on the other hand, is an imperishable and unique treasure. We submit that the highest and best use of Grand Canyon is the use that has no temporal limit. We submit that the Grand Canyon should be preserved in its natural state for the enjoyment of all future generations, and that the national park should be enlarged to include the whole of the Grand Canyon within its boundaries.

Thank you, Mr. Chairman.

(The prepared statement of Mr. Nash follows:)

STATEMENT BY HUGH NASH, EDITOR, SIERRA CLUB BULLETIN

My name is Hugh Nash. I am editor of the Sierra Club Bulletin.

Since there are bills before this committee to include the Marble Gorge area within the boundaries of Grand Canyon National Park, I shall address myself first to the scenic and recreational values of that portion of Grand Canyon extending from Lee's Ferry to the northeastern boundary of the present park. I boated through Marble Gorge within the last six months, and cannot find words to describe adequately the scenery or the experience. Perhaps it's just as well. Rather than ask you to accept the appraisal of an enthusiast, I take this opportunity instead to quote an official of a federal agency—the National Park Service—which thus far has had little to say to this committee about a threatened area now widely acknowledged to be of park caliber. The letter from which I quote was written to Congressman John Dingell by Theodor Swem, Assistant Director, National Park Service.

"The park resources of the area between the eastern boundary of Grand Canyon National Park and Glen Canyon Dam include a magnificent portion of the Grand Canyon of the Colorado River. The lower portion of the canyon in much of this sector is cut into and through the cliff-making redwall limestone. The steep canyon walls rising from the river are very colorful and spectacular.

"This segment of the river offers fine opportunities for float trips amidst spectacular surroundings, possesses unusual value and should be altered as little as possible. The canyon's maximum park value here is achieved when its wild and spectacular scenic grandeur is retained in as nearly a natural condition as possible.

"For the river runner, the only feasible access to the river above Phantom Ranch is Lee's Ferry. The construction of Marble Canyon Dam would block the river and preclude continuation of that activity in the reservoir area. Participation in river running increased from some 60 persons in 1964 to more than 1,000 in 1966. River guides are planning considerable expansion in the number of commercial river trips in 1967.

"The value of the Grand Canyon in the vicinity of the proposed Marble Canyon Dam and Reservoir is greatest from the viewpoint of park resources in its present and relatively unaltered condition. The reservoir would substitute an unnatural appearing lake with higher water elevation as contrasted with the present tortuous river in its natural environment. Marble Canyon Dam would result in still further modifications in the behavior of the river already changed by the Glen Canyon Dam. Basic park resources and values are impaired rather than enhanced by the introduction of man-made developments which cannot be considered to be anything other than damaging intrusions on the natural scene."

For several years, the Sierra Club has urged that the entire Grand Canyon—from Lee's Ferry to Grand Wash Cliffs—be given national park status or equivalent protection. It is gratifying to us that members of this committee have introduced bills that would include Marble Gorge within the national park. We hope that such legislation will be favorably reported and passed, but we hope Congress will not stop there. The lower reaches of Grand Canyon, from the national monument to Grand Wash Cliffs, is equally deserving of protection.

Turning now to the Lower Granite Gorge of Grand Canyon, where Hualapai damsite is located, I recently traversed this too by rowboat and am tempted to describe the indescribable. But I seem to detect a disposition to discount Sierra Club superlatives, and no section of the Canyon can be described without superlatives. Again, I quote from Park Service sources. The following excerpts are taken from the National Park Service Appendix to the Pacific Southwest Water Plan, September 1963.

"The proposed Bridge Canyon Reservoir would change the character of a particularly scenic length of wild river to something far less desirable from the National Park standpoint * * *. The construction of a reservoir in this reach of the Canyon would inevitably result in the loss of park values of national significance * * *.

"The river, with its ever changing currents, pools, and rapids, would be blotted out by the slack water of the reservoir * * *. The existing, natural streambank ecology would be drastically changed throughout the extent of the reservoir. The existing plant and animal habitats would be drowned out, and colonization by exotic species would be expected. In the uppermost regions of the reservoir, silt deposition and debris accumulation would be inevitable * * *."

Let me interject here that the living river, running through the canyon it created, is an education. Substituting a reservoir for the river would divorce cause from effect, and reduce an education to an enigma. Plant and animal habitats that would be drowned would not, for the most part, be recreated at a higher elevation. For much of its length, the reservoir would be confined within sheer walls. And a slack reservoir cannot build new habitat—sandbars, beaches, and dunes—as a living river does. The borders of Hualapai reservoir would be extraordinarily sterile. I would add that silt deposition and debris accumulation would not be confined to the uppermost regions of the reservoir. An alluvial fan would build upstream from the head of the reservoir, penetrating perhaps 15 miles or more further into Grand Canyon National Park. Moreover, the entire reservoir area will become a single gigantic silt deposit within a few generations, if a dam is built. To continue with the Park Service report:

"The change from river to reservoir would change the aquatic fauna. The limited natural range of native fish * * * would be further changed and reduced. Non-native species would become established in the new environment * * *.

"The Grand Canyon of the Colorado affords the finest study area available for students of geology. The effects of the dam on geologic features in this vicinity are discussed in detail by Dr. Edwin D. McKee, now of the United States Geological Survey, in a report he submitted to the Director of the National Park Service by memorandum dated October 21, 1942. The following is quoted from Dr. McKee's report:

"The greatest losses, in so far as geologic features are concerned, from the backing up of water behind the Bridge Canyon Dam will be in the area of volcanic activity at and westward from Toroweap Valley. In this section several

features illustrating the early stages of canyon cutting and of local vulcanism will be concealed. Also covered will be remnants of lavas that flowed down the river channel and sediments, in two places, formed in ancient lakes or reservoirs behind natural lava dams * * *."

Mr. Chairman, another geological feature whose loss would be deplored just as greatly by many of us is the rock sculpture along the river. Multi-colored, intricately carved and polished to a high sheen by the river, the finest sculpture is in the Hualapai reservoir area. Similar sculpture that once existed at higher elevations has been weathered away; all that remains is near river level, and the finest examples would be submerged—first under water, then under silt. To return to the Park Service report:

"The most obvious change in recreational use of the canyon brought about by the Bridge Canyon Project would be the limitation of the traditional and exhilarating experience of wild river boating, for which the Grand Canyon is famous. This unique form of recreation was beginning to show a marked increase prior to the closure of the Glen Canyon Dam. Since 1955, more than 1,300 persons enjoyed boat trips through Grand Canyon; nearly 400 of these made the trip last year."

I would remind the committee that figures on the number of people boating through Grand Canyon are notoriously unreliable. One figure often cited by those who depreciate the recreational importance of river running places at 900 the number of people who have ever, in all recorded time, passed through the Canyon. This was true once, momentarily, but the figure continued to be used after that many people had boated through the Canyon in a single year. In his testimony earlier in these Hearings, Commissioner Dominy told the Committee that about 2,000 people traversed the Canyon by boat in 1966. This would indicate that river running has quadrupled in the last four years. The Park Service was justified in saying in 1963 that:

"Undoubtedly, the running of the Grand Canyon would grow in popularity in the years ahead as the quality of such an experience and its safety with proper preparation, equipment, and guidance became more widely known * * *."

Reservoirs have a limited lifespan, and their usefulness for recreation or power generation is relatively brief. If we look far enough into the future, the total number of people served by the living river exceeds the number that could use the reservoir during its brief lifespan. If we must think in terms of man-days of recreation, regardless of the quality of recreational experience, surely we should consider the fact that a brief period of reservoir recreation would foreclose the possibility of river running for all the foreseeable future.

"If a high Bridge Canyon Dam is constructed at an elevation of 1876 feet above sea level, the resulting reservoir would extend into Grand Canyon National Park a distance of 13 miles to within one-tenth of a mile of the mouth of Kanab Creek * * *. This section of the inner canyon is characterized by extreme narrowness and high, sheer walls of sedimentary rock. Near the mouth of Havasu Creek, the inner gorge is at its narrowest along the entire length. The views into the canyon are spectacular and awe-inspiring * * *."

Mr. Chairman, I believe it is essential to consider not only temporary effects, but ultimate and permanent effects. The ultimate effect of Hualapai reservoir—a century or more hence and thereafter—would be to drive a wedge of sediment approximately 15 miles into the national park and 13 miles along the boundary between park and monument. The extraordinarily beautiful mouth of Havasu Creek would be buried, and the impressive junction of Kanab Creek with the Colorado would be almost as seriously injured.

"The late Norman Neville, well-known organizer of the boat trips through the Grand Canyon, stated of this section of the inner gorge:

"In all of my notes, on four separate trips, I have noted again and again that the section of river canyon from Kanab Creek to Havasu Canyon is outstanding and among the most beautiful of all the Grand Canyon.'"

Even if we were to concede that the reservoir would in general enhance the Canyon, and we certainly do not, the injury inflicted upon this particularly choice section of the Canyon would be severe. Here the rushing river would be slowed and stopped, dumping its silt. Floating debris would accumulate at the head of the reservoir, with no current to carry it onward. Daily fluctuations in reservoir level would produce a lifeless zone of ugliness around the perimeter. All this within the park and monument, which the Park Service is charged to preserve in its natural state.

Park Service reports from which I have quoted excerpts are highly pertinent. I believe, to bills before this Committee to enlarge the present national park or to build Marble Canyon dam or Hualapai dam. The Sierra Club considers it regrettable that the Park Service has not assisted the Committee's deliberations more extensively and more directly.

A power dam on a silt-laden river begins to commit slow suicide from the moment it starts impounding water—and silt. Silt retention dams only postpone the day of reckoning. After a brief period of gradually diminishing usefulness, the dam and its silted-in reservoir become a permanent impairment of the landscape. Even if it were absolutely necessary, to commit any portion of Grand Canyon irrevocably to power production would be a great tragedy. To sacrifice a portion of Grand Canyon when Secretary Udall and many others insist that it is not necessary would be worse than tragic.

A Grand Canyon used for commodity purposes and transitory gain would soon be exhausted as a source of power and profit, and would be permanently diminished as a scenic and recreational resource. An undammed and unimpaired Grand Canyon, on the other hand, is an imperishable and unique treasure. We submit that the highest and best use of Grand Canyon is the use that has no temporal limit. We submit that the Grand Canyon should be preserved in its natural state for the enjoyment of all future generations, and that the national park should be enlarged to include the whole of the Grand Canyon within its boundaries. Thank you, Mr. Chairman.

Mr. Brower. I would like next to have Mr. Soucie from New York make his statement.

STATEMENT OF GARY A. SOUCIE, SIERRA CLUB, NEW YORK CITY

Mr. Soucie. Mr. Chairman, my name is Gary Soucie and I am the assistant to the executive director of the Sierra Club in New York City. I am here today to present what in this committee at least is a minority point of view, that of the urban east.

(The prepared statement of Mr. Soucie follows:)

STATEMENT OF GARY A. SOUCIE, ASSISTANT TO THE EXECUTIVE DIRECTOR, SIERRA CLUB, NEW YORK CITY

Mr. Chairman, my name is Gary A. Soucie and I am the Assistant to the Executive Director of the Sierra Club in New York City. I am here today to present what, in this committee at least, is a minority point of view: that of the urban East.

In New York City I share offices with the Sierra Club's Atlantic Chapter, and it is this chapter's territory that is my primary area of responsibility. This territory includes the 19 eastern states from Maine to Alabama and the District of Columbia and nearly 10 percent of the Sierra Club's 48,000-plus members. In this area live some 83.5 million people, about 43 percent of the nation's population. I might add, parenthetically, that these states have 188 seats in the House of Representatives.

The Atlantic Chapter is the third largest and the fastest growing of the Sierra Club's 20 chapters. It is no accident that our club—founded and headquartered in California—is growing fastest in the East.

In recent years there has been a sudden blossoming of conservation interest in the East, particularly within and around our coastal megalopolis. The reason is simple enough: in our day-to-day lives we are reaping the melancholy harvest of a past in which the conservation ethic played too minor a role. Our air is unfit to breathe, our waters unfit to drink, and our elbow room limited to the proximity of our neighbor's ribcage. Perhaps because we have so little left, we are beginning to understand the value of each little open spot of green amid the asphalt and steel. New Yorkers, for example, cherish their parks so dearly that they have all but canonized the first parks commissioner in decades who espoused the philosophies of Frederick Law Olmsted and Major Welch. In New Jersey, the most densely populated state in the Union, over 900 citizens recently turned out at a public hearing to ask that Great Swamp be preserved as wilderness; thousands more mailed in statements.

Given this intense interest in the conservation of natural areas, it is not surprising, then, that the Sierra Club's ads in the New York Times and Washington Post have brought so many new members into the club. As people became aware of the existence of an organization that stood for what they believed, they responded with application for membership.

Now, the subject of those ads that has captured the largest attention and brought the Sierra Club the most new members is the possibility that the Grand Canyon might be dammed to finance a Southwestern water project. The typical Eastern reaction to learning of this possibility is a mixture of disbelief, outrage, and anger. Disbelief that anyone could seriously entertain such a proposal, then outrage over the preposterousness of the idea, and finally outright anger that one or two, or even seven, states seem to think they have a special right to spoil the greatest natural and scenic resource in the country, if not the world.

"After all, it's our Grand Canyon, too!"

The more than 4000 Sierra Club members I represent are fighting the good fight on several fronts here in the East. In New York we are locked in mortal combat with Con Edison to keep a pumped storage plant out of the Hudson Highlands. In Pennsylvania, our members are working to preserve Tinicum Marsh. Here in the Washington area, the Hunting Creek dam project has kept our Sierrans hopping. Down in Florida, it's the Everglades water problem. But above all of these is the Big One: the threat to Grand Canyon. Almost to a man, our Eastern members regard the preservation of the Grand Canyon, as the most important issue, the one that tugs hardest on the heartstrings.

Why should a New Yorker, a Pennsylvanian, a Marylander, a Floridian be so concerned with the fate of a river canyon in Arizona? Because it is the *Grand Canyon*. You don't have to add "of the Colorado River" for a Maine Yankee to know what's being talked about. He knows you don't mean the Grand Canyon of the Gunnison, or of the Tuolumne, or of any other river. In the minds of Americans everywhere there is only one real Grand Canyon. And they don't want that one dammed, for water or for power or for anything else.

Most Easterners, I among them, have never seen the Grand Canyon neither from the South Rim nor from the mouth of the Thunder River. But we know it and value it in the same way we cherish so many other things we haven't seen: the Mona Lisa, the Matterhorn, the North Cascades, the redwoods of California, or the Sistine Chapel.

While we Easterners appreciate the water problems of Arizona and California and the rest of the arid Southwest, we don't think things have come to the point where the Grand Canyon must be sacrificed. Especially when the impounded water would be used, not to slake the thirst of Arizona's teeming thousands, but to satisfy an outmoded formula for financing reclamation projects. And if there is one thing we megalopolitans understand, it's water shortage. Our recent water rationing campaign is still pretty fresh in our minds. And if ever we New Yorkers start talking about diverting Niagara Falls to irrigate the streets of Manhattan, I hope the Westerners on this committee will rise up in arms.

Thank you, Mr. Chairman.

Mr. BROWER. Next, we would like to have our Southwest representative, Mr. Ingram, make his summary.

STATEMENT OF JEFFREY INGRAM, SOUTHWEST REPRESENTATIVE

Mr. INGRAM. I would like to talk about the National Water Commission. I have some hesitation, mindful of what one Congressman told me: that if the Sierra Club wants to get a negative reaction on a proposal, the best thing to do is to come out for it. But I am sure that the National Water Commission will not be penalized because we are taking a positive and forward-looking approach on this matter.

It is often said to people who are engaged in trying to save the Grand Canyon that time is on your side, that the longer you can keep on fighting, the more possible, the more certain it is that the Grand Canyon will never be dammed. This is true perhaps. I don't see any

great reason for optimism, but is perhaps true on this single issue of the Grand Canyon.

But the Grand Canyon is embedded in a larger issue, an issue which I think overrides all others that face us today, and that issue, of course, is population. It is almost a cliché that the population is too big, it is growing too fast. And yet cliché as it is, there is a very strange ambiguity in our attitude toward population and I would like to quote from remarks that Senator Kuchel made a few days ago in a speech. He was talking about this water project, such bills as the one he introduced and H.R. 3300, and he said, "We will have 50 million Californians by the end of the century." He described life in California in the year 2000 as wall-to-wall people, jammed into a vast coastal metropolis and then he goes on to say that "Water must be provided far in excess of its presently projected availability." He concludes that if we don't prepare for this eventuality, this wall-to-wall people—I take it back; for him it is not an eventuality, it is a certainty—then this will lead to an economic and social cataclysm. I submit that a person who can stand up and say what is going to happen and describe it as wall-to-wall people ought to stop and think and ask himself the question, Is this really going to happen?

I don't think anybody wants wall-to-wall people. I don't think it was even comfortable in this committee room last Tuesday, when we had the Secretary here. That is only for a day. Think what it would be like if we had to stand it for years and years and years.

The point here, then, is to question Senator Kuchel's statement that we will have 50 million people in California in the year 2000. I would submit first of all that grammatically the Senator is wrong. The verb is not "will," the verb is "may be." There may be 50 million people in California in 2000. There may not be. As a matter of fact, there might be a 100 million, might be 8,200 million, and if wall-to-wall people gives you the fits, think what it would be like to take the whole population of the United States today and stuff it into California. This might cause some people to worry.

But there is more than a grammatical error in what the Senator has said. There is an error in attitude and this error in attitude can lead to disastrous errors in policy.

Population, as the Senator has treated it here, and as it is too often treated, the numbers that he uses, are treated as facts—as fixed, as things you can't change, that you have to accept.

Well, that is not true. The figures that I used are projections. They are usually based on various kinds of assumptions, usually present trends extrapolated, and then they give some margin of error.

But there are two points to make about this, I think. The first is that the projection is just accepted. You just say we are going to move along the way things have been going and never ask the question, "Is it desirable, do we want this many people?"

And the second thing we don't realize is that population is not fixed. It is not one of those things which determine everything else.

The number of people we have is perhaps one of the most dependent factors we have today. For verification look at World War II and what happened to the rate of population growth there, and look at the depression and what happened there.

These events have occurred all along. People are very sensitive, when they decide whether they are going to have children, to all kinds of other factors. Consequently I would like to suggest here that we stop thinking that we will necessarily have this many people, and ask the question—it is a difficult question to ask, it seems perhaps heretical—but let's ask how many people are desired in a given area? I am not saying that there are 180 million people now and we ought to cut it down. But let's remember that when Senator Kuchel says there will be 50 million people in California, most of those people haven't even been contemplated, much less born.

We are not depriving anybody who is born now of anything. So we can start thinking in terms of the years ahead as to whether or not a particular projection is one that we want. And then we can choose between the ideal of endless increase, where we always project a steady increase (because this is what we have had and we never bothered to think of anything else), or a realistic point of view that you can't increase forever. The world can't stand it. Not only that, but normal human beings won't stand it. I think everybody will eventually come to the point where they don't want it. So let's plan. Let's think of a realistic point of view. Let's talk about a stable population. Let's talk about a realism which includes planning, which includes preparedness that the Senator is talking about, but which also includes a little bit of self-discipline, a little bit of acceptance of the limits that exist in the natural world—and the limits our own tolerance, of our own abilities to get along in the social situation.

Let's decide not just to accept the figures that the population statisticians come up with and their little bit of margin of error; let's ask the question, "What is desirable?" I would suggest some language for section 3(a) of S. 20, for instance, which could embody this—which would direct the National Water Commission to provide projections which would allow a real choice to be made.

Now, I am not saying that the National Water Commission should go ahead and try and decide what is desirable for the country. This is a job for Congress, and ultimately, of course, it is the duty of people. But I think the National Water Commission can take a look at two things, two different kinds of projections, and provide information for this committee and for all of us, and perhaps then we can make a little more rational decision.

The wording I would suggest is in section 3(a) :

The Commission shall, (1) as its first duty, prepare projections of water needs based on, first, an expanding population, using present trends for the projections, and second, a stable population, where stability would be achieved by 1990; and shall review present and anticipated water resource problems for each of these two projections identifying alternative ways in which the methods of applying water and the amount of water supplied would lead to the realization of these projections.

And then continue as given.

Then a little further on in section 3(a) (2) I would like to suggest the following wording :

The Commission shall consider economic and social consequences of developing water resources at various rates, including, for example, the impact of water resource developments on national and regional population growth, considering such factors as birth rate and migration.

Now, I would submit that this is the realistic course, that this is nothing radical here. We do this in our economic policy all the time.

I don't think anybody today accepts that we have to endure as natural the depressions and inflationary cycles that we had over the hundred years of our industrial expansion. I don't say that these are all ironed out, either, that we all like the methods by which we hope to achieve stability, but the point is we have adopted a policy. We say that it is desirable to try and have an economy that is at one and the same time stable and yet prosperous, which provides the things that we want without going way up and then falling way down. I think we can do the same thing for population and I think that the National Water Commission is one body that can start providing us with some of the information so that we can make a decision. It is not the only one. Water is not the only factor which would enter into any kind of a decision about population. But for the West it is probably one of the most important and I suspect one of the most sensitive. Water planning is too prevalent in everybody's mind in the West for a decision, whether or not you build an aqueduct or whether or not you import water, not to have an effect upon how many people boom or boost their region and whether or not they remain a little quiet about it. So water, I would suggest for the West—as well as other areas, but for the West particularly—is a constraint and it is a limit. Just to speak my own personal opinion here now, I am saying that the National Water Commission may not show this, but I think that we can show that water will turn out to be a limit which can help us, by planning, to avoid this business of wall-to-wall people (who will exist, I am sure, at that time, in earth-to-heaven pollution).

The West may need help in this kind of planning. Water is too emotional an issue for westerners to think that perhaps they can just change the way they think about it all at once. I think perhaps one of the indications of this is a quote from a speech that Congressman Aspinall made last November. He said:

How can an independent evaluation free of state, regional or local interests resolve complicated water issues involving water rights, interstate compacts, long-standing agreements, et cetera?

That is not the issue, however, for the National Water Commission. The National Water Commission is set up actually to deal with the complete reverse of that question, which would be, How can State, regional, and local interests make an independent evaluation of the multifaceted water problem, bringing to bear on problems in many places the elements which are common to those places and to those problems?

The National Water Commission's mission is to provide a forum to discuss and to generate new ways of looking at the water problem.

When the National Water Commission makes a recommendation, this recommendation does not then become law. Nobody here thinks this. Instead it will be mediated and filtered through all these regional and local interests, through this committee. And they will be in turn affected by what the National Water Commission has said.

I think that is the way things work. Nobody gets everything they want. But I think the effect of the Commission in allowing a new framework to be tested against the old, the water rights, and the other things which are long established, will have a beneficial influence on them, particularly if we have before us the choice that if we go along with the present framework we get an expanding population,

while if we go along with the Commission's framework we may possibly be able to achieve a stable population.

And just to dwell on that point a minute, if I may, the kind of water planning we have now is a subtle encouragement of population growth. Thinking of what Senator Kuchel said in his statement—"we will have 50 million people"—we must provide water for them, so water is provided. So, of course, you get 50 million people.

It is sort of subtle, but people don't have to worry about having any provision made for them, so they don't worry about them. They just have the children, and then they have got the 50 million people living wall to wall and choking in the exhaust of each other's cars.

Well, probably one of the best ways to specifically illustrate what the Commission might be able to do is to consider the Marble Canyon project. Because there was a delay last year in authorization of the legislation, Marble Canyon Dam was rethought. In rethinking it, new imaginative ideas were tried and they came up with a solution which would not have been tried, which would not have been thought of, if Marble had been authorized. I would suggest that the same is true for Hualapai Dam. The National Water Commission will be sorely handicapped if Hualapai is authorized because National Water Commission is set up to find new solutions to the water problem and the Hualapai Dam is a solution to a water problem.

I would suggest, then, that if Hualapai is constructed, there is a contradiction—the National Water Commission recommendations are going to be irrelevant. If the National Water Commission is authorized to study Hualapai Dam, there is chance here that we can put it, if it turns out to be necessary—and certainly we hope it does not—in the proper perspective in the water plan.

Well, I have gone on far too long. I made the point about population I wanted to make. I think the National Water Commission can make a contribution here, and I suggest the wording contained in my statement on page 3 to the Committee.

(The prepared statement of Mr. Ingram follows:)

STATEMENT BY JEFFREY INGRAM, SOUTHWESTERN REPRESENTATIVE, SIERRA CLUB,
ALBUQUERQUE, N. MEX.

"Time is on your side" is a remark often made to conservationists working to have the Grand Canyon National Park extended to include all of the Canyon. Perhaps on this single issue, where the main change over time is that more and more people learn about the threat dams pose to the Canyon, this remark is true. Time may be on our side in trying to save the Grand Canyon; it seems so at the moment, though optimism is hardly called for.

However, the Grand Canyon issue—and I include both preventing the authorization of the unnecessary, uneconomic, and destructive hydroelectric dams and preserving the whole Canyon—is embedded in a larger issue, one in which time is on no one's side, and in fact, is working against everything we all believe in. This larger issue overhangs, like an almost-unbalanced avalanche, all conservation issues, and indeed, all social issues. I refer, of course, to the problem of population. Our population is too big now; it is growing too fast; it may soon reach the point where it will become, to use a phrase that Senator Kuchel used in a different sense, an "economic and social cataclysm". (Speech before U.S. Senate, March 1, 1967.)

Senator Kuchel was referring to the possible result of not planning for an exploding population. He said, "We will have . . . 50 million (Californians) by the end of the century." (Emphasis added.) The Senator describes life in California in the year 2000 as "wall-to-wall people jammed into a vast coastal metropolis". The Senator then says that "water must be provided far in excess of its presently projected availability", and concludes that non-preparedness would lead, in the phrase I used above, to a cataclysm.

We can all agree with Senator Kuchel that non-preparedness would be disastrous, but I would submit that the real question is "preparedness for what?" Senator Kuchel would answer, for the 50 million that *will* be in California in the year 2000. I would start my answer by noting that the verb "will" is incorrect. The statement should read: There *may be* 50 million people in California in 2000. There do not have to be that many people there then; after all, most of those 50 million haven't even been contemplated, much less born.

There is, however, more than a grammatical error here. There is an error in attitude, which may lead to disastrous errors in policy. The figure the Senator used is a projection, not a fact, not a certainty. That projection was obtained by calculations based on certain assumptions, which if stated by a population statistician, would sound dry and impressive. However, the assumptions for such presently accepted population projections as Senator Kuchel used can be reduced to one fundamental assumption, an assumption epitomized in a story told by Joseph Wood Krutch the other day in Phoenix: On a television program a man was asked how many children he had. When he answered eight, the audience applauded. All population projections today are calculated on this fundamental assumption; that people will continue to applaud large families and, by implication, an ever larger population. What would be the result if this attitude changes, and people come to share Mr. Krutch's feeling about the war with eight children? The audience should have hissed and booed.

Senator Kuchel and the applauding audience share an ingrained feeling, a very romantic feeling: They like children; there is something pleasant and rewarding about large families. Yet this romantic notion is too idealistic for today's world. Although we are rich enough in many things that perhaps we can fool ourselves for a while longer, believing in the possibility of this romantic, idealistic world where large families are cheered and the prospect of large populations is accepted. But if we accept 50 million in California, wall-to-wall people, won't we soon accept 100 million there, or 200 million there? Can we imagine the whole population of the U.S. stuffed into California? Can we accept the idea and still be considered sane, much less realistic? I don't think so; realism about the future has to be defined, not just to include the idea of preparedness for the future, but also the ideas implied by maturity: discipline, restraint, realization of limitations. This is where the National Water Commission comes in.

The duties of the Commission include "making such projections of water requirements as may be necessary". This is not enough, for the problem we face in maintaining preparedness is not to discover what is necessary, but to decide what is desirable. If our national policy is that a great population increase is desirable then one set of resource requirements will be drawn up. If we conclude that a stable population is desirable, we will end up with an entirely different plan of action. Now it is not the Commission's job to decide what is desirable. That is the task of Congress, and ultimately of the people of this country. However, as it stands, the NWC legislation does not embody as the bill now stands, any idea of what is desirable, unless by default; the Commission is to use projections based on past trends and the old romantic idea that the more people the better. This is not enough, and I would urge the following language for the first part of Section 3(a) of S. 20:

SEC. 3. (a) The Commission shall (1) as its first duty, prepare projections of water needs based on—

- (i) an expanding population, using present trends for the projections;
 - (ii) a stable population, where stability would be achieved by 1990;
- and shall review present and anticipated water resource problems for each of these two projections; identifying alternative ways in which the methods of supplying water and the amount of water supplied would lead to the realization of these projections—giving consideration . . . (then continue as given)

and further, in Section 3(a)(2), I would suggest the wording:

- (2) consider economic and social consequences of developing water resources at various rates, including, for example, the impact of water resource developments on national and regional population growth—considering such factors as birth rate and migration—, (then continue as given).

I submit that this is the realistic course: to state clearly the basic assumptions used in making projections, and to show how the projections are likely to be achieved. I have assumed that there are two possibilities open to us today. One is that of an expanding population, the assumption shared by Senator Kuchel, and the other possibility is that of stabilizing the population.

Is the suggestion that the Commission study alternatives, in order that we may decide what is desirable, so radical? We already do this for economic policy. Not for a long time have we thought that the "natural forces" of the economy should be allowed to take us through cycles of inflation and depression. We may not all like the methods used to achieve a stable, progressive economy; we may be fooled by our present long-term prosperity into thinking that we are controlling the swings better than we really do. Nevertheless, most of us accept the idea that an economy without wild swings is better than one in which we alternate between having our head in the clouds and taking economic prat falls.

We can make such a decision for population, if we will. We are now in a period of population inflation; in some areas of the world, this is a galloping population inflation. We do not now think of it as a possibility, but how many of us would be cheered by the thought of a population depression, with the number of people contracting to the point where social organization is reduced to the bare minimum of providing for survival? Population contraction has occurred in the world's history. It can again, and will, brutally, if we do not think how we can limit ourselves now, how we can curb our population inflation. Do we really believe that 200 million people will ever live in California? Surely before this occurs, there will be a severe reaction. But this reaction will be unplanned, and, like the depression of the 1930's following the unsound boom of the 1920's, would be catastrophic. We can, we should, avoid even the prospect of this; we should start consciously on the road toward a stable population. I state this as a goal, for I believe that if the wording I suggest for Section 3(a) is adopted, the result of the study will be to show that a stable population can be achieved, and then that the people and Congress will decide that it should be achieved.

The role of water and water planning in the problem of achieving a stable population is not hard to see. Water is a limit, a constraint, on expansion. We all recognize that, though we do not like it. Up until recently, we have been like a child in a candy store with an indulgent father. The youngster has sampled this and devoured that, never curbed as he ate to his heart's content, going back again and again whenever his sweet tooth ached a little. Yet there is a limit to father's money, if not to his willingness to spend it on gluttony. At some point he will have to say "stop". Like that kid, we have been sampling and devouring our air, our land, our water. There is no single Poppa to say "stop" to us; we have only the evidence of what expansion has done to pollute the water and air, for instance. That evidence should be enough, but even if we choose to ignore that evidence or explain it away, ought we not ask:

Just how much candy should one greedy little kid get free? Perhaps the child would not stop by himself; we must, if we are to avoid having wall-to-wall people existing in earth-to-heaven pollution.

We must limit ourselves. And for the West, the easiest variable to control is water. Water has too long been a commodity subject to endless development, a completely replenishable resource. Now water supply must be accepted as a constraint, forcing us to plan. We must all—individuals, cities, states, basins—pass self-limitation acts on water; and we must all live up to them.

Possibly the West will not limit itself without help. For example, consider the words of one of the West's most knowledgeable water experts:

How can an independent evaluation free of state, regional, or local interests resolve complicated water issues involving water rights, interstate compacts, long-standing agreements, etc.? (Hon. Wayne N. Aspinall before the National Reclamation Association, Albuquerque, N.M., 11/66)

It cannot. But the National Water Commission would be set up to deal with the reverse of this question: How can state, regional, and local interests make an independent evaluation of the multi-faceted water problem, bringing to bear on problems in many places the elements common to them?

The National Water Commission's mission is to provide a forum to discuss and generate new frameworks in which water issues can be put. Whatever broad recommendations the Commission comes up with will be implemented through the present organs of government. In this way, the Commission's recommendations will be filtered through local interests, and will in turn affect them.

One of the best examples of the values of such a Commission has been shown right on this Colorado Basin problem. The delay in the legislation last year led the Administration to rethink the elements of the problem, and because it was using its expertise not to justify the old method, but to find a new solution, new solutions were suggested. Not having to defend local interests or respond to bureaucratic imperatives, the National Water Commission would be able to pro-

pose new solutions for consideration. Certainly there will be varying degrees of acceptance of these solutions, but most important is that a place be made available for encouraging imaginative departures such as the Administration's prepayment proposal.

There is another lesson here. If Marble Dam had been authorized last year, there would have been no new thinking, no attempts to experiment, no searches for new directions. Similarly, if Hualapai is authorized, the National Water Commission's value will be severely curtailed for the West, for Hualapai Dam and the Commission represent contradictory ways of solving the water problems of the future.

The National Water Commission is to take a broad fresh look at the nation's water resources and come up with recommendations which are not biased by prior commitment or predetermined plan. Hualapai Dam would be built to provide a development fund for future water projects. The existence of such a dam-based development fund is itself a "prior commitment and predetermined plan," and would make unbiased conclusions by the National Water Commission impossible or irrelevant.

Authorization of Hualapai Dam would be a commitment to one particular method of solving the future water problems of the West. This statement might need to be qualified if Hualapai Dam were an integral part of the operation and financing of the Central Arizona Project in the sense that the CAP could not succeed without that dam. The project can succeed, however, without the dam; no proponent of the Colorado River legislation now seriously contends that the Hualapai Dam is necessary in this sense. The dam would provide a convenient way to finance water development because it is the traditional way; but there are other ways.¹ Moreover, it is the very fact that it is the traditional way that makes authorization of Hualapai Dam so dangerous.

What the proponents of Hualapai Dam lay their stress on is the need to accumulate funds to help solve the long-range water problems of the Southwest. They would extend the traditional method of funding reclamation projects far into the future to pay for supplying water for various uses and from various sources. Moreover, the dam would be authorized before anyone has even studied the possible water projects. For the first time, a "cash register" would be provided before there is anything to buy.

Of the various sources being considered for augmented water supply in the Southwest only large interbasin transfers, to move water from one basin to another for agricultural purposes, need the money assumed to come from Hualapai Dam.²

Paradoxically, the dam's contribution will be nowhere near large enough to

¹ Alan Carlin and William Hoehn, RAND paper presented in House hearings, 89th Congress.

William E. Martin and Leonard G. Bower, "Patterns of Water Use in the Arizona Economy," *Arizona Review*, Univ. Arizona, December 1966.

Jeffrey Ingram, testimony in House hearings, 89th Congress. S. 1013, administration bill.

² What methods of augmentation are foreseeable that would require such sums of money?

(1) Reallocation of water from low value, extensive irrigation uses would end the water crisis in large measure, as studies at the University of Arizona show. Such reallocation will not require large sums of money, only the courage to overcome the oft-repeated myth of water shortage.

(2) Weather modification may increase water yield in certain sections of the West, but again there is no indication this will require large sums of money.

(3) Large dual-purpose nuclear plants may help localities. Large capital expenditures will be required, but the fact that such plants will themselves generate large amounts of power for commercial sale indicates that the revenue produced by the Grand Canyon dams may not be required. Moreover, the combination of off-peak power for pumping with on-peak power for commercial sale from these dual-purpose plants will compete with the dams, and according to the work of Carlin, Hoehn, Moss, and the Parsons Co., actually undersell the dams' power. More study of this crucial matter is needed, but the dams seem neither economic nor necessary for this third possible method of augmenting the water supply.

(4) Importation of water from another river basin is most frequently mentioned, in part, of course, because it is the most traditional method. There are three uses for such imported water, and each has a different financial structure.

(a) Importation to relieve the Mexican treaty burden will not require a development fund, since the legislation proposed would charge this job to the taxpayer in New York, Massachusetts, Florida, Oregon, etc.

(b) Importation for municipal and industrial needs, over and above what will be satisfied by taking over water supplies used by agriculture, will not need the dams' revenues because municipal and industrial users are charged enough to pay for their share of the capital costs.

(c) Importation to irrigate crops is traditionally subsidized, and in this brief summary, appears to be the only purpose which needs a development fund which might require the Grand Canyon dams.

cover the cost of such interbasin transfers and other subsidies will be needed.³ In spite of the inadequacy of the Hualapai Dam's revenues, in the final analysis they can serve only one purpose: financing the import of water for irrigation.

A further point, subtle but important, is that the authorization of Hualapai Dam would be a victory for those who believe with Commissioner Dominy that "The high Hualapai Dam project is much more economically feasible and fits into the operating procedure and revenue requirements much better than any thermogeneration proposal."⁴ Without arguing the merits of the statement, we can conclude that what Mr. Dominy is voicing is a self-fulfilling prophecy; i.e., the dam, if built, will be better because the alternative was never tried, except on paper, and concrete is better than paper, and old thinking better than new.

The President and the Senate have approved the National Water Commission to "study alternative solutions to water problems without prior commitment to any interest group, region, or agency of government",⁵ a Commission free to survey the field, to search out the best way to supply water needs. But if the ditch-and-dam method, as Senator Anderson calls it, is accepted as the best way, it will dominate all others. Commissioner Dominy goes a step further when he says: "Weather modification in the high reaches of the Rockies gives extraordinary promise of additional precipitation which will even further justify the proposed hydropower development on the Colorado". Thus, one of the alternatives a National Water Commission might consider is already being used to "justify" the traditional ditch-and-dam method. This "justification" will be turned into a necessity by the dam's proponents if the dam is built; they will say they must have all possible water flowing downstream to generate revenue.

Authorization of the CAP could appropriately close out a period, the reclamation-for-agriculture period, the ditch-and-dam period.

Authorization of Hualapai Dam, however, will project that period too far into the future, a future in which the water needs are most likely to be the needs of cities and industries. Authorization of Hualapai will make it exceedingly difficult to consider city-oriented solutions to water problems. Some dams and ditches may still be needed, but for a city they will probably be a small part of an overall water-supply complex. We cannot predict this, nor can the Bureau of Reclamation. The National Water Commission should be allowed to make its best predictions. Unbiased analysis of what this water-supply complex should consist of will be precluded in the face of the actual presence of a Hualapai Dam.

The National Water Commission is aimed at the future; it is the President's and now the Senate's response, with which we concur, to the need of being responsible to the future. We can do that only with a clean slate. If Hualapai Dam is written in large letters at the top, then the type of solution it represents will most likely fill the rest of the slate in the decades ahead.

In short, the Hualapai Dam, with a purpose of trying to make money the old way to pay for future water projects, and the National Water Commission, with the purpose of searching out the best new way to solve future water problems without commitment to present methods, are contradictory.

If Hualapai Dam is authorized, the Commission's recommendations will either be determined for it or ineffectual against the argument, "We have a dam; it works; our old method works; it is the best way; try no other."

Consequently, if the Hualapai Dam is authorized, the National Water Commission will be a waste of time.

On the other hand, if Hualapai Dam is not authorized, then the National Water Commission can consider all methods, without prejudice, without being faced by a *fait accompli*. The Commission will be able to weigh all data, to choose freely between alternative methods, and to fit those methods into rational plans which, by bringing out the best in present thinking, can most effectively provide for the future's needs.

It may be asked by the proponents of Hualapai Dam: What will be the result if the Commission and Congress do finally conclude that Hualapai is a good idea? Won't five years of revenue have been lost? A rough calculation shows that there will be at most a 2½-year deferral of Hualapai revenues, if Congress

³ Morris K. Udall cited in House hearings, 89th Congress, a capital investment rule of thumb of \$1 billion/1 million acre-feet of import capacity. Bureau of Reclamation testimony, *loc. cit.*, shows only \$2 billion earned by both Grand Canyon dams by 2047.

⁴ Grand Junction (Colorado) Daily Sentinel, Jan. 22, 1967.

⁵ S. Rept. 1212 on National Water Commission, p. 2, 1966.

should authorize the dam. (The time is so short because the Hoover Dam revenues after payout are available earlier in Hualapai's pay-out period.) So even under the worst assumption—that Hualapai is authorized after the National Water Commission study—the effect is small.

The question is often asked: How would the National Water Commission study Hualapai? Hopefully, the study would be in the broadest context. Of course, all water developments need to be considered broadly; that would be the Commission's job. To further this broad study, I would suggest inserting the words "natural and" after the word "on", line 11, p. 3, of S. 20, and the phrase "and the effect of alternative water resource developments on the land and the environment;" after the word "people", line 12, p. 3.

Sec. 3 (a) (2) would then read, including the changes I suggested above:

(2) consider economic and social consequences of developing water resources at various rates, including, for example, the impact of water resource developments on national and regional population growth—considering such factors as birth rate and migration—on regional economic growth, on institutional arrangements, and on natural and esthetic values affecting the quality of life of the American people, and the effect of alternative water resource developments on the land and the environment; and . . . (continue as given)

The aim of such language is to encourage the appointment to the Commission of an outstanding figure, full of experience and wisdom, who would be chiefly concerned with the natural sciences, with the land and its life, with the effect man has on that land.

We must have such people, along with engineers and lawyers and others, to help balance one method against another. This balance is incredibly difficult to achieve, as the Interior Committee is well aware, since that is what it is doing all the time. The difficulty is illustrated by an aspect of the issue at hand:

Suppose the dams are dropped from this legislation in favor of coal plants. Then we get air pollution. But if we give up coal plants for dams to save the air, we lose water through evaporation, (which is one of the dam's hidden fuel costs—sedimentation is another). Yet if we save water by building coal plants instead of a dam, we use up the coal. But if we then argue that we must save coal, a non-replenishable resource, and therefore build dams, we lose the river and canyon bottom, which puts us back where we were.

Going round and round in this way is inevitable. The earth, as far as our resource uses are concerned, is a closed physical system. A gain here is a loss there. These gains and losses need to be broadly considered by the Commission.

The National Water Commission can be a tremendous force for realism in this country, and not just on the water problem, where the Commission can consider all ideas and try to identify their relative value for each region of the nation. The Commission can do more, for it can think of water as a natural limit, and can ask: What will be necessary if the people of an area are to prosper in a land that is still livable? What are the benefits and costs to the nation of providing water for an endlessly expanding population? Of providing water for a population that has stabilized itself?

So I close by urging again that the National Water Commission be instructed to consider the question of population and to provide the information necessary for us to decide which is more desirable: a stable population or an ever-increasing one. With this information, we may then choose: Do we want wall-to-wall people with the attendant destruction of the land that we cherish, the unusability of the air and water, and the disappearance of a way of living that any of us would consider worthwhile? Or do we want the alternative: a stable population, a prospering economy, a civilization of quality, a land of natural beauty and continued inspiration?

DECEMBER 12, 1966

CAN WE END THE GRAND CANYON CONTROVERSY HAPPILY?

The Grand Canyon controversy is at a crucial point. It can be ended now; and what is decided this month will determine whether the conflict will be amicably resolved or whether a bitter struggle will be renewed. The responsibility is shared by all of us on every side of this complex subject. Wishing to go on to other, more constructive work, we offer this memorandum, which we believe provides a basis for negotiation on, and solution of, the problem.

In brief, the repayment analysis of the Lower Colorado River Basin Project, which appears on the next page, shows that more water could flow to Phoenix and Tucson sooner, with less cost to the water user, the power user, and the general taxpayer, than any other plan advanced.

Lower Colorado River Basin Project repayment analysis without construction of Grand Canyon Dams—2500 C.F.S. Aqueduct

	Hoover Dam fund		Municipal and industrial			Irrigation	
	Aid to Lower Colorado River Basin project	Lower Colorado River Basin project	Net operating revenue	Interest on unpaid balance at 3.225 percent	Unpaid balance	Net operating revenue	Unpaid balance
1973			\$32	\$1,176	\$36,477		\$23,151
1974			3,333	4,718	146,306	\$1,560	271,448
1975			3,541	4,969	154,063	593	302,635
1976			3,723	6,863	212,820	2,363	322,091
1977			5,645	6,965	215,960	2,380	319,711
1978			6,001	7,007	217,280	2,089	317,622
1979			6,342	7,040	218,286	2,052	315,570
1980			6,675	7,062	218,984	2,051	313,519
1981			7,031	7,075	219,371	2,018	311,501
1982			7,362	7,076	219,415	1,991	309,510
1983			7,694	7,067	219,129	1,920	307,540
1984			8,025	7,017	218,502	1,967	305,573
1985			8,356	7,015	217,524	1,949	303,624
1986			8,688	6,972	216,183	1,936	301,688
1987			9,029	6,917	214,467	1,921	299,767
1988			9,359	6,848	212,355	1,912	297,855
1989			9,692	6,768	209,844	1,891	295,964
1990			10,022	6,673	206,920	1,888	294,076
1991	\$6,368	\$6,368	10,359	6,565	203,571	1,857	292,219
1992	6,347	12,715	10,694	6,237	193,409	1,840	290,379
1993	6,326	19,041	11,019	5,889	182,605	1,821	288,558
1994	6,305	25,346	11,354	5,520	171,149	1,805	286,753
1995	6,284	31,630	11,691	5,128	159,010	1,727	285,026
1996	6,263	37,893	12,002	4,714	146,163	1,677	283,349
1997	6,242	44,135	12,337	4,277	132,612	1,599	281,750
1998	6,221	50,356	12,661	3,816	118,310	1,485	280,265
1999	6,200	56,556	12,972	3,330	103,274	1,379	278,886
2000	6,179	62,735	13,308	2,819	87,402	1,285	277,601
2001	6,158	68,893	13,308	2,281	70,734	1,172	276,429
2002	6,137	75,030	13,281	1,727	53,549	1,128	275,301
2003	6,116	81,146	13,271	1,156	35,858	1,112	274,189
2004	4,951	86,097	13,245	569	17,627	1,063	273,126
2005		86,097	13,245		0	1,033	272,093
2006		86,097	13,243		0	990	257,858
2007		86,097	13,207		0	940	243,675
2008		86,097	13,207		0	923	229,545
2009		86,097	13,181		0	870	215,468
2010		86,097	13,181		0	845	201,442
2011		86,097	13,171		0	805	187,456
2012		86,097	13,143		0	752	173,533
2013		86,097	13,143		0	735	159,655
2014		86,097	13,118		0	692	145,820
2015		86,097	13,106		0	664	132,038
2016		86,097	13,080		0	617	118,315
2017		86,097	13,055		0	600	104,635
2018		86,097	13,053		0	547	91,008
2019		86,097	13,017		0	519	77,434
2020		86,097	13,017		0	485	63,896
2021		86,097	12,991		0	458	50,421
2022		86,097	12,965		0	405	36,999
2023		86,097	12,955		0	393	23,615
2024		86,097	12,930		0	367	10,283
2025		86,097	12,902		0	324	0
2026		86,097	12,902		0	305	
2027		86,097	12,867		0	280	
2028		86,097	12,839		0	228	
2029		86,097	12,839		0	199	
2030		86,097	12,839		0	185	
2031		86,097	12,839		0	141	

1. The bulk of this memorandum describes a repayment analysis for the Lower Colorado River Basin Project. The analysis demonstrates that the costs of the Project can be paid back :

(1) Without construction of any dams in the Grand Canyon, which extends from Lee's Ferry to the Grand Wash Cliffs;

(2) Without using revenues from Parker or Davis dams;

(3) Without federal construction of or investment in any type of power generating facilities;

(4) Without raising the rates for Hoover Dam power beyond their present level.

Further, any Hoover revenues used in repayment of the Project will be repaid by the beneficiaries of the Project.

Legislatively, repayment by this method could be accomplished by Section 403, H.R. 4671, 89th Congress, plus an amendment to the Boulder Canyon Project Adjustment Act which would provide that:

(1) Revenues from Hoover dam shall be used to aid in repayment of the Lower Colorado River Basin Project;

(2) Any revenues so used shall be repaid by the Lower Colorado River Basin Project as soon as that Project is paid for.

II. A key to this analysis is the recently-signed contract between the California Department of Water Resources and four California power suppliers. Under the contract, the utilities would supply off-peak power to pump water in the California Water Project at the rate of three mills/kwh. (See enclosed clipping.) This repayment analysis is based on the assumption that a similar contract can be negotiated for the Lower Colorado River Basin Project. Since not all pumping power can be supplied during off-peak hours, the analysis uses a 65% load factor as the switch-over point from off-peak to peak rates. The peak rate used here was six mills/kwh. (The switch-over point could have been as low as 40% without changing the analysis and its conclusions.)

The peak power requirements for pumping has been allocated to irrigation, since municipal and industrial water, being of necessity a firm supply, has first claim. It should be noted that the conclusions would not be changed under any other assumption about allocation of peak-rate pumping power.

If the two Grand Canyon dams are not built, then some 100,000 acre-feet of water per year, which would have been evaporated off the reservoirs, becomes available for diversion. This is a firm supply of water. The most advantageous use of this water is for municipal and industrial needs and, if this extra water had been used in the analysis, there would have been additional net operating revenue of some \$3.25 million available after the year 2010. Before that year, some lower figure would be appropriate, depending on how much was allocated to irrigation. However, in order to keep the present analysis as simple as possible, this extra water was not included in the calculations.

III. The repayment analysis presented stops with the repayment of the Hoover dam revenues, and there is thus no build-up of any Development Fund. It has often been pointed out that the main purpose for the Grand Canyon dams, raising the rates for Hoover dam power, building a federally-financed thermal power plant, etc., is to build up a large Development Fund for augmenting the Colorado River's water supply. Since all of these revenue-production methods are controversial, and since the possible means of augmentation are both speculative and controversial, we thought it best to leave the building-up of a development fund to another time. The point of this memorandum is that the Grand Canyon dams—one, two, or more, high, low, or middle-sized—are unnecessary; the Lower Colorado River Basin Project can proceed and succeed without them.

IV. Details of method: The figures for capital costs, water supply, power needs, interest rate, etc., are those supplied to me by the Bureau of Reclamation for the 2500 c.f.s. Central Arizona aqueduct, and used by the Bureau in its own analyses. The Hoover Dam aid is extrapolated from the Bureau figures. The methods used in this analysis are those of the Bureau, as provided for in present practices and H.R. 4671.

The net operating revenue for municipal and industrial water, as provided by the Bureau, was adjusted to take account of the fact that the Bureau's cost for pumping such water is $4\frac{1}{4}$ mills/kwh, while this analysis uses the three-mill figure. Likewise, the net operating revenue figure for irrigation water was adjusted to account for the difference between $2\frac{1}{2}$ mills/kwh, the Bureau's figure, and the three-mill and six-mill figures used here.

Using these adjusted revenue figures, the municipal and industrial costs were repaid, with Hoover Dam aid used as it became available in 1991. Municipal and industrial costs were paid off in 2004. No more aid from Hoover was used, and all water revenues were used to pay off irrigation costs by the year 2024. The Hoover dam aid was then repaid, using all water revenues, by the year 2031.

[From the San Francisco Chronicle, Mar. 19, 1960]

UTILITIES, STATE SIGN WATER-PUMPING AGREEMENT

The State Department of Water Resources and the director of California's four largest utilities signed a contract yesterday pledging enough electricity to pump Northern California water to the Southland.

Roughly, enough power to serve a city of two million will be provided to 42 separate pumping units along the 444-mile pipeline to Los Angeles. The cooperation of the utility companies eliminates the need for the State to duplicate costly, utility-owned facilities along the route.

Under the terms of the agreement, Pacific Gas and Electric Company will supply 43 percent of the power, Southern California Edison Company, 36 percent, the Los Angeles Department of Water and Power, 15 percent and the San Diego Gas and Electric Company, 6 percent.

The agreement calls for the utilities to supply off-peak, steam-generated power through their interconnected systems at a rate of three mills per kilowatt-hour. Ultimately, sales under the contract are expected to reach \$30 million annually paid by the southern water users.

Most of the power will be used to boost the water nearly 3000 feet over the Tehachapi mountains. The task requires pumps with a combined capacity of 1.7 million horsepower.

Department of Water Resources director, William E. Warne, said the project is expected to save water users \$20 million annually. The contract, he added, makes the State the utilities' biggest customer.

"The contract we are signing today required two full years of exceedingly complex negotiations," Warne said at the signing. "After general agreement was reached on the principles and the rates involved, there still remained many details to scrutinize."

"The new director of the Department (of Water Resources) now can move with full confidence into the construction of the remaining facilities needed to put the project into operation."

Warne's administration will end with Governor Edmund G. Brown's.

Mr. UDALL (presiding). Mr. Brower, does this conclude the presentation of you and your group?

Mr. BROWER. Yes. I have an announcement to make when we are all through.

Mr. UDALL. Go ahead.

Mr. BROWER. So that you may see some of the photographs we have in mind that we would like to supply to the committee, over in room 602 of the Congressional Hotel as soon as this meeting breaks up, we have some of these Ernest Braun color photographs on display. I invite anyone here to come over and look. Some of these pictures we hope to put in a new book, "Grand Canyon of the Living Colorado," which is due out very soon.

Mr. STEIGER. Mr. Chairman—

Mr. UDALL. I was advised by the staff that there was a statement by Mr. Evans. Was that the statement you put in previously?

Mr. FOLEY. Yes.

Mr. UDALL. Do you have other material in addition to those mentioned before?

Mr. BROWER. That is all I believe we have now, Mr. Chairman, except that we would be glad to answer any questions if we can.

Mr. STEIGER. Mr. Chairman, before the questioning, I wonder if without objection we could note for the record the presence of the junior Senator from Arizona, Senator Fannin.

Mr. UDALL. We are delighted to have him again. He is one of the great fighters for conservation and wise use of natural resources.

Senator FANNIN. Thank you, Mr. Chairman.

Mr. UDALL. I will announce to the members of the committee we intend to continue, to attempt to finish the witnesses listed this afternoon, and I propose to preside until Mr. Johnson returns in about 10 minutes. So any of you who want to play this game of committee leapfrog with us will probably have an opportunity to get your questions in when you return, if you have any.

The gentleman from California, Mr. Tunney.

Mr. TUNNEY. Mr. Chairman, I would like to reserve my time because I am going to have to leave in 2 minutes and get down and answer on the roll call.

Mr. UDALL. The gentleman's time is reserved. The gentleman from Oregon.

Mr. WYATT. Mr. Chairman, I would like to ask to do the same thing, if I may.

Mr. UDALL. The gentleman's time is also reserved.

The gentleman from Washington.

Mr. FOLEY. No questions, Mr. Chairman.

Mr. UDALL. The gentleman from Idaho.

Mr. HANSEN. It looks like we are all in the same boat, Mr. Chairman.

Mr. UDALL. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Mr. Chairman, I think it might be just as well that I have to leave. I would like to express a few of my own doubts with regard to the statements of these gentlemen, and perhaps, ask some specific questions.

I like the language of Mr. Soucie in which he indicates disbelief, outrage, and anger at a concept. I recognize the emotions very vividly, Mr. Soucie, because I share them, only I feel I share them because of the conclusions that you gentlemen have reached with regard to the Grand Canyon.

I think again I will indicate that the merits of my expertise on this certainly don't go beyond yours with regard to study, but I think the fact that I have spent most of my adult life within 100 miles of this area is of some value at this moment.

I think that the concept that anybody, be he a representative of the people or simply a resident of the area, who would willingly violate anything of beauty, whether it be a national monument or a single tree, would wantonly violate this, would have to offend those who are so accused, and therefore I feel offended.

The concept of—the arbitrary concept that Hualapai Dam is going to do great damage to the Grand Canyon is not only not factual, but by any yardstick of esthetic judgment is irresponsible, and I found myself wondering what was the motivation here.

Obviously you are intelligent people. You obviously have given this thing a great deal of thought and some study. I don't know how objective your approach was, but a great deal of time has been spent on it.

I find myself believing that there must be a sound motivation since you have spent time on it, since you have been in the area, at least Mr. Brower has. He knows that the Grand Canyon itself will not be violated.

Is it conceivable that there is a reward of self-gratification other than that of fighting a cause? And I would like to determine that

now and I assure you that is the spirit in which I am going to ask a few questions.

For example, you mentioned in your statement, Mr. Brower, you mentioned that you had 10,000 new members since June. How many advertisements did you run, and how many paid advertisements, approximately, did you run in the 90 days prior to June?

Mr. BROWER. We ran our first advertisement in the preceding December. We ran a full-page ad on the Redwoods in five newspapers.

Mr. STEIGER. Do you recall the cost of that?

Mr. BROWER. The cost of all those ads, the preceding December, was something like \$19,000.

Mr. STEIGER. \$19,000?

Mr. BROWER. Yes.

Mr. STEIGER. And that was the only national effort you made as far as expenditures for advertising?

Mr. BROWER. That is the first time we have tried the use of newspaper advertising to acquaint the public with problems related to our scenic resources and the public obligation to be responsible for them. However, we have been publishing for a long time in other ways, and we began publishing our books in 1959—

Mr. STEIGER. I was referring—

Mr. BROWER (continuing). Which have provided fully as much notice as the advertisements and brought our membership from 15,000 in 1960 up to the level we had at the beginning of this year, which was 34,000.

Mr. STEIGER. Well, actually December of last year is not the first time that you have resorted to newspapers because on October 31, 1955, you turned to the newspaper—this is from the Denver Post, and it follows the—

Mr. BROWER. You will note that wasn't a Sierra Club advertisement.

Mr. STEIGER (continuing). Informing the—

Mr. BROWER. That was the council of conservationists. I was a member of the executive committee, but that was not the Sierra Club nor was it related to it.

Mr. STEIGER. In this ad—

Mr. BROWER. That is where we got the idea, however.

Mr. STEIGER. So this device, this method, however, of informing the public and soliciting membership is not a new—it didn't start in December of last year.

Mr. BROWER. You will note in that ad that membership was not solicited. I can correct the date. The first ad was December 1965. That was on redwoods. About December 17, 1965. Then we didn't run ads until June of 1966.

Mr. STEIGER. Well, at any rate you generated such an interest in December of last year to gain 10,000 members or more actually in that interval.

Mr. BROWER. No. The thing that really made the gain was the attack of the Internal Revenue Service on the Sierra Club. There was a general feeling that it was unfair and there was a response all over the country editorially and in the feature articles, and I think the Internal Revenue Service gave the Sierra Club a rather enviable

underdog position. It cost us a great deal in major contributions, but it brought us much broader support than we had before. So I think we owe Mr. Sheldon Cohen a vote of thanks.

Mr. STEIGER. Now, were these 10,000 members—were they added at the \$14 membership fee, or were they just a variety of contributions?

Mr. BROWER. The coupon on those ads called for \$14—\$5 for admission fee that lasts the rest of your lifetime, and \$9 a year. Not all membership applications came in on the coupon. Starting with the June advertisement, we had something like 2,500 memberships come in on coupons right up until now, the recent ad.

Mr. STEIGER. Well, the 10,000 new members would represent somewhere in the neighborhood of \$140,000 of income, wouldn't it?

Mr. BROWER. Receipts, not income. There is a difference. It costs something to serve them.

Mr. STEIGER. Right. The cost was \$19,000 plus whatever administrative costs you have.

Mr. BROWER. No. You have got to go into some further figures than that because that was one set of ads in December of 1965. I can just report here roughly that when we placed the advertisement for the new memberships, the requests for information, the outright contributions, and the full cost of the membership, receipts just about recover the cost of the ad. This is a way that the message can be given to the public at least in part at the public's expense. It costs us a little bit but not much, and the information does get out.

Mr. STEIGER. So actually you spent somewhere in the neighborhood of \$140,000 for the ads in this period?

Mr. BROWER. No.

Mr. STEIGER. You spent \$140,000 for the ads in your administrative—

Mr. BROWER. I think you are confusing things a little bit, Mr. Steiger. If you are attributing all the new members to the ads, you can't do that. That is not a proper allocation of cost or income source.

Mr. STEIGER. Well, I think regardless of what the motivation was, my only point in this questioning, which I am sure you are aware of, is to find out if you arrived at a net profit.

Mr. BROWER. My executive committee would assure you this is a futile line of inquiry because we have a fairly handsome deficit. Our last year's deficit was \$97,000 and a great deal of this is part of the effort of trying to bring to the public the news, the factual information about the real damage that is threatened to the Grand Canyon, and of this we have no doubt. You yourself living 100 miles from the canyon might have doubts of it, but if you go down the canyon—Mr. Nash and Mr. Ingram and I have gone down the canyon—we don't have any doubts; we know what would happen.

Mr. STEIGER. I have been down the canyon seven times in 9 years.

Mr. BROWER. Down through the river?

Mr. STEIGER. Seven times in 9 years.

Mr. BROWER. If you would contemplate what a dam 180 feet higher than the Washington Monument would do to some of the finest sculpture on the river, you would know first that that would never be seen again. It would be underwater. And finally as my testimony

shows—and rather sooner than later, possibly—it is perpetually gone under sedimentation. That is major damage to the scenic resource.

Mr. STEIGER. The only result would be to reduce the trip from somewhere up around 13 or 14 days to somewhere around 6 or 7 days.

Mr. BROWER. I think we will have to disagree on that very strongly.

Mr. STEIGER. I wouldn't be surprised if we disagreed.

Mr. Chairman, I am going to have to return it to you, because I need the votes more than you do.

Mr. UDALL. We will miss you, but you are excused.

Mr. STEIGER. Thank you, gentlemen.

Mr. UDALL. Mr. Brower, maybe we can start out by compromising. I have had no indication that the Sierra Club is ever willing to compromise but in the light of Mr. Nash's rather dramatic testimony about population, and as one who introduced the first population bill ever presented in the House of Representatives, maybe we can compromise by your letting us build Hualapai with the understanding that the Bureau of Reclamation would inject there some kind of a birth control substance which would go into the water at that point and stop any population growth in Los Angeles.

Mr. BROWER. Mr. Ingram is the population man.

Mr. INGRAM. Mr. Brower may answer. As you well know, Congressman, and as too many people do not know, the water will not come from the Grand Canyon Dam but only high-cost subsidized power, hopefully.

Mr. UDALL. I know your position, that to take out one dam is not a compromise because one arrow into the heart is just as bad as two—it seems to me in all of the country's resource decisions we have to compromise. Mr. Souci's club, I am sure did not fight the Tocks Island Dam. If I am wrong I hope they will correct me. But this flooded out 37 miles of living river and sedimented up tributaries and areas around them and required 4,000 God-fearing, taxpaying families to be removed from the land. Against that you balance off the regulation of the river, more steady water supply for the cities in that area, and recreation for 50 million or 60 million people in the most populated area of the country. So I had thought that maybe if we took Marble Canyon out as I am willing to do, and put it in the park as I am willing to do, and give you 158 miles of living river instead of 104 which wasn't sufficient last year, that maybe we had the grounds of compromise.

If we lower the dam so that we take out 13 miles more and we give you 171 miles of living river forever, does the Sierra Club find this proposition at all interesting now that you have rejected my birth control proposal?

Mr. BROWER. Maybe Mr. Soucie would like to respond to that because I believe he knows a little more about the Tocks Island problem.

Mr. SOUCIE. I leave to Mr. Brower the answer on the Grand Canyon, but on the Tocks Island project, Mr. Chairman, what I want to point out is that the Sierra Club is not against dams per se. Certainly some dams are necessary and in the case of the Tocks Island project, though this developed before I was a resident of New York, so I can't speak very intelligently about the history of it, but it was felt that this proj-

ect was necessary and that the values sacrificed were in no way on the order of the values of the Grand Canyon.

Mr. UDALL. Well, in short, all I am getting at is the Sierra Club did not oppose that.

Mr. SOUCIE. That is right.

Mr. UDALL. And you agree with me in certain cases you must balance in these resources decisions the things you gain against the things you lose. In this case you would agree that with construction of the dam probably you had more to gain than you had to lose looking at it overall.

Mr. SOUCIE. I am not sure we went that far. What I would say is we didn't get alarmed enough at the beginning to pursue it. I don't think that anyone in the Atlantic chapter, say on the executive committee, the people who make the decision, actually went through all the steps of comparative analysis, but certainly the values to be sacrificed were not so great that immediately we rose up in arms. That is why I say we are not against dams.

Mr. UDALL. I understand.

One of the things that has troubled many of my colleagues here is what they deem the impossibly adamant noncompromising position of the Sierra Club. We have 104 miles of living river, the longest stretch of national park in the country. We enlarge that to 158 miles. We are willing to enlarge the Grand Canyon to take in Marble Gorge and Vermillion Cliffs and all of that. We are willing to talk about going downstream another 13 miles. What would the Sierra Club accept? If we have a low, low, low Bridge Canyon dam, maybe 100 feet high, is that too much? Is there any point at which you compromise here?

Mr. BROWER. Mr. Udall, you are not giving us anything that God didn't put there in the first place, and I think that is the thing we are not entitled to compromise. That is the primary scenic resource of this country. If there are no other ways to go about getting your water, I would still say that the compromise should not be made—that Arizona should be subsidized with something other than the world's Grand Canyon, or any part of it.

We would not expect you to sacrifice a major part of the central Arizona aqueduct for the possibility of getting water. You are here for the principle of getting water for Arizona. And although we could question some of the economics of this, we are perfectly willing to compromise there.

The aqueduct is going to damage a great deal of scenery. The new storage reservoirs along the aqueduct will too. These things we are taking a walk on. On the Grand Canyon, we are not entitled to take a walk.

Mr. UDALL. You won't agree or compromise on any dam at any point regardless of what you conceive to be the total geological Grand Canyon regardless of how high, how low, how little damage or anything else.

Mr. INGRAM. I think we are biased by the use of compromise as a verb. This is not a compromise. You can't compromise when one side says "we will define what is to be compromised." Both sides have to come together, and I have been emphasizing this point, of course, as you know, for several months, that you have to come to-

gether first and talk about what you can discuss as to compromise. We have never been able to do that. Every time we have come in there we have been accused of being inflexible and not bargaining in good faith. But you won't bargain in good faith on issues that are important to us.

Mr. UDALL. We know your position and you know ours. What I am getting at, I want the record to show that the Sierra Club would not slacken its efforts in any degree if we lowered the dam by any amount or changed the dam in any way. This is the point I wanted to make. Nor does the Sierra Club slacken its efforts or compromise when the Secretary of the Interior and the administration are willing to simply defer the dam and take 5 more years to decide whether we build it.

You say that you will continue to fight and try to defeat the bill unless it contains a provision setting aside that damsite once and for all time in the Grand Canyon National Park.

Mr. BROWER. We have no choice. There have to be groups who will hold for these things that are not replaceable. If we stop doing that, we might as well stop being an organization and conservation organizations might as well throw in the towel.

Mr. UDALL. I know the strength and sincerity of your feelings and I respect them. I simply want to make sure I have the position of the Sierra Club firmly laid down here today.

Now, because much of what you brought in today is reargument of things we have had before in the hearings and things that I have discussed with both of you privately, I don't want to take the time to go over them again. But because there probably won't be any answer in the record to your dreary predictions on sedimentation in your "Sedimental Journey" which I read both today and in a previous draft, I want to have just a short colloquy and make a couple of observations on that.

The Coast and Geodetic Survey I am told by a gentleman from the Bureau of Reclamation here, with the Bureau of Reclamation and the Navy a few years ago made a special study trying to determine the useful life of Lake Mead and Hoover Dam. It was calculated by these experts to be more than 500 years without Glen Canyon. With Glen Canyon, Lake Mead's useful life was believed to be considerably longer than that. I know you contest these facts but I am going to ask you a question.

I think we would all like to know ahead of time what really would have to happen with sediment. You don't know and I don't know. We can make projections or guesses. But I think the way I would really want to do it if I were to be sure would be to find some planet off in outer space somewhere where I could build a dam exactly like this and check it out for 50 or 60 or 200 years and see what the sedimentation actually was to guide me in making a decision here on earth.

Well, it seems to me that we actually have almost that good a test, and it is called Lake Mead. You are talking about the silting at Hualapai, the silting which you predicted in Marble Dam, and they closed the gates at Hoover, and for 33 years you got all the sediment in the whole Colorado River. You didn't have Glen Canyon. You didn't have Coconino that we propose to put in or Paria that we pro-

pose to put in, and yet according to your calculations this period of time, 33 years, should have seen wall-to-wall mud about halfway down through Lake Mead. Yet, the truth of the matter is—I flew over it just a few months ago—and less than a fraction of 1 percent of Lake Mead has anything like wall-to-wall mud.

I know you have pictures. I have seen the area. In terms of the huge lake, in terms of the total lake surface, in terms of the flood control that has enabled that whole lower stretch of the river to develop, the disasters that have been avoided all through the river basin down to the Imperial Valley and along the Colorado down below, that very small percentage of wall-to-wall mud in upper Lake Mead, which is certainly inaccessible would seem to be a reasonable price to pay when you balance off the damage and the destruction you would have down below. Now, this is a record of 33 years which doesn't bear out anything like the kind of predictions you have been making.

Mr. BROWER. May I answer?

Mr. UDALL. You may answer in just a moment. I emphasize that, except for the past 2 years, this 33-year test in this very reservoir took place when you didn't have Lake Powell and when you didn't have Paria or Coconino.

My question is, Why didn't we have this complete silting up of that reservoir that you predict will surely happen if we have the other reservoir? And I can't wait for the answer. I have got to go vote. It will be in the record and I will read it.

Mr. BROWER. The answer to Mr. Udall's question is that we are thoroughly aware of the study he cites. I have it back in the hotel room and can bring it in anytime. The study is over a short period, and we have not predicted in this statement that there would be any appreciable silting of Lake Mead in that time. We do have a fairly good measurement of how much sediment has come in in this period, and we also know that there have been no major disruptive floods in that period to add an extraordinary amount.

That was the point of my showing what happened on the Paria to one little silt detention trap and what happened in the redwoods country. The record is terribly short. We have Lake Mead. No conservation organization I know of protested it. It will be there a long time. I think we can have quite a bit of time to see that we silt up just Lake Mead and Lake Powell, and not the Grand Canyon, while this test is running. We have a reservoir there. I have been through it. I know the trouble of getting ashore at the head of Lake Mead for the first 50 miles. I know what a mess it is when the water is drawn down, as it is now. If you are coming down the river from where you hit Separation Canyon, where the top of Lake Mead is when full, you have 50 miles to go to get down to where the river is dumping sediment. Pierce Ferry was going to be a great recreational area, but it is out of action because of sediment. If you want to have fun boating in the canyon, there is 40 miles of Lake Mead in the Grand Canyon. Let the mass recreation go there if it can. It can't because of the mud. Not very many people can navigate through that mud or get over the ultimate barrier.

If it is so good, let's play with that because we do have Hoover Dam and the dam is about half full. We have got plenty of chance to test sedimentation further.

Our records are extremely fragmentary and my testimony bears out that the U.S. Geological Survey has not been allowed any funds to speak of to study this matter. I hope that they will be. I would like to see those studies precede any further authorizations of dams.

The Bureau of Reclamation figures worry me a great deal. If you will read my testimony in detail you will find there are various errors where you have to just decide which page of the Bureau's figures you want to read. I cite one error of 3,600 percent. They don't know much about sedimentation. Mr. Dominy was telling me he didn't think Lake Powell would ever silt up. They don't know. I think they ought to know, and the Congress ought to know before it allows anything more to happen to the Grand Canyon.

Mr. TUNNEY (presiding). What about Mr. Udall's statement with respect to the fact that he has just recently flown over the lake, Lake Mead, and found that only a very small percentage, I think he said one and a half percent of its was—of the shoreline was in any way damaged by silting?

Mr. BROWER. Well, I don't quite understand what he means. I boated through it. The photographs that I am offering to the committee—and I hope a selection of these can be printed in the hearing so that we will understand—show what amounts to a mud glacier from Pierce Ferry on up. There is enormous damage done up there. And you have to bear in mind that the sedimentation and so forth at Lake Powell at maximum drawdown, once it has been filled, is something like 100,000 acres of badly damaged terrain. This is exposed from time to time in Lake Mead as things now stand. Was that responsive to your question?

Mr. TUNNEY. Yes, it was responsive.

Mr. JOHNSON. (presiding). Do you have any further questions?

Mr. TUNNEY. Thank you, Mr. Chairman.

From what I was able to gather from your statement, Mr. Brower, the main objection you have to the building of the dam here, as last year is, one, the damage it would do to the Grand Canyon itself by flooding it, and, two, that the dams would create a great deal of silting behind the artificial wall which in the long run would render the dams themselves no longer efficacious for the purpose that they were being built: to generate power.

Mr. BROWER. Yes, they would go out of action completely by the time sedimentation has run its course. You will notice that I used the figure of 110 miles for the length of damage from the proposed Hualapai Dam. The reservoir is only 93, but as that reservoir silts up, the river begins to build its own grade upstream somewhere between a foot and a quarter to a foot and a half a mile, so that the mud would extend on up another 15 miles beyond what we have always thought in the park—up to Havasu, 30 miles. At Havasu Junction Mr. Dominy said he thought the water would go 85 feet deep. The mud might be 15 feet more—more than 15 feet deeper. It is major damage that nobody has really thought much about.

Mr. TUNNEY. If you could be convinced—now taking this in the abstract—that it was of absolute importance to build a dam at, we will say, the Hualapai area, build the dam to provide power, to construct the central Arizona project, to provide water to the Phoenix-Tucson

area, and that the only method of economically providing for such importation works was the construction of the dam, would you still say that the dam should not be built?

Mr. BROWER. I most emphatically would. I would say then the thing that should happen would be a reallocation of water within Arizona. Our latest advertisement in the Times just alludes very briefly to this. If Arizona stopped growing cotton it would not be a water-short State. It gets a price support on cotton. One-third of its water is used for cotton. Another third for the grains and cattle-feeds. Two-thirds of the water is going to these purposes.

Mr. Goldwater himself pointed out, I think, that if Arizona were to use its water for people instead of for these crops that can be grown elsewhere, it could sustain a population of 20 million people. It could be wall-to-wall, too. I don't think it wants to. But if we are going to postulate something, I would say this: that if there were no Grand Canyon to dam, California somehow would continue to exist. Arizona would continue to exist. They would find their water somewhere else.

I think it is our obligation to pretend that there is no Grand Canyon to dam. That isn't its purpose. It has a higher purpose on this planet as long as people are here, and it doesn't need to be demeaned in any way. We can find routes around the Grand Canyon for our commodity purposes and that is what I hope this committee will do. That is what I hope the National Water Commission will see a way to support.

Mr. TUNNEY. What about the economic impact on the people that do grow cotton in Arizona or the people that grow cotton in California? What about the people who are involved in the farming business and who have a very vital stake in agriculture? Do you feel that they are in any way entitled to consideration when you weigh keeping Grand Canyon inviolate, at least inviolate as it now stands? Do you think that these people shouldn't be figured in the equation?

Mr. BROWER. I think they very much should be—and really, if you will examine some of the new studies that have been done in the central Arizona region—the way to build up the economy is not to waste that water on low-value products such as crops. Industry will produce up to 100 or 200 times as much per acre-foot of water in income for the State. To say we must keep growing cattlefeed and cotton because 5 percent or 1 percent of the people have that habit, where the rest of them don't, is not really making economic sense in our view for Arizona. I hasten to add, as Clair Engle, the late chairman of this committee used to say, it doesn't matter if Arizonians put water on their farms or in their bourbon; it is their water. I am not really arguing that. But I do not want to bleed for Arizona if it doesn't have this water right away. They should have their water and do what they want with their full share of the Colorado, but they should not say they are drying up. They can reallocate their water themselves. That is within their power.

Mr. TUNNEY. Has any member of your organization done any, conducted any studies in the area of weather modification or have you been in touch with the authorities in the Government who have done studies of weather modification?

Mr. BROWER. I think probably they have, but I haven't been pursuing that. I know that by the time you go through the 47,000 members you can find some people quite conversant in many subjects.

Mr. TUNNEY. I would assume from your remarks that you are supporting the administration's bill as introduced by Congressman Saylor and Congressman Edmondson?

Mr. BROWER. Yes. We are in support of that. We put in our letter to the President, which is also included in the file, the stipulation that we hoped the Water Commission would find a way to support us in saving Grand Canyon. We will still be fighting that battle, and I suppose our children will. I hope our grandchildren, too, will always have a chance to try and save the Grand Canyon. I hope it will still be there.

Mr. TUNNEY. I don't know what your answer was to Congressman Udall when he mentioned that because of the silt going into some of the tributaries, like Paria, that it was very unlikely that you would have anywhere near the same degree of silt content flowing from these tributaries into the Colorado River as we now do. And as a result the statistics you used with regard to Lake Mead, assuming that they were correct in and of themselves, would not apply in the eventuality that you did build Hualapai Dam. Did you make any comment?

Mr. BROWER. All those dams are included in such projections as we tried to make with the extremely meager data. That is, you can take any of the projections I have made and multiply by 4 or divide by 4, the figures are so poor. We have been provided with so few, and the Congress has been provided with so few, that you cannot make a good projection. As for the Paria Reservoir, I cited there the sediment trap they built for testing purposes. They thought it would last 10 to 20 years while they tested it. One storm, just one storm, took it out. That was it. One storm filled it up. Now, the same kind of thing must be contemplated at Coconino. I did in the projection I put together.

Mr. TUNNEY. But you must admit that the Colorado River is an awful lot greener as the result of Lake Powell being there than it would have been if there was no Lake Powell.

Mr. BROWER. I don't really admit that, and if you come over to room 602 I will show you why. We were in the Colorado River in September last year. I went down September 18. I arrived at the bridge near Phantom Ranch. The river was running sort of a sickly green at that point, near noon. At 5 o'clock it was really roiling, and for the remaining 12 days of our trip it never cleared up. All you have to do is get one of these storms—

Mr. UDALL. You don't seriously contend if you have a river running 14, 15, 16 million acre-feet a year carrying silt and you dam that stream at a point halfway you are still going to have as much silt coming down the river below that mainstream dam with only the lower tributaries contributing silt, as you did before with both tributaries and mainstream?

Mr. BROWER. There will be a momentary pause, in geological terms, but you have not changed the cause of the trouble. The entire Colorado watershed is still a watershed that gets stripped by rains and snows and running water. It doesn't matter where you put the plugs. That stripping is still going on and it will fill whatever you put—

Mr. UDALL. Granted all that, but I still don't understand—you put in the plug so that all the silt of Colorado, Utah, New Mexico—all that silt can't get by the plugs.

Mr. BROWER. Not until that plug fills up.

Mr. UDALL. Now, do you people tell me there is just as much silt down at Phantom Ranch as before you put the plug in?

Mr. BROWER. No. I said it was running clean and I saw it running clean at 12 o'clock. At 5 it wasn't. The storms continue. The main point is in the projections I tried to put together in the statement about Glen Canyon. We know what the Bureau said the silt sedimentation rate is. It is somewhere around 100,000 acre-feet a year above Lee's Ferry. When Glen Canyon Reservoir is about as old as Harvard University, it will become the Glen Canyon "Memorial Phreatophyte Farm." Harvard is a fairly old university. Meanwhile the other tributaries are still pouring the silt in and most of the sediment comes from below Lee Ferry. If you put a plug in the Paria, you have got the Bureau's figures for how long that would last. Another one in Coconino. We have their figures for how long that will last. We have Kanab, and so far they haven't publicly announced they want to put anything in there. You have all the rest of the country that gets stripped off in streams that don't matter until it storms, when they really count. That is when the country——

Mr. UDALL. Will the gentleman yield further? I don't want to extend the record, but will you give me in about two or three sentences the answer to my question why in the world if all this silt sedimentation is going to occur, fill up all these lakes in 33 or 50 years, with all of New Mexico, Colorado, and the Coconino, and Paria coming into Lake Mead, that we have filled up only a tiny strip, less than 1 percent of Lake Mead. Why, in 60 years the whole lake ought to be filled, whereas in 33 years virtually none is filled?

Mr. BROWER. You left before I finished my eloquent statement. The sediment is laid down wherever the river meets the lake and its current slows down. That fluctuates according to Lake Mead's level. Now, the big silt dumps run for 50 miles in the short time since Lake Mead existed. That silt dump extends 50 miles from Separation Canyon into Iceberg Canyon. That is a long bit of mud and a lot of ruined canyon surface.

Now, below that there is a low velocity current that carries finely divided mud all the way down to the dam. It was that, that frightened them in the first place because they thought if there was silt down there already, they had had it. They found out that wasn't really what counted. The big dump is at the head, and right now, with the lake as low as it is, it is 50 miles below the head of Lake Mead at its maximum elevation——

Mr. UDALL. One more question——

Mr. BROWER (continuing). And it is a mess.

Mr. UDALL. No, I flew over it and it didn't look like much of a mess but in light of what you said and in light of the fact that 33 years have passed since they closed the gates down there, do you believe—you have to believe that either (a) the Bureau of Reclamation and the Navy and Coast and Geodetic Survey don't know what they are talking about, and that you have the only true information.

Mr. BROWER. I am not using any information that I haven't picked up from those three agencies—the Navy, the Coast and Geodetic

Survey, and the Bureau of Reclamation, or other cooperating agencies.

Mr. UDALL. These experts say 500 years and you say 100 years.

Mr. BROWER. They don't quite say that, I believe. And Mr. Dominy, as I said, Lake Powell will never fill up with silt. Now, he is the Commissioner. I think that the man who gave you these sedimentation figures should talk to Mr. Dominy, because the figures are very poor. I am using them because I can't go out and measure them myself. I am using their figures, and it is a kind of indoor sport to check the figures from page to page because that is where you get the real fun. They don't check.

The main reason they have been measuring it that carefully and they have to, is so that they will know what the capacity of the reservoir is at its various levels, because there is a requirement that Lake Mead must always have so much flood control space. At the beginning, and later in the year, they have to know how much of the site is being encroached upon by sediment. I trust those figures. Those are as accurate as you will get. As I said after you left the room, but I will repeat, I would like to see the tests continue in Lake Mead. We have that. Let's not spoil anything else right now.

Mr. UDALL. I thank the gentleman for yielding.

Mr. TUNNEY. I don't have any questions. Thank you.

Mr. UDALL. Let me ask one more question, and I am just pursuing this philosophic argument, but I think in the light of what has been said and put here in the record today, some reply ought to be made on this one point.

As conservationists, you gentlemen are all concerned with the wise use of natural resources, preserving those things that ought to be preserved. And I take it that you support the Secretary's program to have a thermal plant to provide a pumping plant. That has been a position you have taken for a long time, rather than a dam.

Mr. BROWER. We support the elimination of the dams. We have a good many data on alternatives might be best for power.

Mr. UDALL. Do you propose a coal-fired thermal plant, then, as an alternative?

Mr. BROWER. I know what you are up to. I don't like smog either, and neither does the Secretary, and I think the Four Corners plant is going to be improved upon—

Mr. UDALL. Let me finish because I have more than smog. You don't always have—my point is you don't always have perfect alternatives in this, one having all the damage and one having no damage. If you are for a thermal plant or atomic plants, you have got to be for some damage to the environment, so the question really is, is this more damage to the environment than the dam?

I have a little photograph which shows on the Navajo Reservation where you are going to get the coal for this thermal plant you advocate, a little old strip, only 5 miles long, taking out 7,000 tons of coal a day for the Arizona public service generating plant. The mine extends for 5 miles and will be pushed to 23 miles as coal is stripped out. It has a big dragline, moving dirt and rock to expose the coal which is then loaded. The dragline is bigger than a two-story house. You are going to have smoke going into the air out of this thermal plant which will cover several States, no doubt. And on this, just let me give you the

figures. While water is a replaceable resource that we get that all the time, coal is an irreplaceable resource. Every year of delay on the production of power at Hualapai results in annual waste of 13 million barrels of oil, 3.3 million tons of coal, or 7.8 billion cubic feet of natural gas, an unrecoverable natural resource. This waste would represent more natural gas than was used in 1965 for electric generation in the Intermountain States.

Now, if you don't have perfect choices, how can you say that the choice of knocking out the dams and having the thermal plants is a conservationist's choice and that the reverse is not? What is your answer to that?

Mr. BROWER. I think that the Secretary probably should answer that more than I. We don't really think the steam plants are necessary and our argument has been, when we talk about steam plants—either fossil-fuel fired or nuclear—we are talking about what should be used as a reasonable alternative if you are going to do any benefit-cost studies. Mr. Ingram last year threw things out of joint a little bit in the Bureau's calculations, I think you will remember, by taking their own figures and showing that you didn't need anything more than Hoover, Parker and Davis revenues. By the time you take the figures that were produced here when the Secretary was on the stand, and see what fund is built just out of Hoover, Parker and Davis revenues, you find you have a great deal of leeway there.

We are not advocating the alternative steam plants. It is an attempt—and I don't say it is a bad one—to find some way to get the Bureau of Reclamation off the hydroelectric horse which is becoming rather spavined these days. I think this is probably a good thing. We don't like strip mining any better than you do. But I—

Mr. UDALL. You don't pretend that is beautiful, 5 miles—

Mr. BROWER. No.

Mr. UDALL. Across the Navajo Reservation is a thing of beauty?

Mr. BROWER. No. But I also don't think the area was world famous for its scenery, and Grand Canyon is. I also point out that Grand Canyon damsites have far shorter life than coal reserves. These damsites would wear out far sooner than the fossil fuels. We don't even argue that you go into fossil fuels for this, and I will supply a few questions I hope the committee can get answered by the agencies.

The real source of energy, if we look ahead, is going to be the atom. Now, I am not competent to testify on that but Mr. Moss will be here tomorrow and he will be ready.

Mr. UDALL. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. It is not clear in my mind, Mr. Brower, whether the Sierra Club has proposed a solution, or a way to get water to these people in central Arizona. It seems to me that everybody who has appeared has pretty well agreed they need it. Give us your recommendations.

Mr. BROWER. No, we have not. Our position is still in that respect the way it was last time. You don't need the dams for the central Arizona project. The primary financing is that of Hoover, Parker and Davis revenues and sales of water in Arizona. The only reason

these dams are being talked about is to finance the development fund and they aren't even necessary for that.

The way to get the water to Arizona is to go ahead, authorize the central Arizona project, and get on with it. This is what we have been saying in all our statements, that we think that there are some funny things in the economics. But that is Arizona's problem. Arizona should have its chance at its share of the Colorado and should not hazard the entire operation by continuing to argue for the damming of the Grand Canyon, because I don't think the world wants that done.

The rest of the world gets by without having a Grand Canyon to dam, and I think Arizona and California are just as ingenious as anyone else.

Mr. BURTON of Utah. I understand your position against the dam or dams. I am just asking you if you have a proposal of a way to get water to these people who need it in central Arizona. You endorse a big steam—

Mr. BROWER. Yes, we did, and it is in our same testimony.

Mr. BURTON of Utah. Steam generation plant.

Mr. BROWER. No. You don't need that.

Mr. BURTON of Utah. I didn't read that into Mr. Ingram's testimony. I read into it the possibility that maybe we shouldn't even readjust or develop our water supply.

Mr. BROWER. I am talking too much, and this is Mr. Ingram's point that he brought out last year and has refined since then.

Mr. INGRAM. Well, the point of my testimony was not that any particular scheme that I would advance, or the Secretary advanced this year, is the only answer. Just that there are other ways to do it. This was all.

Now, I don't think we have to advocate a particular way of financing the central Arizona project. If we had been engaged in the negotiations over how to do this, perhaps it would be our duty to do it. But our point was that there were other ways, and we tried to bring that out. Apparently we did, because there have been other ways suggested by the Secretary. I don't think we have to back a particular way.

Mr. BURTON of Utah. Sometime uncertain in the future, the idea of a dam at Hualapai, if it should be given up, and then a proposal comes before the committee and we start holding hearings on this coal dragline business for steam generating plants, will you come back and testify against that?

Mr. INGRAM. Testify against—

Mr. BURTON of Utah. Against the steam generating and coal-fired plants?

Mr. INGRAM. I think just to take up the point we made before, you can't win here. You are going to lose something, whatever you do. And all I can think of is, on the case of the coal plants, there are many things that you can do to make them less objectionable. I don't think this is an argument for or against coal plants, but you don't have to take the kind of scars that Mr. Udall has shown pictures of and extend them forever into the future. You can put the dirt back. And in fact, Mr. Udall himself has given an example in Happy Valley, in

Tucson, of what is being done by one of the mining companies with the overburden from a copper mine so that people who live in this area don't object to it.

Mr. BURTON of Utah. I will reserve the balance of my time.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman. I don't think in view of the hour and what has gone on that I will ask any questions or make any statements. I don't believe Mr. Brower would like any statement I might make. I will yield back the balance of my time.

Mr. JOHNSON. The gentleman from Idaho, Mr. Hansen.

Mr. HANSEN. Mr. Chairman, I believe the gentleman from Oregon has voiced my sentiments to a degree. I do have a couple of questions, however.

Mr. Brower, do you subscribe to the statements made by Mr. Ingram earlier in the afternoon?

Mr. BROWER. Yes.

Mr. HANSEN. I think the gentleman from Arizona, Mr. Steiger, mentioned something about other interests than just conservation involved. Is there any possibility that you or some of you gentlemen are using your organization to also promote such things as population control?

Mr. BROWER. I don't think the general conservation effort and population control are separable.

Mr. HANSEN. Well—

Mr. BURTON of Utah. That doesn't answer your question.

Mr. HANSEN. Yes, I believe it does answer my question. Mr. Brower, are we to assume that you are promoting population control as part of the answer to what you believe is the problem?

Mr. BROWER. I believe population stability is an important aspect. Every conservation program, every resource-planning program you can think of, is not worth the paper to draft it on if we keep doubling the number of people every 30 or 40 years as we are doing. This is a statement that I have made many times around the country. There is nothing new about it. We have a policy in the Sierra Club urging the study of population control. Right now, for example, we are planning on doubling population every 30 to 40 years. That is the way the projection goes.

Mr. Ingram, before the Public Land Law Review Commission in his testimony in Albuquerque and here, is pointing out that there is a different goal than forever dividing what we leave our children—and you can't do anything but divide it if you keep multiplying the people. I don't see any recourse than try to get into balance with the environment. That is the primary message of our Sistine Chapel ad, that man could somehow live on this earth for a million and a half years without damaging the environment.

In the last hundred years, or less than that, we have done more damage to the environment than in all previous history. Somehow we figure we can continue, but we can't.

That is our general philosophy.

Mr. HANSEN. I hesitate to say this but it seems that some of these issues make strange bedfellows. There are certain things that you don't want that some of us don't want also, but for different reasons

However, I am wondering if your motives in a sense were entirely honest. I believe that Mr. Ingram engaged in some categorical nonsense in his statement in that he took a statement by the senior Senator from California to be more or less the position that he had to work from so far as this committee's attitude on reclamation is concerned. I don't think you are squarely meeting the problem we are facing right now. I think yours is an evasion of the problem.

We are currently working here in the United States on some sort of a sane and prudent method of holding down on population. But it is categorical nonsense when you state that a big family all across the board, as Mr. Ingram cited in his statement, is undesirable. Now let's get down to the case of what we are really talking about.

We are not concerned about population problems right now. We are talking about the fact that there is a significant natural growth going to occur in the West, the Northwest, Southwest. There is much room for expansion there yet in my area, in other areas of the West.

It will be a long time in the future before we will have a problem of overpopulation. But right now we have problems of development to take care so that we can grow and you are evading the issue with your statement.

Mr. BROWER. I would disagree with you, and agree with Mr. Ingram. He has a response.

Mr. INGRAM. I don't like to be accused of indulging in categorical nonsense, and I am sure you wouldn't. However, I think your statement that you are going to indulge in a certain amount of development is one that is ambiguous enough for you to read anything into it. All right. You are going to have a certain amount of development. But how much? That is the question. What is desirable? Nobody has asked that question.

The Public Land Law Review Commission, if you read their studies, never ask themselves that. And so far as I know, in their public discussions and things that I have been able to find out, they are saying, it has not said what is desirable and what we can do if we decide something is desirable to work toward it. I am not suggesting we should indulge in population control. I am not really suggesting one thing or the other as far as that is concerned. I am just suggesting that the National water commission can perhaps offer some information about alternatives, can help us choose. There are other alternatives. I just picked the two that seemed most likely.

Mr. HANSEN. Were you for the Glen Canyon Dam?

Mr. BROWER. Initially, as when I made my wrong vote in 1949, we said build Bridge but build Glen first. And that was one of the most disastrous things I ever did. We were against Glen Canyon late in the game, too late to stop it. We did not believe it was a good necessary dam, and I do not believe that now. I don't think that it can be proved that it is. I think that there has been quite a bit of evidence right here in this committee meeting, and in this committee hearing that it was a very bad move.

We are talking about scarce water. We have Glen Canyon only one quarter full. We have Mead half full. The prediction was made when we were fighting the Colorado River storage project that if Glen Canyon Dam were built, Lake Mead would never fill again, and the Colorado River seems to be busy trying to prove that.

Meanwhile, because you have it, you have now two master evaporation ponds and the ultimate loss will be enough water practically to supply the city of New York—in a time and in a country that doesn't have that much water to waste.

Mr. HANSEN. Are you against reclamation projects just categorically?

Mr. BROWER. No, we are not, and as I said earlier—perhaps you weren't here—we have no objection to the central Arizona project, which is a reclamation project.

Mr. HANSEN. Which one?

Mr. BROWER. Central Arizona project.

Mr. HANSEN. You supported this one?

Mr. BROWER. Yes. We have no objection to it. That is, we have had no objection to the central Arizona project aqueducts and diversions. The dam that was necessary for control of the Colorado is Hoover. That is there. We did not oppose that.

Mr. HANSEN. You have Hoover and central California. Now, which others have you felt would be proper reclamation projects?

Mr. BROWER. I think if you would go through the records, you would find that we have opposed those that would invade the National Park System, including national monuments, and more recently, those that would do major scenic resource damage when there are alternatives. That is all that we have opposed. There is a lot of reclamation that doesn't make too much economic sense, but we stay out of that. We are concerned about scenic resources. That is our field.

Mr. HANSEN. Well, in reading through Mr. Ingram's statement, you had me wondering for a few moments if you people wanted to substitute all possible reclamation moneys for buying pills.

Mr. BROWER. No. I think you missed the point pretty badly there.

Mr. STEIGER. Will the gentleman yield?

Mr. HANSEN. Yes.

Mr. STEIGER. Mr. Brower, there is one reconciliation among many that I find very difficult to make and perhaps you can qualify it. You have credited Arizona with being willing to violate the Grand Canyon for profit, to establish this cash register. You must surely be aware that Grand Canyon itself represents a very profitable enterprise as far as Arizona is concerned. Over 2 million visitors a year that come to Arizona or at least visit the Grand Canyon.

If you would look at us as only an economic entity, the State of Arizona, one anxious to prosper at whatever the cost, how do you rationalize the rape—in your own language, my paraphrasing of your language—how do you rationalize the fact that we would be willing to destroy that which brings 2 million people into our State?

Mr. BROWER. I go back to the testimony by Mr. Rodack the other evening, that too many Arizonans don't know what is in the Grand Canyon. Many don't know that the water that they want is not going to come from the Grand Canyon, that it is going to come from Lake Havasu. Too many don't know that they don't even need those cash registers. They don't know that the Bureau of Reclamation in this room admitted it does not need those cash registers for the central Arizona project. They do not know that the main purpose is an alleged accumulation of a development fund that the gentlemen from

the Northwest are quite apprehensive about—and so are a lot of other people—to bring an unknown amount of water to an unknown place by an unknown route at an unknown cost, but we must build Grand Canyon dams to put something in the piggy bank. That is what the people in Arizona don't know. They are not told that, and I wish you would help tell them that—where their water comes from, and that there is revenue in the water sales and in Hoover, Parker, and Davis that will pay for central Arizona project.

Mr. STEIGER. Mr. Brower, I think you do the people of Arizona a great disservice. If you will recall in the same testimony, Mr. Udall indicated that out of responses to some 22,000 questionnaires, responses that he got in returns, I think as a fair sample—Mr. Rodack by his own admission represented at the most some 800 people, not all of whom he himself contended were particularly well informed.

But even that aside, even assuming the people of Arizona have been kept in the dark, now, for 27 years and don't understand this central Arizona project and don't understand the Grand Canyon, you will concede that those who have worked for such things as Hualapai Dam, they do understand and they do, yet how can you credit those of us who have worked for the dams with and for profit, as you say, whose sole motivation is profit, would destroy the profitable enterprise if indeed we are going to destroy the Grand Canyon. That is a rationale I think is impossible to make.

Mr. BROWER. I don't want to put aside that first point. I think if you in your district, or Mr. Udall in his district, would put Mr. Rodack's questions, you would get about the same response. Mr. Udall didn't ask people where the water was coming from. His question assumed, I think, the common illusion, and Mr. Rodack's did not. I think that is—

Mr. STEIGER. I have stipulated that the people are ignorant. All right.

Mr. BROWER. No.

Mr. STEIGER. In order to—those of us who are informed, how can you credit us with duplicity on the one hand and that we are going to end up destroying that which is now making money?

Mr. BROWER. I didn't use the word "duplicity."

Mr. STEIGER. I used the word "duplicity." You say that the only motivation, our only motivation in wanting to dam the canyon is to generate revenues.

Mr. BROWER. No.

Mr. STEIGER. You say by the generation of these revenues we are going to violate the Grand Canyon. When you say we violate the Grand Canyon, we are then placing in jeopardy that which is generating revenues now. How do you reconcile that, the fact that we are willing for profit to destroy that which is making profit?

Mr. BROWER. I can't figure your motivations, as a matter of fact, I have heard this testimony, that you don't think the present revenue from visitors in Grand Canyon will be impaired. It has been said again and again in the Arizona papers by the Arizona advocates that when you go to El Tovar and look at Grand Canyon with all the dams built, you won't see a single thing from El Tovar. You have to go by an old jeep trail, it is alleged, to see one of the reservoirs. This is

inaccurate, but I think there are a good deal of people who figure you can have your cake and eat it too, simply because so far too many people don't know what is at stake in the rest of the canyon and what the damage will be.

Mr. STEIGER. I am afraid you are not being consistent. Now you are telling us that the Arizona papers have informed the people, but you are saying they are misinformed. Are they either ignorant or misinformed? Which is it?

Mr. BROWER. I think you are trying to narrow this down and we are getting at cross-purposes unnecessarily.

Mr. STEIGER. I think we start out at cross-purposes.

Mr. BROWER. I would say at this point that we have not argued that the only reason Arizona wants to do this is for money. We have said that is one of the reasons. I have observed here that Arizonans have been informed that there will be nothing visible from El Tovar, the primary visitor point in the Grand Canyon National Park, if both dams should be built.

Now, this is not misinforming them. I said I would use Mr. Rodack's term, his term of people informed or people not informed on this subject, that you recall. First he would ask, "Where would the water come from?" I forget just how the question went. If they said the water would come from Grand Canyon, then they weren't informed on the physical facts of the central Arizona project. There are similar questions—

Mr. STEIGER. You weren't seriously using Mr. Rodack's figures. By his own admissions he talked to less than 100 people on his sample. You certainly aren't supposing that is a statistically accurate evaluation of the knowledge of the people of Arizona.

Mr. BROWER. The number of people questioned is far less important, as Mr. Gallup will tell you, than the accurate and careful phrasing of the question. I would contend that Mr. Rodack's questions will produce a more accurate reply, more accurate than Mr. Udall's.

Mr. STEIGER. You think he was—you think he approached this thing in an objective manner? Obviously we are going to get bogged down here.

Mr. BROWER. I think so.

Mr. STEIGER. I do think you have not answered my question how you can credit Arizonans who support this project, who support the dam, who understand the problem, with a willingness to do this thing for profit that will render by your own definition a profitable venture unusable.

Mr. BROWER. Mr. Steiger, I don't think you understood me when I pointed out that they don't think the dams would render it unusable.

Mr. STEIGER. They are wrong. Is it your position that they simply don't understand?

Mr. BROWER. You misunderstand me. I said they do not think that the building of the Grand Canyon dams will lose them their tourist revenue.

Mr. STEIGER. I see.

Mr. BROWER. That is my point.

Mr. STEIGER. I see. In other words, these badly informed people, these misinformed people feel that this will not violate the Grand Canyon.

Mr. BROWER. They feel that they will not lose their tourist revenue. That is my statement.

Mr. STEIGER. Because the canyon will not be violated.

Mr. BROWER. No, you are putting other words in my mouth, you asked if I understood the question: "Why do the people of Arizona wish to do any damage to the Grand Canyon if it is going to hurt them because this is a good source of revenue." The people of Arizona might not worry about what happens to the Grand Canyon if they are reasonably assured that what they do would not be visible to the people who produce the tourist revenue. That is a valid position. I don't think that it solves your problem of trying to say that we have, well, maligned Arizonans. I think we would like to see more Arizonans, as a good many do, know more about the physical requirements of the central Arizona project.

We would like to see them feel that the central Arizona project is not inextricably tied into the Grand Canyon dams, which it is not.

Mr. STEIGER. Mr. Hansen, I will yield back my time.

Mr. HANSEN. Mr. Brower, I would have to agree with one thing you said some time ago about the possible importation of water from one basin to another under circumstances that weren't very well planned. But I would like to ask you this. You mentioned a lot in your statement about sedimentation problems, gap, whatever you wish to call it. And apparently you don't wish to take the Bureau of Reclamation's figures, or at least their word for it on how much sediment there is and what the problems are involving sedimentation. Is that correct?

Mr. BROWER. I share their problem, because they don't take their own figures from page to page.

Mr. HANSEN. Would you then be willing to take the figures or the conclusions of the proposed Water Commission?

Mr. BROWER. I would like to see them study this and get this kind of information. I don't think we or the Congress or the Bureau has reliable information at this point on a very critical matter—sedimentation rates and the longevity of the proposed reservoirs.

Mr. HANSEN. Do you think they would be prone to be objective enough for your purpose, the type of commission that has been set out in some of the proposed legislation?

Mr. BROWER. Yes, I do.

Mr. HANSEN. I yield to the gentleman from Utah.

Mr. BURTON of Utah. Mr. Brower, you were asked a direct question by the gentleman from Idaho, is the Sierra Club endorsing birth control or something to that effect? Your response, as I recall, was that you thought that conservation and population control were inseparable?

Mr. BROWER. Yes, we do.

Mr. BURTON of Utah. Well, now, has the Sierra Club ever taken any kind of a position on birth control or population control?

Mr. BROWER. Yes.

Mr. BURTON of Utah. Has your board of directors ever voted on it?

Mr. BROWER. Yes. There is a policy statement. I will provide it for the record at this point if you wish.

Mr. BURTON of Utah. I am glad to hear that because a year or so ago before another committee I sat through a hearing in which they

were concerned with the world population explosion. I am aware that something needs to be done to arrest this growth. I would hope that in the future, instead of taking out full-page ads in the New York Times, maybe you would take out just a half-page ad and devote some of your money and extensive resources in other areas.

Mr. INGRAM. Could I respond to that? If you will allow us to spend our time on things like constructive future planning, instead of trying to defend the Grand Canyon from unnecessary dams, we can do that.

Mr. BURTON of Utah. Well, it is a question which comes first, I suppose. Because of overpopulation, 12,000 people die every day of starvation in this world.

Mr. INGRAM. Of where the crisis is.

Mr. BURTON of Utah. I have had the feeling today that you have opposed rather than proposed and I don't have the feeling that the Sierra Club has given us an answer to this problem. How do we get water into central Arizona where there are people who need it now, not 50 years from now?

Mr. BROWER. Mr. Burton, the Secretary has come up with a proposal and we support it. We have no objection.

Mr. BURTON of Utah. You support the steam generating plant, then. This is what I tried to get you to say a little while ago.

Mr. BROWER. The questions I think were about financing of a development fund, not the central Arizona project.

Mr. BURTON of Utah. That is not right.

Mr. BROWER. The purpose of the steamplant is not for the central Arizona project. That is, the water——

Mr. BURTON of Utah. Financing.

Mr. BROWER. I beg your pardon. I believe, if you will review the project, the purpose is not to finance the water project but to build the development fund. We had quite a bit of testimony as to how big the fund would be with this plant and how big it would be with the dam. Now, there will be——

Mr. BURTON of Utah. No.

Mr. BROWER (continuing). Some power; that is, you are looking for energy for the pumping. One of the sources has been and still is Hoover, Parker, and Davis. I think that you will also find that part of the revenue, a good part of it, is going to come from the sale of water to irrigators who can pay \$10, from M. & I. users who pay \$50, and presumably from the proposed ad valorem tax.

Mr. BURTON of Utah. I have reviewed the project very carefully. Mr. Brower, and it is all wrapped up in one ball of wax. The whole thing is involved in power to pump the water up and power sales from the dams and so forth. It is all in the same package. Now you just said it. Let's leave it there. The Sierra Club supports the Secretary's proposal.

That is all the questions I have.

Mr. JOHNSON. Do you have further questions?

Mr. STEIGER. I have taken up too much time now.

Mr. HANSEN. Mr. Chairman, we've all heard the statement about having a pill for every ill, and it appears these gentlemen would even apply this to reclamation.

Mr. JOHNSON. Mr. Brower, you made quite a bit of the siltation problem in the river. Siltation has been a problem for a long, long time where there have been dams on the rivers, where we have navigation, and what have you. And those problems have been resolved for the most part by man and his ability and technology and engineering feats.

Silt has been handled to allow the project or the facility to be used as a resource. We have had to dredge our rivers for navigation, flood control, a little of everything. And in the smaller reservoirs silt is always a problem. The people have been able to handle it, remove the silt. They can handle this today with pipelines. With new equipment, pipelines can transport materials across the Nation. And I see no reason why the silt is a problem because by the time the silt comes down, it is very readily in a form that can be taken out, and I think that is a part of any consideration that goes to one of these projects where silt is going to be a problem.

Now, we transport coal slurry and we are transporting a little bit of everything today in modern facilities. Silt is very readily available in the reservoir for that purpose of removal with new equipment, and we create islands out in the bay, reclaim lands by pumping out of the various places where silt has accumulated.

I am sure that this has been looked at by the engineers, I would say, in behalf of these projects. Silt is going to be a problem.

Mr. BROWER. Mr. Chairman, if I could respond, I don't think you will find any cost estimate whatsoever for any silt removal in any of these projects.

Mr. JOHNSON. If it becomes a problem——

Mr. BROWER. But the——

Mr. JOHNSON (continuing). Where the facility is going to be taken over by silt, I fail to see the silt problem handled because——

Mr. BROWER. The problem here is the enormous volume of it. If you are going to slurry it away, then you are going to be right back in the problem they had before the building of Hoover Dam, where they had to get out with their old shovels to clear up what was being silted in their canals.

Mr. JOHNSON. Well, I think siltation is a problem, no matter where you find it. Man has been able to cope with that problem for the most part.

Mr. BROWER. But not on the Colorado.

Mr. JOHNSON. Today with modern technology I think we can remove the silt. I don't think that would be a real problem because I don't think they could ever work up their cost-benefit ratios and feasibility on these projects and have them approved by such people as the Congress of the United States and put them in operation.

Now, in my time I saw the first facility on the Colorado made useless from the standpoint of silt, a major problem. Another thing you stated a little while ago, and I understood the Secretary yesterday to say that the reason he left Hualapai alone at the present time is because it created a great controversy and why have a bill with controversy when everybody is in harmony with one another. I don't think that is a just reason myself, and I think these figures alone as to Hualapai and the power potential there over the prepaid system in

the coal plants, I think Hualapai is much better all the way around from the standpoint of a financial gain and funds that will be accumulated and at the same time it will eliminate the mining of coal in that area and the other things that go with coal-fired plants.

Now, in southern California our coal-fired plant is just about ruled out. For what reason? We don't mine any coal there but we will bring it in or we will bring gas in but from the standpoint of effluent from the facilities going into the air, causing more of a problem all the time with air pollution, they are just about abandoning that. They are either going to nuclear or they are going back someplace in the hinterlands and tear it up and produce the energy there and then move the energy out with large transmission lines.

Now, I think Hualapai Dam and powerhouse in relationship to pumping stations on the river to take care of the central Arizona project will do less to that country down there than any other thing you can do.

Mr. BROWER. I think, Mr. Chairman, as I was commenting to Mr. Udall, strip mining would do damage. But the country it damages, if we have to do it, and we are not advocating that necessarily, is far less precious to the world than the Grand Canyon. And if you do put in Hualapai at the present rate of projections by the Bureau of the incremental increase in installed hydropower capacity in the Southwest, the entire installation at Hualapai will take care of the Southwest power growth needs for only 3 years. Then you are going to have to go on to something else—strip mining, or go nuclear or stop making such heavy demands on power. I think that going back to the initial observation—

Mr. JOHNSON. I am trying to confine it to the problem before us which is the central Arizona project.

Now, the Secretary said that he needed energy to pump the water for the central Arizona project, the water had to be pumped. Pumping lifts were there. There had to be a supply of energy, and that comes prior to the repayment, the payout period of Hoover, Parker, and/or Davis, and the big accumulation into the fund doesn't come until after these are paid out, but in the meantime central Arizona needs a pumping requirement of a large amount of energy.

Mr. BROWER. Mr. Ingram has been watching—

Mr. JOHNSON. And it will come from here. Now, that energy I say could much better come from the power facilities in the Hualapai Dam itself. I am sure that with today's engineering ability, you could design a dam there and powerplant and get the necessary power potential out of the site and have it look pretty good, and it would be much closer, would disturb a lot less the whole area in that area there and accomplish the purpose. Now, if you didn't have to have energy that would be one thing, but you have to have energy.

Mr. INGRAM. Mr. Johnson, the Commissioner—

Mr. JOHNSON. The energy can't come from Hoover, Parker, or Davis.

Mr. INGRAM. But the energy will come from the coal plants. That is what the Commissioner—

Mr. JOHNSON. I realize that, but I am trying to pin it down that you have to have a source of power.

Mr. INGRAM. No. You have to have a source—

Mr. JOHNSON. Yes, you do. You are going to support the central Arizona project. It is in a prepaid power source that they are advocating to put into this and it is not coming from Parker, Hoover, or Davis.

Now, after Parker, Hoover, and Davis pay out——

Mr. BROWER. Could we supply an analysis of——

Mr. JOHNSON (continuing). Then the money would go into the fund but the power potential from those facilities is already being consumed and they have already been contracted for at the present time.

Mr. INGRAM. But assume Hualapai is built——

Mr. JOHNSON. And the feasibility of those projects was underwritten by people who are taking the power at the present time.

Mr. INGRAM. Suppose Hualapai is built. The Commissioner testified on Tuesday that even if Hualapai is built, pumping power will not come from Hualapai.

Mr. JOHNSON. Oh, yes, it will.

Mr. INGRAM. No, it will not. You look it up in his testimony. You will find there that only in a certain period of time——

Mr. JOHNSON. You look back. I asked the Secretary wouldn't it be more feasible to get the power from the power facilities at Hualapai and run your transmission lines down to where you are going to take the water from the river and pump and divert it.

Mr. INGRAM. Mr. Johnson, I think we ought to get something in the record on this point because the Commissioner has said this year—he said last year, and he said the year before—that the power for pumping the water in the central Arizona project doesn't come from the dams; they trade energy, but it does not come from the dams.

Mr. JOHNSON. That is the same thing.

Mr. INGRAM. No; no, it is not.

Mr. JOHNSON. Oh, yes, it certainly is.

Mr. INGRAM. The only thing you have to have, then, if you don't have the dam, is the money, and the money comes from the water revenue.

Mr. BROWER. Mr. Chairman, could I request here that at this point—it is getting late, and I think that a request from the chairman to the Bureau of Reclamation could verify that, and also the Bureau and the Geological Survey could clarify what the sediment life was like for these reservoirs—what their best estimates were—and what it would cost to clean it out. I think you will not find those figures anywhere in all the hearings we have had.

Mr. JOHNSON. Well, now, last year the Secretary testified before this committee and he advocated Hualapai Dam. This year he comes in——

Mr. BROWER. No, I beg your pardon. No. I am afraid that is not correct. He advocated Marble but advocated the deferral of Hualapai pending a 5-year study by the national water commission.

Mr. INGRAM. The position of the administration hasn't changed on Hualapai since May 1965.

Mr. JOHNSON. I think Hualapai was in.

Mr. INGRAM. That was in Congressman Udall's bill, but the administration never introduced a bill last year, or had a bill introduced.

Mr. JOHNSON. But there was not the opposition, I don't think, at that time to this particular dam.

Mr. INGRAM. Their policy has not changed. The administration's policy is 2 years old.

Mr. JOHNSON. The Commissioner and the whole Department of the Interior did not take the stand they have taken this year in the elimination of Hualapai.

Mr. BROWER. Mr. Chairman, if you will look at the letter of February 15 to the chairman of the full committee from the Secretary, or the Bureau of the Budget, you will find that they reiterate, the position of May 1965 which called for the deferral of Hualapai Dam pending a review of the relative needs for wilderness and scenic resource protection and the needs for power and that was to be studied among other things by the National Water Commission which would be, according to the Bureau of the Budget letter of 1965, would be to report in about 5 years.

Mr. JOHNSON. Well, it might have developed in private conversations. We have had so many on dams here over the years that I am sure at one time both the Secretary and the Commissioner—

Mr. STEIGER. Mr. Chairman, I wonder if you would yield for just a moment. I think possibly it has been brought out again in this last exchange, but I think there is one basic conclusion that kind of points up the arbitrariness of your position and conceivably an honest misconception.

It deals with, Mr. Ingram, your population philosophy. You assume that we are going to consume our resources at the rate that the population increases. You have said that you have assumed that. You credit man with only the capacity of production. His productivity is limited to increasing the population rather than to increasing his resources ingeniously.

You must know that this will not stand observation. I would submit that this position is perhaps symptomatic of the impropriety of your other positions. I like to think so. And I don't expect rebuttal on this but I would like to point out to you that there is no geometric theorem that dictates or correlates the consumption of resources in direct proportion to the growth of the population.

Mr. INGRAM. Since you have misinterpreted me, could I just answer briefly?

Mr. STEIGER. Certainly.

Mr. INGRAM. I just want to say I didn't assume the thing you said I am assuming. What I am assuming is that man indeed can plan and that is why I suggested that the National Water Commission should furnish Congress and the people with two alternatives, with information on two alternatives, so that he can choose.

Mr. STEIGER. I have no further questions.

Mr. JOHNSON. I have no further questions, either. It is late. You people have been on the stand here a long time. I am sure that we will have this under consideration for some time and all of the material certainly will be made available to the committee that is here someplace in these reports as to just what will be needed to service the legislation that we hope is reported out by this committee, whether we have the dam in or the dam out.

I want to thank you, Mr. Brower, and your group here for giving us the benefit of your testimony. Certainly you have been in this for

many years now, much longer than I have been in it, and we appreciate your patience and the answers to the questions.

Mr. BROWER. Thank you very much, Mr. Chairman, for the privilege of appearing before you. I hope that in the years to come there will be some friendly, stimulating disagreements between us and the members of the committee, but that we will not be at cross purposes. I hope that for the gentlemen of Arizona, too.

Mr. JOHNSON. We thank you.

(Subsequent to completion of the hearing the following letter was furnished the committee:)

U.S. DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., April 3, 1967.

HON. WAYNE N. ASPINALL,
Chairman, Committee on Interior and Insular Affairs,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Your letter of March 20 requested that we review Mr. David Brower's statement on the sediment problem of the Colorado River which he presented during the recent hearings on Colorado River legislation.

Mr. Brower's semi-facetious "Sedimental Journey" is similar to most of his other statements, advertisements, books, etc., in that it is designed to appeal to public emotion with too little attention to fact. Where facts do enter into the statement they are, for the most part, distorted, misapplied, and buttressed with unfounded assumptions, rumors, and oblique references to unnamed experts. The net result is a mish-mash of fact and fancy leading to completely erroneous conclusions which no responsible hydrologist could support.

For example, he states that "nowhere do we have a reliable estimate, or more than detached pieces of estimate so far removed as not to fit together, of what the all-important sedimentation rates really are." The facts are that records of sediment flow on the Colorado River are among the best, if not the best, of any major river in the country. In some instances they go back as far as 1926. The most valuable and complete record, as far as reservoir sediment deposition is concerned, is that for Lake Mead, where three separate sediment surveys have been made which provide an accurate historical record of actual sediment accumulation over a 30-year period.

Another absurdity in Mr. Brower's statement is his allegation that there is a 3,600-percent error factor between information on the surface area of the proposed Coconino Reservoir, as shown on maps and tables in the same Reclamation report. To reach this startling conclusion, Mr. Brower scaled reservoir areas, as shown on a location map, and compared them with corresponding areas as indicated in the report tables.

Any person possessing ordinary common sense and a desire for true facts would realize that project features on location maps are not drawn to scale; rather, they are presented generally to show relative importance. If they did not understand this, they certainly would have inquired as to what caused a 3,600-percent error, rather than blandly stating it as an accepted fact as Mr. Brower did in his testimony before your committee. We are not perfect, but this is the first time we have been charged with being 3,600 percent wrong.

As another example, he postulates future water losses in the magnitude of 3,000,000 to 4,000,000 acre-feet per year resulting from what he terms as phreatophyte jungles that he envisions will spring up in the reservoir areas of proposed dams. Typical of his reasoning to reach such alarming figures, he conjures up a 150,000-acre silt trap and phreatophyte jungle behind Coconino Dam on the Little Colorado River that will cost the Colorado Basin an annual loss of 1,500,000 acre-feet through evaporation and transpiration. He doesn't explain how it is possible to lose 1,500,000 acre-feet of water annually from a stream with an annual runoff of less than 200,000 acre-feet.

Further, Mr. Brower recognizes that Lake Powell will act as a huge sediment trap but then apparently ignores this in his calculations of the projected life of Hualapai Reservoir.

Rather than attempt to make reason out of Mr. Brower's labored distortions, we believe it would be simpler and more understandable to provide an up-to-date statement on our sediment studies and their relation to existing and proposed

projects on the Colorado River. The statement is attached. We hope it will be useful to your committee.
Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

[Enclosure]

SEDIMENT RECORDS, ANALYSES, AND PROJECTIONS,
COLORADO RIVER BASIN PROJECT

A great deal of information on sediment flows of the Colorado River and its tributaries between Lees Ferry and Lake Mead has been accumulated over the past 40 years. Included are three sediment surveys of Lake Mead completed in 1935, 1948, and 1964, which measure accurately the actual sediment deposition in Lake Mead over the period covered.

Available records of sediment flow

Records of the suspended sediment load of the Colorado River and its tributaries are maintained by the U.S. Geological Survey and available at several points between Lees Ferry and Lake Mead, for varying periods as follows:

Station and period of record	Years
Colorado River at Lees Ferry, 1929-33; 1943-44; and 1948-65	25
Paria River at Lees Ferry, 1948-65	18
Little Colorado River at Cameron, 1957-65	9
Colorado River at Grand Canyon, 1926-66	41
Virgin River at Littlefield, 1948-66	19
Sediment Survey of Lake Mead, 1935, 1948, and 1964	30

Discharge and sediment records of Colorado River at Lees Ferry

The 25-year period of record shows an average water discharge of about 10.7 million acre-feet and an average suspended sediment load of about 83 million tons. Assuming that sediment weighs 65 pounds per cubic foot, the average annual sediment flow in this period was equivalent to 59,000 acre-feet per year.

Starting in 1959, however, the records are not representative of sediment inflow into Lake Powell. In 1959 the storage back of the cofferdam was filled, and in 1963 the diversion tunnel was closed and storage initiated. Some sediment was deposited in Lake Powell in these recent years. For the 18 years of record at Lees Ferry which were not affected by sediment deposition in Lake Powell, the average annual water discharge was about 12 million acre-feet and the average annual suspended sediment load about 107 million tons, or about 75,000 acre-feet per year.

Historic rates of sediment discharge on the tributaries

The following table summarizes the historical information (averages) on water discharges and suspended sediment loads on the three tributaries:

River	Years of record of sediment	Average annual discharges in period of sediment record		
		Water	Sediment	
		1,000 Acre-feet	Million tons	1,000 Acre-feet
Paria at Lees Ferry	18	18	3.64	2.8
Little Colorado at Cameron	9	141	9.44	6.7
Virgin at Littlefield	19	131	2.39	1.7

The long-time average water flows of these streams are somewhat greater than the flows indicated for the period of record of sediment. From a study of the relationships between annual water flow and annual sediment flow, the long time average annual sediment discharges are estimated to be about as follows:

Paria River at Lees Ferry	4,000
Little Colorado at Cameron	10,000
Virgin at Littlefield	2,500

Colorado River at Grand Canyon

For the 18 years of concurrent record at Lees Ferry and Grand Canyon, the average annual water discharge at Grand Canyon was about 12.3 million acre-feet and the average annual suspended sediment load was about 135 million tons. The average annual equivalent volume of sediment in this period is estimated to be about 95,000 acre-feet.

Sediment deposition at Lake Mead

Storage was initiated at Lake Mead in February 1935. To check the amount of sediment deposition the reservoir was surveyed in that year and resurveyed in 1948 and again in 1964. These surveys show the following average annual rates of sedimentation:

	Years	Acre-feet per year average
1935-48.....	13.7	104,000
1949-64.....	16	80,760
Total 1935-64.....	29.7	91,460

During the years 1935-1964, the average annual sediment flow passing the Grand Canyon station was about 73,000 acre-feet, or about 80 percent of the sediment deposition in Lake Mead in this period.

Estimate of future sediment flow at Hualapai damsite

On the basis of the historic records presented herein, and with allowances for the effects of Lake Powell in storing the sediment flow of the Colorado River at that point, the future average annual sediment inflow initially to the Hualapai reservoir site is estimated to be as follows:

	<i>Acre-feet</i>
(a) Without sediment barrier dams on tributaries.....	25,000
(b) With sediment barrier dams on Paria and Little Colorado Rivers....	16,500

Useful life of Hualapai Reservoir

The reservoir, recommended in several of the bills now pending before the Congress, has a total surface storage capacity of about 3.7 million acre-feet. If we assume 100 percent trap efficiency, but with the capability of flushing 10 percent of sediment from the reservoir, the time required to fill this space with sediment is estimated to be as follows:

	<i>Years</i>
(a) Without sediment barrier dams on the tributaries.....	163
(b) With sediment barrier dams on Paria and Little Colorado Rivers.....	250

Delta deposit at head of Hualapai Reservoir

The Colorado River Canyon is steep and narrow and there is no space for the buildup of a sediment jungle in the backwater. A reservoir at this site will probably cause some deposition of sediment in the river channel upstream from the reservoir pool, but this will be in the bottom of the river and the riverbed will progressively increase in elevation. However, it will still appear as a river.

Now we have some ladies who have been waiting here all day, 2 or 3 days. Dr. Ruth Weiner and Miss Joy Coombs.

STATEMENT OF DR. RUTH WEINER, REPRESENTING THE GRAND CANYON WORKSHOP OF THE COLORADO OPEN SPACE COORDINATING COUNCIL, ACCOMPANIED BY MISS JOY COOMBS

Mrs. WEINER. Mr. Chairman, we will be here tomorrow if you would like to defer.

Mr. JOHNSON. If you look at the list tomorrow it is about as long as the list today. How much time would you want?

Mrs. WEINER. Well, our entire testimony will take only about 15 minutes, I believe, to read and we can cut it down from that if you

prefer. But in view of the lateness of the hour if you would like to squeeze us in at another place we are perfectly willing.

Mr. JOHNSON. Well, if you make your presentation here in 15 minutes that will be fine. We generally work until 6 or 7 here someplace, here in this office or the committee room. Feel free to go ahead and your statements will be placed in the record in full.

Mr. BURTON of Utah. Mr. Chairman, where are the ladies from?

Mr. JOHNSON. The ladies are from the Grand Canyon Workshop of the Colorado Open Space Coordinating Council.

Mr. BURTON of Utah. If it is all right with my colleagues I would like to give them the full 15 minutes if they have come all this way.

Mr. STEIGER. Absolutely.

Mr. JOHNSON. Who would like to open up?

Mrs. WEINER. I will begin. We have combined our statements in order to save time but we are dividing the presentation. This is in deference to the express wishes of the folks back home, the groups which sent us at considerable expense to themselves.

This statement was prepared by the members of the Grand Canyon Workshop of the Colorado Open Space Coordinating Council.

This is a sort of federation of conservation and outdoor groups. The participating organizations which specifically endorse this statement are listed in the statement which we handed in to the committee. We have tried not to repeat testimony given in 1965 and 1966.

Our case against the Grand Canyon dams was presented in ample detail by Richard Lamm in September of 1965 and our testimony on the five Colorado projects by Miss Coombs and by Mr. Ed Hilliard in 1966.

I should like to submit for the committee files a booklet entitled "Facts About the Proposed Grand Canyon Dams and the Threat to Grand Canyon" which was prepared by our group and has been circulated publicly.

Mr. JOHNSON. Without objection, the booklet will be placed in the file. Is there objection?

Hearing none, so will be the order.

Mrs. WEINER. First, we would like to commend the Secretary of the Interior for his recent statement of administration recommendations of the central Arizona project. We are happy to see a proposal made that suggests that those who benefit from CAP pay a large part of its cost.

We are also, of course, gratified that the Grand Canyon dams are no longer proposed as cash registers and that recognition has been given to the uniqueness of the Grand Canyon of Colorado in its present state.

The Secretary has made a significant contribution to conservation and to the entire Southwest in determining that in this one instance the Federal Government and private utilities could cooperate for the sake of saving a great national treasure.

The alternatives proposed for financing CAP are flexible and imaginative as well as realistic and consonant with current technology.

We wish we could support the administration's position entirely but the proposal appears questionable in the following four respects:

First, financing of the CAP. We have already taken the position

previously that we would not support CAP unless the water was sold at the cost of delivery or was financed in some way by the area to be benefited, such as by the ad valorem tax proposed by the administration. It is longstanding reclamation policy that irrigation works be constructed without interest. This was a sound principle and helped to develop the West but we feel that the taxpayer should be given some idea of the economic burden he bears in view of today's application of the principle.

A conservative estimate of money lost to the Treasury by interest-free construction of the central Arizona project yields the total of \$675,900,000. This is derived in a table which I would like to include in my statement. It was calculated by the standard method of calculating compound interest on a decreasing principal using a 50-year payout period, and an 8-year construction period and an interest rate of 3 percent.

On the Secretary's figure of \$719 million for construction of the central Arizona project I used a low interest figure on purpose to sort of balance any—I realize that there are expenses here on which interest is paid and I figured by taking a substantially lower interest figure it would make a simpler calculation.

If this loss is apportioned to the several States according to their share of the Federal tax, and I took these apportionments from the World Almanac of 1966, we find that New York, for example, would pay \$74,349,000 for the interest on CAP. That is, this is the amount that would be lost.

Our own State of Colorado would pay \$6,285,000. West Virginia would pay \$6,759,000. Similar figures could be obtained for Hualapai Dam if you take the construction figure of \$511 million, cut everything down to seven-tenths.

Second, deferral of the Hualapai Dam site for congressional discretion. We have also taken the position prior to this hearing that we would support CAP only if boundaries of the Grand Canyon National Park were extended from Lee's Ferry to the headwaters of Lake Mead. Both the administration and the chairman of the Interior Committee have asked that Marble Dam be included in Grand Canyon National Park. We urge that the Hualapai site be accorded the same protection. If CAP can be paid for without Hualapai Dam as the administration affirms, why leave the damsite open?

The answer has been given several times in these hearings: to pay for as yet unauthorized importation. Hualapai could be removed from the bargaining block by enactment of H.R. 1305 which would also remove both dams from part 1 of the Federal Power Act as has been recommended by the administration. And this would effectively end the Grand Canyon controversy.

We would also like to ask parenthetically who would be the first to benefit from the investment in the central Arizona project and I would like to insert in the record a few lines from a brochure which is being circulated by Arizona Properties, Inc., South Scott Street, Tucson, Ariz.

This is a letter which begins "Dear Sun Lover" and reads:

Looks like the huge one and three-quarter billion Central Arizona Project bill, the CAP bill, has an excellent chance of approval by this Congress. We are

reasonably sure of getting the water into Central Arizona although we are not quite sure of the exact form of approval, that is, with one dam or two dams. However, we do know that cheap hydroelectric power, essential to the project and at least the huge Hualapai Dam will either be approved along with the initial CAP or soon thereafter.

This will be the greatest thing that ever happened to Arizona, not just because such a huge sum of money is being spent in such a small state, 1,800,000 people, but because of the hundreds of factories, resorts, new cities and many other projects that will come into the State because of low taxes, ample water, clear blue sun, the nicest place in the world to look and play and loaf.

There is one more sentence I would like to read :

If you wait until the CAP bill is signed and smart investors from all over the country come rushing in, you will have waited too long.

The committee should also be informed of a recent expression of public concern from citizens of Colorado relating to the proposed hydroelectric dams in Grand Canyon. This concern is expressed in House Joint Memorial No. 1006 of the Colorado Legislature, a copy of which I will submit for the record. This memorial is entitled "Memorializing the Congress of the United States To Refrain From Authorizing Hydroelectric Projects in the Grand Canyon of Colorado."

The memorial was introduced by a partisan committee of five members of the Colorado State Legislature, one of whom, John Mackie, is the majority leader of the Colorado House. It is now under consideration by the Natural Resources Committee of the Colorado House of Representatives.

Third, the efficiency of CAP water use. The primary argument for CAP is the depletion of Arizona water resources. CAP has been characterized for 20 years as a "rescue operation." The proposed legislation states that CAP water will be used only to irrigate land with a previous history of irrigation. We wonder if there is any provision to prevent overdraft of the ground water to irrigate new lands.

There is even controversy as to whether CAP as presently drafted will be economically beneficial to Arizona in the long run. A recent analysis by Robert Young and William Martin to be published in the March issue of the Arizona Review compares the benefits of the different water uses. Their findings suggest that irrigation water allocated to the present CAP would hinder Arizona's development.

Fourth, Hooker Dam. We object to the proposed site for Hooker Dam on the Gila River because it would infringe unnecessarily on America's first established wilderness area, the Gila wilderness. Surely a site could be selected downstream on the Gila, such as Red Rock, which would accomplish the reclamation purposes of the dam just as well. This site, which is about 25 miles downstream from the proposed site is at an elevation of only 550 feet less so that the difference in evaporation would be negligible. Furthermore, flood control would be more effective at this downstream site.

Miss Coombs will present the rest of our statement.

Mr. JOHNSON. You may go ahead.

Miss COOMBS. We have a recommendation about the National Water Commission. We would like to be sure that some members of the Commission will argue for leave-it-alone values and will have train-

ing in the ecological sciences as would, for example, members of the National Academy of Sciences.

We do not want this Commission to be just another group biased, we may indeed say dedicated, to the consumptive use of water to the exclusion of most other points of view. If we were to select a priority in the work of the National Water Commission it would be to determine a definition of water shortage. Congress might find its work simplified if need for water were more closely defined than simply whatever water would be consumed if it could be obtained.

Shortage would have meaning if we agreed on adequacy, but what would be an adequate supply of water for a booming economy located in an arid area? Is it useful to define an area as "water short" when water can be supplied to it only through a continuing subsidy?

The National Water Commission might offer guidelines for judging whether a region is living beyond its resources at the expense of the Nation.

Many of the bills before you provide for a basin development fund, specifically for augmentation of the Colorado River. A recent publication contained a pointed warning concerning such large basin accounts. The annual report of the Upper Colorado River Commission, September 1966, states that the Colorado storage project, the Bureau's most ambitious project to date, now has a deficit of \$353.2 million. This amount is described as "Deficit in authorized appropriation ceiling compared to estimated costs of units and projects of the CRSP under construction and authorized to be constructed."

This is a 40-percent excess of costs over appropriations which is explained as being due to increases in costs, changes in plans, and I read from page 69:

Omissions by the Congress of the cost of Curecanti storage unit currently estimated to cost \$98.6 million from the \$760 million authorized to be appropriated in the Colorado River storage project as of 1956.

The House Committee on Interior and Insular Affairs in its report on H.R. 3383 said:

The Committee did not include funds for the Curecanti unit as the Department of Interior is presently studying a modified plan, a report on which must be submitted to Congress. Firm data on unit not available.

The Curecanti unit has been built, the gates are closed. There is a picture of it in the report.

Basin accounts, then, and reclamation law in general might well be something for the Water Commission to study.

Finally, we are pleased that all proposals for a National Water Commission provide for sets of alternative recommendations for water use. We would like to see this policy adhered to more often by Federal agencies, especially where the issue is complex and where non-monetary values are involved.

This statement has been endorsed specifically by 15 of the member organizations affiliated with the Colorado Open Space Coordinating Council.

Thank you very much for the opportunity to testify.

Mr. JOHNSON. Thank you for your statements.

The gentleman from Utah.

Mr. BURTON of Utah. Miss Coombs, you say that this statement of yours has been endorsed by each of these 15 that appear on the front page of your paper?

Miss COOMBS. Yes, sir; each, separately. It is not an automatic endorsement just because they are affiliated with Colorado Open Space.

Mrs. WEINER. The statement, if I might speak to that—when we prepare statements, they are submitted to the organizations, who then vote on them independently.

Mr. BURTON of Utah. Are there any organizations that you submitted the statement to, that didn't approve it?

Mrs. WEINER. There are organizations in the Open Space Coordinating Council such as Nature Conservancy, who never approve statements of this type. There are others, if I look at those, I might recall some—the Colorado Federation of Women's Clubs, for example. There wasn't sufficient time to bring this before their board of directors. This has occurred also.

I might say in this instance, I don't know of any of the 22 member organizations—well, Planned Parenthood is a member, and for them it is not applicable, of the 22-member organizations, I don't know of a single one which, when questioned, would disapprove of this statement.

Mr. BURTON of Utah. That is all, Mr. Chairman.

Mr. JOHNSON. Mr. Reinecke.

Mr. REINECKE. None took action and disapproved; is that correct?

Mrs. WEINER. That is correct.

Mr. REINECKE. Thank you. No more questions.

Mr. JOHNSON. Mr. Steiger?

Mr. STEIGER. Thank you. Ladies, I would like to congratulate you for having the interest and, obviously, the sincere dedication to come this far. Are you salaried by this—

Mrs. WEINER. Oh, no. This is a totally volunteer effort, the Grand Canyon Workshop.

Mr. STEIGER. I think that lends a great deal of credence to your testimony, the fact that there is no profit for you at all. I take cognizance of that fact. This is not always the case with groups that testify here.

Are you ladies aware that last weekend, in fact, on March 11, which was Saturday or Sunday of last week, the National Wildlife Federation at their national convention endorsed Hualapai Dam?

Mrs. WEINER. Yes, sir; we are aware of that.

Mr. STEIGER. In other words, you are aware that there are conservation people, groups, who are concerned about conservation, who do endorse the dam?

Mrs. WEINER. Mr. Steiger, we might say, that is why all conservation groups are not one. Different people have different views, yes.

Mr. STEIGER. I don't bring that up as an alternative to your view. I just simply want, in view of the fact that none of your groups have expressed disapproval of the statement, I wanted to make you aware of the fact that there were reputable conservation groups that did endorse this.

I have no further questions.

Mr. REINECKE. Will the gentleman yield?

I am not clear. Is the National Wildlife Federation considered a conservation group?

Mr. STEIGER. It is arbitrary on my part, but I consider them so.

Mr. JOHNSON. We want to thank you two ladies for waiting here and giving us the benefit of your testimony and your responses to the questions. The statements will be in the record, the items that you wanted included.

Mrs. WEINER. Thank you.

Miss COOMBS. Thank you, Mr. Chairman.

(The complete, prepared statements of Mrs. Weiner and Miss Coombs, above referred to, follows:)

STATEMENT OF THE GRAND CANYON WORKSHOP OF THE COLORADO OPEN SPACE
COORDINATING COUNCIL

We, Joy Coombs of Boulder, Colorado and Ruth Weiner of Denver, Colorado are here as representatives of the Grand Canyon Workshop of the Colorado Open Space Coordinating Council (COSCC), coordinating structure for recreational conservation organization in Colorado whose total memberships currently number approximately 19,000. The participating organizations specifically endorsing this statement are:

Aiken Ornithological Society, Box 56 Cascade, Colo.; American Camping Association, Rocky Mountain Section, 1375 Delaware, Denver, Colo.; Colorado Mountain Club, 1400 Josephine, Denver, Colo.; Colorado White Water Association, 1765 Carr, Lakewood, Colo.; Denver Beautiful, Inc., 361 Ash, Denver, Colo.; Denver Botany Club, 2560 S. Washington, Denver, Colo.; Denver Field Ornithologists, 7211 East 6th Ave., Denver, Colo.; Colorado Chapter of Federation of Western Outdoor Clubs, 2390 S. University, Denver, Colo.; Mile-Hi Alpine Club, 865 Mohawk, Boulder, Colo.; PLAN—Boulder, 1430 High Street, Boulder, Colo.; Regional Parks Association, 3075 South Clayton, Denver, Colo.; Sierra Club, Rocky Mountain Chapter, 1484 South Eudora, Denver, Colo.; Springs Area Beautiful Association, 14 East Fontanero St., Colorado Springs, Colo.; Trout Unlimited, Cutthroat Chapter, 1285 South Seneca Way, Denver, Colo.

We in COSCC have a dual interest in the provisions of the legislation under consideration in these hearings: as conservation-oriented persons, and as taxpayer-citizens of the Upper Colorado River Basin.

We wish to commend Secretary Udall for his recent statement of administration recommendations for the Central Arizona Project (CAP). We are happy to see a proposal made that suggests that those who benefit from CAP pay at least a part of its cost. We are also, of course, gratified that the Grand Canyon dams are no longer proposed as CAP "cash registers," and that recognition has been given to the uniqueness of the Grand Canyon of the Colorado and the proposed dam sites in their present state. The Secretary has made a significant contribution to conservation and to the entire Southwest in determining *in this one instance* that the Federal government and private utilities could cooperate for the sake of saving a great national treasure. The proposal for financing CAP is imaginative as well as realistic and consonant with current technology.

We wish we could support entirely the Administration's position, but the proposal appears questionable in the following four respects:

(1) *Financing of the CAP.*—COSCC has already taken the position that we would not support CAP unless the water were sold at cost of delivery, or were financed in some manner like the ad valorem tax proposed by the Administration. However, we know that a number of costs of the project are written off as non-reimbursable; presumably, these would be of benefit to the whole nation. Although it is long-standing reclamation policy that irrigation works be constructed without interest payment to the U.S. Treasury, we feel that the taxpayer should be given some idea of his economic burden. A conservative estimate of monies lost to the Treasury by interest-free construction of CAP yields a total figure of \$675,900,000.

(See attached table.) Apportioning this loss to the several states according to their share of the Federal tax, we find that New York, for example, would pay \$74,349,000 for the interest on CAP. Our own state of Colorado would pay \$6,285,870. West Virginia would pay \$6,759,000.

(2) *Deferral of the Hualapai damsite for Congressional discretion.*—We also have taken the position, prior to this hearing, that we would support CAP only if the boundaries of Grand Canyon National Park were extended from Lee's Ferry to the headwaters of Lake Mead. Both Secretary Udall and the Chairman of this Committee have asked that Marble Canyon be included in Grand Canyon National Park. We urge that the Hualapai site be accorded the same protection. (The Administration's proposal would protect both sites from Federal Power Commission action by excluding them from Part I of the Federal Power Act.) If CAP can be paid for without Hualapai Dam, as the Administration suggests, why leave the damsite open for future Congressional consideration?

The Committee should be informed of a recent expression of public concern from citizens of Colorado, relating to the proposed hydroelectric projects in Grand Canyon—one of which is included in all the legislation under consideration in these hearings. This concern is expressed in House Joint Memorial No. 1006, of the Colorado Legislature, a copy of which is attached to this statement. This memorial, which asks Congress to refrain from authorizing hydroelectric projects in the Grand Canyon of the Colorado, is presently under consideration by the Natural Resources Committee of the Colorado House of Representatives.

(3) *The efficiency of CAP water use.*—The primary argument for CAP is the depletion of Arizona's water resources; CAP has been characterized for 20 years as a "rescue operation." (See, for example, John Terrell, "War for the Colorado River.") The proposed legislation states that CAP water will be used only to irrigate land with a previous history of irrigation. We wonder if there is any provision to prevent overdraft of ground water to irrigate new lands.

There even is controversy over whether CAP, as presently drafted, will be economically beneficial to Arizona in the long run. The recent analysis by Robert Young and William Martin in *Arizona Review*, March 1967, compares the benefits of different water uses. Their findings would suggest that the irrigation water allocated in the present CAP will hinder Arizona's development.

(4) *Hooker Dam.*—We object to the proposed site for Hooker Dam on the Gila River because it would infringe unnecessarily on America's first established wilderness area, the Gila Wilderness. Surely a site could be selected downstream on the Gila—such as at Red Rock—which would accomplish the reclamation purposes of the dam just as well. This site which is about 25 miles downstream from the proposed site is at an elevation of only 550 feet less so that the difference in evaporation would be negligible. Furthermore, flood control would be more effective at this downstream site.

The Administration recommends establishment of a National Water Commission. We would like to have at least one member who will argue for "leave-it-alone" values, and at least one member with some training in the ecological sciences, i.e. member of the Water Committee of the National Academy of Sciences. We do not want this Commission to be just another group biased—indeed, we might say dedicated—to the consumptive use of water, to the exclusion of most other points of view. Moreover, all proposals for interbasin transfer of water, including Federal proposals, should be reviewed by the Commission before authorization.

The Office of Water Research of the Federal Council on Science and Technology has undertaken a ten-year program of studies of all phases of water resource problems. Research expenditures, a part of this program, are estimated to approach \$100 million. In the interest of economy, perhaps this program could be merged with the proposed National Water Commission, and its scientists put in a strong advisory position.

We are pleased that all proposals for a National Water Commission provide for sets of alternative recommendations for water use. We would like to see this policy adhered to more often by Federal agencies, especially where the issue is complex and where non-monetary values are involved.

All of the bills under consideration provide for a Basin Development Fund, specifically for augmentation of the Colorado River. A recent publication contains a pointed warning concerning such large basin accounts. The eighteenth annual report of the Upper Colorado River Commission (September 30, 1966), states that the Colorado River Storage Project—the Bureau of Reclamation's most ambitious project to date—presently has a deficit of \$352,212,000 (p. 69). The estimated costs of the project as of 1966 exceed the appropriated funds by 40%. The reasons given for the deficit are: (1) the general increases in construction costs since 1956; (2) the construction of a \$90 million project (the Curecanti project) for which no Congressional appropriation was made. In light of the foregoing, we seriously wonder how accurate are the cost estimates of CAP.

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We are in general agreement with the provisions of Title VI of H.R. 3300, regardless of Congressional disposition of CAP.

In conclusion, we would like to point out that there are still many unanswered questions and dubious aspects about this legislation, which has been hanging fire in Congress for 20 years.

TABLE I.

LOSS TO THE U.S. TREASURY FROM INTEREST-FREE CONSTRUCTION OF THE CAP

The following calculation was based on a total cost of \$719,000,000, interest rate of 3%, a construction period of 8 years and a payment period of 50 years. This was thought to be a sufficiently low estimate not to be substantially altered by interest-bearing parts of the financing.

P_p = initial loan ($\$719 \times 10^6$)
 r = interest rate (3%)
 p = unpaid balance at any time t
 i = interest at any time t
 I = total interest

$$\text{at } t = 0, \quad \begin{aligned} p &= p_0 e^{-at} \\ p &= p_0; \quad -29 \frac{t}{8} \quad t = 58/2 = 29 \text{ years, } p = p_0/2 \\ 1/2 &= e^{-29 \frac{t}{8}} \end{aligned}$$

$a = \ln 2/29 = .024$
 Therefore, $I = rp e^{-at} = (.03)(719)(10^6)e^{-.024t}$
 Total interest $I = \int_0^8 I dt$
 $I = 675,900,000$

Portion of interest loss borne by each State

State	Percent	Amount	State	Percent	Amount
Alabama	1.73	\$11,693,070	Montana	.36	\$3,433,240
Alaska	.12	811,080	Nebraska	.75	5,069,250
Arizona	.69	4,663,710	Nevada	.15	1,013,850
Arkansas	.95	6,421,050	New Hampshire	.32	2,162,880
California	8.33	56,302,470	New Jersey	3.21	21,696,390
Colorado	.93	6,285,870	New Mexico	.50	3,379,500
Connecticut	1.67	11,287,530	New York	10.94	73,943,460
Delaware	.24	1,622,600	North Carolina	2.42	16,356,760
District of Columbia	.41	2,771,190	North Dakota	.34	2,298,060
Florida	2.63	17,776,170	Ohio	5.14	34,741,260
Georgia	2.09	14,126,310	Oklahoma	1.23	8,313,570
Hawaii	.34	2,298,060	Oregon	.94	6,353,460
Idaho	.35	2,365,650	Pennsylvania	6.00	40,554,000
Illinois	7.59	51,300,810	Rhode Island	.46	3,109,140
Indiana	2.47	16,694,730	South Carolina	1.26	8,516,340
Iowa	1.58	10,679,220	South Dakota	.36	2,433,240
Kansas	1.16	7,840,440	Tennessee	1.89	12,774,510
Kentucky	1.61	10,881,990	Texas	5.15	34,808,850
Louisiana	1.73	11,693,070	Utah	.47	3,176,730
Maine	.51	3,447,090	Vermont	.21	1,419,390
Maryland	1.64	11,084,760	Virginia	2.10	14,193,900
Massachusetts	3.40	22,980,600	Washington	1.51	10,206,090
Michigan	4.71	31,834,890	West Virginia	.99	6,691,420
Minnesota	1.81	12,233,790	Wisconsin	2.09	14,126,310
Mississippi	1.15	7,772,850	Wyoming	.36	1,216,620
Missouri	2.29	15,478,110			

H. J. M. No. 1006, by Representative Edmonds, Lamm, Mackie, Jackson, and Fowler.

**MEMORIALIZING THE CONGRESS OF THE UNITED STATES TO
REFRAIN FROM AUTHORIZING HYDROELECTRIC PROJECTS IN
THE GRAND CANYON OF THE COLORADO.**

WHEREAS, The Grand Canyon of the Colorado in its present state is an area of natural beauty unique in the United States and the world; and
WHEREAS, Year by year the Grand Canyon increases in recreational, scientific, and spiritual value for the American people; and

WHEREAS, The proposed hydroelectric projects in the Grand Canyon are not necessary to the Southwest Pacific Water Plan now before the Congress, and impair its chances of passage; now, therefore,

Be It Resolved by the House of Representatives of the Forty-sixth General Assembly of the State of Colorado, the Senate concurring herein:

That the Congress of the United States be requested to refrain from authorizing any hydroelectric projects in the Grand Canyon of the Colorado between Glen Canyon and the headwaters of Lake Mead; and

Be It Further Resolved, That a copy of this Memorial be sent to the members of Congress from the State of Colorado; to the members of the Interior Committee of the House of Representatives of the Congress; and to the Secretary of the Interior of the United States.

Committee on Natural Resources.

Mr. JOHNSON. We have Dr. Stephen Jett. Is Mr. Jett here?

Mr. JETT. Yes, sir.

Shall I proceed?

Mr. JOHNSON. Yes. Tomorrow, we have a full schedule.

STATEMENT OF DR. STEPHEN JETT, IN BEHALF OF THE NAVAJO TRIBE OF INDIANS

Dr. JETT. I have here several documents which I would like to submit.

Mr. JOHNSON. Dr. Jett, would you for the record give us your full name and who you represent?

Dr. JETT. Yes, sir. My name is Stephen C. Jett. I am an assistant professor of geography. I reside in Davis, Calif. I am testifying as an individual to the question of the position of the Navajo Tribe of Indians on this legislation before us.

As I mentioned, I have several documents I would like to submit to the committee, either for inclusion in the record or as part of the file, depending on how the committee—

Mr. BURTON of Utah. Could I ask one further question?

Dr. Jett, are you here to represent the Navajo Tribe?

Dr. JETT. I am not here at their request. I am here with the knowledge and consent of the resources division of the tribe.

Mr. BURTON of Utah. It seems to me we had representatives of the Navajo Tribe here a year or two ago when we were considering this.

Mr. STEIGER. It was Dr. Jett.

Mr. BURTON of Utah. But you are not here officially speaking for the tribe; is that correct?

Dr. JETT. Only to the extent I am presenting official documents of the tribe.

Mr. BURTON of Utah. As a former assistant professor, myself, I would like to know where you are an assistant professor.

Dr. JETT. The University of California.

I will try to make this statement brief. The gist of my statement is quotations from the documents which I am presenting at this time. These are resolutions by the Navajo Tribal Council and are also—the documents include petitions addressed to the Federal Power Commission in regard to the question of licensing the Marble Canyon Dam.

The Navajos, at the time of my previous testimony in 1966, had not taken any official position on this question. They had not, according

to the chairman of the tribe, been adequately informed on the subject.

Since that date, however, the position of the tribe has been made quite clear in several resolutions as well as in these documents prepared by the legal department of that tribe.

The position is a dual one. No. 1 is opposition to any hydroelectric structures in the Grand Canyon. This position is the result of the fact that the Navajos do not wish to see scenic resources impaired by the construction of such a dam, and also because of the availability, particularly with the use of resources on the Navajo Reservation, of alternative power sources, specifically coal and uranium.

The Navajo Tribe has a tradition of respect for the natural landscape. It is a religious matter with the Navajos. Their ritual literature is full of allusions to the beauties of nature.

And I would like to just very briefly summarize, if I may, the history in the last few years of their development of a tribal park system. They have specifically created tribal parks—six, I believe, at the present time—and are also specifically advocating in these documents the extension of the National Park to include the entire Grand Canyon from Lees Ferry to the Grand Wash Cliffs, including a portion of the Navajo Reservation, with the proviso that the Navajo Tribal Park Commission be in charge of the administration of the Navajo Run of the national park.

In 1956, Glen Canyon Dam was authorized. The following year, 1957, the tribal council created the tribal park commission. This was established to identify scenic resources, to make recommendations on the tribal parks, which were to be approved by the advisory committee of the tribal council.

In 1957, the first tribal park was established, unanimously—in 1958, excuse me—as also the tribal park commission was established unanimously. In 1962, Lake Powell Tribal Park and the Little Colorado Park were established. These two are particularly important in that they protect portions of Marble Gorge.

The Lake Powell Park is related not only to Lake Powell but includes the upper portion of the Marble Gorge, as well as the lower part of Glen Canyon.

The Little Colorado Tribal Park includes the lower portion of Marble Gorge.

In 1966, a further tribal park was established to further protect Marble Gorge. This one was called the Grand Canyon Navajo Tribal Park. In 1966, as well, the tribe, having studied this question with some thought, resolved in fairly strong language, as I believe the minority opinion of the committee's report indicates—it has the full text of that resolution—that they were unequivocally opposed to any structures of this sort built in any portion of the Grand Canyon, specifically their own portion, and it is gratifying to note that, with the exception of H.R. 722, Marble Canyon Dam has been omitted from present proposed legislation.

The Arizona Power Authority, in attempting to have a license issued to build a dam at Marble Canyon and one at Hualapai as well, has also run into opposition of the Navajo Tribe, as these documents that I will present indicate.

I think rather than dwell on this subject further, I will let the documents speak for themselves, and thank the committee for permission to testify.

Mr. JOHNSON. Any questions? Congressman Burton?

Mr. BURTON of Utah. Yes, sir.

Professor, one of the arguments you say that the Navajos are advancing against construction of the Hualapai Dam is they feel it might be a deterrent to their scenic values.

Mr. STEIGER. Excuse me, Mr. Chairman. May I interrupt the gentleman? I think the professor will agree the Navajos have taken no position on Hualapai. Their position is only in connection with Marble. The resolution adopted mentioned it is only in connection with Marble.

Excuse me, Mr. Burton, but I did want—

Mr. BURTON of Utah. I understand they were definitely opposed to Marble, and Marble is mentioned in here, but in reading this, they make reference to the "proposed flooding of the Colorado River and the Grand Canyon," and there is reference in here at one point to dams. Quoting further:

The source for generating base power could be transferred from these dams to the existing and planned coal-fired or nuclear generating plants in and around Arizona, and more of the capacity of these dams could then be utilized for producing the higher value peaking power, thereby providing a higher rate of return to the investment in these dams.

The potential tourism benefits to the Navajo Tribe are greater if the Grand Canyon is left in its natural state, than if another huge body of water were impounded.

The Navajo Tribal Council thereby affirms the position of the Navajo Tribe as opposing the construction of any dams, diversions, or obstructions in Marble Gorge or in any other portions of the Grand Canyon.

That is why I assumed they are against Hualapai, too.

Dr. JETT. Yes. Actually, it is specifically mentioned here on page 2, the third quotation, "The Navajo Tribal Council condemns as a needless waste of public funds the immense cost of constructing Hualapai and Marble Canyon Dams."

Mr. BURTON of Utah. As far as Hualapai, it can't be seen from any place that a tourist goes. I mean, the waters.

Dr. JETT. I would have to demur on that because the presently developed viewpoint in the Grand Canyon National Monument at Toroweap Overlook does provide an outlook, and the bottom at that point would be inundated to a depth of 300 feet.

Mr. BURTON of Utah. We had witnesses here and the gentleman from Arizona told us many times that this wasn't possible from the overlooks that now exist where tourists go. It is impossible to see any of the water that would be backed behind Hualapai.

Dr. JETT. Well, I will have to disagree with the gentleman from Arizona because of the fact that this point overlooks a portion of the Canyon which is below—

Mr. BURTON of Utah. What point is this?

Dr. JETT. Toroweap Overlook.

Mr. BURTON of Utah. Does it?

Mr. REINECKE. Is there a paved road there?

Dr. JETT. No. It is a dirt road at the present time.

Mr. BURTON of Utah. There is a considerable volume of opinion that tourism might increase with the presence of the water near the Canyon.

Dr. JETT. Yes, there is. However, the Bureau of Outdoor Recreation does not subscribe to this view. Their statement in the case of Marble Canyon Reservoir site was that the sheer cliffs would prevent any effective access at a point other than Lees Ferry, and that it would have no postive additional recreational benefits.

Mr. BURTON of Utah. Well, it is my understanding that the construction of the Hualapai would involve no traditional, historical, or presently occupied lands of the Navajo. I sometimes wonder if perhaps their position in opposing the dam isn't so much aesthetic as it is that they hope to get the coal-fired plants, using Navajo coal. I submit to counsel this picture, and ask him to let you look at it and see if the Navajo really would rather have us tearing up their actual reservation lands in that fashion, rather than have a dam that perhaps is 200 or 300 miles from where they are.

Dr. JETT. Well, I am sure that the Navajos would just as soon see no damage whatsoever done to the landscape. On the other hand, I think they do see a series of priorities, perhaps, and since they did permit this development to take place on the reservation, presumably they approved it.

I might add that this particular coal-fired power plant, the Four Corners plant, is, fortunately, in the least scenic portion of the reservation.

Mr. BURTON of Utah. Part of those people, I represent, and I know they are good horse traders. I am certain they see a tremendous economic advantage here. I hope that they are not too disappointed when and if it comes, to see their air polluted and their blue skies they have looked at for hundreds of years, gone.

That is all.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. I would like to ask my colleague from Utah, Are we aware of an inversion layer in that area?

Mr. BURTON of Utah. I am not aware.

Mr. REINECKE. That would accumulate air pollution.

Mr. BURTON of Utah. I am not aware of it.

Mr. REINECKE. I think it is well to understand that air pollution occurs where there is an inversion layer in the sense that it puts a lid on.

Mr. BURTON of Utah. There are several known inversion areas in Utah. I can testify to the committee that there might be one in the Navajo lands, because there are valleys and mountains, and peaks, there, that might be subject to that.

Mr. REINECKE. I have never heard of any in that area.

Mr. BURTON of Utah. Never heard of any pollution.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. I just have a few questions. Dr. Jett, you are well aware that the tribe is active in many endeavors which causes them to send representatives to Washington.

Dr. JETT. Yes.

Mr. STEIGER. I take it, are you—have your expenses been paid by the tribe in this effort?

Dr. JETT. No; they have not.

Mr. STEIGER. Well, I would like to interpret their lack of sending an official representative here as a demonstration of the fact that their concern is not of a magnitude that they felt a paid trip was justified. I can testify, as my colleague from Utah mentioned, that the Navajos are excellent horse traders. I have traded horses with them now for 15 years and they are very good. Their interest in a thermal plant is a very genuine one, I think a very proper one, as a matter of fact. I mean, it would mean much employment on the reservation and it would mean significant employment in excess of some 300 people. So I don't think their approach is entirely objective.

I question, personally, their real concern over any destruction *per se*, their definition of either the lakes that were proposed as destructive, and I would have to credit them with a genuine interest in the economic benefits from the thermal plants.

I think you might give them the same credit.

Dr. JETT. Well, if I may address myself to that point, I certainly would agree with you that they have a financial consideration here which is a valid one. I don't think you should minimize, on the other hand, the possible value they place on the esthetics as well as on the integrity of the landscape. The Navajo, being of a different culture than we are, have somewhat different values, and their values are not necessarily as entirely material as ours may tend to be.

Secondly, if I may also comment on the question of their not sending a representative here, they do have two representatives in Washington at this time who are testifying this afternoon at another hearing before the Appropriations Committee. So they were unable to be present.

Mr. STEIGER. I have no further questions.

Mr. McFARLAND. Mr. Chairman—Dr. Jett, the resolution passed last year by the Navajo Tribe indicated the eastern end of the proposed Marble Canyon Dam would be based upon Navajo lands, flooding approximately 46 miles of Navajo Reservation land. Do you think that is an accurate statement?

Dr. JETT. Would you read it again, please?

Mr. McFARLAND. It says the eastern end of the dam would be based upon Navajo land, flooding approximately 46 miles of Navajo Reservation land.

Dr. JETT. Yes, I would say that is accurate.

Mr. McFARLAND. Then, Mr. Chairman, all I say, the Navajos had better find out where their boundary is, because the dam would not affect any Navajo Reservation land, or the reservoir.

Dr. JETT. If I may comment on that, the eastern abutment of the dam would be on the Navajo side of the river. The border of the reservation at that point is the bank of the river.

Mr. McFARLAND. Dr. Jett, that is not correct. Just leave it that way. I want to leave it that way. They do not own up to the river. There is a withdrawal, and the reservation only comes to the withdrawal.

Dr. JETT. May I make a further comment on this?

Mr. JOHNSON. Yes, you may.

Dr. JETT. I have looked into this. Perhaps you are thinking of a bill, I think it was perhaps in 1937 or thereabouts, which had some

mention of a power reservation. This did not mean that this was not reservation land, nor that just compensation would not have to be made in the event of any confiscation. The title of that land had been guaranteed prior to that time, and this would be an *ex post facto* application to it in any event.

Mr. McFARLAND. Mr. Chairman, the only reason I brought it up, it came up in connection with other legislation. It is not appropriate to pursue at this point, but I think it will be borne out and will be part of the other record, as to where the Navajo Reservation ends and the effect of the withdrawal upon the Navajo Reservation land.

Mr. JOHNSON. I understand the counsel; Mr. Witmer, you have a question.

Mr. WITMER. Dr. Jett, how much development, if any, has there been in the three tribal parks that you mentioned?

Dr. JETT. Six I mentioned. I did describe the three specifically, but there are six altogether.

Mr. WITMER. Well, make it six. How many are there?

Dr. JETT. Well, in Monument Valley tribal park there has been a fair amount of development, a good bit of roadbuilding; I think approximately 20 miles of roadbuilding.

The visitor center there is quite large and impressive, a museum and craft shop existing there, and observation decks, and so forth; a campsite with shelters and toilets, and so forth.

In addition to this, there is the Kinlichee tribal park, which is an archeological site. This has been excavated, a shelter has been built to protect the ruins, and so forth. Brochures have been printed to describe these areas and to make them known to the tourists.

There are several visitor centers around the reservation, and the Navajo tribal museum—these sorts of things are the types of things they are doing. Also picnic tables scattered along the major highways all around the reservation.

Mr. WITMER. How much money has been expended? Do you have any idea?

Dr. JETT. I couldn't give you exact figures. I think for Monument Valley, the major construction involved around \$150,000.

Mr. WITMER. That was tribal funds?

Dr. JETT. Yes, sir.

Mr. BURTON of Utah. How much has been spent on the three river parks?

Dr. JETT. In the Little Colorado area, some access road has been built, and I think possibly picnic facilities. In the case of Lake Powell, they are working on developments at several points along that lake itself. As far as the Marble Canyon portion of that is concerned, I don't believe anything has to date been undertaken.

Mr. WITMER. How many people visit it, do you have any idea?

Dr. JETT. Visit what?

Mr. WITMER. The six parks.

Dr. JETT. Again, I don't have exact figures on this. It is in the—well, in the case of Monument Valley Park, I think it is certainly over 50,000 a year. They each pay a dollar entrance fee.

Mr. WITMER. How close to the rim of the Canyon are these?

Dr. JETT. Are the parks?

Mr. WITMER. Yes.

Dr. JETT. Well, the three parks that involve the Marble Gorge area, of course, include all of the gorge which belongs to the Navajos, as well as a portion in back of that.

Mr. WITMER. If you don't mind, Mr. McFarland has already corrected you on what belongs to the Navajos.

Dr. JETT. Well, this—

Mr. WITMER. You are not building up a record by saying that it does, but you may make your point if you want to.

Dr. JETT. I say that portions, of course, belong to the Navajos. I don't think the entire gorge is being contested here. Perhaps a portion is being contested. My opinion doesn't coincide on that. But that is something that can be determined; but in any event, the park extends to the extent that the Navajos do own the gorge, whether it is from the bank of the river or from the halfway up point, or wherever, that is included in their park area.

I have among these documents a description of that as far as just what area is included, if you would like to see that.

Mr. WITMER. And to the extent that the Navajos do not have any proprietary interest in the gorge, they may have spent their money unwisely.

Dr. JETT. Well, as I say, they haven't developed the Gorge itself, but on the other hand, as far as the rim is concerned, they can certainly build facilities on the rim and profit from it.

Mr. WITMER. I think you had better leave out the "certainly," just to be on the safe side, unless you have really checked into it.

Dr. JETT. Well, I will stand on my statement. If that needs correcting at a later date, I will be glad to reconsider it.

Mr. WITMER. Thank you, Mr. Chairman.

Mr. JOHNSON. If there are no further questions, we want to thank you, Dr. Jett.

Dr. JETT. Thank you.

(The above-referred to documents presented by Dr. Jett follow:)

STATEMENT BY STEPHEN C. JETT, PH. D., ASSISTANT PROFESSOR OF GEOGRAPHY

THE NAVAJOS AND GRAND CANYON DAMS

"We are fortunate in occupying an area of unmatched primitive and natural beauty. This is a most valuable resource and must be protected, preserved and utilized wisely."—Raymond Nakai, Chairman, Navajo Tribe¹

"Crops can be replanted. Stock can reproduce. So can human beings. But the land is not like these. Once it is taken away, it is gone forever."—Howard Gorman, Navajo Tribal Councilman²

I am Stephen C. Jett, Ph. D., Assistant Professor of Geography, University of California, Davis, and author of the book "Tourism in the Navajo Country: Resources and Planning," published by the Navajo Tribal Museum.³ I am testifying as an individual.

At the May, 1966 hearings on the Colorado River Basin Bill, I testified as to how the proposed Marble Canyon Dam would detrimentally affect the interests of the Navajo Tribe, which owns the left bank of the Colorado in the area of the reservoir site. At that time, the Tribe had taken no official stand on this issue,

¹ Remarks in *Navajoland Council: Recreation and Tourism*. Window Rock, 1965.

² Translated from a speech in Navajo during discussion by the Tribal Council of the resolution of Aug. 3, 1966, opposing dams in the Grand Canyon. Quoted in Philip Hyde and Stephen C. Jett. "Navajo Country." *Audubon*, vol. 69, No. 1, p. 24. New York, 1967.

³ *Navajo Publications*, Series A. Window Rock, 1967. For the section discussing Marble Gorge and opposing Marble Canyon Dam, see pp. 92-3.

and I was authorized by Tribal Chairman Nakai only to state his feeling that the Navajo Tribe had not been appropriately informed regarding the proposed dam; this situation was in contrast to the pro-dam Hualapai tribe, which, according to its chairman, had been specifically invited to prepare testimony for the hearings (p. 646).⁴

Subsequent to the May hearings, however, the Navajo Tribal Council has given thoughtful consideration to this issue, and it is now possible to present to the Subcommittee two resolutions of the Tribal Council regarding this subject, as well as another Tribal document, addressed to the Federal Power Commission, regarding the Navajos' position. I will summarize their contents by abstracting appropriate quotations.

Resolution CAU-97-66 (Aug. 3, 1966, passed 29 to 2) :⁵

The proposed flooding of the Colorado River in the Grand Canyon, which now offers one of the last great canyon wilderness waterways, would impair and destroy many scenic beauty spots and tourist attractions in the canyon along said route, thereby partially destroying one of the greatest resources of the Navajo people, the Marble Gorge of the Grand Canyon.

The proposed Marble Canyon Reservoir would have no practical point of access from the Navajo side of Marble Gorge due to sheer cliffs . . .

The Navajo Tribal Council condemns as a needless waste of public funds to immense cost of constructing Hualapai and Marble Canyon Dams . . . the high cost of hydroelectric power is rendered obsolete and unnecessary, especially when [coal and] nuclear plants can ultimately generate power at vastly less cost than hydropower.

In lieu and instead of the construction of Hualapai and Marble Gorge Dams the Navajo Tribal Council urges and memorializes the Congress to consider favorably . . . bills to enlarge the Grand Canyon National Park, to include the entire area of the Grand Canyon, provided, however, that the Navajo Rim . . . shall be administered by the Navajo Department of Parks and Recreation in cooperation with the National Park Service respecting tourist facilities in any portions of the area embraced in the Grand Canyon National Park which lie within the Navajo Reservation.⁶

Answer of the Navajo Tribe of Indians Opposing the motion of Arizona Power Authority for Commission Decision & Order Issuing License (Jan. 10, 1967) :

. . . construction costs applicable to the Marble Canyon Project have increased 11.53 percent since 1960, while the costs for constructing a steam generating plant have increased only 1.97 percent. . . such increases in construction costs have a much greater effect in increasing the total costs and lengthening the payout period of hydroelectric dams because they require a higher initial capital investment.

Among the new developments for providing both base and peaking power is the use of gas turbine generators. This method of power generation has already been proven to provide economical peaking power.

There has been an increased use of nuclear powered generating plants during the past several years. Their economic feasibility has already been proven. . . they can be located near the load centers, eliminating or greatly reducing the transmission costs required from hydroelectric plants.

. . . the inter-regional intertie of electrical systems . . . permit[s] different regions of the country to more economically use the natural resource power generating methods of other regions. . . the Pacific Northwest-Southwest intertie . . . will serve the same marketing area as would the Marble Canyon Project.

One of Arizona's basic contentions . . . is that the Grand Canyon dams would provide *peaking power* which . . . cannot be provided by other generation means. But . . . to the extent Glen Canyon Dam is operated to maintain a minimum flow, the proposed plant will have to be operated in step with it, if at all. In other words, for a substantial part of the time, the plant will be capable of generating only non-firm or dump power.

The source for generating base power could be transferred from . . . [Hoover, Park, and Davis] dams to the existing and planned coal-fired or nuclear

⁴ Hearings record, pp. 1581-7.

⁵ For full resolution, see the Committee's Report No. 1849, pp. 138-141. The other two documents cited are being submitted with this statement.

⁶ See also: National Park Service, U.S. Dept. of the Interior. *Cooperation in Recreation Development*. Washington, 1962.

generating plants . . . and more of the capacity of these dams could then be utilized for producing the higher value peaking power, thereby providing a higher rate of return to the investment in these dams.

Petition of the Navajo Tribe of Indians to Reopen the Proceedings [before the Federal Power Commission] (Feb. 21, 1967) :

. . . the costs for nuclear generation are already competitive with costs at which the Marble Canyon Project would produce power . . . in the near future the greater efficiencies which will inevitably be brought about by increased use of and experience in nuclear generation, will bring these costs even further below those for hydro generation.

Another alternative to hydro generation . . . is low cost generation by coal-fired plants. . . coal-fired plants are already competitive with or are even more economical than hydroelectric plants.

Although these alternative systems can be designed to accommodate peak loads, they can also be supplemented by gas turbine generators which can supply the peaks in demand on very short notice.

It is to the best interests of the Navajo Tribe and to the American public to maintain the diversity of recreation type facilities by creating a string of lakes on the Colorado River.

Resolution CJA-13-67 (Jan. 27, 1967, passed 57 to 0) :

The potential tourism benefits to the Navajo Tribe are greater if the Grand Canyon is left in its natural state than if another huge body of water were impounded.

The Navajo Tribal Council thereby affirms the position of the Navajo Tribe as opposing the construction of any dams, diversions or obstructions in Marble Gorge or in any other portions of the Grand Canyon.

A further indication of the Navajos' position is the fact that three Navajo Tribal Parks have been created to protect the full length of Marble Gorge. Two of these parks would be invaded by Marble Canyon Reservoir.

The position of the Navajo Tribal Council has thus been made clear. Its opposition to the Grand Canyon dams and its support of an expanded National Park are based on considerations of the general public interest as well as on considerations of Tribal interest. The reasons for this position are essentially those outlined in my testimony of May 1965: the dams' needless damage to an extraordinarily beautiful and potentially valuable scenic resource, and their subsidized competition with less costly thermoelectric power sources that exist on the Navajo Reservation.

It is of note that of presently pending bills, only Congressman Hosmer's H.R. 722 now includes Marble Canyon Dam. Secretary of the Interior Stewart Udall¹ has submitted a Colorado Basin proposal to Congress eliminating the Grand Canyon dams. Pumping power would be generated by thermoelectric plants, which could be supplied with Navajo mineral fuel. The Secretary also proposes inclusion of Marble Gorge in an expanded National Park. Barry Goldwater² states that Marble Gorge "is one of the world's most beautiful spots," and recommends elimination of the proposed dam there, the gorge to be added to the National Park. Congressman Aspinall, Chairman of this Committee, has introduced a bill (H.R. 6132) including similar proposals. The Navajo Tribal Council is on record as favoring complete National Park protection to lower Grand Canyon as well as to Marble Gorge, as proposed in the bill introduced by Congressman Saylor (H.R. 1805).

ADDENDUM ON STRIP MINING, COAL-FIRED POWER, AND AIR POLLUTION

The colloquy between Mr. Burton and Mr. Reinecke regarding the possible effects on air purity of coal-burning power plants in the Navajo area suggests the utility of some additional discussion of this and related points.

First, it must be recognized that serious air pollution is associated primarily with urban areas, with their concentrations of automobiles and industries. There is no present likelihood that the Navajo Country will become heavily urbanized. Nevertheless, any foreign matter including smoke from coal plants, that is introduced into the air has its negative aesthetic effects.

In the case of coal-burning plants, however, low-cost smoke-control devices can be installed to greatly reduce the release of undesirable substances and to

¹ U.S. Dept. of the Interior news release dated Feb. 17, 1967.

² "How to Save the Grand Canyon and Water the Desert, Too." *U.S. News and World Report*, Vol. 61, No. 17, pp. 124-6. Washington, 1966.

produce salable byproducts.⁹ In any event, the main climatic condition causing smog problems, i.e., persistent temperature inversion, has a very low frequency in the Navajo region. Nor are mountain-ringed valleys, another phenomenon promoting smog accumulation, characteristic of the Navajo Country.¹⁰

The damage to the land caused by strip-mining is also a problem, but not an entirely insoluble one. A conservation text¹¹ states, "Even strip mining . . . can be offset by rather inexpensive reclamation practices. . . . By leveling and soil building [on strip-mined lands], many of them can be made suitable for most any kind of land use." In any case, the coal-producing areas of the Navajo Country are also the least scenic.

BEFORE THE FEDERAL POWER COMMISSION

(Project No. 2248)

Arizona Power Authority—City of Los Angeles and its Department of Water & Power

CORRECTION TO THE ANSWER OF THE NAVAJO TRIBE OF INDIANS OPPOSING MOTION OF ARIZONA POWER AUTHORITY FOR COMMISSION DECISION AND ORDER ISSUING LICENSE

The Navajo Tribe of Indians filed its Answer referred to above on January 10, 1967. In the last sentence of Section III, page 7, and in Section IV, pages 7 and 8 of said Answer, in the discussions of portions of Section 7(b) of the Federal Power Act, the Navajo Tribe referred to and quoted incorrect sections of said Act. To correct said errors, the Navajo Tribe hereby submits its amendment to said Answer, as follows:

Page 7, last sentence of Section III should read as follows:

"In the execution of its authority to issue licenses for projects which, as required by the Federal Power Act, are in the public interest," we submit that the Commission, also, should consider the strong expression of public opinion opposing the construction of any dams in the Grand Canyon which have mounted steadily since public awareness of the possible dam construction was created by the Congressional hearings".

Page 8, the quotation at the top of page 8 and the first sentence following thereafter should be deleted and the following substituted therefor:

"(b) 'Whenever, in the judgment of the Commission, the development of any water resources for public purposes should be undertaken by the United States itself, the Commission should not approve any application for any project affecting such development, but shall cause to be made such examinations, surveys, reports, plans, and estimates of the cost of the proposed development as it may find necessary, and shall submit its findings to Congress with such recommendations as it may find appropriate concerning such development'.

"It is impossible that the requirements of Section 7(b) could have been fulfilled by any of the Congressional hearings or other Congressional consideration of the Colorado River Project proposed in H.R. 4671 because it is only the presiding examiner who has made findings and recommendations in this matter. The Commission has not as yet arrived at a judgment or made any such findings or recommendations to submit to Congress pursuant to Section 7(b). The Chairman of the Commission, Joseph C. Swidler, recognized that no such referral could be made until the Commission made its findings and recommendations, when in his letter to the Honorable Oren Harris, dated June 2, 1964, concerning the bill (H.R. 9752) to suspend the Commission's jurisdiction in this matter,

⁹ A. J. Haagen-Smit. Air Conservation. In: Jack B. Bresler (Ed.), *Human Ecology*. Addison-Wesley. Reading. 1966, pp. 390-5. C. T. Wanzer. "Use of Fly Ash in Concrete." *Combustion*, February 1959. Bituminous Coal Institute. Washington, p. 4.

¹⁰ Philip A. Leighton, "Geographical Aspects of Air Pollution." *The Geographical Review*, Vol. 56, No. 2, pp. 151-74. New York, 1966.

¹¹ Ruben L. Parson, *Conserving American Resources* (2nd Ed.), Prentice-Hall. Englewood Cliffs. 1964, p. 456.

¹² Federal Power Act §§ 4(a), 4(e), 10(a), and *State of California v. Federal Power Commission*, 345 F. 2d 917 (1965); *Northern States Power Company v. Federal Power Commission*, 118 F. 2d 141 (1941).

he recommended that Congress allow the Commission to issue a license effective no sooner than January 1, 1966 from which; ' . . . the Congress would have the benefit of the Commission's opinion, including its judgment under Section 7(b) of the Federal Power Act as to whether the Marble Canyon Project should be constructed by the United States.' " (House Report No. 1544, 88th Congress, 2nd Session).

Respectfully submitted.

THE NAVAJO TRIBE OF INDIANS.
By JERRY L. HAGGARD,
Associate General Counsel.

WASHINGTON, D.C.
Dated March 1, 1967.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing Correction to the Answer of the Navajo Tribe of Indians upon all parties of record in this proceeding by mailing a copy thereof to them, properly addressed.

JERRY L. HAGGARD,
Associate General Counsel, The Navajo Tribe of Indians.

Dated at Washington, D.C., this 1st day of March, 1967.

BEFORE THE FEDERAL POWER COMMISSION

(Project No. 2248)

Arizona Power Authority—City of Los Angeles and its Department of Water & Power

ANSWER OF THE NAVAJO TRIBE OF INDIANS OPPOSING THE MOTION OF ARIZONA POWER AUTHORITY FOR COMMISSION DECISION AND ORDER ISSUING LICENSE

The Navajo Tribe of Indians hereby presents its Answer to the Commission in opposition to the Motion of the Arizona Power Authority for the Commission to issue its decision and license for the construction and operation of the Marble Canyon Project, identified herein as Project No. 2248. In answer to said Motion, the Navajo Tribe shows the Commission as follows:

I

In answer to the allegations of the Arizona Power Authority in Section I of said Motion, the Navajo Tribe denies that the Act of Congress suspending the Commission's authority to proceed in this matter (Public Law 88-491) "manifests a clear legislative intent—in the form of an expressed proviso—that, in the absence of Congressional authorization of Federal development, the Commission should proceed *on the record before it* without change in the 'present status, equities, position, rights or priorities of any parties to applications pending on the date of this Act' ". (Italic added.) There is no such proviso, either express or implied, in the Act or in its legislative history, and nothing can be found to the effect that the Commission should proceed only on the record before it. Stated in full the proviso reads: "Provided, that nothing herein shall change or affect for the purpose of any action which may be taken subsequent to such date the present status, equities, position, rights, or priorities of any parties to applications pending on the date of the enactment of this Act". Clearly the words "nothing herein" mean nothing in that Act shall change or affect the positions of the parties to the pending applications. The intent of Congress was made clear that neither the enactment of the law nor anything contained therein could be construed to be a determination by Congress either for or against the position of the parties in dispute.

It is true, as the Arizona Power Authority points out, that Congress did not comment on the statement made by the Secretary of the Interior to the effect that the said Act would require the Commission to rule on the basis of the then existing facts and circumstances rather than those which might exist at the end of the moratorium. There was no comment on the Secretary's objection by either Committee of Congress which considered this bill, nor was there any such amendment made to the bill for the reasons that the members of the

Committee realized the plain literal meaning of the quoted proviso could not be interpreted as the Arizona Power Authority asserts. If Congress had intended such a severe restriction, preventing the Commission from considering facts and circumstances which might develop subsequent to the date of the Act, Congress would have expressly so stated. Had Congress intended that the Commission consider only the facts and circumstances existing on the record on the date of the Act, Congress would have adopted the recommendation of the Commission that it be allowed to issue a decision to be effective upon the ending of the moratorium. The contentions of the Arizona Power Authority are tantamount to saying that Congress intended to "freeze the public interest" and the ultimate decision of this Commission in a fixed position as of two and one-half years ago. In so vital a matter Congress would not have blinded itself nor this Commission to the facts herein set forth.

II

During the past two and one-half years there have been rapid and significant changes in this country's economy, in proven reserves of the various power resources, and in the technology both of existing and future means of generating and transmitting electrical power. Any present day decision as to planning and selecting the best means to generate electrical power must take into account not only the information which existed prior to 1964, but all of the most recent available data and information. At least some of those changes which have developed in recent years are set forth below:

1. Increased Construction Costs

The construction costs used by the Arizona Power Authority in its application are based on January 1, 1960 figures. It is well known that the costs for materials, labor and construction equipment for heavy construction have increased significantly since 1960. Bulletin No. 84, The Hardy-Whitman Index of Public Utility Construction Costs, July 1, 1966, shows that construction costs applicable to the Marble Canyon Project have increased 11.53 percent since 1960, while the costs for constructing a steam generating plant have increased only 1.97 percent. The significance in the difference between these two cost increases is obvious. But it is just as important to consider that such increases in construction costs have a much greater effect in increasing the total costs and lengthening the pay-out period of hydroelectric dams because they require a higher initial capital investment than steam generating facilities. Since the data presented by the Arizona Power Authority supporting the Marble Canyon Project no longer approximates current costs, it is clear that their cost justification is no longer valid.

2. Higher Rates of Interest

Interest rates for bonds of public utilities have increased from an average of 4.479 percent during 1960 to 5.31 percent in January 1967. (Moody's Bond Survey). This represents an increase during this period of 18.8 percent in the interest which would be paid on the capital to be invested in the construction of electrical generating facilities. To a similar extent as was stated above for increases in construction costs, these increases in rates of interest cause a greater cost increase to the Marble Canyon Project which requires higher capital investment. Before a meaningful comparison can be made between the cost for generating power by hydroelectric dams and steam generation, this factor must be taken into account in considering the total costs and payout schedule of the proposed Marble Canyon Project.

3. Declining Costs of Coal-Fired Thermal Power

The Federal Power Commission, in reporting 1964 steam-electric plant construction and production costs noted that both construction costs per kw. of capacity and unit production expenses were lower, compared with recent years. The decreased unit construction costs were attributed to the construction of larger units and improved construction methods (even in the face of increasing construction cost levels). Production expenses are lower because of "improved operating efficiencies". "Further improvements in unit investment costs and in operating and fuel costs can be expected as plants under construction are put into commercial operation". (Steam-Electric Plant Construction Cost and Annual Production Expenses, Federal Power Commission, 1964, pp. VI-VII).

One of the most revolutionary developments which has occurred in the electric power industry in great part during recent years has been the development of enormous capacity generating plants operating at mine-mouth, accompanied by developments which permit the economical transmission of the energy over distances which were heretofore unthought of.

4. *Additional Existing and Planned Electrical Generating Capacity*

Because of the declining costs of coal-fired thermal power and since the Arizona Power Authority submitted its application for a license to construct the Marble Canyon Project, huge coal-fired plants have been constructed and planned for construction in the Southwest. A 575,000 kw. capacity plant has been constructed and a 1,510,000 kw. capacity addition to it is now under construction at the Four Corners Station near Farmington, New Mexico. Also, a thermal generating plant with a 1,500,000 kw. capacity is now under construction at Mohave, Nevada. In addition, a plant having a 2,000,000 kw. capacity is being planned for installation in the vicinity of Page, Arizona, and one with another 3,000,000 kw. capacity is tentatively planned for installation near Kaiparowits, Utah. At the minimum, these other sources of power provide the flexibility to delay the undertaking of the Marble Canyon Project to a future time when the practicability of alternatives to more economical sources of power can be determined.

5. *New Developments in Thermal Power Generation*

(a) Among the new developments for providing both base and peaking power is the use of gas turbine generators. This method of power generation has already been proven to provide economical peaking power where off-peak gas can be used. An example will be found at the Sewarn Generating Station located in Middlesex County, New Jersey. The total cost of this plant, excluding land, is less than \$9.5 million or an average cost of under \$75.00 per kw., based on 1966 prices, while the proposed Marble Canyon Project cost would average over \$300.00 per kw., based on the lower 1960 prices.

(b) There has been an increased use of nuclear powered generating plants during the past several years. Their economic feasibility has already been proven to a sufficient certainty that among the nuclear plants now under construction are a 375 mw. plant at San Clemente, California, and a 436 mw. plant at Corral Canyon, California. The drastic reduction in recent years in the cost of nuclear plant construction is exemplified by another plant being constructed by General Electric for the Jersey Central Power and Light Company at Oyster Creek, north of Atlantic City, New Jersey. The average cost of this plant is equivalent to \$97.00 per kw., excluding land costs. It is estimated that the total production costs for this plant will be between 3.42 and 4.49 mills per kwh. (Steam Electric Construction Costs and Annual Production Expenses, Federal Power Commission, 1962 and 1963, pages IX and X).

Another obvious and recognized advantage which nuclear and gas turbine plants have over hydro generating plants is that they can be located near the load centers, eliminating or greatly reducing the transmission costs required from hydroelectric plants.

6. *Pacific Northwest-Southwest Intertie*

Another development which has been made possible by the recent advances in long distance, low cost power transmission has been the inter-regional intertie of electrical systems which permit different regions of the country to more economically use the natural resource power generating methods of other regions. At about the same time that the moratorium went into effect in this proceeding, one such plan, the Pacific Northwest-Southwest Intertie, had been approved for construction. These facilities will serve the same marketing area as would the Marble Canyon Project. "Over 4,000,000 kilowatts of power will be carried between the two regions by these lines, with the first line to be completed in 1967 and the last in 1971". (Federal Power Commission National Power Survey, Part I, at page 262).

III

The Navajo Tribe denies the assertions of the Arizona Power Authority in Section II of its Motion that the non-action of Congress by failing to complete its action on H.R. 4671 before it adjourned and by failing to extend the moratorium, is tantamount to an affirmative expression first, that Marble Canyon should be constructed and second, that it should be constructed as a non-federal

project. This assertion avoids or ignores the fact that Congress could not have expressed or implied such intent because it did not have the opportunity to decide whether the Marble Canyon dam should be constructed as a Bureau of Reclamation Project or as a non-federal power project, or whether the alternative Bill, H.R. 14176 should be adopted. This measure would have so extended the Grand Canyon National Park that the construction of any dam at all in the Marble Canyon would have been prevented. Because neither of the bills even reached a vote in the House or the Senate, no Congressional determination was or could have been made.

It is noteworthy that strong public sentiment opposing the construction of any dams in the Grand Canyon which took up more time than was anticipated in the Committee hearings was one of the most substantial causes for Congressional failure to decide these issues before adjournment. In the execution of its authority to issue licenses for projects which, as required by Section 7(b) of the Federal Power Act, are "desirable and justified in the public interest", we submit that the Commission, too, should consider the strong expressions of public opinion opposing the construction of any dams in the Grand Canyon which have steadily mounted since public awareness of the possible dam construction was created by the Congressional hearings.

IV

The Arizona Power Authority states that because Congress passed the Act of August 27, 1964, declaring the suspension of the Commission's authority to continue its consideration of this application, and because hearings were conducted on the federal development alternative to the construction of Marble Canyon dam, that Section 7(b) of the Federal Power Act, requiring a report of the proposed license to Congress, has been fulfilled as a condition precedent to the issuance of the license. The Arizona Power Authority overlooks the express provisions of Section 7(b) as follows:

"That in case the Commission shall find that any Government dam may be advantageously used by the United States for public purposes in addition to navigation, no license therefor shall be issued until two years after it shall have reported to the Congress the facts and conditions *relating thereto . . .*". (Underlining added).

It is impossible that the requirements of Section 7(b) could have been fulfilled by any of the Congressional hearings or other consideration of the Colorado River Project proposed in H.R. 4671 because the Commission has not as yet drawn up a license and the "facts and conditions relating" to such license have not been, and could obviously not be reported to Congress until such license is drafted. Furthermore, since neither the House nor the Senate voted on the Colorado River Project bill, and the only body which did pass on it, the House Interior and Insular Affairs Committee, favorably reported the bill on the basis of all of its inter-relating provisions which are entirely different from those included in the Arizona Power Authority's application, it is obvious that Congress has not had the opportunity for the review it intended pursuant to Section 7(b).

V

The Arizona Power Authority states in its conclusion that "conservation arguments against the project have been shown by Congress to be inaccurate and misleading". No action by Congress is cited to sustain this view other than the House of Representatives' Report No. 1895 prepared by the House Committee on Interior and Insular Affairs, to which report there were many dissenting views with regard to the conservation issue as well as other issues. This can hardly be said to be a showing by Congress that there is no real conservation issue regarding the Marble Canyon Project. To the contrary, the fourteen days of Committee hearings and the nine days of executive consideration on this subject, as pointed out by Arizona, would seem to illustrate adequately that there is in fact a very strong conservation issue.

VI

The Navajo Tribe denies the repeated assertions of the Arizona Power Authority that there is an urgent need for power to be produced by the proposed Marble Canyon Project. Arizona's assertions are basically insincere and constitute an imposition upon this Commission for the following reasons, among others:

1. It has been made entirely clear throughout these proceedings and during the hearings on H.R. 4671 that Arizona's and other parties' true interest in constructing Marble Canyon dam is *not* to provide urgently needed power to the Southwest, but instead to obtain the revenues to construct and operate the Central Arizona Project and other irrigation projects rather than financing these projects by more appropriate means.

2. In the minority views to House Report No. 1849 (89th Congress, Second Session) on the Colorado River Basin Project, H.R. 4671, it is stated that: "We wish to emphasize that Bridge Canyon dam and/or Marble Gorge dam will impound no water that is needed for the Central Arizona Project; they will generate no power that cannot be generated as economically, or almost as economical, by others methods; they are not needed to finance the Central Arizona Project". Developments on and near the Navajo Reservation, and plans rapidly materializing for coal-fired generation of power at vastly less cost, all fully known to the Arizona Power Authority, sustain the minority report.

This urgent need expressed by the Arizona Power Authority in support of its Motion for an immediate decision by the Commission apparently refers to estimates of the additional electrical generating capacity to be required in the Southwest. The Arizona Power Authority does not state, in emphasizing this urgent need, that even without the Marble Canyon project there will be sufficient capacity to meet this need by thermal generating plants.

There are more than sufficient amounts of recoverable coal reserves to supply these and additional generating plants. The United States Geological Survey estimated as of January 1, 1963 that there were more than 147,491 million tons of mineable coal in the States of Colorado, New Mexico, Utah, Wyoming and Arizona. (Pages 7-8 of prepared testimony of Clayton Ball, March, 1964, F.P.C. Docket Nos. CP63-204 et al). Based on 1965 consumptions, these reserves of coal would be sufficient to supply F.P.C. Region 8 (California, Arizona and parts of Nevada and New Mexico) for more than 2,000 years. Because the costs for mine-mouth generating plants are low and are continuing to decline, these proven coal reserves take on added importance as potentially supplying the electrical power requirements for the Southwest.

Therefore, rather than there being an "urgent need" for the generating capacity proposed to be provided by the Marble Canyon Project, no need has been shown for generating capacity above that which already exists, is under construction and is planned.

VII

One of Arizona's basic contentions in this proceeding and that of the supporters of H.R. 4671 is that the Grand Canyon dams would provide *peaking power* which is not available and cannot be provided by other generating means. But the proposed Marble Canyon Project is particularly ill-suited for peaking purposes. The canyon is narrow between the dam-site and Glen Canyon dam which limits the water storage capacity. Further, to the extent Glen Canyon is operated to maintain a minimum flow, the proposed plant will have to be operated in step with it, if at all. In other words, for a substantial part of the time, the plant will be capable of generating only non-firm or dump power.

Sufficient peaking power for the Southwest already exists for the present needs and additional peaking power can and will be provided as required in the future by means other than additional dams in the Grand Canyon. Glen Canyon, Hoover and Parker-Davis dams now provide both base power and peaking power and they have excess capacity to provide additional peaking power. Any future additional requirement for peaking power above that which is now available by the excess capacity of these dams can be provided without invading Grand Canyon. The source for generating base power could be transferred from these dams to the existing and planned coal-fired or nuclear generating plants in and around Arizona, and more of the capacity of these dams could then be utilized for producing the higher value peaking power, thereby providing a higher rate of return to the investment in these dams. This would be to the public's benefit by providing consumers with lower cost base power and also result in an accelerated payoff schedule to the already existing dams.

Even if the present excess peaking capacity of these existing dams or the capability to convert from base load generation to peak load generation should become inadequate to supply additional requirements of peaking power in some distant future, the alternative means for generating peaking power are

already as economical or more economical than hydrogeneration, and in the more distant future, long before the proposed Marble Canyon Project could be paid off, it is certain that the generating costs of these alternatives will be much less.

CONCLUSION

During the time since August 27, 1964 when Congress suspended these proceedings, the facts and circumstances bearing on the advisability of issuing a license for the construction of the Marble Canyon Project have changed in most if not all of their vital aspects. Because these new developments directly affect the factors which the Commission considers before issuing its licenses, no decision should be made and no license should be issued without considering the significance of these developments.

Respectfully submitted.

THE NAVAJO TRIBE OF INDIANS,
BY NORMAN M. LITTELL

WASHINGTON, D.C. 20036
Dated January 10, 1967.

BEFORE THE FEDERAL POWER COMMISSION, WASHINGTON, D.C.

(Project No. 2248)

In the Matter of Application of the Arizona Power Authority for License for a Proposed Hydroelectric Project on the Colorado River

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing Answer of the Navajo Tribe of Indians upon all parties of record in this proceeding by mailing a copy thereof, properly addressed, to each of the following persons, to wit:

Parties

Persons served

The Metropolitan Water District of Southern California.	Charles C. Cooper, Jr., General Counsel, 1111 Sunset Boulevard, Los Angeles, California 90054.
Arizona Power Authority-----	Mr. E. G. Nielsen, Administrator, P.O. Box 6492, Phoenix, Arizona 85005. W. T. Wiley, Assistant Attorney General, State of Arizona, 1810 West Adams Street, Phoenix, Arizona 85007.
Coachella Valley County Water District.	Mr. Earl Redwine, 207 Lewis Building, 3972 Main Street, Riverside, California 92501.
Hualapai Tribe of the Hualapai Reservation.	Mr. Royal D. Marks, 3508 North 7th Street, Phoenix, Arizona 85014. Mr. Arthur Lazarus, Jr., 1700 K Street, NW., Washington, D.C. 20006.
Imperial Irrigation District----	Horton, Knox & Carter, Suite 101, Law Building, 896 Broadway, El Centro, California 92243.
Colorado River Commission of Nevada.	Mr. A. J. Shaver, Secretary, 215 E. Bonanza Road, State Building, Las Vegas 89101.
Palo Verde Irrigation District---	Mr. Roy H. Mann, Law Building, 6th and Main, Corona, California 91720.
Upper Colorado River Commission.	George D. Clyde, Governor of the State of Utah and Vice Chairman of the Upper Colorado River Comm., State Capitol Building, Salt Lake City, Utah 84114. Ival V. Goslin, Chief Engineer-Secretary and Paul L. Billhmer, Gen. Counsel, 355 South 4th East Street, Salt Lake City, Utah 84111.
National Parks Association ----	Brookhart, Becker & Dorsey, Smith W. Brookhart, Esquire, Marvin J. Sheffield, Jr., Esquire, 1700 K Street, NW., Washington, D.C. 20006.
Southern California Edison Company.	John R. Bury, Esquire, P. O. Box 351, Los Angeles, California 90053.
Federal Power Commission-----	Mr. Joseph B. Hobbs, Staff Counsel, Washington, D.C. 20426.

*In the Matter of Application of the Arizona Power Authority for License for
a Proposed Hydroelectric Project on the Colorado River—Continued*

<i>Parties</i>	<i>Persons served</i>
Colorado River Board of California.	Thomas Lynch, Esquire, Attorney General, State of Calif., 600 State Building, 217 West 1st Street, Los Angeles, California 90012. Dallas E. Cole, Chief Engineer, 909 South Broadway—Room 200, Los Angeles, California 90015. Mr. Northcutt Ely, Ely and Duncan Tower Building, Washington, D.C. 20005.
The City of Los Angeles, Department of Water and Power.	General Manager and Chief Engineer, P.O. Box 3669, Terminal Annex, Los Angeles, California 90054. Gilmore Tillman, Esquire, Chief Assistant City Attorney, P.O. Box 3069, Terminal Annex, Los Angeles, California 90054.
Secretary of the Interior. The Department of the Interior.	Hon. Stewart L. Udall, Secretary of the Interior, Frank J. Barry, Esquire, Solicitor of the Dept. of Interior, Edward Weinberg, Esquire, Deputy Solicitor of the Department of the Interior, Washington, D.C. 20025.

NORMAN M. LITTELL,
Counsel for the Navajo Tribe of Indians.

Dated at Washington, D.C. this 10th day of January, 1967.

BEFORE THE FEDERAL POWER COMMISSION

(Project No. 2248)

Arizona Power Authority—City of Los Angeles and its Department of Water & Power

PETITION OF THE NAVAJO TRIBE OF INDIANS TO REOPEN THE PROCEEDINGS

The Navajo Tribe of Indians hereby presents its petition, pursuant to Section 1.33(c) of the Rules of the Federal Power Commission, to reopen the proceedings in the above entitled application to permit the Commission to receive and consider information and evidence establishing changes in facts vitally important to its decision on this application. In support of said petition, the Navajo Tribe of Indians submits the following:

The grounds on which the Navajo Tribe was originally allowed to intervene into these proceedings included, among others, that the rights and interests of the Tribe in its reservation would be directly affected by any action that this Commission may take with regard to Project No. 2248, that it must represent its own interests with respect to the Commission's required finding that such a license issued under the Federal Power Act would not interfere or be inconsistent with the purpose for which the Navajo Reservation was created, and that the Navajo Tribe has a property interest in the project lands protected by the Fifth Amendment to the Constitution of the United States which cannot be represented by any other party.

Based on the then known facts and circumstances, the original position of the Navajo Tribe in these proceedings was that, if any dam were to be constructed at Marble Canyon, it favored one sponsored by the Bureau of Reclamation and opposed the project proposed by the Arizona Power Authority for the reason that the Navajo Tribe and the Public would receive greater benefits from the former. During the period of more than four years since the record in this proceeding was closed, dramatic, and in many instances, unforeseeable changes in the facts bearing on the advisability of constructing the Marble Canyon Project have occurred. It is these changes which have caused the Navajo Tribe to find it necessary to modify its position with respect to its own interest and which, your petitioner submits, also make it necessary in the public interest for the Commission to reopen the record in order to consider said factors before making its decision. Your petitioner has adopted and expressed its position opposing the Marble Canyon Project in Resolution CJA-18-67, passed by the Navajo Tribal Council, with 51 voting in favor and none opposed, on January 27, 1967. (Exhibit 1).

The Navajo Tribe submits that the changes in facts and circumstances set forth herein establish, beyond question, sufficient grounds for reopening this proceeding. At least some of the grounds on which the Navajo Tribe bases its petition for reopening were mentioned in its Answer to the Arizona Power Authority's Motion for a Commission Decision and Issuance of License, filed on January 10, 1967, but are repeated and amplified herein to support fully the propriety of reopening this record.

In presenting these changes and the effects which they produce on the proposed project, petitioner alleges not only that this evidence was discovered through the exercise of due diligence since the conclusion of the hearings on this application but also that, for the most part, this evidence did not come into being until after the hearings were concluded. The fact that most of this evidence, if not all of it, arose after the conclusion of the hearings, speaks for itself in establishing that said evidence is not merely cumulative to evidence previously submitted.

Many of the presiding examiner's findings and conclusions were based on facts which have since changed. It will be established that this evidence and the form of these changes of fact are of such significant materiality that they will or should produce a different result from that expressed in the presiding examiner's decision. There is set forth below these changes of fact for which, your petitioner submits, the Commission must reopen the record in order to receive full evidence and testimony relating thereto before any final decision can properly be made on the application.

1. Lack of need for Marble Canyon Project power

With regard to the need for the power proposed to be produced by the Marble Canyon Project, the examiner stated:

"For the purpose of determining the potential market for the power from the Marble Canyon Project, there was taken into account the power that would be available from other sources including the scheduled additions and probable retirements of fuel-burning stations in the state during the period until Marble Canyon could be brought on the line. The Authority's witness expressed the opinion that the capacity of the Marble Canyon development would be needed by 1968 to meet the capacity requirements of the Arizona market". (Examiner's decision, page 6).

And, in the additional findings and conclusions, the examiner stated:

(32) "The power output from the proposed Marble Canyon development can be absorbed by the Arizona markets by 1969". (Examiner's decision, page 41).

The estimated time at which the area markets will require the power proposed to be supplied by the Marble Canyon Project has been postponed, even by proponents of the Marble Canyon dam, from 1968 to 1973, and even the 1973 estimate assumes unrealistically that no other generating sources would be added after 1968. (Hearings on H.R. 4671, House Subcommittee on Irrigation and Reclamation, 89th Congress, 1st Session, 1965 at page 630). Among the causes for postponements in the estimated dates of requiring the Marble Canyon Project power has been the increase in other more economical sources of power, which have been installed, are planned for installation, or have been proven feasible since the record in this proceeding was closed. Your petitioner is prepared to show both the magnitude of the increases in power supplies which have occurred since the conclusion of these hearings and the planned and potential increases which will be created during the forthcoming years. The conclusion will follow from this showing that the need for power to be produced by such a Marble Canyon Project will occur not in 1968 nor even in 1973, but that it will occur, if at all, at a time sufficiently beyond 1973 that it would be inadvisable to permit the construction of the Marble Canyon Project now or in the near future.

When the presiding examiner found that the power proposed to be supplied by the Marble Canyon Project would be required or could be absorbed in the Arizona markets by 1968 or 1969, he did not possess the information regarding the tremendous increases in electrical generating capacity in and around Arizona which have occurred or have been planned for the most part, since 1962. In its Answer to the Motion of the Arizona Power Authority filed on January 10, 1967, your petitioner advised the Commission that facilities with the total capacity of 8,595,000 kw. had been constructed, were under construction, or were being planned in and around Arizona. In addition to this capacity there are other power plant developments which would total approximately 7,415,000

kw. being considered for installation in the same area. The location and extent of these new facilities are summarized in the Hearings on H.R. 4671 before the House Subcommittee on Irrigation and Reclamation, 89th Congress, 1st Session, 1965 at page 228. All of the foregoing installations are or will be coal fired plants and do not even include the power to be furnished by the Pacific Northwest-Southwest Intertie and the definite possibility of gas, diesel and nuclear powered plants to supplement and balance this system.

Also recognizing that the Marble Canyon Project is not necessary is the Department of the Interior which announced on February 1, 1967 that it has dropped its plans to build the Marble Canyon dam.

2. Need to review duplication of transmission systems

The presiding examiner found:

"There will be no duplication of transmission facilities in the area by reason of the construction of the Authority's proposed lines". (Examiner's decision page 8).

The same later developed and planned increases in generating capacity referred to above such as the Pacific Northwest-Southwest Intertie and the "Four Corners" plant, have given rise to the installation and plans for installation of servicing transmission lines. As a result of the construction of Units 4 and 5 at the "Four Corners" plant, high capacity transmission lines have been constructed to Phoenix and Intertie with lines going to California, crossing much of the same area proposed to be supplied by the Marble Canyon Project transmission lines. The extent to which these and other transmission lines will result in a duplication of transmission facilities must be examined and considered by the parties hereto and by the Commission.

3. The financial justification for the Marble Canyon Project was based upon facts which have since changed

The presiding examiner found that the evidence established the financial feasibility of the project, subject to certain conditions. (Examiner's decision page 10). Among the considerations and conditions for this finding were the following:

- (1) That financing could be obtained by issuing revenue bonds in the amount of \$195,000,000;
- (2) That the estimated rate of interest payable on those bonds would be 4.6 percent;
- (3) That there must be obtained firm long term contracts with responsible purchasers for substantially all of the power at rates which would yield the annual costs of the project;
- (4) That the actual costs of the project would not greatly exceed the estimates;
- (5) That the net interest costs for the bonds would not be such as to prevent obtaining the said purchase contracts; and
- (6) That the applicant could obtain the funds required.

It will be shown here, and can be established conclusively during later hearings that the significant facts which caused the examiner to presume the validity of these considerations and conditions, have changed substantially since the examiner's decision was made. During a rehearing of this Application it can be established that the costs of the proposed project will "greatly exceed" the earlier estimates. The presiding examiner assumed the interest rate for the financing of the project would have been 4.6 percent. Applying this rate of interest to the cost estimated by the Arizona Power Authority, the cost of the project would have been \$170,400,000 based on January, 1960 construction costs. (Examiner's decision page 8). Construction costs of the type which would apply to a hydroelectric project have increased 11.53 percent since 1960, (Bulletin No. 84, The Handy-Whitman Index of Construction Costs, July 1, 1966), and the estimated rate of interest have increased also.

The foregoing increases in construction costs alone amount to an increase of more than \$19,000,000. While the presiding examiner did find that the applicant could obtain the funds required, his finding was based upon the costs estimated in 1960 and the availability of financing in 1961 and 1962. It is submitted that the significant increases in the estimated cost of the project and in the

difficulty of obtaining financing has sufficiently exceeded the original estimates to require that at least a redetermination of the financial feasibility of the project must be made.

The examiner also conditioned the financial feasibility of the project upon the applicant obtaining firm long-term contracts for the purchase of substantially all of the power at rates which would yield the annual costs. By recommending in his decision that the Commission grant the Arizona Power Authority its license, the examiner must necessarily have assumed that this condition could be met. But, at that time, the prospect of alternative sources of power being available at rates competitive with those proposed for the Marble Canyon Project did not exist. The existence of these additional power sources at lower or at least competitive rates will inevitably supply at least part of the requirements of the otherwise potential purchasers of Marble Canyon power, and creates a serious question as to whether substantially all of the Marble Canyon Power can be sold at rates which would provide a return of the annual costs.

4. *Advances in power generation have made alternatives more desirable than the Marble Canyon Project*

The only alternative to power generation apparently considered by the presiding examiner as presented by the Arizona Power Authority was gas fired generating units. (Examiner's decision, page 9). During these proceedings, the Arizona Power Authority assumed that alternative gas-fired steam plants would have capacities equivalent to the proposed project and that they would be operated at the load factor expected for the Marble Canyon Project.

Advances in the technology of producing and transmitting electrical power which have come about since the presiding examiner's decision, have created additional and more economical alternatives which were not and could not have been considered during the hearings in these proceedings. Well known to this Commission and to the industry is the present and even greater potential importance of nuclear generating plants. The petitioner is prepared to establish during reopened hearings in these proceedings that the costs for nuclear generation are already competitive with costs at which the Marble Canyon Project would produce power and further, that in the near future the greater efficiencies which will inevitably be brought about by increased use of and experience in nuclear generation, will bring these costs even farther below those for hydro generation. Illustrating undeniably that the costs for nuclear generation are already competitive with those for hydro generation, is the cost data available for the nuclear plant now under construction at Oyster Creek, New Jersey. Based on the intended operation of this plant, the average cost for producing power over an estimated 30-year period will be 2.83 mills per kwh. Adjusting those costs, as nearly as possible, to the conditions which would apply to the Marble Canyon Project and assuming the Project's load factor of 55.3 percent, the average costs for this nuclear plant over a 30-year period are calculated to be 3.45 mills per kwh. However, actual operation of a nuclear powered or gas powered alternative to the Marble Canyon Project would be at a higher load factor efficiency and the production costs would be decreased to the approximate cost indicated above for the Oyster Creek plant.

Another alternative to hydro generation of electrical power which has developed and been proven economically feasible since the record in these proceedings was closed, is low cost generation by coal-fired plants made possible through larger unit sizes, higher thermal efficiencies, plant locations near newly developed sources of coal and high voltage long distance transmission.

In estimating the cost of producing power by coal fired plants as a alternative to that which would be produced by the Marble Canyon Project, the following factors were applied:

(a) Construction costs for coal-fired units were adjusted to July 1966 price levels by the Handy-Whitman Index for "Total Plant-All Steam Generation", Bulletin No. 84, July 1966.

(b) Separate estimates were made for private ownership and public ownership to take into account the variance in fixed charges of from 12.1 to 12.83 percent for private ownership (assuming a 6 percent rate of return) and 5.96 percent for public ownership (assuming the elimination of the cost for taxes).

Applying these factors to the costs for producing power at the "Four Corners" plant near Farmington, New Mexico, after all five units in that plant are completed and are producing at their full capacity, the costs are calculated to be

approximately 1.7 mills per kwh. if the plant were compared on the same basis as the Marble Canyon Project, i.e. publicly owned, and approximately 2.4 mills per kwh. if the plant were privately owned. The coal-fired plants being planned for construction at Page, Arizona and Kaiparowits, Utah, like the "Four Corners" plant will be operated at mine-mouth and will therefore be expected to produce power at approximately the same cost. Therefore, it is shown, and can be conclusively established during rehearings, that coal-fired plants are already competitive with or are even more economical than hydroelectric plants.

Another alternative to the proposed Marble Canyon power source which has developed since the record in these proceedings was closed and which is particularly suitable for supplying peaking power, is the "extra high voltage method" of transmitting power over long distances at very low cost. This development in the transmission of electrical energy has allowed regions of this country to be supplied with power produced in other regions and the establishment of interties of electrical systems over distances which heretofore were economically impracticable. One such system, the Pacific Northwest-Southwest Intertie scheduled for completion in 1971, which will serve the very market area proposed to be served by the Marble Canyon Project, was approved after this record was closed and after the presiding examiner had issued his decision. (Federal Power Commission National Power Survey, Part 1, page 262 (1964).)

Although these alternative systems can be designed to accommodate peak loads, they can also be supplemented by gas turbine generators which can supply the peaks in demand on very short notice. Illustrating the feasibility of such gas turbine generators is the Searn Generating Station located in Middlesex County, New Jersey, and the four such units on order by Southern California Edison. (Power Engineering, January, 1967, pp. 9-10).

5. The Marble Canyon Project would interfere with the Grand Canyon National Park

Based on the record before him, the presiding examiner found that:

"The proposed development will not encroach upon, or interfere in any way with, the (Grand Canyon) National Park". (Examiner's decision, page 11), and "the operation of the Project as proposed by the applicant would not be expected to change the flows of the streams; . . . and there is no evidence that it will interfere with or impair in any way national park areas". (Examiner's decision, page 20).

Testimony and evidence presented in the hearings on the proposed Colorado River Project Bill (H.R. 4671) in the House Interior and Insular Affairs Committee during the 89th Congress after this record was closed, established that there will be daily rise and fall in the Colorado River below the proposed Marble Canyon dam of approximately 15 feet. The presiding examiner did acknowledge in his decision that a re-regulating reservoir might be necessary, although the cost for it was not considered in the cost allocated to the proposed project, but nowhere in the record was the fact acknowledged that this daily rise and fall would amount to the variance of 15 feet. The technical data establishing this fact, being uniquely in the control of the applicant herein, was not emphasized in the record of these proceedings and did not become known to this petitioner until after this record was closed, and therefore was not asserted in the record as being damaging to the Navajo tribal lands and to the Grand Canyon. In addition to the lands of the Navajo Reservation which will be flooded above the proposed dam, inundating the portions of the Grand Canyon Navajo Tribal Park, such a daily rise and fall of 15 feet in the level of the Colorado River adjoining the Navajo Reservation below the dam can be characterized only as producing a tremendous change in the flows of the stream along the Navajo Reservation and in the Grand Canyon National Park, rather than, as the presiding examiner found, producing no change in the flows of the stream.

6. The Marble Canyon area of the Grand Canyon contains a high recreational value and exists as a great potential for the development of tourism on the Navajo Reservation

The presiding examiner found that:

"At the present time there is virtually no recreational use of the Marble Canyon area. It is visited only by a few persons who are able to afford the high price of a boat trip down the river . . . The testimony is that the proposed

project would transform a now isolated rocky wilderness into an area attractive to the sportsmen and vacationers".

Since the examiner made this statement the tourism potential of the Marble Canyon area of the Grand Canyon has been recognized and the recreational use of the area in its natural state has accelerated greatly. On August 1, 1966 the Advisory Committee of the Navajo Tribal Council passed Resolution ACAU-149-66 (Exhibit 2) establishing the Grand Canyon Navajo Tribal Park along the Marble Canyon Gorge to develop that area of the Grand Canyon paralleling in a more limited area the scenic beauty of the Grand Canyon National Park, to benefit the members of the Navajo Tribe and the public by making this area of the Navajo Reservation along the Colorado River available for their enjoyment and by encouraging the development of its tourism potential.

The number of persons who have taken the incomparable boat trip through this portion of the Grand Canyon has nearly tripled in the period of four years since the examiner's decision was issued stating that the Marble Canyon area was visited by only a few persons each year. In 1966, 1,067 persons took this boat trip through the Marble Gorge of the Grand Canyon along the western edge of the Navajo Reservation. And your petitioner can establish, as the Sierra Club has stated in its supplemental Answer filed on January 30, 1967, that rather than the boat trip being high priced, as was stated by the presiding examiner, the cost for such a trip has declined to as low as \$225.00 per person, total cost for a three week trip.

After the record in this proceeding was closed, the Glen Canyon Dam was completed and the use of Lake Powell as a water recreation area has become available. The Navajo Tribe and other parties have developed recreational areas along Lake Powell which would merely be duplicated by another adjoining body of water impounded by the Marble Canyon dam. It is to the best interests of the Navajo Tribe and to the American public to maintain the diversity of recreation and scenic facilities of this region rather than overdeveloping and duplicating reservoir type facilities by creating a string of lakes on the Colorado River along the Navajo Reservation.

7. *The proposed Marble Canyon Project would interfere and be inconsistent with the purposes for which the Navajo Reservation was created*

The presiding examiner found that the construction and operation of the Marble Canyon Project would not interfere or be inconsistent with the purposes for which the Navajo Reservation was created. (Examiner's decision, page 15, and additional Finding and Conclusion 13, at page 39.) The petitioner objected to this Finding in its exceptions to the decision of the presiding examiner filed on November 30, 1962. New facts, which have arisen since the presiding examiner's decision was issued and since the Navajo Tribe submitted its exceptions thereto, make it necessary to reopen the record to determine whether, in view of these later developed facts, the construction of the Marble Canyon Project would interfere and be inconsistent with the purpose for which the Navajo Reservation was created.

As hereinbefore stated, the technology permitting the economic mining and use of the enormous coal deposits located on the Navajo Reservation has developed within recent years. If this development is not curtailed by the saturation of unneeded and higher cost hydro generating facilities, the coal from the Navajo Reservation and surrounding areas will supply what will become some of the largest electrical generating facilities in the world.

The purposes for which the Navajo Reservation was created are expressed in several treaties and Acts of the United States. Among the first of these was the Treaty of 1850 (9 Stat. 974) which provided in Article IX that:

"... It is agreed by the aforesaid Navajos that the Government of the United States shall, at its earliest convenience, designate, settle, and adjust their territorial boundaries, and pass and execute in their territory such laws as may be deemed conducive to the prosperity and happiness of said Indians". (Emphasis added.)

In reviewing the Treaty of 1868 (15 Stat. 667), the Supreme Court of the United States in *Williams v. Lee* (358 U.S. 217, 221-22, (1959)) stated:

"On June 1, 1868 a treaty was signed between General William T. Sherman, for the United States, and numerous chiefs and head men of the 'Navajo nation or tribe of Indians'. . . . In return for their promises to keep peace, this treaty 'set apart' for 'their permanent home' a portion of what had been their native

country, and provided that no one, except United States Government personnel, was to enter the reserve area." (Emphasis added.)

The Navajo-Hopi Rehabilitation Act of April 19, 1950, 64 Stat. 44, 25 USC § 631-40 (1958) provided:

"In order to further the purposes of existing treaties with the Navajo Indians to provide facilities, employment, and services essential in combating hunger, disease, poverty and demoralization among the members of the Navajo and Hopi Tribes, to make available the resources of their reservations for use in promoting a self-supporting economy and self-reliant communities, and to lay a stable foundation on which these Indians can engage in diversified economic activities and ultimately obtain standards of living comparable with those enjoyed by other citizens, the Secretary of the Interior is hereby authorized and directed to undertake, within the limits of the funds from time to time appropriated pursuant to this Act, a program of basic improvements for the conservation and development of the resources of the Navajo and Hopi Indians, the more productive employment of their manpower, and the supply of means to be used in their rehabilitation, whether on or off the Navajo and Hopi Indian Reservation" (Emphasis added.)

These and other actions taken by the Congress of the United States clearly show that among the purposes for which the Navajo Indian Reservation was created was the purpose to encourage the Navajos' economic progress by utilizing their natural resources on the Navajo Reservation. The continued economic and social progress of the Navajo Tribe depends, to a great extent, upon the development and sale of their huge coal deposits before other sources of energy, even more economical than coal or water power, pre-empt the usability of these coal reserves. Permitting the construction of the Marble Canyon Project would, because of the unretrievable investment of enormous capital, commit the production of the full capacity of power by the Marble Canyon Project whether or not this power would have to be sold at prices which would not return all of the investment, thereby diluting the market otherwise open to thermal produced power. To permit the resulting diminution of the development potential of the Navajo coal deposits by granting a license to construct the Marble Canyon Project to produce power at higher costs could be nothing less than interfering and being inconsistent with the purposes for which the Navajo Indian Reservation was created.

CONCLUSION

The above material changes of facts and others have occurred since the conclusion of these hearings. This petition respectfully urges the Commission to reopen the record in this matter to permit hearings and introduction of evidence on these new and changed facts which are vital to the proper determination of the Commission's final decision and which, this petitioner submits, will cause the Commission to deny the application of the Arizona Power Authority to construct Project No. 2248.

Respectfully submitted.

THE NAVAJO TRIBE OF INDIANS,

Associate General Counsel, 1826 Jefferson Place, N.W.,
Washington, D.C. 20036.

Dated February 21, 1967.

VERIFICATION

DISTRICT OF COLUMBIA, ss:

JERRY L. HAGGARD, being first duly sworn, deposes and says:

That he is Associate General Counsel for The Navajo Tribe of Indians; that he has read the foregoing Petition and knows the contents thereof, and that the same are true to the best of his knowledge and belief.

Dated February 21, 1967.

Subscribed and sworn to before me this 21st day of February, 1967.

Notary Public in and for the District of Columbia.

My commission expires -----

RESOLUTION OF THE NAVAJO TRIBAL COUNCIL

Opposing the Construction of Dams in the Marble Gorge and Other Portions of the Grand Canyon

Whereas:

1. There is now pending before the Federal Power Commission an application by the Arizona Power Authority, identified as Project No. 2248, for a license to construct a dam at Marble Gorge on the Colorado River to be used for the generation of electrical power, and

2. On May 22, 1961, the Navajo Tribal Council passed Resolution CMY-28-61 urging construction of the Marble Canyon Dam by the Federal Government and authorizing the Chairman to seek enactment of legislation by Congress to construct the dam at Marble Canyon as a Bureau of Reclamation project for the purpose of assuring the availability of electrical power to and its purchase by the Navajo Tribe, and pursuant to said resolution the Navajo Tribe did intervene in the proceedings before the Federal Power Commission, and

3. By the Act of August 27, 1964 (Public Law 88-491, 78 Stat. 607), Congress declared that no licenses or permits shall be issued for the reach of the Colorado River between Glen Canyon Dam and Lake Meade during the period ending December 31, 1966 for the purpose of providing Congress with the opportunity to pass upon a comprehensive plan for a unified integrated system of such projects on the entire Colorado River basin, and

4. Among other House and Senate companion bills, H.R. 4671 was introduced in the House of Representatives on February 9, 1965 proposing such a plan for the construction, maintenance and operation of a Colorado River basin project and extended hearings in Committees of Congress were held on said bill during the 89th Congress. Also introduced in Congress was H.R. 14176 on March 31, 1966 and other similar bills which proposed enlarging the borders of the Grand Canyon National Park to include the Marble Gorge. But Congress adjourned before the Senate or the House voted on either of the bills, and

5. During the year subsequent to 1961 when CMY-28-61 was passed by the Navajo Tribal Council, factors causing the Tribe to support the construction of the Marble Canyon Dam by the Bureau of Reclamation had changed, namely that the construction of a dam at Marble Gorge would now be contrary to the best interests of the Navajo Tribe in the following respects:

(a) Hydropower produced by such a dam would inevitably compete with thermopower produced from other sources in the same area which ultimately would decrease the value and saleability of the huge deposits of coal located on the Navajo Reservation;

(b) Having more than sufficient supplies of electrical power available to the Tribe from the Four Corners project and other proposed thermogenerating plants, the Tribe has no need for the additional electrical power which might be made available to it from the hydro-generating plant;

(c) The potential tourism benefits to the Navajo Tribe are great if the Grand Canyon is left in its natural state than if another huge body of water were impounded, particularly considering that the Navajo Tribe already has available to it the means for developing water and boating recreation in the same geographic area by the already existing Lake Powell;

(d) The Arizona Power Authority has not offered and therefore it must be assumed that it will not offer reasonable compensation to the Navajo Tribe for the taking of Tribal lands, water and other rights by its proposed project;

and the construction of a dam at Marble Gorge would be contrary to the best interests of the American public in the following respects:

(a) the construction of a dam in the Grand Canyon would irreparably damage one of the greatest and last natural scenic wonders and nature refuges remaining in the United States;

(b) the cost of electricity, which must eventually be borne by the consumers, will be greater if it is produced by means of hydropower rather than by coal or nuclear powered generating plants.

6. As a result of these changed conditions, the Navajo Tribal Council passed Resolution CAU-97-66 on August 3, 1966 revoking Resolution CMY-28-61 and opposing the construction of dams in Marble Gorge and other portions of the Grand Canyon, and

7. Anticipating that the moratorium on the Federal Power Commission expires on December 31, 1966, the Arizona Power Authority filed on December 27, 1966 a "Motion for Commission Decision and Order Issuing License."

Now, therefore, be it resolved that:

1. The Navajo Tribal Council hereby affirms the position of the Navajo Tribe as opposing the construction of any dams, diversions or obstructions in Marble Gorge or in any other portions of the Grand Canyon.

2. The Navajo Tribal Council hereby authorizes the General Counsel and/or the Legal Department of the Navajo Tribe to continue to represent the Navajo Tribe to carry out its position as hereinbefore stated before the Federal Power Commission, the Congress of the United States, and before any and all other courts, tribunals or legislative bodies to which this matter may be presented or appealed.

3. Any and all costs, including but not limited to witness fees, travel expenses, telephone and telegraph expenses, special stenographic or reporting costs, including transcripts of records and preparation of pleadings and any and all other expenses necessary to carry out the purposes of this resolution shall be paid by the Navajo Tribe pursuant to any appropriation heretofore made or special appropriation to be hereafter made when the amounts of these costs and expenses become known.

CERTIFICATION

I hereby certify that the foregoing resolution was duly considered by the Navajo Tribal Council at a duly called meeting at Window Rock, Arizona, at which a quorum was present and that same was passed by a vote of 57 in favor and 0 opposed, this 27th day of January, 1967.

Chairman, Navajo Tribal Council.

RESOLUTION OF THE ADVISORY COMMITTEE OF THE NAVAJO TRIBAL COUNCIL

Establishing the Grand Canyon Navajo Tribal Park

Whereas:

1. Navajo Tribal Council Resolution CF-31-57 established the Navajo Parks Commission and delegated to the Advisory Committee authority to establish Navajo Tribal parks and monuments on Navajo Tribal lands, and

2. The area adjacent to and east of that portion of the Colorado River lying between the Glen Canyon National Recreation Area on the north and the Little Colorado River Navajo Tribal Park on the south (which area is sometimes referred to as the Marble Gorge of the Grand Canyon) has potential for development as an area of recreational and scenic interest, and the Navajo Tribal Parks Commission has recommended to the Advisory Committee the creation of a Navajo Tribal Park in this area.

Now, therefore, be it resolved that:

1. The Grand Canyon Navajo Tribal Park is hereby established as described in Exhibit "A" attached hereto.

2. The Navajo Tribal Parks Commission shall make such rules and regulations for the use of the Grand Canyon Navajo Tribal Park as shall be consistent with the authorities granted to the Commission by Navajo Tribal Council Resolution CF-31-57 in order to preserve and develop this area of the Navajo Reservation for scenic, historical, recreational, and scientific purposes.

CERTIFICATION

I hereby certify that the foregoing resolution was duly considered by the Advisory Committee of the Navajo Tribal Council at a duly called meeting at Window Rock, Arizona, at which a quorum was present and that same was passed by a vote of 10 in favor and 0 opposed, this 1st day of August, 1966.

HAROLD DRAKE,

Chairman Pro Tempore, Navajo Tribal Council.

Beginning at a point where the westerly right-of-way line of Highway 89A intersects the south boundary of the Lake Powell National Recreation Area;

Thence southerly along the west right-of-way line of said Highway 89A to the intersection of said line of the westerly right-of-way line of Section 89;

Thence southerly along the westerly right-of-way line to said Highway 89 to the point where said right-of-way line intersects the northerly boundary of the Little Colorado River Navajo Tribal Park;

Thence westerly along the northerly boundary of the said Little Colorado River Navajo Tribal Park, to a point on the (SE) bank of the Colorado River;

Thence northerly along the (SE) bank of the Colorado River to a point where said (SE) bank intersects the southerly boundary of the Lake Powell National Recreation area;

Thence in an easterly direction along the southerly boundary of said Lake Powell National Recreation area, to the point of beginning.

BEFORE THE FEDERAL POWER COMMISSION, WASHINGTON, D.C.

(Project No. 2248)

In the Matter of Application of the Arizona Power Authority for License for a Proposed Hydroelectric Project on the Colorado River

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing Petition of the Navajo Tribe of Indians upon all parties of record in this proceeding by mailing a copy thereof, properly addressed, to each of the following persons:

<i>Parties</i>	<i>Persons served</i>
The Metropolitan Water District of Southern California.	Charles C. Cooper, Jr., General Counsel, 1111 Sunset Boulevard, Los Angeles, California 90054.
Arizona Power Authority-----	Mr. E. G. Nielse, Administrator, Post Office Box 6492, Phoenix, Arizona 85005. W. T. Wiley, Assistant Attorney General, State of Arizona, 1810 West Adams Street, Phoenix, Arizona 85007.
Coachella Valley County Water District.	Mr. Earl Redwine, 207 Lewis Building, 3972 Main Street, Riverside, California 92501.
Hualapai Tribe of the Hualapai Reservation.	Mr. Royal D. Marks, Marks & Marks, 3508 North 7th Street, Phoenix, Arizona 85014. Mr. Arthur Lazarus, Jr., 1700 K Street, NW., Washington, D.C. 20006.
Imperial Irrigation District----	Horton, Knox & Carter, Suite 101, Law Building, 895 Broadway, El Centro, California 92243.
Colorado River Commission of Nevada.	Secretary, Post Office Box 1748, Las Vegas, Nevada 89101.
Palo Verde Irrigation District--	Mr. Roy H. Mann, Law Building, 6th and Main, Corona, California 91720.
Upper Colorado River Commission.	George D. Clyde, Governor of the State of Utah and Vice Chairman of the Upper Colorado River Commission, State Capitol Building, Salt Lake City, Utah 84114. Ival V. Goslin, Chief Engineer and Secretary, and Paul L. Billhymer, General Counsel, 355 South 4th East Street, Salt Lake City, Utah 84111.
National Parks Association----	Brookhart, Becker & Dorsey, Smith W. Brookhart, Esquire, Marvin J. Sheffield, Jr., Esq., 1700 K Street NW., Washington, D.C. 20006.
Southern California Edison Company.	John R. Bury, Esquire, Post Office Box 351, Los Angeles, California 90053.
Federal Power Commission----	Mr. Joseph B. Hobbs, Staff Counsel, Federal Power Commission, Washington, D.C. 20426.
Colorado River Board of California.	Thomas Lynch, Esquire, Attorney General, State of California, 600 State Building, 217 West 1st Street, Los Angeles, California 90012. Dallas E. Cole, Chief Engineer, 909 South Broadway, Room 200, Los Angeles, California 90015. Mr. Northcutt Ely, Ely and Duncan, Tower Building, Washington, D.C. 20005.

*In the Matter of Application of the Arizona Power Authority for License for
a Proposed Hydroelectric Project on the Colorado River—Continued*

<i>Parties</i>	<i>Persons served</i>
The Sierra Club-----	Mr. Dale Doty, 1028 Connecticut Avenue NW, Washington, D.C., Mr. David Sive, Winer, Neuberger & Sive, Chrysler Tower East, 161 East 42nd Street, New York, New York. Mr. R. Frederic Fisher, Lillick, Geary, Wheat, Adams & Charles, 1625 K Street NW., Washington, D.C. 20006.
The City of Los Angeles Department of Water & Power.	General Manager and Chief Engineer, Post Office Box 3669, Terminal Annex, Los Angeles, California 90054. Gilmore Tillman, Esquire, Chief Assistant City Attorney, Post Office Box 3669, Terminal Annex, Los Angeles, California 90054.
Secretary of the Interior, The Department of the Interior.	Hon. Stewart L. Udall, Secretary of the Interior, Frank J. Barry, Esquire, Solicitor, Department of the Interior, Edward Weinberg, Esquire, Deputy Solicitor, Department of Interior, Washington, D.C. 20025.

Associate General Counsel, the Navajo Tribe of Indians.

Dated at Washington, D.C. this 21st day of February, 1967.

THE NAVAJO TRIBE,
Window Rock, Ariz., March 23, 1967.

Hon. HAROLD T. JOHNSON,
*Chairman, Subcommittee on Irrigation and Reclamation,
U.S. House of Representatives,
Washington, D.C.*

MY DEAR MR. JOHNSON: It has been called to my attention that during the hearings on the Colorado River Basin Project bills before your subcommittee on March 17, 1967, certain remarks regarding the Navajo Tribe of Indians and their interests, were made a part of the record.

First, Congressman Sam Steiger (Arizona) stated the following:

"Well, I would like to interpret their [Navajos] lack of sending an official representative here as a demonstration of the fact that their concern is not of a magnitude that they felt a paid trip was justified."

I would appreciate the record showing a correction to that statement. On the same day on which Congressman Steiger made that statement, there were two representatives of the Navajo Tribe, Mr. Ned Hatathli and the writer present in the Nation's Capital. These two representatives had brought with them the copies of the documents placed in the record by Dr. Stephen Jett, in behalf of the Navajo Tribe of Indians. At about the same time that Dr. Jett was presenting these documents of the Navajo Tribe to your subcommittee, Mr. Hatathli and the writer were testifying before the House Interior Appropriations Subcommittee and it was considered that the policy of the Tribe with respect to the Grand Canyon Dams would be expressed sufficiently in these documents as they were placed in the record by Dr. Jett.

Secondly, statements made and placed in the record by two members of the committee staff, Messrs. Sidney L. McFarland and T. Richard Witmer, also on March 17, 1967, charged that the Navajo Tribe did not own any interest in the land of the Navajo Reservation adjoining the Colorado River. Messrs. McFarland and Witmer did not cite and could not have cited any authority establishing this. Without amplifying fully the entire legal basis establishing that the Tribe does own the interest in this land, and that such interest has not been withdrawn, I ask respectfully that the record show this fact to be the position of the Navajo Tribe. The Navajo Tribe is prepared to establish conclusively in law its interest in this land whenever it becomes necessary to do so.

The Navajo Tribe would be most grateful, in view of the statements made by Congressman Steiger and Messrs. McFarland and Witmer, if this letter could be included in the record of your subcommittee to clarify these matters.

Very truly yours,

EDWARD O. PLUMMER,
Supervisor, Land Investigation.

Mr. JOHNSON. We have one witness left, a private citizen. Is Mr. Behr here?

STATEMENT OF ARMIN BEHR

Mr. BEHR. Mr. Chairman, I have a brief statement, which I think I will read.

Mr. JOHNSON. Fine.

Mr. BEHR. And I would like, after reading my statement, permission to read from a statement of a good friend of mine who is somewhat more familiar with the area.

Mr. JOHNSON. Well, I think you had better give us yours and submit his for the record. We have no objection to his going into the record, but the hour is late.

Mr. BEHR. Then may I submit two short statements for the record?

Mr. JOHNSON. By whom?

Mr. BEHR. In addition to my own. They are two statements by individuals.

Mr. JOHNSON. You made a request to come here as a private citizen and give us the benefit of your remarks. We have no objections to submitting the other two.

Mr. BEHR. Thank you, Mr. Chairman.

Mr. BEHR. My name is Armin Behr. I am employed by the U.S. Atomic Energy Commission and live in Bethesda, Md. One point on which nearly everyone seems to agree is that the beauty of the Grand Canyon should not be harmed. It is perfectly true that if a dam were built at Bridge Canyon, the Grand Canyon as it is seen by the many who visit only the tourist centers at Grand Canyon Village and on the North Rim would not be greatly changed.

But the very fact that so many people have seen the Grand Canyon from its most glorious vantage points will assure an increasing demand to see other aspects of it and on more intimate terms. Just as those who have seen Europe now want to try Latin America or Africa, those who have "done" Grand Canyon and fallen in love with it want to get off the beaten path and away from the crowds.

The canyon has much more to offer than the roadside views that we all know personally or on film. Already thousands of people each year leave their cars to walk down the Bright Angel and Kaibab Trails. To enjoy solitude and new vistas in years ahead many of us will look for a side canyon or bend in the river of our own.

For over a decade I was fortunate enough to live in the Southwest, within weekend distance of the canyon. I made the trip many times. A favorite destination was Vulcan Rapids in Grand Canyon National Monument. Few people know about it, although it isn't hard to reach. From Hurricane, Utah, there is a drive of 90 miles over dirt road to Toroweap Overlook.

Here the Colorado River is 1,500 feet almost straight down from the rim.

A 2-hour hike on rough but passable trail brings you to the river, and you hear the pounding of Lava Falls for half an hour before reaching it.

Sand bars along the banks make good campsites. You can walk for miles up or downstream along the sand and over boulders until

you encounter steep cliffs. The more adventurous hikers can bypass these obstacles by floating downstream on an air mattress and find a new side canyon worth exploring. The possibilities are endless and there are other access points like the one at Toroweap which could be opened up for hikers.

If the Bridge Canyon Dam were built, the boulder-strewn sandy banks for walking and camping would be gone. The pounding of the river would be stilled and replaced by the roar of the motorboat. Left as it is, the lower Grand Canyon will provide for countless people in the future that special kind of recreation which is becoming scarce—the chance to see and do new things away from crowds and mechanical comforts, and with a touch of adventure.

Some of the money which would have gone for access roads to the damsite could be used for more and better roads along the less accessible parts of the canyon rim and for marking or building simple trails.

Mr. JOHNSON. Now, you have statements from two other gentlemen.

Mr. BEHR. Yes. One is by Howard G. Booth, of Las Vegas, and the other is by Dr. Samuel M. Ford.

Mr. JOHNSON. Without objection, they will be placed in the record at this point, following your statement.

Do I hear objection? Hearing none, so will be the order.

(The letters from Messrs. Booth and Ford, above referred to, follow:)

4224 CHATHAM CIRCLE NO. 2,
Las Vegas, Nev., March 8, 1967.

Chairman and Committee for March 13 Hearings, Bridge Canyon (Hualapai) Dam Bill, Washington, D.C.

GENTLEMEN: I am a ten year resident of Las Vegas, Nevada. This letter represents my personal testimony concerning the Bridge Canyon Dam proposal which I would appreciate having made a part of the hearing record.

My professional is meteorology and in this field I am one of the lucky individuals who finds it relatively easy to live and find work in just about any part of the country I desire. It is no accident, therefore, that I've lived in the desert southwest so long. I guess you would say that one of my chief reasons is the austere wilderness character of the desert canyonlands, and of all these many places the Grand Canyon in particular. I have come to know and love the lower Granite Gorge of the Canyon the best—its primitive wild beauty so remote in many ways from anywhere and yet so near in terms of distance from my home city.

I think it takes a few hikes to the river through such gems as Tuckup Canyon, Havasu Canyon, Prospect Valley of Spencer Canyon or one of the many others to really understand the feeling that these mosaics of color, monuments of stone, and glimpses of wildlife leave with the traveler. But I know that the most important element of these adventures of the body and spirit is the final arrival at the bottom through these serpentine approaches to hear the roar and watch the spectacles of something unique in all the world. I've stood at different times on both edges of the Canyon high above Vulcan's Rapids as its sound pulses and wanes with the caprice of the winds, and I've made my way with groups of friends down through the cliff breaks from either side to catch that thrill of close proximity to this largest of all rapids.

Having experienced these adventures I can imagine the canyon in no other way than as the scene of an untamed, wild force. A passive, emasculated body of water resulting from a dam at Bridge Canyon would, for me and many friends, reduce such hikes to events without a climax. In place of a spectacle of raw nature, lovely sandbars and towering cliffs our way would be blocked in the silted lower canyons. My hikes in the lower Grand Canyon will end if the dam is built!

I think I could live with new Colorado River dams if they were essential for water storage, but to conceive of their construction as an expedient for hydro-power when serious doubt exists as to their present or future economy in competition with other production methods, seems unforgivable!

Please take every opportunity to leave the remaining parts of the Grand Canyon undisturbed.

Sincerely yours,

HOWARD G. BOOTH.

SAMUEL M. FORD, M.D., *Las Vegas, Nev.*

March 12, 1967.

DEAR CONGRESSMAN ASPINALL: I would appreciate having my comments opposing any further dams on the Colorado River entered for the record at the hearings on the Southwest Water Plan and Central Arizona Project.

I sincerely believe the day of building dams solely for the sale of "peaking power" is gone in this country. Pumped storage systems, utilizing efficient fossil fuel fired or atomic plants are considerably cheaper as will be also the "wheeling" of large blocks of power over direct current high-voltage lines.

As you are aware the Colorado is already a bankrupt river and losing one million acre feet per year through evaporation from the dams we presently have on it. It strikes me as a bit dishonest to build more and then hammer lock the Pacific Northwest for water because we haven't enough water in the Colorado to keep them filled and meeting their power commitments. The concept of dams as "cash registers" for reclamation projects is no longer valid in the face of the technological strides made in the past few years in electrical power generation and transmission.

Let us not be saddled with obsolete and expensive modes of power generation simply to preserve the Bureau of Reclamation's dam building section.

Sincerely yours,

SAMUEL M. FORD, M.D.

Mr. JOHNSON. The Representative from Utah.

Mr. BURTON of Utah. No questions, thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. I would just like to make one observation, that the point Mr. Behr makes, the fact that the reservoir and dam can be seen from the conventional viewing point does not diminish the value of the canyon. We can look at any of our national parks and certainly cannot see all of the value of the scenery from points that can be seen from an automobile. I think it is an excellent point.

Mr. JOHNSON. The gentleman from Arizona.

Mr. STEIGER. I have no questions, Mr. Chairman.

Mr. JOHNSON. We want to thank you, Mr. Behr, for coming here and waiting all this time to get on the witness stand.

The committee will stand adjourned until 9:45 tomorrow morning, when we will start off with the Governor of Colorado, Governor Love.

(Whereupon, at 6:25 p.m., the committee adjourned, to reconvene on Friday, March 17, 1967 at 9:45 a.m.)

H.R. 3300 AND SIMILAR BILLS TO AUTHORIZE THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE COLORADO RIVER BASIN PROJECT, AND FOR OTHER PURPOSES

S. 20 AND SIMILAR BILLS TO PROVIDE COMPREHENSIVE REVIEW OF NATIONAL WATER RESOURCE PROBLEMS AND PROGRAMS, AND FOR OTHER PURPOSES

FRIDAY, MARCH 17, 1967

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION OF
THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met, pursuant to recess, at 9:50 a.m., in room 1324, Longworth House Office Building, the Honorable Harold T. Johnson (Chairman of the subcommittee) presiding.

Mr. JOHNSON. The Committee on Irrigation and Reclamation will come to order for the purpose of further hearings on the Colorado River bills and the National Water Commission.

This morning we are very honored to have the Governor of the State of Colorado, Mr. John A. Love, and his assistant, Mr. Felix L. Sparks, the executive director of the Colorado Water Conservation Board. And Mr. Richard Eckles. I do not see his name here but I presume he is there with you.

Governor LOVE. Right here behind me.

Mr. ASPINALL. Mr. Chairman, may I welcome my Governor to these hearings. His contributions in his two former appearances have been beneficial and his contribution this year will be most beneficial. I have not read his statement, but I commend the Governor and his staff for appearing here and presenting this statement. I wish to publicly thank the Governor for his cooperative attitude with the congressional delegation from Colorado, especially with the senior member of that delegation, the gentleman now speaking.

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STATEMENT OF JOHN A. LOVE, GOVERNOR OF THE STATE OF COLORADO; ACCOMPANIED BY FELIX L. SPARKS, EXECUTIVE DIRECTOR, COLORADO WATER CONSERVATION BOARD; AND RICHARD T. ECKLES, DIRECTOR OF NATURAL RESOURCES, STATE OF COLORADO

Governor LOVE. Thank you very much.

Mr. JOHNSON. Governor, I want to say, too, I have had the opportunity to hear you here twice and once on a visit with the chairman of the subcommittee to Colorado. It is always a delight.

Governor LOVE. I am pleased to be back again and certainly pleased to have the kind words and warm welcome.

I would think if I might presume to be a little locally patriotic, that the work of this subcommittee would be much enhanced if you could get to Colorado more often. We would be delighted to have you out there.

If I may, Mr. Chairman, gentlemen of the committee, as Congressman Aspinall says, this is my third appearance before this committee in connection with legislation to authorize the Colorado River Basin project.

It is probably true that neither I nor anybody else can present anything to this committee which has not already been said in one form or another at some time. However, since there are now pending before the committee various new propositions to authorize the Colorado River Basin project, I propose, with your permission, to express the position of the State of Colorado on the new legislation. To do so, some review is necessary.

Most of the flow of the Colorado River originates in the State of Colorado. This river system accounts for about 70 percent of the total surface water produced in our State. Obviously, it is important to us. For the past 20 years at least, the waters of the Colorado River have been the subject of innumerable court battles within the internal boundaries of our State. When this situation is viewed together with the increasing demands of our downstream neighbors, a picture emerges which makes it most difficult for us in Colorado to endorse any further downstream development of the Colorado River.

Within the past 2 years, three of our neighboring States to the east and south have filed suit against us in the U.S. Supreme Court to assert certain claims to waters which originate in the State of Colorado. During this year our State legislature is making a strenuous effort to end a major conflict between our ground and surface water users—an almost impossible task. I cite these facts simply to illustrate that Arizona is not the only State which is having water problems.

In August of 1963, there was forwarded to us for our review a report by the Secretary of the Interior entitled, "The Pacific Southwest Water Plan." We were expecting that report and for some years prior to its receipt we had been reviewing our position on Colorado River matters. It has long been obvious that the Colorado River system does not produce sufficient water to fulfill the apportionments of the Colorado River and the Upper Colorado River Basin compacts. It is equally obvious, based upon various interpretations of

the compact made by lower basin States, that the greatest loss under the compact allocations would fall upon the State of Colorado—a loss which we cannot afford any more than Arizona or any of the other basin States can afford it.

Actually, the State of Arizona today is using more water from the Colorado River system than is the State of Colorado. We are not complaining about this fact, but we do wish to observe that there are equities and considerations due the State of Colorado that have been largely ignored in the struggle to authorize the Central Arizona project.

Following receipt of the Pacific Southwest Water Plan, the State of Colorado insisted that the State of Arizona clarify its position with reference to the Gila River, a tributary of the Colorado. We considered this clarification necessary in order to protect ourselves against an additional draft of water which might be imposed as a result of the Mexican Water Treaty. As our negotiations progressed, it became apparent that the internal situation in Arizona was such that it was almost impossible for the representatives of that State to reach any agreement with the upper basin concerning the accounting for waters of the Gila River. This situation was not of our making in Colorado, but it created a problem for us which was just as volatile as the atmosphere seemingly was in Arizona.

The upper basin States are now in the position that during the next few years their reclamation projects will be attacked on the basis of an insufficient water supply. The first stone presumably to be hung around our necks will be the Mexican Treaty obligation.

It has long been our position that the delivery of 75,000,000 acre-feet of water in every consecutive 10-year period at Lee Ferry, together with the flow originating in downstream tributaries, provides sufficient water to satisfy the lower basin allocation and the Mexican Treaty burden. We have well understood that unless some type of agreement could be reached among the Colorado River States we would be forced to institute suit in the U.S. Supreme Court to obtain a judicial determination of the Mexican Treaty obligation. Such a suit is a certainty unless a different solution can be found.

We probably have been engaged in more interstate water litigation than any other State. We have never enjoyed nor really profited from such litigation. We have, therefore, directed all of our energies toward arriving at some agreement among the seven States that would make it possible to bypass or otherwise solve the Mexican Treaty issue. This was accomplished under the terms of H.R. 4671, considered by this committee last year.

In a report by the Secretary of the Interior to this committee under date of January 21, 1963, entitled, "Future water resources development in the Lower Colorado River Basin," the Secretary stated: "The inadequacy of the Colorado River system to meet this region's continuing and rapidly growing water needs is already evident." The Secretary further stated that the availability of additional quantities of Colorado River water to Arizona, "is no solution at all to the regional water problems. It merely temporarily moves the shortage from one place to another." We are, therefore, appalled at the apparent abandonment of the other Colorado River Basin States in favor of Arizona

as reflected in the Secretary's recent letter to the chairman of this committee on the subject of H.R. 3300 and similar bills.

H.R. 3300 incorporates a regional approach to a Southwest problem, involving agreements and compromises that brought the seven States together last year under the committee version of H.R. 4671. Contrary to what was stated to this committee a few days ago, the administration's proposal does not constitute a basis on which a comprehensive long-range solution to the many, varied and complex water problems of the basin can be developed and carried forward. The proposal advanced by the Secretary is actually a short-fused time bomb which will lead to destructive competition among the States of the Colorado River Basin. It proposes a piecemeal solution to a part of a problem of only one State.

The State of Colorado is in complete accord with the text and purposes of H.R. 3300, introduced in this session of Congress by our distinguished Colorado Congressman, Mr. Aspinall. We cannot support H.R. 9 nor the legislation proposed by the Secretary. Since 1963, we have constantly modified our position in order to make it possible for a second Colorado River Basin project to be authorized by the Congress. No State has acted with more spirit of compromise than has the State of Colorado. Because of the many concessions we have made, our own internal situation has reached the point where we can go no further.

At the close of the 89th Congress, we again reviewed our position in an attempt to resolve two major problems which caused the demise of H.R. 4671. Those problems were the proposed Marble Canyon and Hualapai Dams and the proposed feasibility studies looking to the importation of water into the Colorado River Basin. In the face of serious disagreement among our own citizens, we have modified our position to recommend the elimination of Marble Canyon Dam and the substitution of a reconnaissance study in lieu of a feasibility study on the import problem. We are unable to make further concessions. We fully understand that the enactment of Federal legislation is solely the responsibility of the Congress. Therefore, it would be presumptuous for us to insist upon any specific formula which would make it possible to determine methods of augmenting the Colorado River. However, we do ask that some meaningful, timely study be made looking to the augmentation of the Colorado River, and that the provision for such a study be authorized as a part of, or concurrently with, legislation to authorize the Colorado River Basin project.

The construction of the Hualapai Dam is vital to the creation of a development fund which will assist in the future augmentation of the Colorado River of whatever nature. The proposal by the Secretary to postpone the construction of Hualapai Dam pending some unknown future determination is barren of logic. We believe that Chairman Aspinall has proposed in H.R. 3300 and H.R. 6132 a most sensible and fair solution to the Hualapai Dam problem.

It has been stated that H.R. 4671 failed of enactment last year because it was overloaded with too many provisions for too many States. We reject that contention. The provisions that brought the seven Colorado River States together in H.R. 4671 were its strength, not its weakness.

There has been some criticism of the five Colorado projects included in H.R. 4671, and now included in H.R. 3300. Any such criticism is based upon a total lack of understanding of Colorado's situation. In 1956, Congress authorized the Colorado River storage project and directed the Secretary of the Interior to conduct feasibility investigations on a number of projects in the upper basin. The Animas-La Plata, Dolores, San Miguel, Dallas Creek, and West Divide projects were all specifically enumerated in that act. At this point in history, 11 years after the enactment of the Storage Project Act, the State of Colorado has received authorization of projects which will consume about 95,000 acre-feet of water—a sum considerably less than authorized for any other State of the upper basin, notwithstanding the fact that Colorado's entitlement of water is greater than all of the other upper basin States combined. The five projects for which we now request authorization have been under study for at least the past 20 years. Like Arizona, we know the meaning of the word frustration. Detailed information demonstrating the economic feasibility of these projects has already been presented to the committee.

The administration has indicated that it has no objection to the authorization of the Animas-La Plata and Dolores projects. However, there was a recommendation that the other three projects be deferred, "pending the establishment and completion of review by the National Water Commission of related water problems." We have asked ourselves, and we ask you, Why should the State of Colorado be singled out for such special consideration by a proposed National Water Commission? If our development must halt pending a study of our problems by such a commission, then we think in all fairness that water development throughout the United States should meet a similar fate, whether it be the central Arizona project, projects in the Pacific Northwest, or Federal projects anywhere in this country. To suggest that a National Water Commission should determine the internal allocation of water within a State is to perpetrate a cruel hoax upon our people. We feel that Colorado deserves a better fate. If this National Water Commission legislation has been proposed to frighten people of the Southwest, that purpose has been achieved. A thought to remember, however, is that a monster owes no allegiance to its creator.

Hundreds of hours of most difficult negotiations have been incorporated into H.R. 3300. It is not a bill which provides an immediate solution to all the water problems of the Colorado River States. It does not contain everything that Colorado or any other State would like to have. We nevertheless support each of its provisions. Even though there are commitments to California, New Mexico, and other States in which we have no direct interest, we support these commitments as being inseparable parts of the legislation. If provisions for the protection of other States as now incorporated in H.R. 3300 are deleted, then the provisions for the benefit of Colorado are not entitled to any better fate. Acknowledging that we have accepted a great risk, we nevertheless feel that it is either all or nothing.

If the members of this committee in their collective wisdom see fit to report favorably on H.R. 3300, then the official agencies of the

State of Colorado pledge their full and active support toward its enactment.

The members of this committee have been incredibly patient in listening to the problems of our southwest area. I have tried to state as frankly as possible the position of the Colorado State government. We in Colorado are most ably represented in both Houses of the Congress. We leave our case in their hands and yours.

Mr. JOHNSON. Thank you, Governor, for a very fine comprehensive statement. The problem has been before the committee for some time. We are glad to see that you incorporate the interests of California before you closed your statement.

Is there anyone else who wishes to speak at this time?

Governor LOVE. I do not believe so, Mr. Chairman, no.

Mr. JOHNSON. The gentleman from Colorado, the chairman of the full committee, Mr. Aspinall.

Mr. ASPINALL. Mr. Chairman, I wish to commend the Governor and his staff for a very considered and very temperate statement, under the circumstances. I think that when the Governor refers to the fact that the interests of Colorado have largely been ignored by the administration in its presentations, he is bringing to us a statement of fact as it really is. Colorado happens to have been the "big brother" on this river ever since the beginning. As the Governor states, its contribution to the Colorado River system is about 70-percent-plus.

As I said before, I take no issue whatsoever with the Colorado River compact and its division. There are benefits flowing in both areas. Neither do I take any issue with the upper basin compact, but in each instance the State of Colorado has voluntarily and willingly stated its position to work with its neighbors, even to the extent of releasing, for benefits secured, any rights it might have to more than certain amounts of water and certain percentages of the basin fund of the Colorado River Storage Act. And I think that this should be considered by everybody. It has been considered by this committee very well, but it seems to me, there are people in the administration that pay no more attention to these equities than they pay attention to some of the problems of getting to other planets.

The Governor's reference at the bottom of page 7 to Colorado's position and what Colorado got out of the Colorado River Storage Act and what it is asking for in this legislation is certainly timely. Also the Governor's reference on page 8 to the administration's National Water Commission proposal is most timely. The idea that the State of Colorado or any of the upper basin States, as far as that is concerned, or any of the lower basin States would have to wait to take care of their internal problems until a national commission spoke, even though the equities had already been decided upon the stream, is beyond my imagination and I cannot understand the mind processes of an individual that would write that into a report.

Now, Governor, I have nothing to add to your statement because it is well placed, but I do have some figures that I wish to present to you and see whether or not you are in reasonable agreement, keeping in mind that I use thousands instead of getting down to the hundreds of acre-feet as I relate the situation as it applies to Colorado and the

upper basin States and the lower basin States on the water supplies of the river.

Under the Colorado River compact of 1922, the lower basin was given an entitlement of $7\frac{1}{2}$ million acre-feet of water to be delivered at Lee Ferry. At the same time, there was to be $7\frac{1}{2}$ million acre-feet of water to the upper basin before any division of surpluses was to be considered.

Are you in reasonable agreement with that statement of the Colorado River compact?

Governor LOVE. Yes, I actually am. The intent of the compact was that there was to be an equal division and the seven and a half and seven and a half was the number that was thought to be true at that time.

Mr. ASPINALL. As I understand your position as spokesman for Colorado at the present time, you are not quite sure whether or not you go along with the philosophy that the lower basin gets $7\frac{1}{2}$ million acre-feet of water regardless of what amount of water is in the river as its first entitlement, is that right?

Governor LOVE. No, I do not go along with that concept at the present time. I will not make a lengthy argument on it, but I will simply say I make no such concession at this moment.

Mr. ASPINALL. Now, the upper basin's entitlement under the study of the last 35 years of the river's flow would be something like this, as a minimum, if I am correct. There would be given to the State of Arizona 50,000 acre-feet of water as the first entitlement of the upper basin because of its position in the upper basin.

Governor LOVE. That is right.

Mr. ASPINALL. There would be remaining 6,200,000 acre-feet of water to be divided among the upper basin States, is that correct? Approximately so?

Governor LOVE. Well, again I do not concede that that is all that we are entitled to but on the historical flow of the river, if you do first allocate the first seven and a half to the lower basin, that 6.2 would be the remainder at that point, yes.

Mr. ASPINALL. And, there would be taken from that approximately 700,000 acre-feet of water, because of loss by evaporation from the three main reservoirs: the Flaming Gorge, the Glen Canyon, and the Curecanti Reservoirs. Is that correct?

Governor LOVE. That is right.

Mr. ASPINALL. Leaving approximately 5.5 million acre-feet to be used by the upper basin States, with Colorado, under the compact to receive 51.75 percent; Utah, 23 percent; Wyoming, 14 percent; and New Mexico, 11.25 percent. Is that correct?

Governor LOVE. Yes. Those are the provisions in the division, the allocations of the upper basin compact.

Mr. ASPINALL. Now, using the percentages and the figure of 5.5 million acre-feet, Colorado would then be entitled to 2,845,250 acre-feet of water. Colorado's uses, pre-Storage Act (pre-1956) have been said to be about 1,700,000 acre-feet. Is that correct?

Governor LOVE. That is correct.

Mr. ASPINALL. Which would leave Colorado entitled to develop 1,145,250 acre-feet of water after 1956.

Governor LOVE. And again, I would interject even on the minimum basis that we are talking about.

Mr. ASPINALL. Now, the Colorado Storage Act disposition in acre-feet of water to each upper basin State is as follows:

To Colorado, for Florida, 16,000 acre-feet; for Paonia, 10,000 acre-feet; for Silt, 6,000 acre-feet; for Smith Fork, 6,000 acre-feet; and for the Pine River extension, nothing. That makes a total of 38,000 acre-feet of water, as far as the Colorado River storage project is concerned, out of the 1,145,250 acre-feet to which the State of Colorado is entitled. Is that correct?

Governor LOVE. That is correct, Mr. Aspinall.

Mr. ASPINALL. To Wyoming, for La Barge, 14,000 acre-feet; for Lyman, 10,000 acre-feet; and for Seedska-dee, 165,000 acre-feet. That makes a total of 189,000 acre-feet for Wyoming.

Governor LOVE. That is right.

Mr. ASPINALL. To Utah, for the central Utah project (the initial phase only), 208,000 acre-feet and for Emery County, 17,000 acre-feet—for a total of 225,000 acre-feet.

Governor LOVE. That is right, Mr. Chairman.

Mr. ASPINALL. To New Mexico, for Hammond, only, 10,000 acre-feet.

Governor LOVE. That is right.

Mr. ASPINALL. Now, the authorizations, since the Colorado River Storage Project Act, for reclamation development:

To Colorado, the share of Savery-Pot Hook, 28,000 acre-feet; Bostwick Pack, 3,000 acre-feet; Fruitland Mesa, 28,000 acre-feet; and the Fryingpan-Arkansas transmountain diversion, 69,200 acre-feet—for a total of 128,200 acre-feet. Is that correct?

Governor LOVE. That is right.

Mr. ASPINALL. To Wyoming, its share of Savery-Pot Hook, 10,000 acre-feet.

Governor LOVE. That is right.

Mr. ASPINALL. To Utah, nothing. So far.

Governor LOVE. That is right.

Mr. ASPINALL. To New Mexico, San Juan Chama, 110,000 acre-feet and Navajo, 254,000 acre-feet—for a total of 364,000 acre-feet. Is that correct?

Governor LOVE. That is correct.

Mr. ASPINALL. In other words, the combined authorizations of the Colorado Storage Act and those since its passage are: to Colorado, 166,200 acre-feet; to Utah, 225,000 acre-feet; to Wyoming, 199,000 acre-feet; to New Mexico, 374,000 acre-feet. But keep in mind the allocations under the compact are for Colorado, 51.75 percent; for Utah, 23 percent; for Wyoming, 14 percent; and for New Mexico, 11.25 percent.

Governor LOVE. That is right. With Colorado entitled to almost 52 percent of the upper basin water, as a matter of fact, as it stands today, we have authorized less than any other State in the upper basin.

Mr. ASPINALL. The Governor is correct and that is the reason, of course, that I am using these figures, to show that Colorado, which is producing 70 percent of the water and which has cooperated with its neighbors since 1922 to the present time, today stands in the position

of having only 166,200 acre-feet while Utah has 225,000 acre-feet, Wyoming has 199,000 acre-feet, and New Mexico has 374,000 acre-feet—although Colorado is entitled to more than the combined allocations of the other three.

Now, to come to the provisions of H.R. 3300, keep in mind that the reason that these projects in Colorado are in position to be authorized is because of the fact that Colorado has not had equitable treatment. These projects have been surveyed and are ready to go. The Animas-LaPlata project would be 112,000 acre-feet; the Dolores project would be 87,000 acre-feet; the San Miguel project would be 85,000 acre-feet; the West Divide project would be 76,000 acre-feet; and the Dallas Creek Divide project would be 37,000 acre-feet—for a total of 397,000 acre-feet. That, plus what there is in the Colorado River storage project and authorizations since, would be 563,200 acre-feet.

The total that Colorado is asking for—563,200 acre-feet—includes its development under the provisions of this bill and every authorization preceding this bill. New Mexico is asking for 34,000 acre-feet in the Animas-LaPlata project plus that under the Storage Act and authorizations since, (totaling 374,000 acre-feet) making a combined total of 408,000 acre-feet. This then, would provide Colorado, which has a 51.75 percent entitlement, with 563,000 acre-feet while New Mexico, with its 11.25 percent entitlement, would have 408,000 acre-feet; Utah, with its 23 percent entitlement, would have 225,000 acre-feet; and Wyoming, with its 14 percent entitlement, would have 199,000 acre-feet. These are the equities as far as the amounts are concerned.

Now, this does not tell the story because it does not take into consideration waters in use under rights existing before the Colorado River Storage Act. I want to put this in the record.

In Colorado, prestorage act, as I said before, that amount is 1,700,000 acre-feet. Since the storage act and with the provisions of H.R. 3300, the amount is 563,200 acre-feet. The Denver-Dillon diversions is 150,000 acre-feet, and the Homestead diversion is 70,000 acre-feet. That makes a total of 2,483,200 acre-feet. Keeping in mind that Colorado's share, based on what has been in the river in the last 35 years, would be 2,845,250 acre-feet, less the 2,483,200 acre-feet that I have just quoted to you, then Colorado would still be entitled to approximately 360,000 acre-feet, even if all of these projects were constructed in the next year.

Governor, are you in agreement, approximately, or reasonably so, with this statement?

Governor LOVE. I certainly am. At the risk of repeating, I think it is well to stress that as you have said, in addition to the equity or lack thereof as far as the allotments, the entitlement to the various States, I think it needs to be stressed that even with the authorization of the five projects that H.R. 3300 contemplates for Colorado, that Colorado would not be using even at the minimal figures you have used, which are based on the historical flow in recent years, even at these minimal figures Colorado would not be using all of its entitlement under the compact, upper basin compact.

Mr. ASPINALL. And, in relation to the percentages to which each upper basin State is entitled, Colorado would not be overriding its rights at all, is that correct?

Governor LOVE. We are not, even with these entitlements, these authorizations which we seek, we would not be encroaching upon the rights of any other State.

Mr. ASPINALL. Thank you very much.

Mr. JOHNSON. The gentleman from South Dakota, Mr. Berry.

Mr. BERRY. Thank you, Mr. Chairman. I want to commend Governor Love on this very capable statement and say something that I know he knows, and that is that the State of Colorado, the water problems of Colorado, are most capably represented on this committee, and if anyone has any questions about the ability of our chairman and the knowledge of our chairman, I think they would have lost it in the last 10 minutes.

Mr. Chairman, I would like to make a unanimous-consent request that the Governor's statement and the questioning of Chairman Aspinall be made available to all members of this committee immediately; that is, tomorrow morning.

Mr. ASPINALL. Let us wait until after Sunday.

Mr. BERRY. Yes. But I mean at our next meeting, if that would be possible, because certainly these are figures, these are historical facts that the committee should have available in its considerations.

Mr. HOSMER. Reserving the right to object, at the close of the hearings, a summary might be easier to read and better to understand than the actual testimony itself.

Mr. BERRY. The only question is, who is going to summarize it?

Mr. HOSMER. I would assume the chairman will, but I will withdraw my reservation.

Mr. JOHNSON. You have heard the unanimous consent request of the gentleman from South Dakota, Mr. Berry. Is there objection? Hearing none, so will be the order. There will be prepared for each and every member of this subcommittee for our next meeting, the contents of the Governor's statement and the questions and answers that followed by the chairman of the full committee, Mr. Aspinall of Colorado, and the Governor.

Mr. BERRY. I just have one question, Mr. Chairman, and that is, in the event that this regional approach is not possible at this time, what do you propose, Governor, that this committee do to resolve this issue at this time?

Governor LOVE. Of course, my proposal is that the passage of H.R. 3300 and its companion bill that deals with the park would be the proper solution for this committee. It may not be responsive to the question. You say if the regional approach—that is what I am thinking, is the regional approach, and that I think the bill does include an overall plan which as my testimony says does not solve all the problems for all time, but it does represent a regional approach.

If your question is what should we do if we cannot do that, I cannot give you an answer in that I do not believe that I can consider an alternative that would be acceptable to Colorado.

Mr. BERRY. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Florida, Mr. Haley.

Mr. HALEY. I reserve my time, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. Hosmer. Governor, I want to join with all of the others in congratulating you on the fine water statesmanship you have displayed this morning.

Governor Love. Thank you very much.

Mr. Hosmer. I think your delegation and your people have a right to be proud of you and I think some of your neighboring Governors should have reason to emulate you.

Mr. Johnson. The gentleman from Arizona, Mr. Udall.

Mr. Udall. Mr. Chairman, unusual as this may be, I would like to fully associate myself with the remarks Mr. Hosmer just made.

Governor Love. Thank you.

Mr. Udall. Governor, yours is one of the finest statements that I have read in the last few years. Parenthetically I observe that you and I hold the record of testifying on this legislation—I said the other day that I testified four times now. You only have three. But you are approaching my record and I hope neither of us will have to testify again. We hope we can resolve it this year.

Your people in Colorado have really displayed in the last 3 years, great statesmanship and your spirit has been most heartening to all of us. You are well represented here in Congress and the chairman of this great committee has done so much to try to resolve these stormy and difficult problems.

I cannot let this opportunity pass either without paying tribute to the gentleman on your right here, Mr. Felix Sparks. When the history of all this is written, he will surely have a prominent place. His really outstanding efforts to try to bring the region together and resolve the many problems that you have in the State of Colorado are ones that I follow with admiration. You know, Colorado really has tried to cooperate with its neighbors and I think you really have grounds to insist that your interests be protected and that starts be made on your particular problems.

I had an editor in Arizona send me just in the last few days this Engineering News Digest publication which has a summary of all the water resource projects in the Nation that are going on right now and this adds up to \$12 billion, with 200 projects going on right now. They have them broken down by region and the State of Arizona is not mentioned anywhere in any of these 200 projects, any of this \$12 billion of ongoing construction. All that Colorado has is the last stages of Frying-pan Arkansas and some of the smaller projects that Chairman Aspinall referred to earlier.

California, I might add, has \$4 billion in projects that are on-going right now, according to this summary. I hope that will be of some comfort to my friends from that great State.

Delighted that you are here with us again and I thank you for your constructive efforts.

Governor Love. Thank you very much, Congressman.

Mr. Johnson. The gentleman from Utah, Mr. Burton.

Mr. Burton of Utah. I would like to say, Governor, that I associate myself fully with the complimentary remarks made previously by my colleagues. And your statement is not only an eloquent plea for Colorado, but I think for the entire upper basin. I am one member of this committee who appreciates your being here and taking time

to come. I know this is a busy season for all Governors. We appreciate your coming.

Governor LOVE. Thank you very much.

Mr. JOHNSON. The gentleman from Texas, Mr. Kazen.

Mr. KAZEN. Thank you, Mr. Chairman. I, too, am very privileged to sit in and listen this morning to your statement, Governor. You show a tremendous knowledge of this problem and certainly between you and the chairman of this committee, you have given us something to really work on.

Governor LOVE. Thank you very much.

Mr. KAZEN. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman. Governor, it is a pleasure to have you before us again this year and I think you articulated the position of Colorado exceptionally well. I congratulate you upon the statement and I pledge to you as I have to the chairman of the full committee that I will do everything I can consistent with our position to cooperate.

Governor LOVE. Thank you very much.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. Thank you, Mr. Chairman. I want to also thank you, Governor, for a very forthright statement.

In the event that an importation works is authorized and constructed, and let us assume that the capacity of the importation is the two and a half million acre-feet to offset the Mexican Treaty, and let us say just another 2 million acre-feet beyond that, would the State of Colorado feel that they would be entitled to half of that as the—not the Colorado, but the upper basin would be entitled to half of that as would the lower basin.

Governor LOVE. It has been Colorado's position, still is, that if importation into the basin is in fact made a reality, that the first water in sufficient quantity to cover the Mexican Treaty obligation will be set aside for that purpose. We would think that anything that conceivably would be over and above that Mexican Treaty obligation should be subject to the terms of the compact; that is, the division between the upper and lower basins on an equal basis.

Mr. HALEY. Would the gentleman yield there?

Mr. REINECKE. Certainly.

Mr. HALEY. Governor, let me ask you this: In case this project is authorized, do you feel that it is a general obligation of the taxpayers, the general taxpayers of the United States, to assume the burden and cost of the diversion necessary from other sources to the Colorado River to take care of that two and a half million acre-feet? Or do you think it is just an obligation of the river and the States?

Governor LOVE. My answer, Congressman, is twofold. First, the treaty which the United States as a national government agreed to an amount of water to go to the nation of Mexico was a decision that was made and action that was taken by the Federal Government, not by the State of Colorado or the State of California or the State of Utah, and I think that, therefore, the Nation itself and, therefore the taxpayers of the Nation have an obligation there. Second, I would add that as I have said in my testimony, one of the reasons that

Colorado, and I think all of the States of the Colorado River Basin, should be interested in the basin fund that is contemplated if Hualapai is built or the additions to the basin funds, is to provide some source, some beginning of funding for augmentation of the basin water supply from whatever source, whether it be importation or desalinization or whatever it is.

We do not know at the present time. All we know is we need additional water and whatever the procedure is going to be, the solution, it is going to cost money and that is one reason we are interested in that fund.

Mr. HALEY. Will the gentleman yield further?

Mr. REINECKE. Certainly.

Mr. HALEY. Governor, your State is the headwaters, you might say, of about 70 percent of the water that goes into the Colorado River. Is that not true?

Governor LOVE. Yes, sir, that is true; and in addition we find ourselves in the position of being the headwaters of at least four of the major river systems of the United States. There is not only the Colorado, the Rio Grande, the Platte, which is a large tributary of the Missouri, and then the Arkansas.

Mr. HALEY. Have you ever thought, Governor, about maybe damming up these tributaries and creating reservoirs and then maybe you could sell the water that is surplus to the States of California and Arizona and the rest of the States? There might be pretty substantial revenue.

Governor LOVE. We have thought about that in years past and, as a matter of fact, we have thought about it prior to the time we entered into the compact on the Colorado River. We have thought about it since but our position is, of course, sir, that we will rely on the provisions of the compact between the States of the Colorado River Basin.

Mr. ASPINALL. Will my colleague from California yield to me?

Mr. REINECKE. Yes.

Mr. ASPINALL. The fact is that we have spent money in defending ourselves against our neighbors, which we could have used to build a pretty good dam, could we not?

Governor LOVE. We could, I think, have trapped all of that water with that amount of money.

Mr. HALEY. I thank the gentleman.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Thank you, Mr. Chairman. I would like to preface my remarks by noting the presence of the senior member of the Arizona House of Representatives delegation, the Honorable John Rhodes. His youthful appearance belies a world of experience in water legislation.

Mr. ASPINALL. If my colleague will yield to me, he got his experience from this committee. [Laughter.]

Mr. STEIGER. Thank you, Mr. Chairman.

Governor, I would like to join in the aura of good will that your fine statement has generated. I have a personal attachment other than my allegiance to the chairman of this committee. I studied at then Colorado A. & M. and enjoyed it thoroughly. I join with my colleague, Mr. Udall, in hoping fervently that this is the last time that you and

Mr. Sparks and the rest of your staff will have to appear and the solution will be forthcoming this year.

Governor LOVE. I certainly join in that.

Mr. STEIGER. Thank you, Mr. Chairman.

Mr. JOHNSON. Are there any other questions from any of the members of the committee?

Mr. HALEY. Mr. Chairman—

Mr. JOHNSON. Mr. Haley.

Mr. HALEY. Governor, I just might make this observation. I do not know how long the term of "Governor" extends out there or how many times you can run but with the fine bouquets that you have received from this side of the aisle, maybe you should make a permanent record so when you come up for reelection as a Republican again you can quote some Democrats.

Governor LOVE. I am perfectly willing to try it, Congressman. If I can get everybody to sign it, we will have it printed up.

Mr. JOHNSON. Governor, I am glad to learn in your statement and your answers to questions here that you are highly in favor of the Hualapai Dam as a revenue producer for future development on the river.

Governor LOVE. Certainly so.

Mr. JOHNSON. Whether it be importation, desalinization, or weather modification, there are going to be additional funds needed. There is a great potential on the river. Certainly we should develop it.

Governor LOVE. This is certainly true, that we found, as you well know, that the funds which already are in existence being created at Hoover Dam, now at Glen Canyon and Flaming Gorge and soon Curecanti, and so on, have been a vital part of the development of the whole system. We were discussing last night the early fund, Hoover Dam, in which we only, I think, got the 500,000 a year in the Upper Basin. Nevertheless, it was of extreme importance to the progress of our development.

Mr. JOHNSON. We find that out in California, too, with our Red River project, a State project, and also with the central valley project. If it were not for the power producing features of it we would be in real trouble. We hope the power features will help us repay that \$4 billion we have under construction now.

I know that is a tremendous figure out there and we greatly appreciate the consideration given California by this committee.

Mr. HALEY. Will the gentleman yield?

Mr. JOHNSON. Yes.

Mr. HALEY. I did not think that the State of California had any problems about money. I thought it was the land of honey and sunshine and that you had all the money that you needed. I thought everybody in California was about like the people of Texas. All of them were wealthy.

Mr. JOHNSON. There are a good many wealthy ones and a lot of people yet to come and we have a great deal in the way of resource development to take place and take care of these people.

We thank you, Governor, and your staff there for your appearance here this morning.

Governor LOVE. Thank you very much, gentlemen.

[Applause from audience.]

Mr. JOHNSON. Our next witness is Mr. Pat Head, administrator of the Colorado River Commission of Nevada, representing the Governor, Paul Laxalt, newly elected Governor of the State of Nevada. Glad to have you here, Mr. Head. We have dealt with you for a long time, at least I have, out there in the State of California and now that you are over in Nevada, I presume you are doing the same fine job in the State of Nevada.

You may proceed, Mr. Head.

STATEMENT OF HON. PAUL LAXALT, GOVERNOR OF THE STATE OF NEVADA, AS PRESENTED BY PAT HEAD, ADMINISTRATOR, COLORADO RIVER COMMISSION OF NEVADA

Mr. HEAD. Thank you, Mr. Chairman, members of the committee. It is indeed a pleasure for me to be back with you again. Governor Paul Laxalt has asked me to express his deep regret for his inability to be here today. However, the many pressing problems of the State and before the legislature now in session demand his presence in Carson City.

He has asked me to present his statement to you on this very important subject dealing with further development on the Colorado River and resource development planning to meet the foreseeable water needs of the West. This is his statement, Mr. Chairman.

Mr. Chairman, and members of the committee, I appreciate the opportunity to present to you the views of Nevada on the proposed legislation before you. After many, many months of discussions, arguments, studies, and compromises the seven Colorado River Basin States appeared to be in agreement one year ago on legislation known as H.R. 4671, a bill to authorize the construction, operation, and maintenance of the Colorado River Basin project. Today the unanimity among the seven basin States appears to be absent.

My testimony will touch on the various bills before you regarding authorization of the central Arizona project, authorization of other projects in the Colorado River Basin, and establishment of a National Water Commission. It is my sincere hope that through my testimony and through the testimony of others appearing before you having a sincere desire for water resource development on the Colorado River and for planning for regional water development to meet the foreseeable needs of the thirsty Southwest, your committee can favorably act on legislation necessary to accomplish this in a manner beneficial to all the Southwest and to the entire West.

Nevada feels that the central Arizona project should be authorized to meet, in part, the critical water problems of central Arizona. It is imperative, however, that legislation also be enacted providing the framework for the development of plans to meet the foreseeable demands upon the Colorado River. There have been literally volumes of testimony presented to your committee on the inability of the Colorado River to meet the near future needs of the seven basin States and we find no reason to repeat any of that testimony today.

We would like now to make specific comments on the legislation before you on this subject and we will use H.R. 3300, introduced by Chairman Aspinall, as the base for our comments.

Title II of H.R. 3300 entitled, "The National Water Commission: investigations and planning" is similar through section 205 to S. 20 passed by the Senate and now before you for consideration. We strongly urge the retention of title II in legislation favorably considered by your committee dealing with the Colorado River Basin project. However, if it is found to be expedient to separate title II from your legislation and to consider S. 20 favorably, Nevada strongly urges that sections 206 and 207 of H.R. 3300 be incorporated into S. 20. We further urge that legislation then dealing with the National Water Commission and legislation dealing with the Colorado River Basin project be cross-referenced in a manner to assure, if possible, favorable consideration and the passage of both. We would be very concerned over passage of S. 20 in its present form without the passage of H.R. 3300 or a similar bill containing specific direction for study of the Colorado River Basin and importation of water thereto. We also would be very concerned over passage of H.R. 3300 or similar legislation not containing title II or reference to an amended S. 20.

Nevada supports the construction of the high Hualapai Dam as provided for in section 302 of H.R. 3300. We note that the Secretary of the Interior proposes deferment of construction of any hydroelectric generating plant on the Colorado River and substitutes therefor participation in a thermal generating plant through a prepayment arrangement. The high Hualapai Dam provides more pumping energy for the central Arizona project. It provides revenues to help pay for the construction and operation of the central Arizona project. But most important to Nevada and the remainder of the Southwest is that the high Hualapai Dam would provide valuable peaking power to complement the rapidly increasing thermal generating facilities in the Southwest area.

Nevada supports the authorization of the central Arizona unit as provided for in section 304 of H.R. 3300.

We find no fault with section 305 of H.R. 3300. It would provide, in part, that "* * * water users in the State of Nevada shall not be required to bear shortages in any proportion greater than would have been imposed in the absence of this section 305(a)." We consider the guarantee of Arizona to the State of California, under this section, to be a matter for resolution and agreement between those two States. However, we offer to assist those States in any way we can in the resolution of this very important matter if invited to do so.

Section 309 of H.R. 3300 would provide for integrating the Dixie project and southern Nevada water project, heretofore authorized into the Colorado River Basin project. Nevada concurs in the provision.

Although we recognize that by the continuation of payments for the use of power from Hoover Dam and the Parker-Davis system Nevada will be paying far more than it contracted for under the Boulder Canyon Project Act, we concur in the purpose of title IV to establish the Lower Colorado River Basin development fund. We strongly urge, however, that the proviso contained in section 403(c)(2) of H.R. 722, "Provided, however, That the Secretary is authorized and directed to continue the in-lieu-of-taxes payments to the States of Arizona and Nevada provided for in section 2(c) of the Boulder

Canyon Project Adjustment Act so long as revenues accrue from the operation of the Boulder Canyon project" be restored to 403(c) (2) of H.R. 3300 for favorable consideration by your committee and the Congress. Nevada testified during the week of May 9, 1966, in support of insertion of that proviso. I refer you to page 1123 of those hearings for supporting testimony for the continuation of in-lieu-of-taxes payments.

Title V of H.R. 3300 provides for the authorization for construction of five Colorado River projects where H.R. 9, introduced by Congressman Udall, remains silent in this regard. We support the authorization of the Animas-La Plata and Dolores projects. We do not oppose the authorization of the Dallas Creek, West Divide, and San Miguel projects. We believe, however, that if cleared by the Bureau of the Budget, they also should be authorized.

Mr. Chairman, we in the Colorado River Basin must all exercise water statesmanship of the highest level if we are to succeed in completing the development of the waters of the Colorado River and to find the means to augment those waters to meet our growing water needs. If we are unsuccessful in obtaining additional water supplies for our thirsty Southwest, by, say, 1990 or 2000, economic and social chaos will result. Your committee has a grave responsibility in weighing the testimony presented to you in connection with the legislation now before you. We seven Colorado River Basin States, together with the other States of the West, also have a grave responsibility to work together and coordinate our efforts toward basin and regional water resource development. I know you will discharge your responsibilities and we must discharge ours.

I thank you for the opportunity of making this presentation before you today.

That is the end of the Governor's statement.

Mr. JOHNSON. We thank you for giving us the benefit of the Governor's statement. It certainly is a very comprehensive statement. It compares the legislation pending before this committee that we are now in the process of holding hearings on. I know that you were here before and we do appreciate your coming back here and giving us this statement.

The gentleman from Colorado, the chairman of the full committee, Mr. ASPINALL.

Mr. ASPINALL. Mr. Chairman, I, too, wish to thank Mr. Head for presenting Governor Laxalt's statement. It was my privilege to be with the Governor last Sunday evening. We were able to speak briefly about his presentation.

The State of Nevada is the one State which has a direct statement concerning the amount of water to be provided under the Colorado River compact. Is that correct, Mr. Head?

Mr. HEAD. Pardon? We have a direct—

Mr. ASPINALL. The State of Nevada has a stated amount of water to which it is entitled under its contract with the Department.

Mr. HEAD. That is correct.

Mr. ASPINALL. And that is 300,000 acre-feet.

Mr. HEAD. That is correct.

Mr. ASPINALL. Does this in any way take care of your potential uses as far as the future is concerned?

Mr. HEAD. I feel it will take care of our needs through, say, 1990, or the year 2000, but within 20 to 30 years after that time we will need another million acre-feet, so it only meets our foreseeable or within-century demands.

Mr. ASPINALL. And we have already provided, by law, for the construction of those facilities through the offices of the Bureau of Reclamation for the use of that 300,000 acre-feet, is that correct?

Mr. HEAD. Nearly the entire amount. The MOAPA Valley pumping project now under investigation would complete use of 300,000 acre-feet.

Mr. ASPINALL. What is Nevada's normal annual contribution to the Colorado River?

Mr. HEAD. Oh, it is zero in the Virgin River, Muddy River drainages; I estimate about 30,000 acre-feet annually would be Nevada's contribution to the Colorado River.

Mr. ASPINALL. Now, Mr. Head, do you believe that the Bureau of the Budget or the Congress of the United States has the ultimate authority in deciding on legislation of any kind?

Mr. HEAD. No question about that. It is the legislative branch of the Government that has that final decision in connection with authorizations.

Mr. ASPINALL. If the Congress of the United States should see fit to override the Bureau of the Budget in respect to the other three Colorado projects, Dallas Creek project, the San Miquel project and the West Divide project, you would take no offense to the action of the legislative department of the Government, would you?

Mr. HEAD. And I have so stated in this statement. The Governor has so stated in this statement that that is the case. We do not oppose the authorization of the other three and as you know, I am acquainted personally with the other three projects.

Mr. ASPINALL. Of course, it is not likely that these projects, although authorized, would be constructed until the Bureau of the Budget, speaking for the President, whoever he might be, makes that affirmative decision; is that correct.

Mr. HEAD. That is correct.

Mr. ASPINALL. That is all.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. No questions.

Mr. JOHNSON. The gentleman from Florida, Mr. Haley.

Mr. HALEY. I yield.

Mr. ASPINALL. Will the gentleman from Florida yield to me? Mr. Head, you have stated that you would like to have incorporated in S. 20 sections 206 and 207 of H.R. 3300. Would you explain further just why these provisions should be included?

Mr. HEAD. As I stated, if S. 20 is going to be considered separately and title II was to be stricken from this legislation, we feel that sections 206 and 207 of title II should be incorporated in S. 20. The reason for this is to give direction specifically to studies in the Colorado River Basin in the Southwest, and that is what sections 206 and 207 provide for.

Mr. ASPINALL. And if any study is approved, no matter how it is authorized, would you make it applicable to the entire West? Would

you give a priority to such a study by the National Water Commission—a study of all of the West, including the Northwest as well as the Southwest or the central West, if you want to put it that way? Would you want priority attention to be given to this particular area in the United States?

Mr. HEAD. I would, yes.

Mr. ASPINALL. Another question, Mr. Head. In your statement you urge that the proviso contained in section 403(c)(2) of H.R. 722 be retained in any legislation. Would you state your reason for that?

Mr. HEAD. As I stated before, we have testified on this previously and I make reference to that, I make reference to that testimony, but it is our opinion that as we are making these payments continually after 1987 and as this is still a revenue producer for the—Hoover is a revenue producer for the payment of additional works, studies, and so forth, in the Southwest, as long as it continues to be a revenue producer, we should continue to get the in-lieu-of-taxes payments because it is a revenue or it is an operative project.

Mr. Aspinall. At the present time, you get payments in lieu of taxes from Hoover Dam. Is that correct?

Mr. HEAD. That is correct, in the amount of \$300,000 a year, right.

Mr. ASPINALL. And you feel that, if this is to be continued, after the year 1987, as a producing unit for the benefit of all of the Southwest, the Colorado River Basin, but primarily for the Lower Colorado River Basin, then the State of Nevada should continue to be entitled to payments just as it is at the present time.

Mr. HEAD. Yes. We feel that the situation remains the same upon which the first \$300,000 decision was made and authorization was made.

Mr. ASPINALL. In other words, your position is that, if the power was sold at the cost of producing the power after 1987, then perhaps you might not have a right to these funds, but if it continues to be a revenue producer, then you, in the State of Nevada, still have this right?

Mr. HEAD. Yes, we feel the intent changes; yes.

Mr. HALEY. Mr. Head, would the State of Nevada be opposed to a water commission making a study of the needs of the entire United States? Would you oppose the formation of such a commission?

Mr. HEAD. Certainly not. Certainly not. We would be in favor of S. 20 as passed by the Senate with the incorporation of direction of the Secretary to make studies of the Colorado River Basin importation potentials into that basin.

Mr. HALEY. But you do feel that probably the States in the Colorado River Basin probably should have more or less a priority because of the critical situation that you have there. Is that a fair statement?

Mr. HEAD. Maybe not necessarily—maybe not necessarily—a priority if it is keyed to do the entire job, but if not, it should be a priority, because I realize, and Nevada realizes, and the whole Southwest realizes that the East is facing a critical situation waterwise, maybe not from the standpoint of water resource itself but from the standpoint of the usability of that water in the future. We understand those problems also.

What we are saying is that this study needs to be made because if we do not get underway pretty soon we are going to run into grave troubles in the Southwest.

Mr. HALEY. Well, of course, if an overall study of the entire United States is made by this commission, it would probably take several years and your situation out there is a critical situation, is it not?

Mr. HEAD. I feel that the study must be completed within the next 5 years to 6 years in the Southwest.

Mr. HALEY. Of all the States or just the——

Mr. HEAD. The Western States.

Mr. HALEY. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. No questions, Mr. Chairman, thank you.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall.

Mr. UDALL. It is good to have you back. Nevada has been a good neighbor, and Congressman Rhodes and I and all of us in Arizona have enjoyed working with you the past few years. I simply want to convey my appreciation for all of this and to have you tell your Governor that we appreciate his constructive stand. We always get a little apprehensive when the voters rise up and have a change in administration and we wonder if there is going to be a change in water policy. But Nevada, like California and other States, has made this a non-partisan matter and I am happy to see your present Governor is continuing the kind of cooperative policy Nevada has followed in the past.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. I am delighted to see Mr. Head again. I thank him for his statement.

Mr. JOHNSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Head, did I understand you to say that you would feel satisfied if there were a time limit on the study to be conducted in the Western States?

Mr. HEAD. I stated that I felt a study must be completed within the Western States within 5 to 6 years on the resources, the needs and the resources of the West, pointing, of course, to importation or implementation of the waters of the Colorado River. I say we need a lead-time of 25 years, and I do not think that is even conservative, to construct a large water resource, authorize and construct a water resource development project of the size that would be necessary and to say that we are going to be in trouble by the year 2000, we do not have any time. We only have the 5 or 6 years in order to get this base so we know where we are going.

Mr. FOLEY. Well, now, you say, "looking toward importation of water into the Colorado River." By that do you mean interbasin transfers, by traditional surface means?

Mr. HEAD. Yes. I believe it has to be importation by surface means. We will implement, I hope, this need and alleviate to some extent the shortage by desalinization but we will still need surface importation into the basin in my opinion.

Mr. FOLEY. Well, is there another opinion, to your knowledge, within the professional engineering community?

Mr. HEAD. Not to my knowledge.

Mr. FOLEY. Would it be possible, for example, to have weather modification and a combination of water recharge, desalinization and—

Mr. HEAD. In my knowledge of it that would not be enough.

Mr. FOLEY. Do we really know very much about the technology of these alternatives at this time?

Mr. HEAD. No. I will have to admit we do not. I said but in my knowledge of it, the answer is "No."

Mr. FOLEY. I think that your testimony raises a question of possible misunderstanding about the purposes of a National Water Commission. Some of us have looked toward a National Water Commission as a method of approaching general solutions to these problems and making general recommendations. Do I understand that you feel the National Water Commission should be instructed to proceed with one alternative method and develop plans for it?

Mr. HEAD. Oh, certainly not. If I gave that implication that is entirely in error, because weather modification—but most important, efficient use of water—all of these factors must be taken into consideration in the developing of the data on the resources available and the needs of the areas.

Mr. FOLEY. Why instruct the Commission, then?

Mr. HEAD. Pardon?

Mr. FOLEY. Why instruct the Commission?

Mr. HEAD. To be sure attention is focused on the Southwest problems.

Mr. FOLEY. Do you conceive that a National Water Commission could ignore the problems of the Southwest?

Mr. HEAD. I do not.

Mr. FOLEY. If you do not conceive they could ignore them, why do you think it necessary to direct them to give it attention?

Mr. HEAD. To assure, very frankly, in a selfish way, that the Southwest is given attention and attention is pointed on the Southwest through the legislation.

Mr. FOLEY. Do you consider the Southwest to have the most pressing water problems in the West in terms of shortage?

Mr. HEAD. Yes; I do, over a long-range basis I certainly do.

Mr. FOLEY. Do you think that is the general opinion of the professional hydrology engineering, water experts generally.

Mr. HEAD. Oh, I am sure the Northwestern States would not agree with that.

Mr. FOLEY. Would not agree with what?

Mr. HEAD. Would not agree with that. They consider their problems the same as we consider our problems. And rightly so. Their problems are of paramount importance and needing of attention.

Mr. FOLEY. Well, excuse me for commenting. I do not think the Northwest has ever claimed it can rival the Southwest in being a water shortage area but my point is this. Do you know of anybody in the water resource area that denies the Southwest has critical water problems?

Mr. HEAD. No; of course not.

Mr. ASPINALL. Will my colleague yield?

Mr. FOLEY. Yes.

Mr. ASPINALL. I think that what Mr. Head is trying to say is that the National Water Commission, as originally planned, would have had a limitation period of 5 years. It is his feeling, as it is mine, that we cannot take care of even a small percentage of all of the United States on water problems within the 5-year period. He would like to see to it, as I am sure my colleague and I would, that the situations in the West are, at least, decided by the end of the 5-year period rather than to carrying it over to the end. I think we would have to carry the Commission over beyond that because of other problems in other areas and that is why he would have this study during the 5-year period. I think that is all that you have in mind, is that not right, Mr. Head?

Mr. HEAD. That is correct.

Mr. FOLEY. I thank the chairman. I did not want to confuse the record. I was trying to clarify it. What I first understood you to say is that you would be satisfied if the language directed a report on Western water problems within 5 years and subsequently you said something which indicated to me that the Water Commission should be specifically instructed to study means of importing water into the Colorado River Basin as a sole direction to their study.

Mr. HEAD. I will apologize. It takes a westwide approach to that problem in order to even evaluate how you should meet these water conditions.

Mr. FOLEY. You are worried as to legislation introduced in the other body and several bills here?

Mr. HEAD. Yes.

Mr. FOLEY. And you do not propose to acquaint any internal priority in the study of various means of augmenting water to water shortage areas in the West?

Mr. HEAD. No. What I am saying, the legislation should include a direction of the Secretary to study the western water resources needs, transbasin diversion, all other factors required in order to come out with a westwide water plan and, of course, as I stated, being from the Southwest, we are concerned most with the Southwest water problems.

Mr. FOLEY. How would you define the Western United States?

Mr. HEAD. The 11 Western States as far as—the four Northwestern States and the seven Colorado River Basin States. They are the Western States to which I refer.

Mr. FOLEY. You would not want to inhibit the Water Commission from considering possible alternatives such as the Parson's plan, the great American plan involving the Missouri Basin States and Western States?

Mr. HEAD. I think it would be a very important part of their work, very important part; and I am acquainted with the Nawapa project. It would be an important part of their work.

Mr. FOLEY. So in that sense you would like that to be included in any consideration of the West, you say?

Mr. HEAD. Oh, certainly, sir.

Mr. FOLEY. Thank you.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. I have no questions.

Mr. JOHNSON. The gentleman from Texas?

Mr. KAZAN. No questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. No questions, Mr. Chairman.

Mr. JOHNSON. We want to thank you, Mr. Head, for appearing here today in behalf of the Governor of the State of Nevada. We have a lot in common with the State of Nevada, at least on the east side, the rivers up there, and I know how interested you are in California.

Mr. HEAD. Thank you very much.

Mr. JOHNSON. The next group is the group from New Mexico, headed by Mr. Claude Mann. You are accompanied by Mr. David Hale?

Mr. MANN. Yes, sir.

Mr. JOHNSON. You may proceed, Mr. Mann.

**STATEMENT OF CLAUDE MANN, LEGAL ADVISER, NEW MEXICO
INTERSTATE STREAM COMMISSION; ACCOMPANIED BY DAVID
HALE, ENGINEER, NEW MEXICO INTERSTATE STREAM COM-
MISSION**

Mr. MANN. Mr. Chairman, our statement was to be presented by Mr. S. E. Reynolds, State engineer, and secretary of the Interstate Streams Commission from the State of New Mexico, but he was unable to attend and, as a result, we are pleased to be able to appear before this committee and present the statement in question.

New Mexico's position on legislation to authorize the Central Arizona project remains substantially as was stated before this subcommittee at the May 1966 hearings on H.R. 4671 and similar bills. The purpose of this statement is to very briefly outline the State's position and to indicate adjustments in our positions which have been in response to the current situation with respect to legislation pending before this committee to authorize the central Arizona project.

New Mexico supports authorization of the central Arizona project including the Hooker Dam and Reservoir unit in New Mexico.

Section 304 of H.R. 3300 would direct the Secretary of the Interior to offer to contract with users in New Mexico for water from the Gila River system in amounts that will permit consumptive use of water in New Mexico not to exceed an average of 18,000 acre-feet per year over and above the consumptive uses provided for by the decree in *Arizona v. California, et al.*, when the central Arizona project is completed and in operation. That section would further direct the Secretary to offer to contract with water users in New Mexico for water from the Gila River system in amounts that will permit consumptive uses of water in New Mexico not to exceed an annual average of an additional 30,000 acre-feet. This further increase in consumptive use would not begin until works capable of importing water into the Colorado River system have been completed and water sufficiently in excess of 2,800,000 acre-feet per annum is available from the mainstream of the Colorado River for consumptive use in Arizona to provide water for the exchanges authorized.

These provisions are consistent with the Arizona-New Mexico agreement reflected at pages 1212 of the record of the hearings before this subcommittee on H.R. 4671 and similar bills. If the Congress finds it

wise or necessary to allay the concern of the Columbia River Basin States by excluding from the legislation any authorization of studies of projects to import water to the Colorado River, New Mexico can agree to provisions which would authorize only 18,000 acre-feet of increased consumptive use in New Mexico conditioned upon the completion and operation of the main aqueduct of the central Arizona project. However, if studies of works which might reasonably be expected to augment the supply of the Colorado River by importation and otherwise in an amount sufficient to provide as much as 2.8 million acre-feet annually for consumptive use in Arizona are authorized, as would be done by title II of both H.R. 3300 and H.R. 9, the legislation should also authorize additional consumptive uses in New Mexico of 30,000 acre-feet annually for a total of 48,000 acre-feet annually as contemplated by the Arizona-New Mexico agreement.

We are confident that studies and projects to augment the supply of the Colorado River by an amount sufficient to give Arizona at least 2.8 million acre-feet of consumptive use will be authorized ultimately—and with the support of areas having a surplus supply. We fully expect that when this is done, Arizona will honor the May 1966 Arizona-New Mexico agreement in its entirety.

New Mexico recognizes the desirability of a compromise on the issue of new power dams on the Colorado River, and does not object to eliminating the Marble Canyon unit from consideration for authorization or to legislation which would place the Marble Canyon Dam site within the boundaries of the Grand Canyon National Park. Furthermore, New Mexico does not object to deferring the authorization of the Hualapai power unit if other means of financing and furnishing low-cost pumping power for the central Arizona project, which are satisfactory to the Congress, can be devised.

Section 501 of H.R. 3300 would require the Secretary to give priority to the completion of planning reports on certain participating units of the Colorado River storage project in Colorado, Utah, and Wyoming. We are pleased to support early completion of reports on these projects.

Section 501 also would authorize five Federal reclamation projects in Colorado. One of these five projects, the Animas-La Plata, would furnish water for irrigation, municipal, industrial, and recreational purposes in northwestern New Mexico. The State of New Mexico has reviewed and commented favorably on the Bureau of Reclamation reports on each of these projects. New Mexico supports authorization of the five projects.

Section 501(b) of H.R. 3300 would give the consent of the Congress to the Animas-La Plata project compact between the States of Colorado and New Mexico. The States of Colorado and New Mexico are in agreement that the project, because of its interstate character, must be operated by the Secretary at all times and that, to insure equitable operation of the project, there must be an agreement between the States in the nature of an interstate compact. Negotiating commissioners for the States of Colorado and New Mexico have reached agreement on the compact wording set forth in section 501(b). I might also state that the Interstate Streams Commission has also approved the wording of the compact as therein set forth.

New Mexico supports the provisions of section 502 of H.R. 3300 which would direct reimbursement from the Colorado River development fund or the Lower Colorado River Basin development fund for all expenditures made from the Upper Colorado River Basin fund to meet deficiencies in generation at Hoover Dam during the filling period of storage units of the Colorado River storage project.

Section 602(a) of H.R. 3300 would establish guidelines for the operation of reservoirs on the Colorado River. These guidelines will serve to protect to some extent the interests of both the upper basin and the lower basin while leaving sufficient discretion with the Secretary to permit a practical operation of these reservoirs within the terms of the Colorado River compact. New Mexico offers no objection to the language of section 602(a) of H.R. 3300.

New Mexico supports the creation of a National Water Commission and believes that such a commission should be authorized and directed along with the Water Resources Council to give highest priority to the preparation of a plan and program for the relief of growing water shortages in the Colorado River Basin. The attached letter to Senator Jackson, chairman of the Senate Interior and Insular Affairs Committee, dated May 4, 1966, sets forth New Mexico's position on the establishment of a National Water Commission.

For the people of the State of New Mexico, for Governor Cargo, and for myself, we wish to express great appreciation of the opportunity to present the views of the State of New Mexico on pending legislation to authorize the central Arizona project.

Mr. JOHNSON. Mr. Hale, do you have anything further in the way of a statement?

Mr. HALE. No, sir.

Mr. JOHNSON. We want to thank you, Mr. Mann, for your statement here. I presume the letter attached you would like to have follow your statement in the record.

Mr. MANN. If you please, sir.

Mr. JOHNSON. It will appear right after your statement.

(The letter referred to follows:)

MAY 4, 1966.

HON. HENRY M. JACKSON,
Chairman, Senate Interior and Insular Affairs Committee,
Washington, D.C.

DEAR SENATOR JACKSON: By letter dated April 18, 1966 Mr. Jerry Verkler has advised me that your Committee would be happy to receive my comments on S. 3107, the National Water Commission bill.

It is my view that the National Water Commission would be able to furnish what will be generally accepted as unbiased recommendations on the nature and extent of investigations and reports needed for the complex of water problems facing the United States. Such unbiased recommendations would give invaluable guidance in the studies so urgently needed to meet the imminent water supply problems of the western states. A unity of purpose among the western states that could develop from the Commission's recommendations would improve and accelerate the necessary studies.

I concur with your view that we can look to the National Water Commission for broad vision, independent judgment and imaginative solutions in meeting the critical water needs of the future. I support early enactment of S. 3107.

The invitation to present my views on S. 3107 is greatly appreciated and I hope that you will be able to make this letter a part of the record of the hearings on the bill.

Yours truly,

B. E. REYNOLDS, *Secretary.*

Mr. JOHNSON. The gentleman from Colorado, the chairman of the full committee, Mr. Aspinall.

Mr. ASPINALL. Mr. Chairman, I am glad to have the position of the State of New Mexico which Mr. Mann has presented to us.

I have just one question. Does the State of New Mexico support the administration's position, in anyway, if the administration's bill is left only as it is?

Mr. MANN. I might state in answer to that question, Congressman, that we certainly hope that the central Arizona project can be authorized in H.R. 3300 or something of that kind because we feel that, like other witnesses who have testified on the matter, the entire Southwest and the entire basin would much better off with the building of Huapapai Dam.

Mr. ASPINALL. That is all, thank you very much.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. No questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall.

Mr. UDALL. A very fine statement, Claude. New Mexico along with Nevada, as I said earlier this morning, has been a good neighbor and has tried very hard to work out with us solutions to these most difficult problems. I think you made a real contribution here this morning.

Mr. MANN. Thank you.

Mr. JOHNSON. The gentleman from Utah, Mr. Burton.

Mr. BURTON of Utah. No, thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Mann, in your letter to the chairman of the committee in the other body, you say you favor the creation of a National Water Commission and believe that its unbiased recommendations on the nature and extent of investigations and reports satisfying the pressing problems of water resource would be valuable.

What sort of direction do you contemplate giving to the National Water Commission?

Mr. MANN. Well, similar to that that is contained in H.R. 3300, so the Commission will not overlook the studies within a limited period of time of the situation in the Colorado River Basin.

Mr. FOLEY. Do you foresee that any National Water Commission could overlook the Colorado River Basin water project?

Mr. MANN. No, sir; we do not, but if they have no direction whatsoever, we just fear that it will—in trying to study the water problems of the entire United States, that it might be some 20 years before any specific studies were made to alleviate the situation in the Colorado Basin.

Mr. FOLEY. How specific do you anticipate the studies will be?

Mr. MANN. Just sufficient to cover any method of augmentation of the supply that is needed in the basin, and will be needed even more so, of course, in a few years to come.

Mr. FOLEY. Would you be satisfied with the work of the National Water Commission, all other things being equal, if at the end of 5 years they made general recommendations as to the direction they felt should be followed, the direction they felt should be followed in solving water supply and quality problems in various areas of the United States?

Mr. MANN. Well, personally I feel that they should be more specific in covering this particular area within the 5-year period.

Mr. FOLEY. Would you expect some kind of an engineering report on a reconnaissance or feasibility type basis for the National Water Commission?

Mr. MANN. Not necessarily feasibility or anything of that type but at least a report as to possibilities of alleviating and methods of carrying them out.

Mr. HOSMER. Would the gentleman yield?

Mr. FOLEY. Yes.

Mr. HOSMER. Is that a hope or an expectation?

Mr. MANN. Well, it is an expectation after the studies are made.

Mr. HOSMER. You really do not anticipate they would come up with anything more than a rather ambiguous ball of fuzz, or something like that?

Mr. MANN. I am afraid that is what they might do. I am afraid that is what might happen unless they are more specific in their directive.

Mr. HOSMER. Thank you.

Mr. FOLEY. I did want to compliment you on the second paragraph of your letter to Senator Jackson, because I thought that spoke very well for what I anticipate the National Water Commission might be able to do. But I am a little confused now as to whether you expect the National Water Commission to do more than establishing policy directions for a solution to these problems or do you actually expect complete engineering reports?

Mr. MANN. Well, we would hope that specific studies would be made as to this augmentation and reports as to how that might be carried out.

Mr. FOLEY. We hear witnesses, Mr. Mann, use the wording "augmentation," "importation," rather interchangeably and I am never exactly sure what is meant when they use one word or the other. When you use the word augmentation, what do you include?

Mr. MANN. That includes any method, whether importation or weather modification or salvage or salinity or anything of that kind.

Mr. FOLEY. You do not propose giving the National Water Commission any directions to study one means on a higher priority than another?

Mr. MANN. None whatsoever.

Mr. FOLEY. And I assume, you would not want to make any judgments for a National Water Commission.

Mr. MANN. I certainly would not.

Mr. FOLEY. You give them the broadest authority to study the problems of water and come up with recommended approaches.

Mr. MANN. Correct, sir.

Mr. FOLEY. Is it your judgment that their value, then, would be perhaps to form the basis of, provide the basis of some agreements between various regional interests and various other conflicting viewpoints on this whole question?

Mr. MANN. I would hope that they would make recommendations which would take care of all of the areas that might become involved in the situation.

Mr. FOLEY. But its real value would be to form the basis of some possible future agreements and directions?

Mr. MANN. I think that would certainly be a part of it, yes.

Mr. FOLEY. And to do that it would have to have a confidence, would it not, of all regions of the country and all various interests involved in this particular problem.

Mr. MANN. I assume it would so.

Mr. FOLEY. In the field of legislation?

Mr. MANN. I would assume so.

Mr. FOLEY. And to the extent it has the confidence it would have to be largely unfettered, would it not?

Mr. MANN. Beg pardon?

Mr. FOLEY. In order to make a report that would form the basis of confidence and conclusions unbiased and objective it would have to have a rather free range, would it not?

Mr. MANN. Well, to the extent of consulting maybe with the various areas involved and that type of thing, yes, but I think the question eventually would be a feasible method that would not damage any one area but might help our particular area would be the ultimate that we could look for.

Mr. FOLEY. Do you have confidence that the State of New Mexico and other States of the Colorado Basin have the facts in the case to put to a National Water Commission?

Mr. MANN. That we have, you say? I think we can certainly show our need for additional water that will be needed in the entire basin, yes.

Mr. FOLEY. Well, you are confident that you can support the urgency of the case you feel exists in the Colorado Basin?

Mr. MANN. I think the basin States can support such a position.

Mr. FOLEY. And that any unbiased and objective national commission would have to give those pressing water problems attention?

Mr. MANN. I would think so, yes, and particularly with the directive that they do so in the legislation.

Mr. FOLEY. Well, now, if the direction were not in the legislation, would you oppose it?

Mr. MANN. Well, we certainly feel that it should be in there. We would not necessarily oppose it but without that direction, it might be rather futile as far as aid to the basin is concerned within the next 8, 10, maybe 20 years or so.

Mr. FOLEY. You are aware that the Pacific Northwest States have been deeply concerned about the possibility of what I might call precipitant direction for study of importation works from the Pacific Northwest area?

Mr. MANN. Yes, sir.

Mr. FOLEY. Do you recognize any risks that those States take in supporting a National Water Commission that is authorized to include, among other things in its study, interbasin transfers?

Mr. MANN. Well, I do not see that there is any risk in the studies, no, because I do not think any commission would recommend—let us use the word importation, from the Northwest States if it were going to do any harm to the Northwest States unless there is an abundance of water that is not needed in those States. I do not think the Com-

mission would ever come up with any directive or scheme for importing water to the Colorado River Basin from the Northwest States.

Mr. FOLEY. But we have to rely on being able to make a case for the National Water Commission. We do not have any direction against that sort of result in the study, do we?

Mr. MANN. I am not sure I understood your question.

Mr. FOLEY. Well, the Northwest does not have any restriction in the legislation that prevents the National Water Commission from recommending exactly that kind of plan.

Mr. MANN. No. That is correct, sir.

Mr. FOLEY. To what extent the Northwest is venturing its confidence on the conclusions of the National Water Commission without any legal protection in the bill to prevent the National Water Commission from coming forth with that conclusion.

Mr. MANN. That is true. On the other hand, though, the Northwest are not in need of water as of this time or within the near future and are not facing the problems that are being faced in the Colorado River Basin and will be facing.

Mr. FOLEY. I suggest to you that is a conclusion that not everybody in the Northwest shares. Looking at it from our standpoint if you can for a moment, would you not agree that the Northwestern States are placing what they regard as their vital interest in water in the full discretion and unbiased judgment of a National Water Commission?

Mr. MANN. Yes, to a great extent, I think that is true.

Mr. FOLEY. Without any restrictions at all in the legislation. In fact, with specific inclusion of language that permits the study in inter-basin transfers. And my final comment is that our question in the Northwest is, if we are willing to venture on an unbiased journey the vital interests that we feel are ours in our region of the country, we expect and think that other regions of the country might do the same.

Mr. HOSMER. Will the gentleman yield?

Mr. FOLEY. I yield.

Mr. HOSMER. I do not think there is any question involving bias on the National Water Commission. It is a matter of telling them to get busy, come up with a solution one way or another, give some attention to an area that has demonstrably needed water over the past period of time, since the memory of man runneth not to the contrary.

Thank you.

Mr. FOLEY. I might say when I used the word biased there, I was including direction. We have no desire to direct the National Water Commission away from importation studies.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman. I would just like to say to the gentleman from New Mexico I appreciate your statement but I think you will find there will be considerable dispute over your statement that we in the Northwest do not have need for our water. If this is the case then the State of Oregon is wasting over a million dollars in the current study that it is conducting on this very matter and the rest of the Northwestern States are also wasting their money. The Federal Government is wasting \$5 million on a coordinated study going on in the area.

We certainly want to find out and be able to document exactly what our water inventory and needs presently and in the future are and study the matter scientifically rather than view it from the distance of New Mexico looking at the Northwest just at a glance saying we have a huge surplus of water.

That is all I want to say.

Mr. MANN. I think you must have misunderstood me, Congressman, or else I certainly gave the wrong impression. I did not mean to make the statement that you had a lot of water that you did not need. What I did try to say was from what little I know about the situation, there is a possibility after your studies and the others are made that there may be excess water. That is what I intended to say.

Mr. WYATT. I certainly grant that possibility and I appreciate the gentleman's remarks but that is not what I understood him to say.

Mr. MANN. As I say, either you misunderstood me or I did not state it correctly.

Mr. WYATT. Thank you, sir.

Mr. JOHNSON. The gentleman from Texas, Mr. Kazen.

Mr. KAZEN. Just one question, Mr. Chairman.

For the record, does New Mexico favor the construction of the Hualapai Dam?

Mr. MANN. Yes.

Mr. KAZEN. Thank you.

Mr. JOHNSON. The gentleman from California.

Mr. REINECKE. No questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. No questions, Mr. Chairman.

Mr. JOHNSON. We want to thank you, Mr. Mann and Mr. Hale, for giving us the benefit of Mr. Reynold's paper and the answers to the questions asked.

Mr. MANN. Thank you, sir.

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., March 13, 1967.

HON. HAROLD T. JOHNSON,
*Chairman, Subcommittee on Irrigation and Reclamation, Interior and Insular
Affairs Committee, Longworth Office Building, Washington, D.C.*

DEAR MR. CHAIRMAN: Reference is made to H.R. 3300.

The case for Hooker Dam has been ably presented by Mr. Steve Reynolds, State Engineer for New Mexico, and I agree that there is nothing to be gained from repeating the testimony.

I would like to inform the Committee, however, that an influx of an estimated five thousand people into the Southwestern portion of New Mexico is expected because of the reactivation of the Phelps-Dodge mines and the expansion of operations of the U.S. Smelting, Refining and Mining Co.

A large increase in domestic and industrial use of water is therefore imminent. Underground water supplies are dropping at an alarming rate, according to figures from the Water Resources Division of the Geological Survey, U.S. Department of Interior. The Department noted a 50-foot drop in the water table of the Woodward Well Field since 1958 and the Franks' Well Field has dropped 10 feet since 1954.

The Municipal water use in Silver City, New Mexico has jumped from 270.5 million gallons of water in 1960 to 311.6 million gallons in 1965. The city does not have any new sources of water available at present.

I would appreciate it if you would consider these items in your deliberations.

Respectfully,

E. S. JOHNNY WALKER,
Member of Congress.

Mr. JOHNSON. We now have our next witness, who is Mr. Floyd Goss, chief electrical engineer and assistant manager of the Los Angeles Department of Water and Power.

Mr. Goss. Thank you, Mr. Chairman. May I have the privilege of having Mr. Gilmore Tillman and Mr. Myron Holburt up at the table with me?

Mr. JOHNSON. Certainly, bring them up.

I have one matter that I would like to take care of at this time. I have the statement here of Mr. Arthur Lazarus, Jr., counsel for the Hualapai Tribe of Indians, and I would ask unanimous consent that his statement appear at this point in the record prior to Mr. Goss' statement, following the gentleman from New Mexico. Do I hear objection? Hearing none, so will be the order.

(The statement referred to follows:)

STRASSER, SPIEGELBERG, FRIED, FRANK & KAMPELMAN,
March 16, 1967.

Re Hualapai Tribe of Indians, Colorado River Development.

Hon. HAROLD T. JOHNSON,
Chairman, Subcommittee on Irrigation and Reclamation of the Committee on
Interior and Insular Affairs, House of Representatives, Washington, D.C.

DEAR CONGRESSMAN JOHNSON: In view of the Chairman's request that testimony on the pending legislation to authorize the Colorado River Basin Project be limited to new matters, we are not requesting at this time an opportunity to appear personally before the Subcommittee on Irrigation and Reclamation on behalf of the Hualapai Tribe of Indians. Tribal representatives have testified about comparable proposals in prior years, most recently during the hearings before the Subcommittee in May of 1966, so the views of the Hualapais about development of the Colorado River already are well known.

In order that the record concerning bills introduced during the 90th Congress may be complete, however, we are submitting with this letter a Statement by Rupert Parker, Chairman of the Hualapai Tribe, reaffirming the Tribe's support for construction of Hualapai (Bridge Canyon) Dam as long as the authorizing legislation grants the Hualapais reasonable compensation for the use of tribal lands in connection with the project and a fair share of its benefits, and, in this regard, specifically endorsing the language of H.R. 9 and H.R. 3300 which so provide. Attached to Chairman Parker's statement are:

(1) A copy of Resolution No. 7-67, adopted by the Hualapai Tribal Council on March 4, 1967, authorizing testimony in support of H.R. 9 and H.R. 3300 as recognizing and protecting the rights and interests of the Tribe in connection with construction of Hualapai Dam on the Colorado River;

(2) A copy of a Resolution adopted by the Arizona Inter-Tribal Council on October 9, 1965, which petitions Congress in any legislation authorizing the Central Arizona Project or the Colorado River Basin Project to "provide for the Hualapai Tribe not the promise of possible future benefits but rather a binding and enforceable commitment as to actual payments and rights"; and

(3) A copy of Resolution No. 13-66, adopted by the Havasupai Tribal Council on July 21, 1966, which supports the position of the Hualapai Tribe in connection with the construction of Hualapai (Bridge Canyon) Dam, together with a letter dated February 15, 1967, from Lee Marshall, Chairman of the Havasupai Tribe of Indians, stating that the Havasupais' position with respect to Colorado River development has not changed since July 21, 1966.

Finally, during the course of testimony by the Secretary of the Interior last Tuesday afternoon, March 14, a question was raised concerning the legal rights of the Hualapai Tribe in the site of the proposed Hualapai (Bridge Canyon) Dam. Secretary Udall correctly responded that the Tribe *owns* the south half of the dam site and a substantial additional acreage which will be inundated by the reservoir or otherwise needed for project purposes. Again in order that the record may be complete, we are enclosing a copy of our letter of March 15,

1967, to Congressman Ed Reinecke which briefly sets forth the legal authorities showing that the Hualapai Tribe has vested property rights in the site of the proposed Hualapai Dam and adjacent reservation lands.

We would appreciate your making this letter and the attached documents a part of the record before the Subcommittee.

Respectfully submitted.

ARTHUR LAZARUS, Jr.,
Counsel, Hualapai Tribe of Arizona

STATEMENT OF RUPERT PARKER, CHAIRMAN, HUALAPAI TRIBE OF ARIZONA

The undersigned, Rupert Parker, is Chairman of the Hualapai Tribe, Peach Springs, Arizona, and makes the following statement for and on behalf of the Hualapai Tribe. I have been requested by the Hualapai Tribal Council to make sure that the rights and interests of the Tribe in the site of the proposed Hualapai Dam (Bridge Canyon), and related facilities, are fully recognized and protected by any legislation to authorize the Colorado River Basin Project. The members of the Sub-committee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, House of Representatives, I am sure will recall that George Rocha, who was then Chairman of the Hualapai Tribe, testified on this same subject in August, 1965 and in May, 1966.

The Hualapai Tribe feels it is quite important that we continue to make clear what the representatives of the Hualapai Tribe have been saying for years; if proper consideration is given to, and payment made for, our ownership of the dam site, the development of the Colorado River at Bridge Canyon for power and recreational purposes is the only hope we Hualapais have of bringing a decent standard of living to our reservation. Hualapai Dam (Bridge Canyon) is the one asset we possess which can provide my people a real chance to raise themselves out of continued poverty. We ask nothing more than continued assurance in the authorizing legislation of reasonable compensation for the use of tribal lands in connection with the project and, of course, a fair share of its benefits.

The Secretary of the Interior has gone on record as agreeing with the previous recommendation of the Bureau of the Budget that Federal construction of Hualapai Dam (Bridge Canyon) should be postponed and that the issuance of a construction license to any non-Federal agency should be prohibited for years to come. Through our Tribal Attorneys, Royal D. Marks and Arthur Lazarus, Jr., the Hualapai Tribe testified before this same Committee and urged that such a moratorium not be approved for this would further delay development of the one major resource on our reservation. I repeat what the Tribe and its representatives have said before: if the Federal Government does not plan to build a dam at Bridge Canyon and for any reason the State of Arizona does not see fit to go forward alone on the Central Arizona Project, then the Hualapai Tribe again requests that it be allowed to proceed to build Hualapai Dam under license from the Federal Power Commission.

There are bills pending before the Interior and Insular Affairs Committee of the House of Representatives, particularly H.R. 3300, introduced by the Honorable Wayne Aspinall, and H.R. 9, introduced by Congressman Morris Udall, which include authority for the construction by the Federal Bureau of Reclamation of a high dam at Bridge Canyon and, according to my understanding, electric power revenues from that source generally are believed to be a necessary part of the proposed Colorado River development. The bills referred to contain language which the Hualapai Tribe considers fair treatment for the taking of its lands. It is important to the Tribe that our rights and interests be determined and fixed and H.R. 3300 and H.R. 9 accomplish this purpose. I can state that the Hualapais wholeheartedly endorse the said bills and urge that one of them be approved by the 90th Congress, First Session. The Hualapai Tribe, by its Resolution No. 7-67, a copy of which is attached hereto, indicated in writing its endorsement of H.R. 3300 and H.R. 9.

Finally, I would like to mention the fact that many conservation groups are opposing the construction of Hualapai Dam (Bridge Canyon) because of its supposed effect upon the Colorado River and Grand Canyon. Some of these groups are misinforming the public by stating that our neighbors, the Havasupai Tribe, are opposed to Hualapai Dam. I have been assured by the Chairman of

the Havasupai Tribal Council that such is not the case and they have re-affirmed their resolution that they passed last year, a copy of which is attached hereto. When it comes to a clearcut choice between opening up new opportunities for my people and saving the wilderness for a select few, the Hualapai Tribe has only one way to go and that is toward the end of advancing our people and we hope by the building of Hualapai Dam.

RUPERT PARKER, *Chairman,*
Hualapai Tribe of Arizona.

RESOLUTION No. 7-67 OF THE GOVERNING BODY OF THE HUALAPAI TRIBE OF THE HUALAPI RESERVATION (A FEDERALLY CHARTERED INDIAN CORPORATION) PEACH SPRINGS, ARIZ.

Whereas there have been introduced in the 90th Congress, First Session, several bills to authorize the construction, operation, and maintenance of the Colorado River Basin Project; and

Whereas certain of said bills give recognition to the rights and interests of the Hualapai Tribe in carrying out said project; and

Whereas the construction of Hualapai Dam in connection with said Colorado River Basin Project, if the rights and interests of the Hualapai Tribe are protected, would benefit not only the Tribe but the whole State of Arizona and other states interested in said project; and

Whereas the bill introduced by The Honorable Wayne Aspinall, being H.R. 3300 and the bill introduced by Congressman Udall, being H.R. 9 which is joined by Congressmen Rhodes and Steiger of Arizona, give appropriate recognition to the rights and interests of the Hualapai Tribe; and

Whereas hearings have been scheduled on the Colorado River Basin Project Bills during the week of March 13, 1967: Now, therefore, be it

Resolved by the Hualapai Tribal Council in regular meeting assembled this 4th day of March, 1967, That it endorses both H.R. 9 and H.R. 3300 and reaffirms the stand the Hualapai Tribe has previously taken in connection with legislation pending before Congress on the Colorado River Basin Project respectfully requesting the Congress to recognize the rights and interests of the Hualapai Tribe; and be it further

Resolved, That the Tribal Attorneys, Royal D. Marks and/or Arthur Lazarus, Jr., are authorized to testify before Congressional committees concerning said legislation or submit written statements on behalf of the Hualapai Tribe; and be it further

Resolved, That copies of this resolution be transmitted to the Arizona Congressional Delegation, to members of the committees in the 90th Congress who may be considering said legislation; and to other persons interested in the Colorado River Basin Project.

CERTIFICATION

I, the undersigned, as Secretary of the Hualapai Tribal Council, hereby certify that the Hualapai Tribal Council of the Hualapai Tribe is composed of nine (9) members of whom six (6) constituting a quorum were present at a regular meeting assembled thereof this 4th day of March, 1967; and that the foregoing resolution was duly adopted by the affirmative vote of six (6) members, pursuant to authority of Article VI, Section (a) and (b) of the Revised Constitution and Bylaws of the Hualapai Tribe approved October 22, 1955.

[CORPORATE SEAL]

MALINDA HAVATONE,
Secretary, Hualapai Tribal Council, Peach Springs, Ariz.

RESOLUTION

Whereas several of the Indian tribes in Arizona are vitally interested in and will be affected by a bill now pending in the 89th Congress in connection with the Central Arizona Project and the Colorado River Basin Project; and

Whereas there are drafts of a new bill, which it is understood is to be substituted for H.R. 4671, the title of which is "Colorado River Basin Project"; and

Whereas in reviewing the draft dated September 20, 1965, the members of the *Inter-Tribal Council of Arizona* are pleased to see that Bridge Canyon Dam is again made a part of the Project; and

Whereas it is further evident to the members of the *Inter-Tribal Council of Arizona* that there is absolutely no protection in said bill for the rights of the Indian tribes in Arizona that will be affected by the said Project and especially the building of Bridge Canyon Dam; and

Whereas the building of Bridge Canyon is important not only to the *Hualapai Tribe of Arizona* but to other tribes who are members of the *Inter-Tribal Council of Arizona*; and

Whereas as expressed in previous resolutions and correspondence with the *Arizona Congressional Delegation* as well as the *Secretary of the Interior Udall*, the *Hualapai Tribe* has requested in connection with the *Central Arizona Project* and the building of the *Bridge Canyon Dam* consideration at least equal to what others are receiving or would receive; and

Whereas it is also evident that the rights of the *Salt River Pima-Maricopa Indian Community* and the members of the *Ft. McDowell Reservation* would also be materially affected by the passage of the *Colorado River Basin Project* and that their rights are not protected under the draft of the bill hereinabove referred to; and

Whereas after the expressions made by prominent officials in public life that it is their desire to bring the American Indian tribes into the main stream of the American society, if these desires are to be meaningful the *Hualapai Tribe* and other tribes affected should not be forced like other Indian tribes have in recent years to petition Congress for gratuities after the damage is done: Now, therefore, be it

Resolved by the Inter-Tribal Council of Arizona at its meeting regularly called this 9th day of October, 1965, That it respectfully requests the Congress of the United States and the *Secretary of the Interior* in acting upon the *Central Arizona Project* or the *Colorado River Basin Project*, that they shall at the very outset consider all relevant facts concerning the *Hualapai Tribe*, including the total compensation due the *Hualapais* for the losses they will suffer, and that in any authorizing legislation concerning *Bridge Canyon Dam* this key issue of compensation should be finally disposed of, and that any such legislation should provide for the *Hualapai Tribe* not the promise of possible future benefits but rather a binding and enforceable commitment as to actual payments and rights; and be it further

Resolved, That the rights of the other Indians of Arizona affected by the proposed legislation be protected in said bill; and be it further

Resolved, That copies of this Resolution be forwarded to the members of the *Arizona Congressional Delegation*, to the officials of the *Central Arizona Project* and the *Arizona Inter-State Stream Commission*, *Governor Sam Goddard*, and to the Committees of the 89th Congress which may consider legislation concerning the *Colorado River Basin Project* and the *Central Arizona Project*.

CERTIFICATION

We the undersigned, as Chairman and Secretary, respectively, of the *Inter-Tribal Council of Arizona*, hereby certify that at a duly convened meeting of the *Inter-Tribal Council of Arizona* held at the *Executive House, Scottsdale, Ariz.*, on October 9, 1965, the foregoing Resolution was duly adopted by unanimous vote of the members present.

EDMUND JACKSON,
Chairman, *Inter-Tribal Council of Arizona*.
EVA NORTHUP,
Secretary, *Inter-Tribal Council of Arizona*.

RESOLUTION NO. 13-66 OF THE GOVERNING BODY OF THE HAVASUPAI TRIBE OF THE HAVASUPAI RESERVATION (A FEDERALLY CHARTERED INDIAN CORPORATION) SUPAI, ARIZ.

Whereas there is pending in the House of Representatives of the 2nd session 89th Congress, H.R. 4671, and

Whereas in said Bill there is a section providing for the building of *Hualapai Dam Bridge Canyon*), and

Whereas there is included in the latest Committee Print #24 amendments to H.R. 4671 which would benefit our neighbors, the Hualapai Tribe, and

Whereas the members of the Havasupai Tribal Council have read in the papers and magazines statements by members of the Sierra Club and others that by building Hualapai Dam the lake behind it would flood the Grand Canyon and ruin it, and

Whereas the Havasupai people have lived in the area now called Grand Canyon for hundreds of years and the Havasupai Reservation is located down in the Canyon, and

Whereas the Havasupai Tribe would have long ago protested the building of the Hualapai Dam if the lake behind it would ruin the Grand Canyon and flood out their homes and interfere with the beautiful falls, a part of our home place, but the tribal representatives of the Havasupai Tribe know it will not do such a thing: Now, therefore, be it

Resolved by the Havasupai Tribal Council in meeting assembled this 21st day of July 1966, That it endorses the actions taken by their neighbors, the Hualapai Tribe, in their efforts to keep Hualapai Dam (Bridge Canyon) included in H.R. 4671, and be it further

Resolved, That copies of this resolution be sent to officers of the Sierra Club and to others interested in H.R. 4671 and Hualapai Dam.

CERTIFICATION

I, the undersigned, as Chairman of the Havasupai Tribal Council hereby certify that the Havasupai Tribal Council of the Havasupai Tribe is composed of seven (7) members of whom 5, constituting a quorum, were present at a meeting thereof this 21 day of July 1966; and that the foregoing resolution was duly adopted by the affirmative vote of 5 members. Pursuant to authority of Article V, Section 1(a) of the Constitution and Bylaws of the Havasupai Tribe approved March 27, 1939.

RALPH PAYA, *Chairman.*

Attest:

REED WATAHOMIGIE, *Secretary.*

HAVASUPAI TRIBAL COUNCIL,
Supai, Ariz., February 15, 1967.

Mr. RUFERT PARKER,
*Acting Chairman,
Hualapai Tribal Council,
Peach Springs, Ariz.*

DEAR MR. PARKER: I have your letters which concerns the proposed Hualapai Dam and you will find enclosed our Tribal Resolution supporting this project. The Havasupai Tribe has no reason to change their stand as stated in the original Resolution.

You may use this letter and Resolution to refute the misinformation in the press.

Sincerely yours,

LEE MARSHALL, *Chairman.*

STRASSER, SPIEGELBERG, FRIED, FRANK & KAMPELMAN,
Washington, D.C., March 15, 1967.

Re Hualapai Tribe of Indians Colorado River Development.

HON. ED REINECKE,
*House of Representatives,
Washington, D.C.*

DEAR CONGRESSMAN REINECKE: As counsel for the Hualapai Tribe of Indians, I attended the meeting of the Subcommittee on Irrigation and Reclamation yesterday afternoon at which, during the course of testimony by the Secretary of the Interior on pending legislation to authorize the Colorado River Basin Project, you raised a question concerning the legal rights of the Hualapai Tribe in the site of the proposed Hualapai (Bridge Canyon) Dam. According to my notes, Secretary Udall correctly responded that the tribe owns the south half of the dam site and a substantial additional acreage which will be inundated by the

reservoir or otherwise needed for project purposes, but I am taking the liberty of submitting this further answer to your question in order that the record on the subject may be entirely clear.

Physically, one-half of Hualapai Dam, a significant portion of the reservoir pool and such project facilities as the operating townsite, transmission lines, access roads, etc. will be located within the exterior boundaries of the present Hualapai Reservation. Historically, the Federal Government has long recognized the Hualapai Tribe's ownership of the reservation. Legally, therefore, the tribe possesses a vested interest in such property, and thus would be entitled to just compensation for the taking or use of its land by the United States as a matter of constitutional right.

The Hualapai Reservation—established by Executive Order on January 4, 1883—actually consists of part of a far larger tract in northern Arizona to which the Hualapai Tribe held original Indian title. In one of the leading cases about Indian land titles, the Supreme Court rules that the creation of this reservation in effect constituted an agreement between the Federal Government and the tribe under which the Hualapais released "any tribal rights which they may have had in lands outside the reservation * * * on condition that permanent provision was made for them too." *United States as guardian of the Hualapai Indians v. Santa Fe Pacific Railroad Company*, 314 U.S. 339, 358 (1942). In the light of this finding, the Court upheld the Hualapais' title to alternate sections of land within the reservation as against a railroad claiming under a Federal statutory grant. Equally important, the Court's opinion makes crystal clear that the Hualapai Tribe gave up a valuable consideration for establishment of the reservation and was not merely the beneficiary of a revocable trust or other gratuity.

In addition to the property rights for which it bargained in 1883, and such other rights to own land vested in Indian tribes generally under existing law, the Hualapai Tribe is organized under Section 16 of the Act of June 18, 1934, 48 Stat. 984, 987, 25 U.S.C. 476, which specifically empowers these Indians to prevent the sale, disposition, lease, or encumbrance of tribal lands, interests in lands, or other tribal assets without the consent of the tribe * * *." The United States may not lawfully disregard this statutory protection over Indian land (and the Hualapai Tribal Constitution, approved by the Secretary of the Interior on December 17, 1938, pursuant to 25 U.S.C. 476, defines the 1883 Reservation as tribal land) without being liable for damages. In other words, Congress heretofore has recognized and vested in the Hualapai Tribe such ownership interests in reservation property that, no matter how worthy the project—and the Hualapais have endorsed Hualapai Dam—the use by the Federal Government of lands within the Hualapai Reservation without payment to the tribe would be a taking of private property for public use without payment of just compensation in violation of the Fifth Amendment.

I hope and trust that the foregoing summary of the applicable legal authorities is sufficient to prove that the Hualapai Tribe has vested property rights in the site of the proposed Hualapai Dam and adjacent reservation lands. If you have further questions or wish any additional information about this subject, however, I would welcome your calling upon me.

Sincerely yours,

ARTHUR LAZARUS, Jr.

Mr. ASPINALL. Mr. Chairman, as we are approaching the noon hour and are going to meet this afternoon, the next witness has a new thought to bring before this committee. I would ask unanimous consent, if it does not upset any individual's plans, that we hear the statement, but that we postpone our questioning of Mr. Goss until this afternoon when we meet at 1:30.

Mr. JOHNSON. You have heard the unanimous consent request. Is there objection? If not, so will be the order and if you will give us the benefit of your paper, Mr. Goss, then we will adjourn for lunch and come back promptly at 1:30 and you will be on the witness stand with your people for questions.

Mr. Goss. Thank you very much, Mr. Chairman.

STATEMENT OF FLOYD L. GOSS, CHIEF ELECTRICAL ENGINEER AND ASSISTANT MANAGER OF THE LOS ANGELES DEPARTMENT OF WATER AND POWER, ACCOMPANIED BY MYRON B. HOLBURT, PRINCIPAL HYDRAULIC ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA; AND GILMORE TILLMAN, CHIEF ASSISTANT CITY ATTORNEY, CITY OF LOS ANGELES

Mr. Goss. I have with me today Mr. Gilmore Tillman on my right, chief assistant city attorney for water and power, city of Los Angeles. On my left Mr. Myron Holburt, who is the principal hydraulic engineer for California's Colorado River Board.

I will read my statement and try to digress as little as possible during that and I greatly appreciate this opportunity to present this statement on behalf of the city of Los Angeles and its department of water and power in connection with the Bridge Canyon (Hualapai project) and hereafter I will refer to this as the Hualapai project, as it relates to the Colorado River Basin project.

I shall endeavor to make these points:

First, the department of water and power recommends the immediate authorization and construction of Hualapai Dam and powerplant.

Second, we recommend increasing the generating capacity of the Hualapai powerplant from the 1,500,000 kilowatts originally proposed for the project to 5 million kilowatts as a combined hydro-pumped storage peaking plant.

Third, we believe that the peaking power from a 5 million-kilowatt plant, if the units are operated as integral part of the power systems it serves, can be absorbed by the market within 6 years after the plant goes into service, commencing, say, in 1975.

Fourth, Hualapai peaking power is more attractive to us than peaking power generated by nuclear or fossil fuel thermal plants, again assuming that the Hualapai units serving us, like the steam units, are fully integrated into our system for peaking and spinning reserve, and operated as a part of that system.

Fifth, the financing and operation of the larger Hualapai powerplant can be accomplished in several ways. At Hoover Dam the powerplant, like the dam, was financed by the United States, and the generating units are operated under Federal agency contracts by the utilities responsible for repayment of their cost. Alternatively the department of water and power would be willing to prepay its share of the capital costs of a larger Hualapai peaking-pumped storage plant. In either event, we would provide our own transmission lines. If similar arrangements were made with other utilities, the Federal capital required for the 5 million-kilowatt plant would be several hundred million dollars less than the Federal capital proposed for a 1,500,000-kilowatt plant and transmission lines. The plant's financial contribution to the development fund would be substantially greater, and would commence earlier, if the Federal investment were limited to the cost of the dam and water control facilities.

Sixth, an early decision is imperative, because transmission lines now in an advanced planning stage, from large new coal-fired steam-

plants to load centers, passing within a short distance of Bridge Canyon, must be redesigned for larger capacities to include Hualapai power, in order to obtain the lowest cost and maximum values for this power.

COMBINED HYDRO PEAKING-PUMPED STORAGE DEVELOPMENT

Preliminary engineering studies which we have made indicate that the Hualapai site should be developed as a combination hydro peaking-pumped storage project rather than a conventional peaking plant as originally proposed. Under the new concept, low-cost energy from thermal plants would be used to pump water back into the reservoir during offpeak periods. This water would be released, together with the water required for downstream use, during the hours of peak demand. The total Hualapai generating capacity usable in this way would be 5 million kilowatts, not the 1,500,000 kilowatts planned under the old concept, which did not include the use of pumped storage. Sites such as Hualapai, which permit the development of both a high-head, regulated streamflow powerplant, and augmentation by pumped storage, are extremely rare. The Hualapai site is ideally suited to such an installation. The full value of the resource can only be obtained by complete integration of such a plant into the systems of the utilities which absorb the power. So integrated, it can be operated with great flexibility, from zero to full load. For example, at times the units may constitute simply spinning reserve, available against emergencies in the system, instant insurance against blackouts. But when needed, the full capacity of 5 million kilowatts may be generating power on peaks. At other times, only part of it may be at work. At others, it will be fully employed pumping water back into the reservoir for later use.

TRANSMISSION

There are already a number of high-voltage transmission lines in the vicinity of the site of the Hualapai project, some of them extending to the southern California area. Additional lines are either under construction or planned in connection with the development of large coal-fired plants in the four corners area and elsewhere on the Colorado River. The incremental cost of a present increase in the planned capacity of these lines to enable them to transmit Hualapai power to load centers, including Los Angeles, is drastically lower than the cost of building new lines later for the sole purpose of transmitting Hualapai power. Time is, therefore, of the essence in making the decision to build this dam and powerplant now, as contrasted with deferring that decision to a later time. This is one of the primary arguments for authorizing this project at this time, so it can be phased into the planning of the transmission lines which go with this large coal-fired plant which will be and is being developed generally in the four corners area.

POWER MARKET

We believe that substantially all of the 5 million kilowatts of peaking capacity which we propose can be absorbed within 6 years after 1975, when the plant is assumed to go into operation.

The market area for this power can be considered to be generally the area within a circle with a radius of 250 miles and centered at the Hualapai site, plus southern California. I would like to digress very briefly here. This 250 miles is related to the cost of the transmission. The increased cost of the power over that at the bus bar resulting from the transmission places a limit on how far you can take that power and find it economical to integrate into your system. The reason for including southern California is there is already a substantial transmission system from this area to southern California. The Department alone has three high-voltage transmission lines from near this site to southern California.

The utilities serving this power market area have already made commitments for generating capacity and associated transmission facilities to satisfy their requirements through 1973. As the committee will recall, a couple of weeks ago I was before this committee in connection with the desalting plant that is proposed to be located off the coast of southern California and the second unit, as you remember, will go into service in 1973 and that is the unit the department of water and power will build.

Some commitments have been made for the period 1974-75, although most capacity additions for this period are at this time only in an advanced stage of planning.

But we believe that the utilities serving this market area have not yet made substantial commitments to construct the capacity which must be added to their systems to serve the growth of load from 1975 through 1980. There is thus a present opportunity for Hualapai power to occupy that gap, provided the decision is made now. The statistics are as follows:

It is estimated that the combined loads of these utilities will be about 28 million kilowatts in 1975, and 40 million kilowatts in 1980, a total increase of 12 million kilowatts. With the addition of required reserves, these utilities will need to add about 14 million kilowatts of capacity during this period.

Based on computer studies of expansion plans for our own system, about 30 percent of the added capacity will be peaking capacity. We believe this to be a typical pattern of system development for other utilities in the market area. Now this means that if we are going to develop these very large coalburning steamplants in the Southwest and these very large nuclear plants on the coast to produce power at the lowest possible cost and to be economically attractive for this purpose, these plants should be operated at full load 100 percent of the time when they are available to offset the high capital cost that goes with such developments and to take advantage of the low energy costs from them. Since electric customers do not use load at that kind of a load factor but rather in the range of 55 to 65 percent load factor, you have to have other generation that operates economically at a lower percentage of loading and this is the purpose, then, of these peaking-type plants. They are on for a few hours a day and the rest of the time they are off and shut down and the baseload plants are carrying the load.

This is a typical pattern, although it does vary from utility to utility. For example, our load factor on the department of water

system is right now about 62 percent and it is fairly constant throughout the year. Our summer and winter peaks are almost identical, whereas in the State of Arizona, the utilities there have a much higher load factor in the summertime than winter and their peakload occurs then due to pumping but this changes from time to time.

This 30-percent figure gives a peaking requirement of 4,200,000 kilowatts in the Hualapai power market area in the 5-year period following 1975. That means 30 percent of the 14 million kilowatts should be peaking.

The remaining 800,000 kilowatts of the 5-million-kilowatt capacity of the project (or any portion of that quantity not reserved for pumping for the Central Arizona project) could be absorbed very soon thereafter.

COST TO GOVERNMENT AND EFFECT ON DEVELOPMENT FUND

The total Federal investment in the dam, a 1.5-million-kilowatt powerplant and transmission lines, as originally proposed, was \$540 million. The total Federal investment in the dam and a 5-million-kilowatt powerplant we propose could be as much as \$728 million, but could be as low as \$254 million, or less than half the Federal investment originally proposed for a project less than a third as large. The reduced Federal investment of \$254 million would be the consequence of prepayment by the utilities of the capital cost of the units serving them, and non-Federal financing of the transmission lines. While I cannot speak for other utilities which might participate in this project, I can assure you that the department of water and power would prefer to make its own investment in this fashion, prepaying the cost of the units integrated into its system.

The unit capital cost of the dam and powerplant for the 1.5-million-kilowatt installation was \$234 per kilowatt. This is reduced to \$146 per kilowatt for the 5-million-kilowatt plant we propose. Based on Federal cost of money, the annual cost of capacity at the bus bar furnished by the larger plant is cheaper by about \$3.50 per kilowatt-year than the cost of capacity at the bus bar supplied by the smaller plant. And I mention this cost since this capacity would be sold to the utilities on some basis of a per-kilowatt-year charge for capacity.

Inevitably, there is opportunity for greater revenue to the Development Fund from the greater plant. The capacity is $3\frac{1}{2}$ times as great, and the cost per unit of capacity is much less.

The cost, value, and quantity of energy generated by the flow of the stream would remain unchanged. Some additional energy would be generated by the use of the pumped-back water. This is a plus value. The cost of providing steam-generated energy for the pump-back would be borne by the participating utilities, not by the United States.

CONSERVATION OF NATURAL RESOURCES

Statements have been made that steam peaking units and even nuclear peaking units are economically more attractive than peaking power from Hualapai. So far as we know, no manufacturer has offered to either design or build nuclear peaking units. From our

knowledge of the high capital cost associated with nuclear units, we seriously question their attractiveness for this use.

Conventional fossil fuel burning peaking units are notoriously inefficient, hence they waste valuable, irreplaceable natural resources. It is also a waste of a valuable natural resource to delay construction of the Hualapai project beyond that date when there is a need for the capacity and energy from this project within the area where it can logically be marketed.

CONCLUSIONS

From our studies which are discussed briefly above, we have concluded:

(1) A 5-million-kilowatt-hydropeaking-pumped-storage development of the Hualapai site is feasible and will provide substantially increased benefits as compared to 1.5-million-kilowatt hydroplant originally planned for the site.

(2) The utilities in the area can provide a market for Hualapai power.

(3) Since only incremental additions to existing and planned transmission capacity will be necessary, economic transmission from the project can be provided.

(4) Authorization of the project at this time is necessary to permit planning for integration of Hualapai capacity with other capacity to be installed in the 6-year period following 1975.

Now, I have included as an attachment a chart showing, first, the capacity of the peaking pump-back plant, as compared to the capacity of the 1,500,000-kilowatt plant.

Second, the investment under two different schemes for financing the large plant, and then the unit costs in dollars per kilowatt in the final chart.

Thank you very much, Mr. Chairman.

Mr. JOHNSON. We will now recess until 1:30, where you gentlemen will be back on the witness stand for the purpose of questioning.

(Whereupon, at 11:45 a.m., the hearing was recessed, to reconvene at 1:30 p.m., this day.)

AFTERNOON SESSION

Mr. JOHNSON. The Subcommittee on Irrigation will come to order. Our witness this afternoon is Mr. Floyd L. Goss, of the Los Angeles Department of Water and Power.

STATEMENT OF FLOYD L. GOSS, CHIEF ELECTRICAL ENGINEER AND ASSISTANT MANAGER OF THE LOS ANGELES DEPARTMENT OF WATER AND POWER—Resumed

Mr. JOHNSON. A few questions, Mr. Goss, that I would like to ask you before we get into questioning.

How long have you been with the city of Los Angeles?

Mr. Goss. I started working for the department of water and power in 1928, as a student engineer while I was going to the University of California. I started permanently in 1933. So that would be about 34 years.

Mr. JOHNSON. How much thermal power capacity do you have in the system now?

Mr. Goss. 2,400,000 kilowatts.

Mr. JOHNSON. How much hydro do you have?

Mr. Goss. About 740, I think it is—740,000 kilowatts.

Mr. JOHNSON. Do you now participate in the developments on the Colorado?

Mr. Goss. Yes. We have assigned to us at the Hoover powerplant, six units. In addition to that, we are the operating agent for the units assigned to us, to the States of Arizona and Nevada and to the Metropolitan Water District.

Mr. JOHNSON. Do you purchase power from any of the other developments—Parker or Davis?

Mr. Goss. No, we do not.

Mr. JOHNSON. You are a part or will be a part of the Pacific Northwest, Pacific Southwest Intertie?

Mr. Goss. Yes, sir. We are building the 750,000-volt, direct-current line from Los Angeles to the Oregon border, where it will connect to a like line which is being constructed by the Bonneville Power Administration, and go on up to the Columbia River. And we will take power over this line.

Mr. JOHNSON. Now, do you own your own transmission grid from the Colorado?

Mr. Goss. Yes, we do.

Mr. JOHNSON. And, are you going to participate in the new power transmission facilities from the Colorado?

Mr. Goss. In this proposed one?

Mr. JOHNSON. No—in the proposed intertie facilities.

Mr. Goss. Well, yes, we are going to connect to Mead substation, which will be the terminus for the 750,000-volt, direct-current line the Bureau of Reclamation is building from Oregon to Boulder City—the Mead substation.

Mr. JOHNSON. You are also going to participate in the joint venture of MWD, the private utilities, the Atomic Energy Commission, and the Office of Saline Water?

Mr. Goss. Yes, sir, we will finance and construct one of the reactor turbine generator trains in that plant.

Mr. JOHNSON. And in your statement, you show an interest in the power facilities of Hualapai. In your opinion, this can be built, and the power that will be generated can be marketed and used within a brief period of time?

Mr. Goss. Yes, sir.

Mr. JOHNSON. And to meet increased needs for electric energy in the area?

Mr. Goss. Yes, sir, particularly this type of development where you have peaking capacity and the flexibility of using it.

Mr. JOHNSON. That is all, Mr. Goss.

The gentleman from Colorado, the chairman of the full committee, Mr. Aspinall.

Mr. ASPINALL. Mr. Goss, you certainly have given the committee some new material—I may say that. We have had a lot of repetition from all groups, but this is something new. Have you ever talked

this matter over with any representative of the Bureau of Reclamation?

Mr. Goss. No, sir.

Mr. ASPINALL. Now, as I understand it, the units of facilities that you contract for in the Hoover Dam, after a 50-year period, become the property of—whatever there is left—the Federal Government; is that correct?

Mr. Goss. They always have been the property of the Federal Government. We own nothing at Hoover Dam or in the powerplant.

Mr. ASPINALL. Would you own anything in this powerplant under this proposal?

Mr. Goss. Under my proposal we would not.

Mr. ASPINALL. You would have the same kind of operation at Hualapai, as proposed by you, as you presently have at Hoover; is that correct?

Mr. Goss. Yes, sir.

Mr. ASPINALL. You would expect to enter into a 50-year contract. Is that right?

Mr. Goss. Well, that would be a subject of negotiation. Frankly, I would like to enter into a longer contract on this project. As a matter of fact, I would like to extend the one at Hoover.

Mr. ASPINALL. I can understand that. I am trying to find out what the equities are. Of course, we have had people testify, and tell us in private, that there is not any market for this kind of power. Now, you come up and you not only tell us that there is a market, but that you are willing to contract for the power at reasonable rates, such as those rates set forth in the administration's proposal; is that correct?

Mr. Goss. No, sir. I am willing to contract for the power, and it is power that we can use on our system. However, this is a different proposal than the one offered by the—

Mr. ASPINALL. I understand that. But we have to use comparable rates in order to see whether or not this would bring back a return, more or less, within the 50-year period.

Mr. Goss. It would bring back more return.

Mr. ASPINALL. For the same amount of power or the increased amount of power?

Mr. Goss. Because of the increased amount of power, and the way in which it is proposed that this be done, the return from this would be greater than the former Hualapai project.

Mr. ASPINALL. Would this in any way increase the rates to the Arizona project as far as pumping?

Mr. Goss. No, it would not. If anything, it would decrease the rates.

Mr. ASPINALL. Would the installation that you support be the same sized dam as is now provided for in H.R. 3300?

Mr. Goss. Yes, sir; the same size, same height dam.

Mr. ASPINALL. If the dam is constructed and the reservoir is allowed to fill in accordance with the proposal, would the reservoir be used to a great extent for recreation? What would be the effect upon the surface of the lake, as far as fluctuations on the lake, because of pump-back water.

Mr. Goss. We have looked at that in a very preliminary manner. We are sure that we can stay within a 4-foot maximum fluctuation of the elevation of the surface of the water under normal operation.

Mr. ASPINALL. This fluctuation would be less than would be possible in the reservoir as presently contemplated; would it not?

Mr. Goss. I think so, sir.

Mr. ASPINALL. I think that is all, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. Mr. Goss, I am glad we waited over the lunch period. You left us kind of breathless. The members here should appreciate that your testimony this morning is perhaps the most dramatic and significant and far reaching that at least I have heard in a decade and a half of service on this committee.

I think I understand the way this will work better perhaps in these terms—and this is perhaps in contrast to the Bureau's operation up at Glen Canyon where they put in the dam, put in the facilities, and then went about simultaneously and are still going about the process of trying to sell the power.

What you are proposing to the committee here is that this entire operation not be handled on a basis of somebody just selling power and hoping that people will buy it, but on actually integrating all the enlarged capacity of this dam, with all the requirements of the utilities, both public and private, in the market area you describe.

Is that correct?

Mr. Goss. That is correct. That is the basic difference.

Mr. HOSMER. By the preciseness of timing here, this integration can be accomplished with considerable skill, and bring peaking power in at points and places and times when it is required.

Mr. Goss. Yes, sir. The operation of a large electric system requires the total cost of producing power be kept at a minimum. In order to do this, from time to time throughout the day, the various units are loaded to a different percentage or varying percentage of full load. In other words, all the generating resources available to the utility are integrated in such a manner as to produce the lowest cost of electricity, and the greatest reliability of the system.

Now, the flexibility that would result from this project would make it extremely valuable for this purpose.

For example, at some hours of the day the units could be motored without using any water at all. They would then be on the line and all ready to pick up load in case one of these large efficient units went off the line, and your system would remain stable and you would have no interruption of service. At other times of the day they could release water to the units and reduce the load on a less-efficient generating resource and keep the cost down. And at night they could pump water back into the reservoir so it would be available for that purpose in the future. And it is this integration of the operation of the units with the other units available to the utility that makes this valuable.

Mr. HOSMER. Not only to your utility, but to all others who would take part.

Mr. Goss. All others participating in the project; yes, sir.

Mr. HOSMER. And the benefit is multiplied by roughly the number of customers involved over a very large geographical area?

Mr. Goss. Yes, sir.

Mr. Hosmer. Is my understanding correct that the Department of Water and Power of the city of Los Angeles is the largest public utility in the country?

Mr. Goss. We are the largest municipal-owned utility, and the largest publicly owned utility that distributes electricity to customers. Of course, the TVA is a larger utility, publicly owned utility, but they wholesale power and do not distribute it directly to the customers.

Mr. Hosmer. You have had to operate almost throughout the history of the department in an area of very rapid population growth and increasing electrical demand, have you not?

Mr. Goss. That is right. We have to plan on doubling our production facilities about every 10 years.

For example, if we have 3,100 megawatts, or 3,100,000 kilowatts of generating capacity now, this means in 1977 we will have to have 6,200,000 kilowatts, which means in this 10-year period we have to add an amount of generating capability equal to that which we now have.

Mr. Hosmer. How long has this department been in the electrical business?

Mr. Goss. Fifty-one years this November.

Mr. Hosmer. Just over a half a century.

Mr. Goss. Yes, sir.

Mr. Hosmer. Have you, during the period of emergency of nuclear energy, examined that field as a possibility for your system?

Mr. Goss. Yes, sir. We have had an application before the Atomic Energy Commission for too long now for a 500-megawatt-nuclear unit to go on the coast near the community of Malibu, at Corral Canyon. We hope to get an answer from the Commission on this soon. We would like to have that answer now, as a matter of fact.

We have also, as the chairman said, agreed to participate and are presently negotiating a contract for the Bolsa Island project, which is a dual-purpose project as you know, providing the participation of the Government is also authorized in that project.

Mr. Hosmer. That is a 750,000-kilowatt plant?

Mr. Goss. Our capacity from that plant would be 754,000 kilowatts.

Mr. Hosmer. The department has had direct and intimate experience with 1,250,000 kilowatts of nuclear power.

Mr. Goss. That is right; yes, sir.

Mr. Hosmer. Which I believe, just about represents the amount of nuclear kilowatts on the line today throughout the country.

Mr. Goss. Just about that amount; yes, sir.

Mr. Hosmer. You have been pretty big in this area?

Mr. Goss. We have been very interested.

Mr. Hosmer. And you have made your studies and examinations with extreme care. And despite that, you mean to tell this committee that you would choose this Hualapai scheme for peaking power over nuclear?

Mr. Goss. Yes, we would. As a matter of fact, having such a resource as this, with its flexibility of operation, is the thing that makes nuclear power economical for us. It enables us to keep the nuclear unit fully loaded every minute it is available.

Mr. Hosmer. That is the result of 51 years experience, dedicated hard work, major participation in the nuclear electrical program of the country right up to this minute.

Mr. Goss. Yes, sir.

Mr. Aspinall. Will the gentleman yield? And it also takes into consideration the economics for the investors, whoever they might be, whether public or private investors. Is that right?

Mr. Goss. Yes, sir.

Mr. Hosmer. Now, you say you have not spoken to the Bureau of Reclamation about this?

Mr. Goss. No, sir; I have not.

Mr. Hosmer. The other day I questioned Mr. Dominy and they said they had some pump storage ideas for Hualapai, but they had not come up with anything at this time.

I rather imagine it was on the same basis that they had tried to do their sales at Glen Canyon rather than an integrated operation as you mention here.

Mr. Goss. I would imagine so; yes, sir.

Mr. Hosmer. Do you intend to initiate discussions with the Bureau regarding this?

Mr. Goss. Do I intend to? Yes, sir.

Mr. Hosmer. Are you a member of this WEST organization?

Mr. Goss. Yes, sir.

Mr. Hosmer. How many States does that extend through?

Mr. Goss. Seven.

Mr. Hosmer. Name them.

Mr. Goss. Colorado, Texas, New Mexico, Arizona, Utah, Nevada, and California.

Mr. Hosmer. That is seven. Has the department in this participation in the WEST organization had an opportunity to familiarize itself with the power problems in the area that is covered by WEST?

Mr. Goss. Yes, sir.

Mr. Hosmer. Have you had an opportunity in the WEST organization to make some type of demand increase forecast, and so on?

Mr. Goss. Yes, sir, we have.

Mr. Hosmer. And, are these generally agreed upon among the people who are in WEST?

Mr. Goss. Yes, sir.

Mr. Hosmer. And, are they the studied best efforts of the organization?

Mr. Goss. Yes, sir.

Mr. Hosmer. And, are your figures presented to the committee relatively to the requirements for peaking power based on those calculations?

Mr. Goss. Yes, sir, based on information that came out of that study—those studies.

Mr. Hosmer. I know you say that you cannot speak for the other utilities in this very large service area, but based on your experience in WEST, do you believe it likely that they will view this approach to the Hualapai Dam the same or in a similar fashion as to the department of water and power?

Mr. Goss. Yes, sir.

Mr. HOSMER. Now, can you tell me why you and these other utilities would assume to relieve the U.S. Government of an expenditure—for 5 million kilowatts capacity—of somewhere around a half-million dollars?

Mr. Goss. Of course, I cannot speak for the other utilities. I can say why the department would do this. There are primarily three reasons. One is, of course, California is very interested in this whole basin project, and we would like to see it go forward and a study made of the importation of water, because we have a great interest in this as a water utility as well as a power utility, and we have a great interest insofar as the economy of our area is concerned. The department of water and power has been interested in the Colorado River, since the early 1920's when we went over there and filed on water to bring to Los Angeles.

The second reason is that with these large units coming on the line, these joint projects where several utilities go together and build a facility such as Mojave steamplant which is a large coal-burning steamplant to be located on the river below Davis Dam; it takes a considerable amount of negotiation and time to work these things out. You cannot schedule these as precisely as you could if this was just adding another unit to a steamplant on your own system. So we need a little flexibility in putting units into this Hualapai project. This method of financing, putting up our own money, would obviously allow us to advance a unit or delay a unit for a period of months without having to come back to the Congress for a change in appropriation or that sort of thing, or having the Secretary do so.

The third reason is that each of the utilities participating in this will no doubt have a different concept of their participation insofar as size of the unit is concerned, for example. We would like to have more to say about the design of the unit—and by participating financially in this way we think we would have.

For example, if we took our share of this, and say this share was around a million kilowatts, we may very well want to install two very large units, whereas the Salt River project, or Nevada, might wish to install smaller units, because of their smaller system. This, we feel, would give us the flexibility to do that.

Those are the primary reasons.

Mr. HOSMER. I seem then to gather that in addition to the flexibility of operating this 5 million kilowatts of capacity you describe and the saving that it involves, there is a saving and also a tailoring to system requirements in the period of the installation of the capacity as well.

Mr. Goss. That is correct.

Mr. HOSMER. And, that the individual needs of the various participants can rather well be served in this manner.

Mr. Goss. Yes; I feel that they can. In the case of the department of water and power, I am sure they can.

However, I should say that if for other reasons this committee does not feel that this is the right way to finance the project, we would still participate in this project on a basis in which we did not advance the money for the powerplant but paid for it in some other way.

Mr. HOSMER. Now, I understand that another way that this will work is that whereas at Page the Government went to a lot of expenses

for powerlines, the Government would not have to construct powerlines under your proposal. This is because there are being planned certain non-Government powerlines whose capacities could be increased, and as a consequence the expense would be an incremental one rather than one for the installation of the system. It would be a non-Government expense.

Mr. Goss. That is correct. That is what makes the project go, and that is what makes it important. I feel that this great resource should be developed at this particular time, so that this planning can take place before construction of the proposed transmission lines.

Mr. Hosmer. Mr. Goss, let me again say this is the type of imaginative brilliant thinking that has long characterized organizations like yours based in my State. I am proud that you have been able to do this. And I certainly intend to offer what amendments may be required to whatever legislation we finally take up here to permit this to go forward.

Mr. Goss. Thank you, sir.

Mr. Hosmer. Thank you, Mr. Chairman.

Mr. Johnson. The gentleman from Arizona, Mr. Udall.

Mr. Udall. Mr. Goss, you know, I am sure, that you have really shaken the branches with this little bombshell. How long have you been working on it?

Mr. Goss. Well, I personally have been working on it—on Bridge Canyon—for a great many years, and on the Colorado River I wrote a thesis on it when I was in college in 1928, on power development on the river. But this particular project, I have had some people working on it since about the first of January and I personally have been working on it 10 days.

Mr. Udall. From what you have said, obviously your agency would only use a part of this 5 million kilowatts to be produced. The other portions would be used by your partners in the WEST group and other utilities in the Southwest?

Mr. Goss. Yes; plus the pumping power also.

Mr. Udall. And, you say because of the lateness of the development of this, you have not yet consulted with the Bureau of Reclamation about it, nor have you consulted with any of the other WEST partners or the other agencies that would be using some of this capacity?

Mr. Goss. No, sir; I did not. I have not had time to.

Mr. Udall. You do not know what their reaction might be?

Mr. Goss. No; I do not.

Mr. Udall. You think it would be to their advantage to sign up for a share of it from what you have discovered so far?

Mr. Goss. Yes, sir.

Mr. Udall. Have you plugged into your equation the fact that you are building a pump storage project of some kind now, or have one contemplated in California?

Mr. Goss. Yes, sir. And, we are doing it the same way we propose to do here—put up our capital.

Mr. Udall. You have considered the new Northwest Intertie and the third powerhouse at Grand Coulee, and all that tremendous energy available out of the Northwest?

Mr. Goss. Yes, sir.

Mr. UDALL. And, you have considered the unused capacity at Lake Powell that is apparently still available now?

Mr. Goss. Yes, sir.

Mr. UDALL. And, despite all of this, you are satisfied you have a workable scheme that would save you money, save the Government money, and do a better job for all?

Mr. Goss. And, fully develop this beautiful site, this resource.

Mr. UDALL. You are satisfied, based on what you told Chairman Aspinall, that not only would this not increase the drawdown, the yo-yo effect of the lake, but it would probably be less than under the present scheme that we have?

Mr. Goss. Yes, under normal operation I would think so.

Mr. UDALL. I must say that I am impressed and a little bit stunned. You have not checked this out with the Sierra Club or the Rand Corp., I would take it?

Mr. Goss. No, sir. I thought this committee is in pretty good touch with them.

Mr. UDALL. I was reminded walking out of here this morning, in Sorenson's book about Kennedy, he tells where the President sent two men to Vietnam to advise him on the situation in 1962. One was military and one was State Department, and they were hostile; they fought the whole way over and hardly talked coming back. He had them report to the National Security Council. One said everything was lovely, we were doing just right, and the other said a disaster was building up. There was a pause, and President Kennedy said, "Gentlemen, were you in the same country?"

I think of this in connection with your testimony, the testimony we are about to have from Mr. Carlin this afternoon. Mr. Carlin has more testimony, I think, in this 1,800 pages of record than almost any single witness. And, he says, he tells us that hydro is outmoded, that you cannot even use this 1.5 million, that it is foolish to even use water that is already uphill, to take the energy out of it when it goes down hill, you cannot sell it, it is unneeded, it is a turkey, it is a white elephant. And you, on the other hand, say you are not only thrilled by this 1.5 million at the original Hualapai, but you want three and a half times more, and you are willing to pump the water back up the hill and catch it coming down a second and third time.

All I am getting to, I suppose, is to make sure you have fully considered the alternatives, and that you honestly and sincerely believe this proposal has merit.

Mr. Goss. Yes, with this exception. You said we were willing to buy the original Hualapai. We were not. That was a development under which the Government proposed to sell power, take and/or pay for so many kilowatt-hours of firm power from a project at a price. And, this price was too high for us in Los Angeles.

Now, under this arrangement, we are buying only capacity, really—although we will agree to take our share of the flow of the river kilowatt-hours at 3 mills—essentially we are buying capacity which we can use, and we can use this capacity in a most flexible manner under our load curve to keep our low-energy-cost large units running at their most efficient point, and to minimize or keep to a minimum the cost of supplying power to our consumers.

Now, it interests me that you should mention this fact that hydro is passe and this sort of thing, because this Department is presently embarking on a program, expending over \$150 million to develop a hydro project called the Castaic project. So, apparently we do not think hydro, properly used, is obsolete. As a matter of fact, we think it is necessary to have this kind of capacity in order to use effectively these large, efficient thermal units.

Mr. UDALL. Well, this agency that you represent, which is the largest in the country that serves customers, I take it that your experts have considered all the arguments against hydro and all the arguments for nuclear and thermal that this committee has had the benefit of over the last 2 or 3 years.

Mr. GOSS. I would imagine so.

Mr. HOSMER. If the gentleman would yield—I suppose some of these decisions were made after you became aware of the testimony of Mr. Carlin and some other people?

Mr. GOSS. Yes, sir.

Mr. HOSMER. And, despite it?

Mr. GOSS. Yes, sir.

Mr. HOSMER. Thank you.

Mr. UDALL. And, if you are wrong and Mr. Carlin is right, this proposal would be a disaster for your agency—you would be wasting several hundred million dollars—if the Congress took your advice and went ahead with this scheme?

Mr. GOSS. Yes, sir.

Mr. UDALL. And if that occurred, the city would be unlikely to dedicate a power station in your name or anything of that sort.

Mr. GOSS. I would think you are right.

Mr. UDALL. All I am trying to do is emphasize the great importance of what you are urging us to do, to make sure that you understand all the ramifications of this—that you and your experts are quite sure you are right about this unusual proposal.

Mr. GOSS. Well, we feel we are right.

Furthermore, we feel that this is such a good proposal that there is quite a bit of insurance against inflation or other things which might increase costs.

But I am sure I do not need to remind some members of this committee that this argument sounds somewhat familiar. I think some of the same arguments were made against Hoover Dam when that was developed—that it would never be used. This great jewel of the Southwest is certainly well used.

Mr. UDALL. Why is it that the Hualapai site is such a choice pump-back hydro site as compared with others that you might have available to you?

Mr. GOSS. Why is it?

Mr. UDALL. Yes. If there anything about its location, its physical characteristics?

Mr. GOSS. Yes, there is. There is excellent geology. There is a narrow canyon, where you can put a little sliver of a dam, so to speak. You get a lot of head, which is important. Immediately below the dam there is a large body of water. You are not faced with a long

reach of the river in which you are going to be surging water back and forth.

It has a great many advantages.

Mr. UDALL. You mentioned a need to make a decision soon because of planned powerlines, so that you could add increments. Would you think that you would have single transmission lines of 2 million, 3 million, 5 million capacity? Do you not have to build a separate line when you get above, say, 1 million? What is the most capacity you can put on one line?

Mr. Goss. The maximum capacity of a 500,000-volt line is about a million kilowatts, not from carrying capacity primarily, but from the standpoint of firmness. I was talking about a network of transmission, which is going to be tied into this big Mead substation at Hoover, and out of which lines will radiate to the various market areas, load centers in the Southwest area.

For example, our three Hoover lines—we have always contemplated that at the right time we would increase the capacity of those lines by raising the voltage. We could not see that far in the future to build them for higher capacity at that time.

The existing transmission system, going right near this site, to the sites of large coal plants, generally in the Four Corners area, are being built now, or are in the planning stages. There will be an extensive power transmission grid, which could absorb the 5 million kilowatts that would be distributed over the area, in my opinion.

Mr. UDALL. I thought you had either planned or under construction lines of about a million capacity, and if the proposal you made today were adopted, you would not change that line into a 2 or 3 million line—you would have to build new parallel lines, would you not?

Mr. Goss. Certain lines are actually under construction, past the planning stage. In addition to that, though, in connection with future developments over there, there will be an extensive transmission grid. What I am saying here is if we know now that this amount of power is going to feed out into this area, that grid can be expanded at the lowest cost at this time, during the planning stage, rather than coming back later and building a separate transmission for that purpose.

Mr. UDALL. Have you been able to run projections yet as to difference in accumulations to the basin fund with your plan as against the plan embodied in Chairman Aspinall's bill, Mr. Hosmer's bill, or some of the others?

Mr. Goss. I have tried very hard to do that this week.

Mr. UDALL. All you have at this point are some general conclusions that the contributions would be more than under the present plan without giving a specific figure?

Mr. Goss. Well, I would like to give you one.

I think the power, the capacity from this 5-million-kilowatt plant, can be brought to the bus bar for about \$4 a kilowatt-year.

Now, I think at that point this kind of capacity is worth more than that. If it is worth a dollar more, then that would mean \$5 million immediately going into a development fund. If it is worth \$2 more, that is \$10 million. And if it is worth \$3 more, it is \$15 million.

Now, that is as far as I can go at this time. This would be \$15 million a year, or 5 million or 10 million or whatever it is.

I used in making this estimate the capital recovery factor that the Government uses, and I gave credit for selling the more than 5 billion kilowatt-hours run of the river energy that is available at the project—and, I arrived at this \$4 figure. Certainly, I think the capacity is worth more than that. How much, I do not know. That is a subject of negotiation.

But for every dollar more than that that you get for it, you add to the development fund from the start in this project. After the amortization period, then you add considerably more.

Mr. UDALL. I thank you for shaking up the committee and giving us something to think about.

Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman. Mr. Goss, I have a couple of questions here. This strikes us out of the blue.

In regard to the water supply for the larger capacity electrical plant that you have described here, are you placing in your plans any reliance on water augmentation in order to make this attractive to you as a 50-year investment?

Mr. Goss. No, I am not.

Mr. WYATT. In other words, it would be attractive to you as an investment based upon the current anticipated waterflow in the Colorado River without any augmentation, is that right?

Mr. Goss. Yes, sir.

Mr. WYATT. And secondly, I would like to ask you if you have any feeling as a result of your studies or knowledge in this area as to the inevitability of imports into the Colorado River from the Northwest?

Mr. Goss. Well, I think that is a matter that simply must be studied. That determination must be made. Because obviously, this river—as we all know—is in trouble. As a river supplying a tremendous number of people, it is in trouble. And, I think that is something that should be studied, must be studied immediately.

Mr. WYATT. But as far as the trouble is concerned, it does not directly concern you in proposing this present plan that you have come to the committee with?

Mr. Goss. No, except that I think that if an augmentation plan was found feasible, and a source of water was found that could rightly be assigned to this river, this plan would help provide funds.

Mr. WYATT. Has your organization done any work, completed any studies, reconnaissance or otherwise, on imports from the Northwest into the Colorado River system?

Mr. Goss. Yes, sir, our organization has.

Mr. WYATT. How recently?

Mr. Goss. Mr. Tillman, how long ago was that?

Mr. TILLMAN. Years.

Mr. WYATT. Well, in the last couple of years you have not directed any attention to this particular subject?

Mr. TILLMAN. That is correct. The last couple of years we have not.

Mr. WYATT. I believe I have no further questions at this time. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Goss, going back to the Hualapai Dam, you propose to increase the capacity of the dam to 5,000 megawatts, is that right?

Mr. Goss. The capacity of the powerhouse. The dam would be the same.

Mr. FOLEY. With the same basic structure and reservoir?

Mr. Goss. Yes, sir.

Mr. FOLEY. By just increasing the size of the generator?

Mr. Goss. Yes, sir, or adding more. Some of each, I think.

Mr. FOLEY. It will not be any extension of the height of the dam or the reach of the reservoir?

Mr. Goss. No, we had not planned on it.

Mr. FOLEY. I assume you have done some preliminary engineering on it?

Mr. Goss. Yes, we did it on the basis of exactly the same dam.

Mr. FOLEY. You say that this dam was studied since February of this year, is that right?

Mr. Goss. I asked some people to take a look at this beginning in January, right after the moratorium ended, the 31st of December.

Mr. FOLEY. You are a member of the WEST group?

Mr. Goss. Yes, sir.

Mr. FOLEY. You participated in discussions with the Bureau of Reclamation on their proposals to obtain power for pumping purposes from the WEST group?

Mr. Goss. No, I did not.

Mr. FOLEY. Your organization did not?

Mr. Goss. No, sir.

Mr. FOLEY. You are not a member of the WEST group?

Mr. Goss. Yes, sir, we are.

Mr. FOLEY. You were not consulted on that?

Mr. Goss. No, sir.

Mr. FOLEY. Did your studies of the proposed increase of the powerhouse at Hualapai begin subsequent to that proposal of the Bureau of Reclamation?

Mr. Goss. I do not really know when that proposal was made, Mr. Foley.

Mr. FOLEY. Well, subsequent—

Mr. Goss. My first knowledge of any discussions with the Secretary, any proposal that they do that sort of thing, was February 1, I believe.

Mr. FOLEY. You are not suggesting to the committee that a proposal that was pretty well circulated here in Washington among people that are not in the business of providing power was unknown to the Department of Light and Power of the city of Los Angeles?

Mr. Goss. It was unknown to me.

Mr. FOLEY. Well, perhaps you have some people here on your technical staff that can answer whether it was unknown to them.

Mr. Goss. No, I do not.

Mr. FOLEY. Then, about February 1 you became aware of the proposal of the Bureau of Reclamation to contract with the WEST group?

Mr. Goss. Yes—but primarily the proposal to delay Hualapai.

Mr. FOLEY. And simultaneously with that, or subsequent to that, accidentally and by coincidence you came forward with this proposal to increase the powerhouse at Hualapai.

Mr. Goss. It was not quite accidental. I had asked some people to start work on that in January.

Mr. FOLEY. You are suggesting to the committee there is absolutely no connection between your decision to study the increased power capacity of Hualapai and the proposal of the Bureau of Reclamation to purchase power from the WEST group. Is that what you are suggesting here?

Mr. Goss. That is what I am stating. There is no connection.

Mr. FOLEY. You had made the decision, tentatively at least, not to purchase power from Hualapai as originally proposed in last year's hearings?

Mr. Goss. It was never formally offered to us. It was discussed with us, and we had decided that that particular power sold under that arrangement was not attractive to us, yes, sir.

Mr. FOLEY. On the other hand, where it was not attractive to you to purchase power from a Federal power project to be constructed at the entire capital cost of the United States, you now feel it is attractive to you to prepay as a part of a syndicate to the Federal Government to participate in the capital cost of the dam.

Mr. Goss. Not only that, Mr. Foley. We would also be just as interested if the Government wanted to put up the \$728 million. I thought my proposal had certain advantages for the Government as well as the flexibility it gives us.

Mr. FOLEY. Now, could you not have proposed some of these very accommodating design features to the Federal Government, the Bureau of Reclamation, if they were going to build Hualapai alone?

Mr. Goss. Yes, I could have.

Mr. FOLEY. But you did not do that last year.

Mr. Goss. No, I did not.

Mr. FOLEY. How much capacity of the proposed 5 million would you anticipate purchasing?

Mr. Goss. Well, we would take whatever our share is. I have given a little thought to that, and I would think our share probably would be around a million kilowatts.

Mr. FOLEY. What do you propose the range of capital investment share would be in construction of the dam? How much would the city of Los Angeles be participating in the capital expense of the project?

Mr. Goss. About \$100 million.

Mr. FOLEY. You would be providing about a \$100 million toward the construction of this dam?

Mr. Goss. Roughly, yes, sir.

Mr. FOLEY. And, that is more attractive to you than letting the Federal Government purchase it and buying the power from the Federal Government?

Mr. Goss. Mr. Foley, obviously I have not made myself clear on this.

If the Federal Government developed this project and put up all the money, we would still be interested in a million kilowatts of capacity in the proposed plant to be used to integrate with our system as I have said.

Mr. FOLEY. That is this year, but not last year.

Mr. Goss. This was never under consideration last year.

Last year the proposal or the plan was to develop this as a source of firm power, so many kilowatt hours that you would buy and take and use or pay for whether you used it or not.

Under this scheme, we are buying capacity principally.

Mr. FOLEY. And the economics of this buying capacity as against firm power enables you to make a contribution of a \$100 million toward the capital expense of the dam and still find it economic.

Mr. Goss. It is the capital expense of the powerplant that it would go against. This is exactly the same thing, Mr. Foley, that justifies our participation in the intertie. We are buying capacity from the Northwest.

Mr. FOLEY. I am not arguing with you. I just want to know. Yes, is the answer?

Mr. Goss. Yes, is the answer, yes, sir.

Mr. FOLEY. And, over what period of time would you be involved in this present purchase at a \$100 million? What sort of a contract period are you talking about?

Mr. Goss. We would put our money as prepayment of rent, put up our money as part of the powerhouse is built, and we would have no further fixed charges to pay on the equipment. We would have to continue to pay the fixed charges, our share of it, on the balance of the project.

Mr. FOLEY. On a 50-year basis?

Mr. Goss. Well, that is subject to negotiation. I would like to run it longer, frankly. I think this dam should last a hundred years at least.

Mr. FOLEY. Is any part of your decision in this matter related to the advantages that you might see of building up the development fund?

Mr. Goss. No. The project stands alone as something that should be done. That is a valuable resource. It should be developed for the benefit of this whole area. Now, it does have this additional advantage—it is so very feasible that there could be a substantial contribution to the development fund.

Mr. FOLEY. What interest do you have in the development of the development fund?

Mr. Goss. Well, as I say, the department of water and power supplies water to over 2¾ million people. Part of our water entitlement is in this river. As a matter of fact, the first filing for appropriation of water for the southern California coastal plain was made by the department of water and power in 1924. So we are interested in maintaining a firm supply of water if we can for the aqueduct running to southern California, a part of which is our water.

Mr. FOLEY. What connection does the development fund have with that?

Mr. Goss. The development fund, as I see it, would be useful in augmenting in some manner the water in that river.

Mr. FOLEY. Is it not true that you basically see the development fund as financing importation?

Mr. Goss. That is certainly one way it should be considered.

Mr. FOLEY. Is that not the principal reason that you look toward the development fund as a matter of your interest?

Mr. Goss. It may well be. That is a personal view.

Mr. FOLEY. I do not want to press you, but could you not be venture-some and say, yes or no? I mean, I think in fairness that is the reason that you are principally interested in the building of the development fund—to import water. Is that not right? Is that not the position that the department has had?

Mr. Goss. I am not here to speak to the department's position on that. I think California's position has been well stated. And the reason I appear to hedge, which I do not intend to, Mr. Foley, is I am not an expert waterman. I am in the power business. I have this interest.

Mr. FOLEY. I do not want to ask you an unfair question, and one that is not in the area of your immediate expertise, but do you really have concern about providing the people of Los Angeles with water?

Mr. Goss. Yes, sir.

Mr. FOLEY. Do you foresee there will be a problem, in your present view of the resources of the Colorado, and related tributaries and stream in California, to provide the basic element of life for your citizens, municipal, and industrial water—not agricultural?

Mr. Goss. Yes, I do. Although as I say, I am not purporting here to be a water expert. I do, yes.

Mr. FOLEY. Let me ask you this.

You conducted your studies on water importation from the Northwest. Is that the Columbia River you were studying?

Mr. Goss. I made no studies.

Mr. FOLEY. I used the "you" in terms of the department of light and power. You answered a question in response to Mr. Wyatt's inquiry that your department had conducted studies of importation.

Mr. Goss. The department has, yes.

Mr. FOLEY. Now, to your knowledge, when the department conducted those studies, were they studying the Columbia River?

Mr. Goss. It was from the Snake River, I believe.

Mr. FOLEY. Not the Columbia, the Snake?

Mr. Goss. The Snake.

Mr. FOLEY. You did not consider the Columbia at all?

Mr. Goss. To my knowledge it was the Snake.

Mr. FOLEY. Do you know any of the conclusions of that study?

Mr. Goss. I do not think I am in a position to give the conclusions of that study. However, I would be very happy to furnish—

Mr. FOLEY. If I may specify—I am particularly interested if you know any of the cost analysis conclusions of that study.

Mr. Goss. Mr. Foley, I would like permission to supply the committee with a copy of the study. I think that is the best answer to all of this.

Mr. JOHNSON. We would certainly like to have a copy, for the file of the study that has been made by the Los Angeles Water & Power people concerning importation into California.

Mr. Goss. Into the Colorado River.

Mr. JOHNSON. Yes.

Mr. FOLEY. Last year—

Mr. HOSMER. With the understanding it is only a study and not a proposal or a promise or a threat, anything of that nature.

Mr. FOLEY. I do not think anything I suggested would create that impression.

Last year this committee heard the testimony of Mr. Udall, Secretary of the Interior, and Mr. Dominy, the Commissioner of the Bureau of Reclamation, Mr. Holum, and in response to a question of mine, the Commissioner indicated that they had done a cost analysis study in recent years between the cost of importation of water to the Southwest from the Columbia and desalimization. And I asked him what the conclusions of that study were, and he said in effect that they could not tell from the extent of their study which was more expensive. Do you know if that is generally the conclusions of your study?

Mr. Goss. I do not know, sir. I am sure I do not.

Mr. FOLEY. I wonder if you could address yourself in that point in your submission to the committee.

Mr. HOSMER. Reserving the right to object, I do so with the statement there has been no route selected, no source, whether it is going to be northern California or the Columbia at the mouth, or some other place. There has been no comparative desalting plant. We know they preempted one site, sopping up 150 million kilowatts of power and we do not have too many locations like that. I want it understood that it is a very tentative and speculative thing.

Mr. FOLEY. If the gentleman will yield to me, I am merely asking them to address themselves to the question. I am not presuming their answer. Their answer can be anything they choose to give. I am just asking them to address themselves to the question. I do not think that is an improper request.

Mr. HOSMER. If we had a question that would be all right. But we do not really have a question.

Mr. FOLEY. I referred the witness to the testimony of Mr. Dominy in last year's hearing, which the staff and I will cite to the witness, and they can do what they want with the answer.

But I do think, Mr. Chairman, that I would like to have them address themselves to the question at least. I am sure the department of water and power has nothing to hide about its study. I think they would be willing to provide the committee with the results of the study.

Mr. JOHNSON. The witness has stated he has no objections to making a copy of their study available for the committee's files. And in that there will be their findings and their conclusions.

Mr. Goss states that he is a powerman and other people have made the study as far as water and importation into the Colorado is concerned.

Now, I think that information would be all that the Los Angeles Water & Power people had. Mr. Dominy's testimony and Mr. Holum's testimony and Mr. Udall's testimony here—Secretary Udall's testimony before this committee last year—was to the effect that they had made schematic studies, I presume, and come up with end results of not knowing which was the cheaper—the desalination program or the importation program from, I presume, the Pacific Northwest, or the mouth of the Columbia.

So I think the witness has been fair in stating that he is not in a position to answer for the people who actually made the study.

Mr. FOLEY. I think, Mr. Chairman, the record will show my request was not for the witness to answer here, but to communicate my inquiry, if it is in agreement with the Chair, and if the study shows and if the people who conducted it not what their judgment is about the comparative cost of desalinization and importation. If it is not available in the study, or if they want to qualify it, that is certainly within their capacity. But I think it is a matter that at least this member would like to be informed about if the city of Los Angeles and the department of water and power can inform the committee.

Mr. HOSMER. If we could do it, we would not need the National Water Commission.

Mr. FOLEY. I do not want to argue with the gentleman from California. But if the determination of all these issues was to be made by the Department of Water and Power of Los Angeles, this committee will not have to exist.

Mr. REINECKE. Would the gentleman yield? If it will facilitate anything I have a copy of the report right here. Perhaps Mr. Goss could answer any specific questions you have from the report.

Mr. FOLEY. I do not want to press Mr. Goss to answer questions that are not in his area of expertise. I understand he is not a water expert for the department. He is an electrical engineer, and head of the electrical division. I think it is reasonable that he be asked questions relating to his expertise.

With that—I would still like to have your water people help us if they can.

What is the position of the department of light and power, if you know, with respect to the central Arizona project in the event that a qualified dam is not authorized?

Mr. Goss. Our position, I think, is expressed through the Colorado River Board, and has previously been presented here. I would not want to take upon myself the province of that board.

Mr. FOLEY. You answered a question by the gentleman from Arizona, Mr. Udall, concerning the need for a prompt decision relating to the authorization of the Hualapai, and the increased capacity of the powerhouse. You said that the grid would be expanded if Hualapai were authorized at this level of capacity.

Now, if the grid is expanded, that means adding basically additional lines, does it not?

Mr. Goss. Or increasing the capacity of those lines beyond that that is necessary to carry the particular project for which they are primarily being built.

Mr. FOLEY. Your present plans are to build what size line?

Mr. Goss. For example, in our own case—I use that as an example—those lines operate at 287,500 volts. We can triple their capacity by raising the voltage to the neighborhood of 400,000, and adding compensation in the lines. That is an existing line.

Now, were a system being planned that required, for example, two lines for firm transmission for a certain part of a project, and you wished to add some of this Hualapai power to that, by changes in the design of those two lines, you could accommodate a considerable amount of that power, and, of course, the additional cost would be only that incremental cost of increasing the capacity of something that is going to be built anyway.

So there is a substantial saving that results from a coordinated development of the transmission.

Mr. FOLEY. You do not anticipate—how much power do you anticipate now carrying over the lines as presently designed?

Mr. Goss. From Hoover Dam?

Mr. FOLEY. The ones you are talking about on the plan, at the Mead Station—the ones that serve the Mead Station.

Mr. Goss. We are talking—

Mr. FOLEY. I thought you had plans underway to construct transmission lines to the Mead Station, to tie into your system.

Mr. Goss. We have underway plans to expand the Boulder transmission lines which we have, to increase their capacity, and to connect them to Mead substation, and to the Mojave steamplant. If this project is built, we would include in the plans for the increased capacity of these lines capacity sufficient for our share of Hualapai. We are doing that planning right at this moment.

Now, what the other utilities would do, what capacity lines they are planning, while I know in general, very general terms, I would not want to speak to that.

Mr. FOLEY. Well, you can speak for your own case. What are your present plans, assuming the Hualapai is not authorized—what kind of loads are you going to carry over your proposed line?

Mr. Goss. About a million.

Mr. FOLEY. Two lines?

Mr. Goss. Three lines.

Mr. FOLEY. The economics of that are better than building one?

Mr. Goss. Oh, yes.

Mr. FOLEY. On the other hand, if we would authorize Hualapai, this amount—

Mr. Goss. I would increase the capacity of these lines more. And to give you a feel for the economy in this, were we to build a new line from Hoover, for example, a new firm transmission system, to bring that power to our city, it would cost in the neighborhood of \$50 a kilowatt of capacity—whereas we can increase the capacity of these existing lines, at a cost of approximately \$30.

It is the economy of incremental increases in capacity of existing and planned transmission, that makes this proposal, particularly in the case of Los Angeles, which is some 340 miles from Hualapai, economical for this Department.

Mr. FOLEY. How much time do you have?

Mr. Goss. Well, we are in the process of planning this transmission scheme now, right at this moment.

Mr. FOLEY. I know that is what your testimony indicated. But the committee does not know whether we have a week or a month or 2 months or a year to authorize Hualapai Dam.

Mr. Goss. Well, the final decision on Mojave will be made sometime in June, probably, and immediately after June, sometime later this year, we will start the actual design of the modification of the transmission system. So we are talking about perhaps as much as a year, perhaps as little as 10 or 11 months.

Mr. FOLEY. If this committee authorized—reported a bill authorizing the dam, that would not be sufficient. You would want to wait until the House and Senate acted, would you not?

Mr. Goss. I would at least want to have a feel for the way this is going.

Mr. FOLEY. It takes a calculated risk on your part. You do not know whether we are going to appropriate money for it.

Mr. Goss. We always take that risk. We have taken it at Hoover ever since we have been there. We have taken it on this \$86 million line we are building in the Northwest. We are taking the risk that Bonneville will build units to supply it and that money will be appropriated. We have confidence in the Government.

Mr. FOLEY. On the basis of a congressional authorization, you would go ahead and design?

Mr. Goss. Yes, sir.

Mr. FOLEY. Can you tell us again why it is that the Department has not consulted the Bureau of Reclamation regarding this proposal?

Mr. Goss. Had I had time, I certainly would have. But this developed very fast.

Mr. FOLEY. Well, you did not even tell them you were considering it?

Mr. Goss. I think I told Mr. West I was looking at it, yes—one day this week. Mr. Arleigh West is the director of region 3 for the Bureau of Reclamation. Because actually this report which the committee has, I only finished yesterday afternoon.

Mr. FOLEY. Is there—I am not an electrical engineer, of course. There is one thing that still puzzles me.

It seems to me, you have explained to the committee that this is not that revolutionary a concept. And yet you are suggesting to the committee that suddenly in February of this year it blossomed forth in your Department as a possible means of providing power for your service area at a great economic benefit. I just ask you—is your proposal a revolutionary proposal from an engineering standpoint, or is it not?

Mr. Goss. No, it is not a revolutionary proposal. I think I can answer it best in this way.

Ten years ago the Department and most of the large utilities were building 150,000 kilowatt steam units, and today we are building 750,000, and million kilowatt steam units.

Now, these large baseload units require two things that are not new. These are not new, but they have developed tremendously in their impact.

They require substantially more reserves, because when you lose a million kilowatts of generating capacity, you have got to be sure you have something to pick up the load and pick it up quickly. Otherwise, your systems go into a tailspin.

The economy of their operations require that they operate fully loaded. That is their most efficient operation—fully loaded, a base load plant.

Mr. FOLEY. Neither of these facts are new to the technology of steamplants, are they?

Mr. Goss. I did not say they were new, but it is their impact that is new, due to their size primarily—that is new, yes.

Mr. FOLEY. A final question.

Have you consulted on your proposal with the State of California?

Mr. Goss. No, sir. Not officially, earlier this week I discussed the concept of it informally with representatives of the Colorado River Board and the Department of Water Resources of the State of California.

Mr. FOLEY. Is this committee the first body outside of our own Department to know of this?

Mr. Goss. Officially, so far as I know, yes, sir.

Mr. FOLEY. Your proposal is made here for the first time, and there has been no consultation with any other utilities, public or private, with any other municipal or governmental organization?

Mr. Goss. With the exception, as mentioned, and a telephone conversation with Mr. James Drake, who is the manager of system development for the Southern California Edison Co. I told him what I was looking at. Those are the exceptions.

Mr. FOLEY. It has been, in effect, a quite carefully guarded secret until this day?

Mr. Goss. No, I was happy to tell anyone. I had not finished it. I just finished yesterday afternoon.

Mr. FOLEY. Thank you.

Mr. JOHNSON. The gentleman from Utah.

Mr. BURTON of Utah. No questions.

Mr. JOHNSON. The gentleman from Idaho, Mr. Hansen.

Mr. HANSEN. Thank you, Mr. Chairman.

Mr. Goss, it is a pleasure to have you before us. I understand you dropped quite a bomb in the lap of the committee today. I have been looking your statement over. It is very interesting to note the similarity of your proposal to that of others I have seen but for different purposes. We have known about pumping back for purposes of re-use of water for reclamation, but yours is for electricity.

Do you propose to have a reregulating reservoir for Hualapai Dam if this became a reality?

Mr. Goss. Yes, sir.

Mr. HANSEN. What do you propose to use for the reregulating reservoir?

Mr. Goss. Our design has not gone that far.

Actually we are in the process of developing the Castaic project, which is almost exactly like this, except it is a 1,250,000 kilowatt plant rather than 5 million.

What we have proposed is in effect, a wide channel below the dam with a release facility at the end to release water for downstream requirements, and to furnish an after-bay out of which water could be pumped back into the reservoir.

Mr. HANSEN. You were not thinking then of Lake Mead?

Mr. Goss. No, sir.

Mr. HANSEN. Now, if the Hualapai Dam development as you mention it here becomes a reality, would this make the Snake River, Colo. plan that has been discussed earlier more feasible or not?

Mr. Goss. I do not think it would affect the feasibility of the Snake plan at all.

Mr. HANSEN. And at this time, can you say whether you have abandoned plans for this type of importation?

Mr. Goss. I am sorry, sir. I am on the power side of the water and power, and I am not in a position to say whether they have abandoned it or what is being done.

Mr. HANSEN. None of those gentlemen with you would know either?

Mr. Goss. I do not know, perhaps Mr. Tillman would, our lawyer. It is not being actively pressed at the moment, he says.

Mr. HANSEN. That is comforting.

Thank you. No further questions.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke.

Mr. REINECKE. Thank you, Mr. Chairman.

Mr. Goss, inasmuch as you just completed this yesterday, you feel this plan is adequate and appropriate to a reasonable degree?

Mr. Goss. Yes, I do. As in all of our system development work, we try to be conservative, so that anything that happens to a project increases its feasibility.

Mr. REINECKE. I am sure you get the feeling here that because the promises made in your paper are so drastic, and it is such a panacea to all problems, all of us are wondering why the Bureau of Reclamation has not made this proposal to us.

Mr. Goss. Let me hasten to say I am not one of those who think that the Bureau of Reclamation has not considered it. I do not know whether they have or not.

Mr. REINECKE. I recognize that. But as was pointed out on the other side, inasmuch as it does seem to be a rather revolutionary proposal, why was this not brought up before? I think, is a question in all our minds.

Did you consider the possibility, if this pump back is such a reasonable idea, of using Hoover, in view of the fact that the lake is existing, the transmission lines are existing instead of having to build Hualapai. You could get essentially what you are getting here without having to build a dam.

Mr. Goss. Yes, sir. And throw away the investment you have in all that generating machinery there.

Mr. REINECKE. Throw away?

Mr. Goss. Yes. In order for this to work, these turbine generators have to be designed to run backwards, to act as pumps.

Mr. REINECKE. You mean the equipment at Hoover at the present time?

Mr. Goss. Yes.

Mr. REINECKE. Well, will you not be required in both cases to add generating capacity? Let me put it another way. What plant factor do you intend to operate this at?

Mr. Goss. It would vary all over the map. I would think there would be times during the year when our units would be just idling on the line without using any water, used as reserves. At other times they would be operating 14 hours a day. And it would vary with other utilities, depending on their particular system conditions at the time.

Mr. REINECKE. In view of the fact that you are talking about—back to Hualapai—more than tripling the design energy drop there, are you not going to have to have a greater generating capacity?

Mr. Goss. Oh, yes.

Mr. REINECKE. As I recall, the design of the plant factor for Hualapai was about 36 or 38 percent. And you are more than tripling that. So obviously, we cannot run this thing 108 percent. So are you going to have to add—unless you are going to have an overall plant factor of something in excess of 60 or 70 percent, which is not generally recommended for hydroplants, I think you are going to have to add a lot of generating.

Mr. Goss. No. Actually, you see, the 38 percent in the original design was governed by the capacity of the plant and amount of water available to go through that plant. That determines the capacity factor, 38 percent.

In my proposed development the capacity factors under which the units are operated will depend on how much pumping you do, how much water you put back in the reservoir. You can change that practically to suit yourself. And it would be different for different units.

Mr. REINECKE. How far downstream below Hualapai do you intend to put this after-bay?

Mr. Goss. I do not know.

Mr. REINECKE. Are you familiar with the geology out there? It is pretty flat country?

Mr. Goss. Yes, I am generally familiar with it. Not so familiar that I would be able to actually design this.

Mr. REINECKE. Again, to talk about $3\frac{1}{2}$ times the capacity, the afterbay will have to have a pretty substantial capacity itself.

Mr. Goss. Yes.

Mr. REINECKE. As such it would have to go quite a ways downstream or certainly into the Lake Mead area, and flood the whole Gods pocket area out.

Mr. Goss. Well, I could not say as to that—except this: The same engineers who are designing our Castaic project have looked at this—they consider it feasible, and see no reason why this should not be developed.

Mr. REINECKE. Do they consider it feasible in detail or in theory?

Mr. Goss. Well, as you may know, the department of water and power has had for many years an application to build a project at this site. In connection with that, we had extensive geological work done. The hydraulic engineers who have been working on that project and determine its feasibility are the same ones familiar with the work done there. That is all available to us. I personally have not reviewed that. But they have assured me that it is.

Mr. REINECKE. On your fourth point, you indicate that Hualapai peaking power is more attractive to us than peaking power generated by other plants. Why is one peaking power of a better quality than another?

Mr. Goss. Well, I said—

Mr. REINECKE. Without regard to the sources. If a plant is operated at peaking power, we have to assume it is capable of being operated efficiently under those circumstances. I am wondering why hydropeaking power is better than nuclear or thermal peaking power.

Mr. Goss. Well, for one thing it is readily available. A hydrounit you can start in a matter of minutes. Or you can have it spinning on the line and immediately available.

Mr. REINECKE. You are saying that hydro is more adaptable to peaking power than thermal or nuclear?

Mr. GOSS. That is right. And there is a lesser cost.

Mr. REINECKE. No difference in the quality?

Mr. GOSS. That is considered better quality, sir.

Mr. REINECKE. I do not fully understand this. I am a customer of yours. I am a taxpayer of the city of Los Angeles and a member of this committee.

We are going to invest a hundred million dollars roughly.

Mr. GOSS. Yes, sir.

Mr. REINECKE. And for this—this is a prepayment on capacity only?

Mr. GOSS. Yes, sir.

Mr. REINECKE. Who owns that capacity?

Mr. GOSS. The Government will own it.

Mr. REINECKE. And the department of water and power will have no equity in this facility whatsoever?

Mr. GOSS. Just a lifetime use of it, I hope.

Mr. REINECKE. A lifetime use?

Mr. GOSS. That is what I would like.

Mr. REINECKE. But you have not talked to the Bureau yet?

Mr. GOSS. I am sure of 50 years.

Mr. REINECKE. I am pleased to see that you say you want to build your own transmission lines. I think that is fine.

You say the plant's financial contribution to the development fund will be greater. Is this because of a lower initial investment on the part of the Federal Government?

Mr. GOSS. It is because you have 5 million kilowatts upon which you can make some profit rather than a million and a half.

Mr. REINECKE. Now, talking about pumping substantial water back up above the dam, for the pump-back unit. You say under the new concept low-cost energy from thermal plants will be used to pump water back. Where is this thermal energy coming from?

Mr. GOSS. Ours will come, I imagine, from the Mojave plant in the early years. Later on, from nuclear plants.

Mr. REINECKE. Could we say if we did not build this, we would not need to build Mojave? If we can consume the substantial part of the capacity of either Four Corners or Mojave, then we do not need them right now?

Mr. GOSS. This would be offpeak energy from Mojave.

Mr. REINECKE. Mojave, I understood, was to run at a very high plant factor.

Mr. GOSS. That is right.

Mr. REINECKE. You said it was offpeak?

Mr. GOSS. I am speaking of system peak.

Mr. REINECKE. It is not from Mojave. It is from the system?

Mr. GOSS. It is from the system.

Mr. REINECKE. Again, on page 3, you say the full value of the resource can only be obtained by complete integration into the systems of the utilities in the area.

And yet you have not talked with any of these other utilities. I understand there are 35 or 40 such utilities generally in the WEST organization.

Mr. Goss. Yes, sir.

Mr. REINECKE. Do you feel that these other companies will go along with you?

Mr. Goss. Well, I feel it would be an attractive scheme, that is as far as I can go. It certainly is attractive to us. I see no reason why it would not be attractive to them.

Mr. REINECKE. As a customer—what is in it for me as a customer? I am investigating part of my \$100 million. Where does the department of water and power get that money back?

Mr. Goss. In the first place, if we do not invest a hundred million dollars here for this capacity, we will have to invest in some other plant for the same amount of capacity, because every year the demand on our system goes up, it increases—doubles in 10 years. So every year we have to bring additional generating capacity on. So, if we do not put the hundred million here, we will put it in some other plant in order to meet our demand and not shut our system down, and cut your lights off. And by virtue of the economy of this development, as it applies to the department of water and power, and the fact that we have got this very economical transmission scheme, by increasing the capacity of our Boulder lines, this should enable us to help maintain the low rates that you are now paying for electricity, which is our objective.

Mr. REINECKE. I thank you for that. Again, to the power market, it has been my impression from talking to a number of people that we were in pretty good shape as far as peaking capacity up to 1972 or 1973, and at that time we were going to begin to develop problems. I have also been assured since then from several private organizations that the private companies, the utilities, have no fear of construction of enough capacity beyond that to take care of the problem. And yet you are suddenly dumping 5 million kilowatts of peaking energy along with 1,350 megawatts from the intertie, and some 1,200 megawatts from Castaic, and I do not know how much from Glen. But it looks like we are going to have something on the order of 10 million kilowatts of peaking energy in a market that I do not feel is ready for it and will not be ready for it by 1975.

Mr. Goss. I do not believe that all of the capacity of this project will be needed in 1975. But in the period following 1975 until the early 1980's 1981, and 1982 perhaps, I have said in the report, 6 years, additional capacity will have to be added. No doubt there will be large nuclear or thermal plants. A great deal of it certainly will be large coal-burning plants in the area near Four Corners.

If we are going to operate those low-energy-cost, thermal plants, efficiently, then we have to have a certain amount of additional capacity that operates efficiently at a low-capacity factor, to integrate with it. And that is the purpose this would serve.

Mr. REINECKE. Can you legally make a prepayment purchase of this type?

Mr. Goss. Yes, sir.

Mr. REINECKE. Is this within your charter?

Mr. Goss. I am assured by Mr. Tillman we can do this without a charter amendment.

Mr. REINECKE. Do we have that much in the bank?

Mr. Goss. No, sir. We do not need it yet, either.

Mr. REINECKE. The figures indicate \$234 a kilowatt, I believe. Yet, when I divide \$540 million by 1,500, I get 360. Is there a reason for that?

Mr. Goss. Yes. We took the transmission out. It was \$188 million worth of transmission. We took that out. Because we are only comparing the project at the bus bar exclusive of the transmission system.

Mr. REINECKE. Is that the figure that was introduced in the estimates by the Bureau of Reclamation last year on the transmission lines?

Mr. Goss. Yes.

Mr. REINECKE. So that you have taken out the entire amount of transmission, even though you are only talking about adding incremental?

Mr. Goss. This is a Government expenditure. I am only comparing the projects in effect at the bus bar.

Mr. REINECKE. You say on page 6—based on Federal cost of money, the annual cost of capacity is so much. Can you borrow money for 3.22 percent?

Mr. Goss. Well, historically, I think our cost of money is in that neighborhood; yes.

Mr. REINECKE. I did not realize you were doing that well.

Mr. HANSEN. Is this tax free?

Mr. Goss. Tax-free revenue bonds.

Mr. REINECKE. In the case of pumpback—we are going to have to buy this from offpeak, as you say, Mojave or Four Corners or Northwest or wherever?

Mr. Goss. It would come out of our system.

Mr. REINECKE. What price is that power?

Mr. Goss. Somewhere around 1.8 mills per kilowatt-hour.

Mr. REINECKE. You are going to turn around and regenerate it back and resell it for how much?

Mr. Goss. No. We are going to pump the water up there and reuse it for our own system.

Mr. REINECKE. You have to credit the system, do you not?

Mr. Goss. I would think, although this is a matter for negotiation, we would pump water up into the reservoir, and get a credit for so many kilowatt hours that we could use in our units, for supplying our system.

Mr. REINECKE. Without keeping track of how much it was, other than just total kilowatt-hours. My point is this.

As I understand pumped storage, you lose about one-third in the process of going around the circle.

Mr. Goss. That is right.

Mr. REINECKE. So, you are really adding 50 percent to the cost of your pumping power you are buying in the first place.

Mr. Goss. Yes. Actually what that amounts to, I think, on a 1.8-mill basis considering our Castaic project, which is a similar operation—the cost of the energy in the reservoir, ready to be released when we want to use it, will be somewhere around 2.2 mills. That is to be compared with an average cost of power on our system, of

about 3 mills, and a cost on peak when this might be offset, in the neighborhood of 5 mills. So it is a very economical source of energy.

Mr. REINECKE. Inasmuch as you have not talked with the Bureau—you indicated earlier you were not willing to purchase power from the original Hualapai proposal because it was 3 mills and \$10 a kilowatt of capacity. How much do you think—

Mr. Goss. And furthermore, because we had no flexibility in integrating this, using it from time to time throughout the week, year, so that we would make the most effective use of it. That is the secret of this.

Mr. REINECKE. What do you feel the Bureau will charge you for this power?

Mr. Goss. I have no idea. Based on my analysis of it, they will charge us a price somewhat higher than \$4 a kilowatt for the capacity.

Mr. REINECKE. I am sure they will. The way they justify things around here is \$10 and 3 mills, as you well know. And if they come in here telling us all of a sudden they can build these things for \$4 and maybe 2½ mills, they are going to be in trouble on a lot of other projects.

Mr. Goss. In their proposed 10-3, they included transmission to the load centers, you see. That was not at the bus. Now, if you take this \$188 million in transmission, and take this power back to the bus, you would come at somewhere around \$4 a kilowatt and 3 mills.

Mr. REINECKE. The bus bar is where?

Mr. Goss. The bus bar is at the plant.

Mr. REINECKE. Where?

Mr. Goss. At Hualapai, for example.

Mr. REINECKE. At Hualapai. And you say you are saving that—in other words, if they were charging \$10 and 3 mills at the dam.

Mr. Goss. No, they were charging \$10 and 3 mills at the load center in Phoenix.

Mr. REINECKE. The load center, then, was where in the previous consideration?

Mr. Goss. It was an area load center. It was a postage stamp rate over an area. It could be in Phoenix.

Mr. REINECKE. You indicated you would only have a 4-foot level variation in the reservoir approximately.

Mr. Goss. Our preliminary studies indicate it is less than 4 feet under normal operation.

Mr. REINECKE. This is strange, too, because again our friends down at the Bureau have indicated a 10-foot requirement to operate a 1½-million-kilowatt plant. You are operating a 5-million-kilowatt plant.

Mr. Goss. Was that a pump storage plant?

Mr. REINECKE. No.

Mr. Goss. I am talking about a pump storage.

Mr. REINECKE. Are you pumping at the same time you are generating?

Mr. Goss. No. As I remember this—and I am certainly no expert in this—and this committee has heard day after day of this. But I believe the 10 feet was at Marble, and I thought the 4 feet was at Bridge originally. But I could be wrong.

Mr. REINECKE. I thought 10 feet was at Bridge.

Mr. Goss. I believe the 4 feet was at Bridge.

Mr. REINECKE. This is quite amazing, that you can put $3\frac{1}{2}$ times the water through without varying the lake more than 4 feet.

Mr. Goss. We may not put any more water through. It depends on how the units are operated.

Mr. REINECKE. And yet you are going to generate $3\frac{1}{2}$ times more power?

Mr. Goss. We produce this capacity. How that capacity is used, whether it just spinning there with no load, no water going through at all, as it would be, certainly in our case—

Mr. REINECKE. If you do not generate more energy, you cannot justify a \$720 million investment.

Mr. Goss. You can, by selling more capacity. You sell the capacity.

Mr. REINECKE. WEST has not seen this. I was going to ask if they had agreed to the proposal, but obviously they have not.

Mr. Goss. No, sir.

Mr. REINECKE. Are you aware of the other WEST proposal to build a steamplant up near Page?

Mr. Goss. I knew a steamplant was going to be built up there.

Let me say these are not WEST proposals. WEST is a study organization, a means of getting all these utilities, public and private, including the Bureau, together to coordinate the planning of our facilities.

Now, when it comes to any particular project, that is not a WEST project. It is a project of certain utilities who are also members of WEST, who get together and build it. For example, Mojave, as it is now planned, is a project in which the Salt River project, the Nevada Power Co., Southern California Edison, and the Department are going together to build a large coal burning plant. It is not a WEST project. It is ours, the participants.

Mr. REINECKE. One final question. I am sure that we are all very much interested in this particular proposal. But I am also sure that we would not be able to really finalize our opinions on it until we have an opportunity to study it more. And the Bureau will have to give us a report on this proposal. Is it possible for you to give us as a part of the record, the detailed studies that have brought you to this conclusion?

Mr. Goss. Yes. But let me say this is a very preliminary study. And for a project such as this, I certainly feel—

Mr. REINECKE. I recognize that. But this is a very final piece of legislation. We need your figures if we are going to include your proposal in our consideration.

Mr. HOSMER. If the gentleman would yield—I think as they detail this out for the Bureau, those figures will be developed there rather than funnel it through the committee, which is not equipped for it. Probably we will have to hear from the Bureau sometime on this.

Mr. REINECKE. This is what I am getting at. I am sure the Bureau will have to have the figures, and I am sure the committee will want to see the figures.

Mr. ASPINALL. May I suggest this. There never has been and never will be from the Bureau or from anybody else, a final design before

an investigating committee before the authorization. Now, the witness can only go so far. I hope, of course, that we will not have the changes, like we are having on the Frying Pan-Arkansas, and some of these other proposals. But most committees do not even dig in to the depths that we do.

Mr. JOHNSON. Would the gentleman yield? I think a good example of this is the powerhouse at Grand Coulee. We authorized a certain capacity in that for a certain amount of money, and within 6 months after they got into the final design, they came back to us and stated they were going to increase the capacity and double it.

Mr. REINECKE. There is no question about this. I simply say I feel we have to have more specific details before we can include this in the legislation.

Mr. Goss. Mr. Reinecke, may I say I certainly intend to discuss this in great detail with Reclamation. Certainly from the standpoint of staff and their knowledge of Government financing they are in the very best position to make an analysis of it. And I would expect they would.

Mr. REINECKE. Thank you, no further questions.

Mr. STEIGER. You stated you would be able to dispose of or sell 4,200,000 kilowatts in this 250-mile radius in Hualapai market area in the 6 years—

Mr. Goss. Plus southern California.

Mr. STEIGER. Plus southern California.

Mr. Goss. Not to sell it. I think there is a market there. Selling involves a price.

Mr. STEIGER. A market for it. You yourself are prepared if the market is appropriate to purchase a million kilowatts.

Mr. Goss. Yes, in that neighborhood, yes, sir.

Mr. STEIGER. Who do you anticipate specifically would purchase it other—in that case it would be the other 4,200,000. What specific market areas did you have in mind?

Mr. Goss. Well, for example, right here at the meeting I discussed this with Mr. Ivan Patrik Head, of Nevada, and they are very interested. I would think that—I would hope that all the utilities, public and private, would find this attractive, and wish to participate. So it would be generally the whole area of utilities in Arizona, Nevada, southern California.

Mr. STEIGER. But you came to the committee with this proposition, having made determination that there was available 4,200,000 kilowatts to be marketed in a specific area, and discussed it with only one of the potential users in that area; is that correct?

Mr. Goss. I did not really—I just had this discussion with Mr. Head today.

Mr. STEIGER. Did he make a commitment to you as to how many kilowatts?

Mr. Goss. No; he said he was interested.

Mr. STEIGER. Was there any purpose in not discussing with these other potential users the possibility—I will put it this way: You do recognize you would have strengthened your position before the committee if you could have come in with even the most tentative interest expressed by specific consumers?

Mr. Goss. I greatly regret that time did not permit me to do this. And I realize that this committee is faced with a problem as a result of the fact I have not been able to do it. But I simply have been working on this under a full head of steam 7 days a week, all night the other night, trying to get it ready to present to the committee. I simply have not had time.

Mr. STEIGER. You do recognize that your position is weaker because these people were not contacted?

Mr. Goss. Yes, sir. It would have been much stronger had they been.

Mr. STEIGER. And your contention is that the only reason you did not contact them was simply the time element?

Mr. Goss. That is not my contention. That is what I said. Mr. Steiger.

Mr. STEIGER. You also recognize that at least one result of this plan, which is a very exciting and interesting plan, will be to very possibly delay the consideration of this committee. Is that not so? Did you consider that possibility?

Mr. Goss. Yes, sir; I did.

Mr. ASPINALL. If the gentleman will yield to me—I think that is a matter for the chairman of the committee and the subcommittee chairman to determine. I see no reason why this should unduly delay this committee's considerations any more than has been planned.

Mr. STEIGER. Thank you, Mr. Chairman. I just wanted to arrive at the point—the point was the value of the commitment from the other consumers would have been a very significant one as far as the consideration of the committee. I stand corrected.

Mr. ASPINALL. We may get those.

Mr. HOSMER. Would the gentleman yield?

The witness has pointed out himself there is an urgency on this which will cause you to get the CAP this year. We cannot delay or this whole thing is out. He has been badgered.

Mr. STEIGER. I would like to assure my friend I have no intention of badgering the witness. And I would like to assure him of my genuine interest in the plan.

Mr. UDALL. Would my colleague yield so I can badger him a little? You said I think on two occasions here—you have responded by saying while you were not interested in buying from the 1.5 million Hualapai as outlined in the pending bill, that you would be very much interested in buying a million kilowatts from this 5-million-capacity, pump-back Hualapai that you propose.

Now, my question is—Your agency now has pending before the FPC an application to build the Hualapai Dam?

Mr. Goss. Yes, sir.

Mr. UDALL. If there is no Federal Hualapai, or if there is no Hualapai of the kind that you propose here today, would your department still be interested in pursuing that application before the FPC?

Mr. Goss. Yes, sir. Although we have always said that we consider this an area resource that should be developed as such, with others participating. And I feel so strongly about this, that I would be willing to pursue this with others to see if we can't go ahead with it.

Mr. UDALL. Thank you.

Mr. STEIGER. Mr. Goss, how long do you estimate it would take—I guess you would call it—to complete a reconnaissance study of sufficient detail to allow it to be evaluated by either Reclamation or other interested groups?

Mr. Goss. Well, I would expect Reclamation to make such a study. I proposed this as a Federal project. And certainly they are the proper ones to do it if they are interested.

Mr. STEIGER. It is your position then at this time—your idea is now ready for a Reclamation analysis?

Mr. Goss. Yes, sir.

Mr. STEIGER. I have no further questions, Mr. Chairman.

Mr. JOHNSON. Mr. Burton?

Mr. BURTON of California. I have no questions.

Mr. JOHNSON. No questions from the gentleman from California.

Mr. Goss, you mentioned in your statement earlier that you have become more interested in this after December 31.

Mr. Goss. Yes, sir.

Mr. JOHNSON. That was due to the withdrawal of the—power applications. That expired on December 31, did it?

Mr. Goss. That is right. I had a decision to make. Do we pursue this now that the moratorium has run out? And so I asked my people to have a look at it.

Mr. JOHNSON. Well, now, in connection with your participation in the intertie, in the early years of your contract, now pending before the Secretary of Interior for final approval, you bought capacity out of the Northwest?

Mr. Goss. Yes, sir.

Mr. JOHNSON. And some of that was Canadian?

Mr. Goss. Yes, sir.

Mr. JOHNSON. The balance of that over the years, that capacity will be built into the Bonneville system itself?

Mr. Goss. That is right.

Mr. JOHNSON. And they will firm your capacity and you will come up to about 528,000 kilowatts of capacity?

Mr. Goss. That is right.

Mr. JOHNSON. I think you are participating in the Bonneville project and its future developments?

Mr. Goss. Yes, sir.

Mr. JOHNSON. Now, another thing is—in the WEST organization of this particular area, for these coal-fired plants, they have made a study of the one that is proposed at Page, Ariz.?

Do you know, from your participation, did the organization that was going to build Page ever get together and make an honest offer to the Bureau of Reclamation for power for public purposes?

Mr. Goss. I don't know that they did. I have no knowledge on that. I knew about Page, because it was discussed. We had no interest in that plant, that particular plant.

Mr. JOHNSON. Then probably you do not know the actual organizations that are participating in Page at the present time?

Mr. Goss. No, sir.

Mr. JOHNSON. And you would not know anything about the actual offering of the necessary pumping power or prepaid power out of the Page plant?

Mr. Goss. Only what I read in the Secretary's report on February 1.

Mr. JOHNSON. Seemingly there is a rumor there has never been a firm offer made that the organization put together really. Now, they speak about WEST. I am glad you brought this up. Because WEST is just an organization formed to put this together. After they developed the potential down there, individual private companies and public agencies get together and agree to build a certain plant?

Mr. Goss. That is correct.

Mr. JOHNSON. I don't know whether this actually has been put together at Page or not.

Mr. Goss. Nor do I.

Mr. JOHNSON. Or whether there has ever been any firm offer for the prepaid participation on the part of the Government in the Page plant.

I should have asked the Secretary the other day and Mr. Dominy and Mr. Holum when they were here, but I forgot about it. I will in the very near future.

Now another matter I am sure you are confronted with—not only you, but the other private utilities—in your area of operation now, is that there be no more gas or coal-fired plants within that area I assume?

Mr. Goss. We have been notified of that.

Mr. JOHNSON. So you have to get out and seek a source of energy from some other area, if you are going to use gas or coal, and you are pioneering in the nuclear field now within the area. And then I presume you look at Hualapai here as your greatest hydro potential left in that area?

Mr. Goss. Yes, sir.

Mr. JOHNSON. You have had experience in that area, you know exactly what you can do?

Mr. Goss. Yes, sir.

Mr. JOHNSON. That will be all.

I would certainly say as the chairman of this subcommittee that you have made a very fine witness here, you and your group this afternoon. And while this is a very new subject matter to come into this picture, I am sure that the committee and subcommittee will pursue this further, and as we rock along the road to finalization of a piece of legislation, it will probably have many more hearings, both with the Bureau and yourself or your organization, before this would be a reality?

Do you have any further questions?

Mr. ASPINALL. Mr. Chairman, I would ask unanimous consent that any new information that the witness can furnish to us within the time permitted for this hearing be permitted to be placed in the record at this point.

Mr. JOHNSON. You have heard the request of the chairman of the full committee, Mr. Aspinall. Is there objection?

If not, we will ask you, Mr. Goss, and your people to give us further information on this. It is intended that the record will be held open for 10 days after we complete the hearing, for such information.

That is a very short period of time.

Mr. Goss. I will endeavor to supply this committee with all the information I can find that would aid their understanding of the project.

Mr. McFARLAND. If that would include any backup information for your statement, particularly with respect to future power marketing and so forth, and the effect upon the fund—any information along that line that would support your statement would be helpful.

Mr. Goss. Thank you very much. Yes, sir.

Mr. JOHNSON. We want to thank you, Mr. Goss, and your people, for appearing here today.

Mr. Goss. Thank you, sir.

(Information requested follows:)

DEPARTMENT OF WATER AND POWER,
The City of Los Angeles, March 25, 1967.

HON. HAROLD T. JOHNSON,
Chairman, Subcommittee on Irrigation and Reclamation,
Committee on Interior and Insular Affairs,
House of Representatives, Washington, D.C.

DEAR MR. JOHNSON: Accompanying this letter is back-up information in support of the statement which I made before your Subcommittee on March 17, 1967, proposing the development of an enlarged Hualapai Project as a part of the Colorado River Basin Project.

This back-up information includes: (a) A general description of the project; (b) Transmission and Power Market Data; (c) Estimate of Cost to Government and effect on Development Fund.

You also requested for the Subcommittee's file a copy of the study that had been made by the Los Angeles Department of Water and Power in connection with importation of water. This was the "Snake-Colorado Project," a copy of which is also furnished.

Congressman Thomas S. Foley requested that I find out if the Department of Water and Power has studied the comparative costs of desalination and importation. In response to that request, I have determined that the Department has not studied the comparative costs of desalination and importation. The Snake-Colorado Project report considered only the cost of that plan of importation as compared to the Pacific Southwest Water Plan.

This opportunity to present additional information related to the statement which I made before your Subcommittee is appreciated.

Sincerely yours,

FLOYD L. GOSS,
Chief Electrical Engineer and Assistant Manager.

SUPPLEMENTAL INFORMATION TO STATEMENT BY FLOYD L. GOSS, CHIEF ELECTRICAL ENGINEER AND ASSISTANT MANAGER, LOS ANGELES DEPARTMENT OF WATER AND POWER

GENERAL DESCRIPTION

PROPOSED HUALAPAI POWER PROJECT

Recent development of the highly efficient reversible pump turbine and the reversible electric drive unit which functions both as a motor and, in reverse, as a generator, makes possible the expansion of a potential hydroelectric development to a much greater generating capacity. At Hualapai, our preliminary studies indicate that through the use of reversible pump turbines, an installation of 5,000 Mw would produce much greater benefits than the original proposed 1,500 Mw project utilizing conventional hydraulic turbines.

Basically, such a hydroelectric power storage project functions to convert off-peak electric energy which would generally be available to each of the participating utilities, into potential energy, i.e., the energy of water pumped to a higher elevation by the reversible unit. This stored potential energy is then available during on-peak load periods to drive the turbines, developing on-peak energy which is of much greater value than the off-peak energy which was utilized for pumping. During off-peak periods, any water utilized, in excess of stream flow, would be restored by pumping.

Project Design

The Hualapai Dam and Reservoir are proposed to be the same as those designed by the Bureau of Reclamation as indicated in the Pacific Southwest Water Plan, Bridge Supplement, Modified, dated January, 1964.

Figure 1 indicates the proposed power plant layout which is also based on the Bureau of Reclamation design referred to above; however, two underground power plants are indicated instead of one. Our preliminary design sketch indicates six units, each of 425 Mw capacity for each plant. Actual number and sizes of units installed, as well as staging thereof, would be determined by the participants.

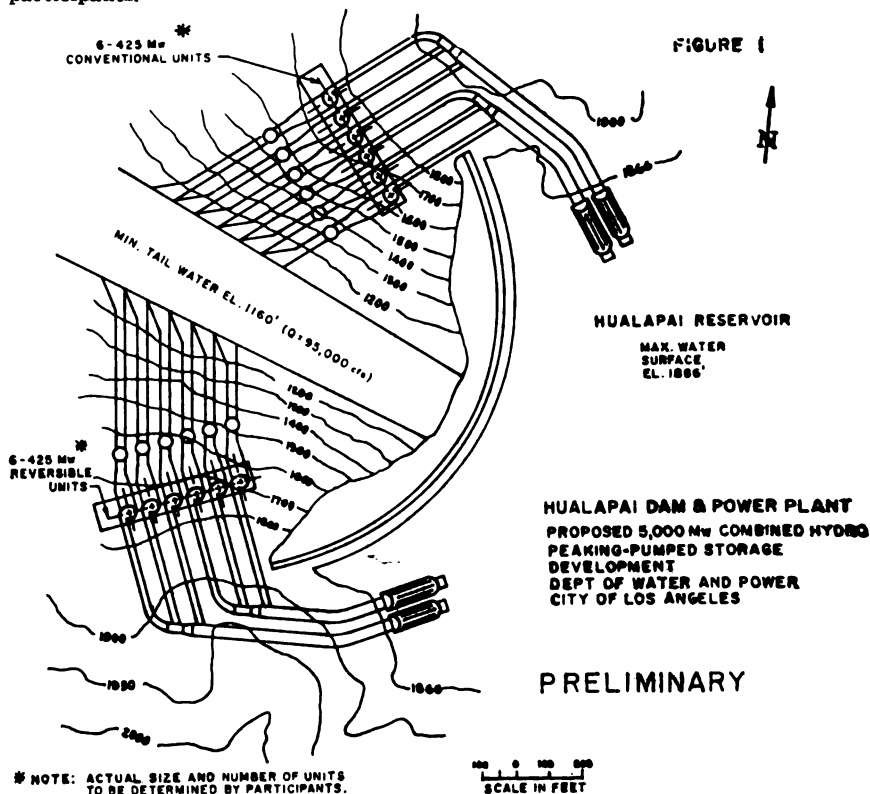


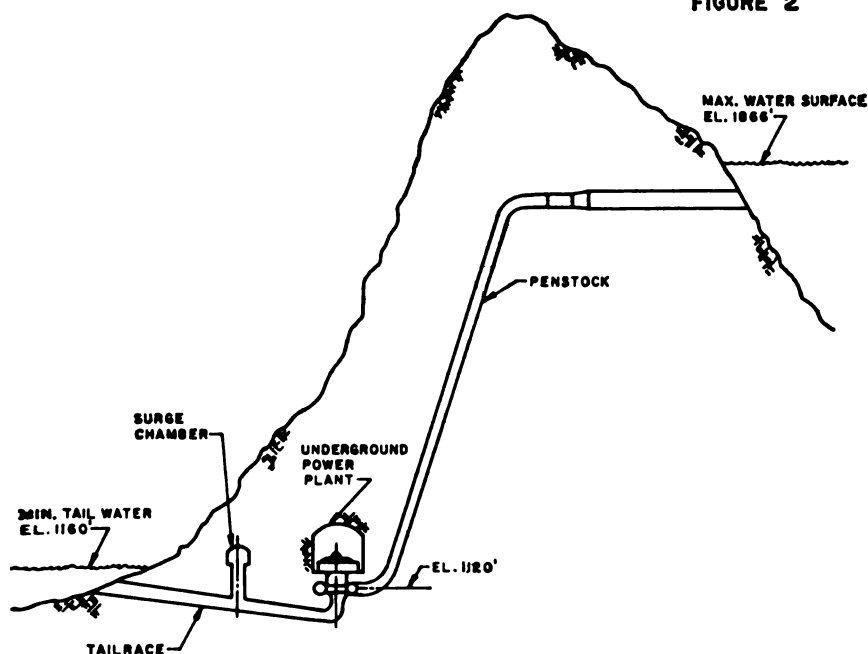
Figure 2 indicates a single generating unit and its associated water ways. This preliminary layout indicates a downstream surge chamber. Final design studies may indicate that this will not be necessary, depending on machine characteristics and length of the tailrace discharge conduit.

The tailbay, which is commonly called the lower forebay for a pumped storage project, would be created by excavation of a tailrace discharge channel downstream from the plant to the site of a weir. It is planned to excavate all of the loose material, sand, gravel, and boulders from the river channel, and, in addition, to excavate, by blasting, a channel of adequate width to handle the design generation flow of 95,000 cubic feet per second.

Due to the extremely flat slope of the river channel downstream from the Hualapai Dam site, it is possible to create a pumping forebay of any desired volume.

This weir will be located at a suitable distance downstream, and constructed to such an elevation as to provide a storage of approximately 40,000 acre feet. It will be a reinforced concrete structure designed as a full over-flow spillway having a capability of passing 500,000 cfs, which is the design flood flow. In the

FIGURE 2



PRELIMINARY

HUALAPAI POWER PLANT
PROPOSED 5,000 MW COMBINED
HYDRO-PEAKING PUMPED
STORAGE DEVELOPMENT
DEPT OF WATER AND POWER
CITY OF LOS ANGELES

lower portion of the tailbay weir will be a number of slide gates which can be opened to permit passage of the design generation flow of 95,000 cfs.

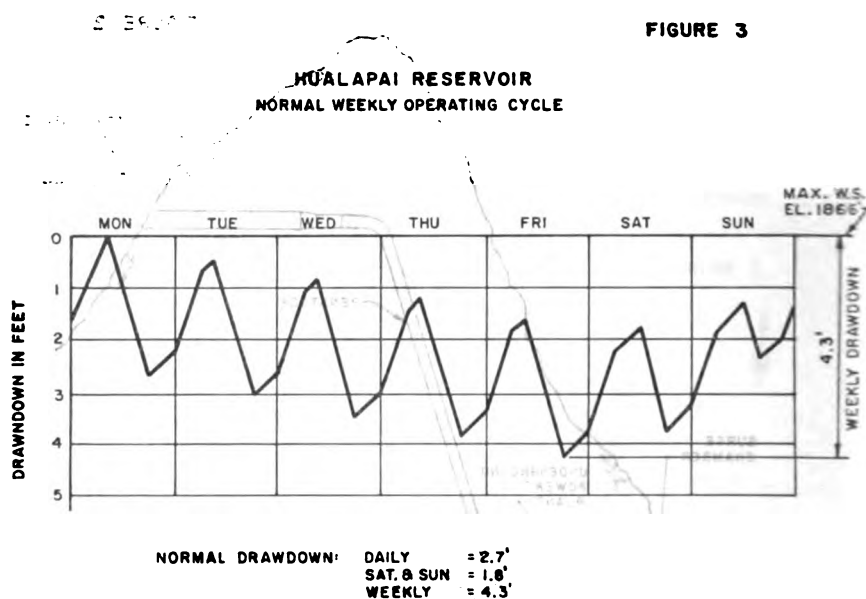
When it is desired to accumulate water in the tailbay for pumping during the forthcoming off-peak period, these slidegates will be closed by remote control from the power plant. Under these conditions, water from the turbine discharge will accumulate in the tailbay, and be available for pump-back at the close of the generation period.

Project Operation

The operation of this project has been analyzed on a daily and a weekly basis in terms of its effect on the water surface elevation in Hualapai Reservoir. Figure 3 indicates the variation in the elevation of the water surface of Hualapai Reservoir during a normal weekly operating cycle. The variation on weekdays is indicated as 2.7 feet. However, on Saturdays and Sundays, the variation is approximately 1.8 feet. The large surface area of the Hualapai Reservoir permits the operation of this pumped storage cycle on a weekly basis with these small variations in the elevation of the water.

When a generating unit, conventional or reversible, of any participant, is not in service for either pumping or generation, this unit would probably be utilized as spinning reserve. Under this condition, it is running as a motor, synchronized to the system, and immediately available to pick up load. Compressed air is introduced into the runner space, forcing the water level down to a lower elevation, so that the turbine runner turns in air, not water. Due to the large storage

FIGURE 3



NOTE:
UNDER ASSUMED CONDITIONS OF INFLOW,
ALLOCATION OF CAPACITY TO SPINNING
RESERVE AND GENERATION PATTERN.

capacity of Hualapai Reservoir, in a large-scale emergency involving a number of the participants, and perhaps extending over a period of many hours, the entire project generating capacity would be available until the cause of the emergency was rectified.

Advantages of the Hualapai Site

The Hualapai site is unique in that it combines all of the following:

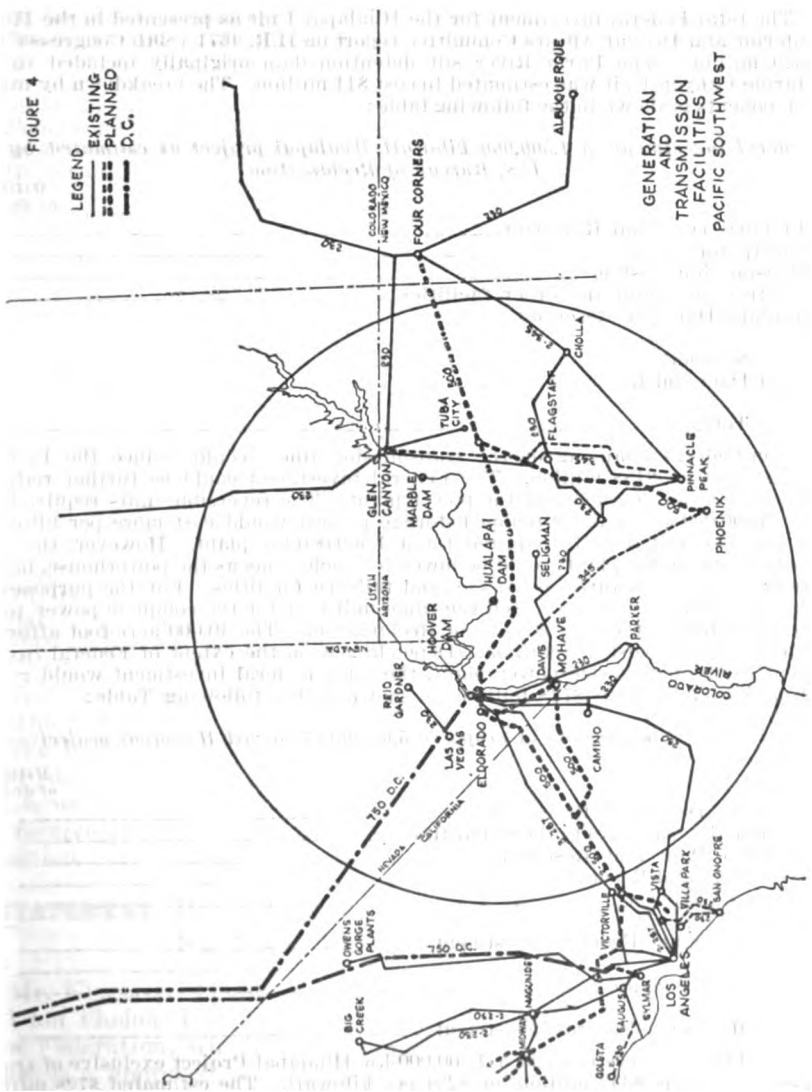
1. The geologic structure of the canyon permits the construction of a relatively inexpensive arc dam of sufficient height to develop hydroelectric power in a very economic manner.
2. Due to the very shallow slope of the river channel downstream from the Hualapai Dam site, it is possible to create a pumping forebay of any desired volume.
3. The proximity of the upper forebay (Hualapai Reservoir) to the lower pumping forebay, represents a tremendous economic advantage for this location. This proximity results in a minimum expense for water ways, and also minimal friction-head losses which, in many projects, would be a significant economic factor.
4. The flow of the Colorado River being regulated upstream at Glen Canyon is an ideal circumstance. This permits the operation of a large project of 5,000 Mw for an appreciable period without pumping; in contrast, pumped storage projects generally have to pump all of the water which they utilize at an over-all cycle efficiency of approximately 70 percent.

The combination of these attributes at one location is a rare circumstance. This is especially true, considering the magnitude of the flow involved. Few locations in the entire United States would provide the setting for the development of such a large peaking power plant.

TRANSMISSION AND POWER MARKET

Transmission

Figure 4 is a map showing existing and planned generation and transmission in the Pacific Southwest.



Power Market

The load estimates for 1975 and 1980 were taken from studies made by WEST Associates. The area included in the circle of radius 250 miles shown on Figure 4, plus Southern California, was taken to be the power market area for Hualapai.

COST TO GOVERNMENT AND EFFECT ON DEVELOPMENT FUND

The total Federal investment for the Hualapai Unit as presented in the House Interior and Insular Affairs Committee report on H.R. 4671 (89th Congress) was \$529 million. The Paria River silt detention dam originally included in the Marble Canyon Unit was estimated to cost \$11 million. The breakdown by major components is shown in the following table:

Federal investment in 1,500,000 kilowatt Hualapai project as estimated by the U.S. Bureau of Reclamation

	Millions of dollars
Hualapai Dam and Reservoir.....	168
Powerplant	140
Transmission system.....	188
Construction camp and other facilities.....	21
Coconino Dam and Reservoir.....	12
Subtotal	529
Paria Dam and Reservoir.....	11
Total	540

Non-Federal financing of the transmission lines would reduce the Federal investment by \$188 million. The Federal investment could be further reduced by non-Federal financing of the power plant. The reversible units required for the 5,000,000-kw peaking pumped-storage project would cost more per kilowatt than conventional units required for a 1,500,000-kw plant. However, the unit costs of the larger plant would be lower for such items as the powerhouse, larger units, intake structures, penstocks and tailrace facilities. For the purposes of this preliminary study we used the same unit cost for the complete power plant as estimated by the U.S. Bureau of Reclamation. The 40,000 acre-foot afterbay is estimated to cost \$50 million. Depending upon the extent of Federal investment in the larger size power plant, the total Federal investment would range from \$254 million to \$728 million as shown in the following Table:

Federal investment in proposed 5,000,000-kilowatt Hualapai project

	Millions of dollars
Hualapai Dam and Reservoir.....	168
Construction camp and other facilities.....	13
Coconino Dam and Reservoir.....	12
Paria Dam and Reservoir.....	11
Hualapai afterbay.....	50
Minimum Federal investment.....	254
Powerplant	486
Construction camp.....	8
Maximum Federal investment.....	728

The Federal investment in a 1,500,000-kw Hualapai Project exclusive of transmission lines is \$352 million, or \$234 per kilowatt. The estimated \$728 million cost for the 5,000,000-kw Hualapai Project results in a unit cost of \$146 per kw. Use of the current Federal interest rate of 3.225% and the maximum payout period of 50 years gives an annual capital cost of capacity at the bus bar of \$9.30 per kw-yr. for the smaller project, and \$5.85 per kw-yr. for the larger project, a difference of \$3.51 per kw-yr. We have not made a detailed year-by-year payout analysis of the larger project, since the U.S. Bureau of Reclamation has an established computer program which can accomplish this task. Also, the precise terms and conditions for the sale of capacity and energy are a matter

for future negotiation. However, our preliminary studies show that there is no doubt that the larger plant will produce greater revenue to the Development Fund than the smaller plant.

We have assumed that the cost of power for pumping for the Central Arizona Project will remain the same as estimated by the Bureau of Reclamation (2.5 mills per kilowatt-hour for irrigation and \$10 per kw-yr. and 3 mills per kwh for municipal and industrial pumping). Appropriate arrangements can be made with the utilities to deliver the energy to the pumping plants.

An approximation of the contribution to the Development Fund is as follows:

	<i>Amount (in millions)</i>
Annual amortization of maximum Federal investment in 50 years at Federal interest rate of 3.225 percent = $\$728,000,000 \times .0406$	\$29.5
Less annual sale of streamflow energy as estimated by U.S. Bureau of Reclamation	16.5
Annual amount to be paid by capacity charge	13.0
Annual capacity charge required to amortize investment = $\$13,000,000$ $\div 5,000,000$	2.60
Annual operation, maintenance, and replacement	1.00
Total annual cost of capacity at bus bar	3.60

¹ Per kilowatt year.

If capacity at the bus bar were to be sold for as little as \$4.60 per kw-yr., the contribution to the Development Fund from Hualapai Project would be \$250 million at the end of the 50-year payout period, and \$1.1 billion at the end of 75 years. If capacity were to be sold for \$7.00 per kw-yr., the contribution to the Development Fund would be \$2.0 billion at the end of 75 years. A complete financial payout study using the Bureau of Reclamation schedules would show larger contributions if Hoover-Parker-Davis funds were utilized for a rapid repayment of the Hualapai Project and a reduction in Hualapai interests costs. The above values are also conservative since they do not include contributions to the Development Fund from the additional energy produced from the additional head made available by the afterbay excavation. By comparison, the Bureau of Reclamation estimated that the 1,500,000-kw Hualapai plant would contribute about \$845 million to the Development Fund at the end of 75 years.

Mr. JOHNSON. Our next witness will be Mr. Thomas L. Kimball, of the National Wildlife Federation.

We are very glad to have you here, Mr. Kimball. We understand you just returned from a meeting in San Francisco. By the grapevine, we heard you had endorsed the Hualapai Dam. We are glad to receive you here today to give us the benefit of your organization's position.

STATEMENT OF THOMAS L. KIMBALL, EXECUTIVE DIRECTOR, NATIONAL WILDLIFE FEDERATION

Mr. KIMBALL. Thank you, Mr. Chairman.

I am Thomas L. Kimball, executive director of the National Wildlife Federation, which has headquarters here in Washington, D.C. Ours is a nonprofit organization which seeks to attain conservation goals through educational means. The federation has affiliates in 49 States. These affiliates, in turn, are made up of local groups and individuals who, when combined with associate members and other supporters of the National Wildlife Federation, number an estimated 2 million persons.

I appreciate and welcome the invitation to appear here today. Except to file a letter relating to fishing lakes and the central Arizona

project, the National Wildlife Federation heretofore has not expressed its position with respect to the proposals before the subcommittee. I might add that I have just returned from a series of meetings in California. Consequently, I have not been able to follow the testimony of other witnesses who have appeared before the committee.

Before proceeding, however, I should point out that I am a native of Arizona who was fortunate enough to administer State wildlife agencies in both Arizona and Colorado before assuming my present position. Therefore, I am acquainted with most of the Colorado River and can identify personally with problems of the people who reside in its watershed.

Attached is a copy of a resolution adopted last week by our organization. While this resolution is self-explanatory, I should like to enlarge briefly upon it. Obviously, however, we will not comment on all aspects of all bills under consideration here today.

First, we fully recognize the necessity to bring water into the interior of Arizona. Without it, the growth of this State will be severely handicapped.

Second, we hope that power for the central Arizona project can be provided through thermal generation, thereby obviating the need for any hydroelectric dams in the Grand Canyon area. We were pleased when the Interior Department recommended the purchase of power from a utility. We also believe that the Federal Government, or the State of Arizona or its political subdivisions can follow the precedent already established in the Tennessee Valley to utilize steam generation for providing pumping power for the central Arizona project.

Ideally, this steam generation would utilize nuclear energy. Of course, a plant or plants also could utilize fossil fuels to achieve the same objective. In the event such a plan is authorized, we recommend that the principles of conservation be required; (1) that cooling towers or other methods be used to avoid creating thermal pollution and (2) that any coal used for the project be mined under regulations applying the maximum protection for and rehabilitation of the land resources involved.

Third, if the Congress does not adopt the thermal generation concept, we believe that a high dam at the Hualapai—Bridge Canyon—site should be authorized if measures are taken to protect units of the national park system from the dangerous precedent of an invasion by dams and reservoirs. We hope that a narrow strip of land around the resulting reservoir, and the waters, will be designated as a national recreation area. We believe that the remaining lands in the Grand Canyon National Monument should be combined with Grand Canyon National Park, with its boundaries extended upstream to the Glen Canyon National Recreation Area, generally as proposed by the chairman and ranking minority member of this fine committee. Of course, one major benefit of such an extension would be to preclude the construction of a dam at the Marble Canyon site.

We agree on inclusion in the park of a limited area to the rim of the Vermillion Cliffs one-half mile on each side of the river through House Rock Valley in the park. In order to create the least possible disruption to Grand Canyon Game Preserve, the Kaibab National

Forest, and other areas, we recommend that the extended boundaries of Grand Canyon National Park be set as a half-mile on either side of the centerline of the Colorado River rather than following contour lines. Also attached to this statement is another resolution relating to this park extension.

Because of language recognizing the possibility of a dam in the area in the basic acts establishing both Grand Canyon National Monument and Grand Canyon National Park, we do not regard such a revision of boundaries as compromising the integrity of these units of the national park system. However, we prefer the alternate means of no dams.

Fourth, and finally, Mr. Chairman, I should express one other hope of our organization. We hope that the committee, in legislation already under consideration or by new introductions, will reserve for itself all decisions on granting a license for any dam between Glen Canyon Dam and Hoover Dam. Such a procedure, of course, would call for a moratorium on licensing by the Federal Power Commission even if the Congress does not take definitive action to enact legislation for the Colorado River Basin or the central Arizona project.

Again, I thank you for the opportunity of appearing here today.

Mr. JOHNSON. I want to thank you, Mr. Kimball, for your statement. I presume you want both resolutions to appear in the record following your statement.

Without objection, so be it ordered.

Hearing none, so ordered.

(The resolutions referred to follow:)

COLORADO RIVER BASIN PROJECT ACT

Whereas the program of the National Wildlife Federation is firmly based on principles of conservation which recognize a reasonable balance between the preservation and prudent use and development of natural resources for several beneficial purposes, including fish and wildlife management and outdoor recreation; and

Whereas this Federation exerts a leadership role in the development and protection of sound conservation practices, bringing matters in this vital area of American life to the attention of the public; and

Whereas various proposals would authorize a high dam at the Hualapai (Bridge Canyon) site for the purpose of providing revenues to help finance the Central Arizona Project, whereby badly needed supplies of water would be brought into the interior of Arizona; and

Whereas construction of Hualapai Dam would create new fish and wildlife and outdoor recreational opportunities in the lower Colorado River Basin and enhance properties owned by the Hualapai and Havasupai Indian tribes; and

Whereas water salvage programs in some proposals recognize "a reasonable degree of undisturbed habitat for fish and wildlife;" and

Whereas specific provisions are made in some proposals for conservation of scenic, historical, natural, wildlife and archeological features, as well as for the public use and enjoyment of included lands, facilities, and water areas; and

Whereas any Lower Colorado River development should consider this Federation's policy of protecting the integrity of national parks and monuments: Now, therefore, be it

Resolved, That the National Wildlife Federation, in annual convention assembled March 11, 1967, in San Francisco, California, hereby supports these principles: (1) that power for pumping for the Central Arizona Project should be provided through thermal generation; (2) that, if the Congress will not adopt the thermal generation concept, then a dam at the Hualapai site should be favorably considered with Grand Canyon National Monument being incorporated into Grand Canyon National Park and its boundaries adjusted to: create

a narrow Park corridor northward along the west boundary of the Colorado River, including the least amount of wildlife habitat, from the Park's present eastern boundary to the southern boundary of the Glen Canyon National Recreation area, thereby pre-empting construction of Marble Canyon Dam by any agency; and, (3) create a national recreation area adjacent to the proposed Hualapai reservoir in such a manner that the Reservoir will not invade either Grand Canyon National Monument or Grand Canyon National Park.

GRAND CANYON NATIONAL GAME PRESERVE

Whereas by Act of Congress and proclamation of the President of the United States, the Grand Canyon National Game Preserve was set aside for the protection and production of the Kaibab mule deer and other native wildlife; and

Whereas the area known as Kaibab North has attained national recognition because of its ability to provide outstanding hunting and to produce outstanding trophy mule deer; and

Whereas the Kaibab North area provides an outstanding example of multiple use resources management; and

Whereas inclusion of this area in the Grand Canyon National Park would preclude hunting under present policies of the National Park Service; and

Whereas hunting is necessary for proper management of the deer herd, keeping it in balance with the sustaining capability of the environment; and

Whereas elimination of hunting from this area would result in a recurrence of tragic deer die-offs prevalent in the past; and

Whereas sportsmen have contributed in excess of \$350,000 to enhance wildlife values of the Preserve: Now, therefore, be it

Resolved, That the National Wildlife Federation, in annual convention assembled March 11, 1967, in San Francisco, California, hereby asserts its belief that the present status and integrity of the Grand Canyon Game Preserve must be maintained except, possibly, for a narrow strip of land bordering the Colorado River which might be included in an extension of boundaries of Grand Canyon National Park.

Mr. JOHNSON. The chairman of the full committee, Mr. Aspinall?

Mr. ASPINALL. Mr. Chairman, I wish to thank Mr. Kimball, who has proved his capability and his understanding so many times. He has worked in Arizona and Colorado and here in Washington. I want to thank him for the statement.

As I understand it, this is given in the spirit of trying to settle a very complex problem. As far as the organization which you presently head, as executive secretary, you would like to have the canyon as free as it is at the present time. But knowing that there are possibilities that—even if this Congress did not authorize some construction, such as the proposed Hualapai Dam—later on, even as the Secretary of Interior presently recommends, we will have to fight this problem all over again. More than likely, if the power is needed, the facility will be built. In that spirit, you are willing to go along with the Hualapai Dam. Is that correct?

Mr. KIMBALL. That is correct.

Mr. ASPINALL. Also, I think that you have evaluated, have you not, the fight that would result on the floor of the House if we brought up authorizing legislation permitting the Bureau of Reclamation to own and operate thermal-fired plants, comparable to the authority presently given to the TVA operation, which is not in the present reclamation program?

Mr. KIMBALL. Yes, we recognize that problem, and consequently we came up with the other recommendation. In the event Congress in its wisdom does not authorize the thermal plants.

Mr. ASPINALL. And with the experience that you have had, while trying to get water to Arizona, which do you think would be the more

difficult fight at the present time: the fight to give the Bureau of Reclamation this additional authority or the fight with some of those people with whom you are associated and who are so sincerely dedicated to their position of complete preservation? Which do you think would be the most serious fight?

Mr. KIMBALL. They are both extremely difficult, Mr. Chairman. I would hesitate to determine which would be the most difficult, except that private utilities, I think, would take an extremely dim view of breaking into ground in this area. And of course, this will be up to Congress to determine in its wisdom.

Mr. ASPINALL. You referred to other legislation relative to the river. It is not before this committee, but I can assure you that I wish to work as constructively as possible in trying to obtain our goals as far as keeping the river inviolate from now on.

Mr. KIMBALL. I am hopeful that if the Hualapai Dam is authorized, that the park can be extended, not only that portion of the monument that would be included, but also the extension up to Lee's Ferry and above, so that we can preempt any further developments in the river, and maintain that hundred miles plus to the principal part of the Grand Canyon inviolate.

Mr. ASPINALL. You realize that in the bill that was introduced by myself, relative to the change in the boundaries, all that I had in mind was to continue, regardless of nomenclature—to continue the area in the same condition in which it is at the present time.

Mr. KIMBALL. That is right.

Mr. ASPINALL. That is all.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. Is that a fairly firm figure—2 million members in the group you represent?

Mr. KIMBALL. Yes.

Mr. HOSMER. Do you know what the Sierra Club claims?

Mr. KIMBALL. I am not familiar with their latest developments.

Mr. UDALL. The testimony yesterday was 47,000, or something like that.

Mr. HOSMER. Thank you; thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall.

Mr. UDALL. Mr. Kimball, I wanted to say your statement and the action of your organization in California recently was one of the most heartening things that happened in sometime, and restored by faith in the reasonableness of man. And I think it contrasts rather markedly with that of another organization whose name was mentioned just a moment ago here. Yesterday, I pointed out that they had refused to accept two dams last year. I asked them if they would accept a new proposal for one dam. They said "No." I said would you accept a proposal if we lowered the dam 90 feet, and kept it away from the national park? "No." Would you accept if we lowered it 200 feet, and kept it out of the national monument. They said "No." I said would you accept as a compromise knocking the dam out altogether, but reserving the question for the next 5 years in the National Water Commission as to whether we build a dam then; and they said "No." So I think the position of your organization is a realistic one; it is a statemanlike position, and one that, as I say, is heartening.

I thank you.

Mr. ASPINALL. Would my colleague yield? Do I understand that my colleague is—you are damned if you do and you are damned if you don't. Is that it?

Mr. UDALL. Yes.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt?

Mr. WYATT. I would like to thank you, Mr. Kimball, for your remarks here, and would like to comment that I appreciate personally the temperate tone of your statement and the responsible approach and tactics which you have presented on behalf of your organization.

Mr. KIMBALL. Thank you.

Mr. JOHNSON. The gentleman from California, Mr. Burton?

Mr. BURTON of California. No questions, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke?

Mr. REINECKE. No questions, Mr. Chairman.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Thank you, Mr. Chairman.

Mr. Kimball, do you see any relationship between the population explosion and the construction of a dam in the Grand Canyon National Monument, or the Grand Canyon itself?

Mr. KIMBALL. I am sorry—I did not get that.

Mr. STEIGER. Do not be dismayed, Mr. Kimball. You pointed out that you had not had the advantage of listening to previous testimony. This was a relationship established in previous testimony. I just wondered if you had ever given the relationship of the two any thought, in view of your role as a leading proponent of conservation?

Mr. KIMBALL. No; I had not.

Mr. STEIGER. Thank you. I have no further questions.

Mr. JOHNSON. Any questions by the staff?

We want to thank you, Mr. Kimball, for giving us the benefit of your paper here this afternoon.

Our next witness will be Robert T. Dennis, who is going to give us the statement in behalf of the Izaak Walton League of America.

STATEMENT OF ROBERT T. DENNIS, ASSISTANT CONSERVATION DIRECTOR, IZAAK WALTON LEAGUE OF AMERICA

Mr. DENNIS. I am Robert T. Dennis, assistant conservation director of the Izaak Walton League of America.

I have filed a short statement and resolution which I ask to be printed in the record.

Mr. JOHNSON. Your request will be granted. Your statement will be printed in the record in full as well as the resolution.

You may summarize your statement.

(The prepared statement follows:)

STATEMENT OF THE IZAAK WALTON LEAGUE OF AMERICA, PRESENTED BY ROBERT T. DENNIS, ASSISTANT CONSERVATION DIRECTOR

I am Robert T. Dennis, Assistant Conservation Director of the Izaak Walton League of America.

The League is a nationwide organization of citizens dedicated to the wise and proper management and use of the Nation's natural resources. We appreciate the opportunity to appear before you today.

The legislation under consideration here is a complex package. We support the central purpose of all these bills—to head off a major water crisis in the southwest.

We oppose construction of dams in the Grand Canyon. A resolution establishing that policy, adopted by our national convention of 1965, is attached to our statement. We request that it be included in the hearing record.

The League does not see any conflict between its opposition to Grand Canyon dams and its support for the purpose of the legislation. Apparently the Administration shares our view—we support the approach it has recommended.

Mr. Chairman, we outlined our position in considerable detail during committee hearings of the last Congress. We see little need to burden the record with repetition.

In closing, however, we wish to emphasize one other concern. The proposed Hooker Project would invade the Gila Wilderness Area. We recognize that such intrusion is permitted under terms of the Wilderness Act—but special action of the President is required.

The Wilderness Act, would also seem to require careful analysis of proposed projects incompatible with its purposes—and, at least by implication, a thorough search for alternatives. No evidence of special consideration of this issue by the Administration has come to our attention. Interior Department statements make no mention of it. And, as nearly as we can determine, neither the Forest Service nor the Department of Agriculture have recently discussed the problem with this committee—or been asked to do so—during consideration of Colorado River legislation.

The Izaak Walton League believes this situation should be corrected. We support the integrity of wilderness areas as we support the integrity of the Grand Canyon. Perhaps Hooker Dam is another matter deserving attention by a National Water Commission.

Mr. Chairman, thank you for considering our views.

DAMS ON LOWER COLORADO RIVER

Whereas the Grand Canyon National Park and Grand Canyon National Monument comprise one of the world's most remarkable scenic climaxes, are keystones in the National Park System, and are recognized throughout the world as symbols of America's far-visioned national park policy; and,

Whereas proposals are now before Congress to construct two dams on the Colorado River—one at Marble Canyon above the Park which would change the river regimen through the Grand Canyon, and one at Bridge Canyon which would create a reservoir flooding through the Monument and into the Park, inundating or damaging for all time vital elements and phenomena of this unique and inspiring region; and,

Whereas such invasion would be clearly adverse to the purposes of the Monument and Park, would serve no direct reclamation purpose, and would flout President Theodore Roosevelt's admonition to the American people: "I want to ask you to do one thing in connection with the Grand Canyon in your own interests and in the interest of the country. Leave it as it is. You cannot improve on it. The ages have been at work on it, and man can only mar it," and,

Whereas the policies of the Izaak Walton League of America and the principles of the National Park System hold that the purposes of national parks and monuments are for conserving areas of unique scenic, ecologic, geologic, historic, and related natural values unimpaired for the benefit of all the people and such invasion, if permitted, would carry an awesome threat to the very foundations of the National Park System; and,

Whereas the proposed Bridge and Marble Canyon dams would in no way contribute to the water needs of the southwest, but are conceived solely for the purpose of producing hydroelectric power to finance a water supply project elsewhere in the region; and,

Whereas coal, shale oil, and atomic energy offer alternative sources of electric power for the area: Now, therefore, be it

Resolved by The Izaak Walton League of America in convention assembled this 19th day of June, 1965, at Cody, Wyoming, That it opposes construction of dams at Bridge Canyon and Marble Canyon on the lower Colorado River, or any other regimentation of the Colorado River between Glen Canyon Dam and Hoover Dam which would have similar impact upon the National Park and the National Monument.

Mr. DENNIS. Mr. Chairman, last year in the last Congress, before this committee we went into some details of our concern about both the proposals to construct Marble Canyon and Hualapai Dams. There has been no change in that. I do not believe, then, that we would need to go through that sequence again.

The league is opposed to both of those dams. We do support the purposes of the legislation to improve the water resources situation in the Southwest. We gather that this general viewpoint is now shared by the administration, and support its approach.

I would like to go into—just take a little time to talk about the Hooker project in New Mexico. This proposal, as we understand it, would invade the Gila wilderness area. We recognize such intrusions permitted under the terms of the Wilderness Act, but that special action of the President is required in that regard. The Wilderness Act would also seem to require careful analysis of proposed projects incompatible with its purposes, and at least by implication a thorough search for alternatives to such projects. No evidence of special consideration of this issue by the administration has come to our attention. The Interior Department statements make no mention of it, and as nearly as we can determine, neither the Forest Service nor the Department of Agriculture has recently discussed the problem with the committee.

We believe that this situation would be corrected. In short, what we are asking I think is that there be presented to the public some of the aspects of this proposal so that we can judge it more fully. Certainly we do support the integrity of wilderness, as we support the integrity of the Grand Canyon. Just a request on our part, I guess, that this issue be brought out in the open also.

Mr. Chairman, we thank you for considering our views.

Mr. JOHNSON. Thank you for your statement.

The gentleman from Colorado, Mr. Aspinall.

Mr. ASPINALL. Mr. Chairman, I don't believe I have any questions of Mr. Dennis.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer?

Mr. HOSMER. No questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall?

Mr. UDALL. Pass.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt?

Mr. WYATT. I have no questions.

Mr. JOHNSON. The gentleman from California, Mr. Burton?

Mr. BURTON of California. No questions.

Mr. JOHNSON. The gentleman from California, Mr. Reinecke?

Mr. REINECKE. No questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger?

Mr. STEIGER. No questions, Mr. Chairman.

Mr. JOHNSON. We want to thank you, Mr. Dennis. I notice your organization appeared here last year, and your testimony is in the old record. And your statement and resolution will be in this record.

Thank you.

Our next witness is Mr. Alan P. Carlin.

Mr. Carlin, are you supported with another gentleman who wishes to participate?

Mr. CARLIN. I regret that my colleague, Dr. Hoehn, is unable to be here as he had hoped, due to urgent medical problems. And I would ask that Mr. Laurence Moss might be able to assist me in his area of expertise.

Mr. JOHNSON. All right. Mr. Carlin.

You have a very strong statement here. Your statement will be placed in the record at this point in full. We hope that you can summarize your statement for us.

Mr. CARLIN. Yes, sir.

Mr. JOHNSON. All right.

You may proceed.

**STATEMENT OF ALAN P. CARLIN, ECONOMIST; ACCOMPANIED BY
LAURENCE I. MOSS, NUCLEAR ENGINEER**

Mr. CARLIN. Dr. Hoehn and I have made several minor corrections in our statement since it was submitted to the committee staff. I will leave a corrected copy with the staff. I also have an errata sheet showing the most important if these corrections for anyone wishing a copy.

I should like first to stress that the views expressed here and in our prepared statement are offered as private citizens and professional economists, and are not necessarily those of our employer, The RAND Corp., or the Federal agencies that support it.

Since I last appeared before this subcommittee in May 1966, our research into the economics of the proposed Grand Canyon dams has continued along three general paths.

First, we have reviewed the arguments made last year by all parties to pick out the issues of greatest importance from the standpoint of economic theory, and to relate these issues to the basic guidelines used for evaluating Federal water resource projects.

Chart 1 enumerates the four major differences found between the cost-benefit practices of the Bureau of Reclamation in their evaluation of the dams and those dictated by prevailing economic theory. Our 1966 analyses were corrected for the first three of these.

With regard to the first item, I should like to point out that it is quite possible to justify any hydroelectric project by choosing a sufficiently high cost alternative, but only the least cost alternative provides any information as to the economic feasibility of such a project.

The second item, the use of a higher interest rate for the alternatives, can be compared to the use of, say, the price of common brick in costing one brick building and face brick in costing an alternative. Naturally the latter looks worse than it really is, and the results are even more meaningless in the case of the hydroelectric projects under consideration, since the price differences are greater.

What the Bureau maintains in the third item listed on the chart is that an alternative must distribute energy to precisely the same customers as would the project, rather than seeking to minimize the total delivered energy costs through an appropriate redistribution of loads among the region's existing and planned generating facilities.

The fourth item concerns the Bureau's use of a rate of interest below even that at which the Treasury can currently borrow, and with no allowable for the economic risks associated with projects of this type.

This brings us to the second line of inquiry—the revision of our 1966 benefit-cost ratios. Although we used the same low rate of interest used by the Bureau for the projects in evaluating both the projects and the alternatives in these earlier studies, our new analysis, the results of which are shown in chart 2, also evaluates the projects at 5 percent to show the marked sensitivity of the benefit-cost ratios to changes in the assumed rate. This new analysis was necessitated by changes in nuclear costs in the last year—a year which has seen nuclear plants gain unprecedented acceptance by both public and private utilities—and reflects the increased interest in the Hualapai or Bridge Canyon project. This analysis also incorporates some added refinements recommended by a Federal Power Commission technical memorandum.

The new ratios shown in chart 2, which we believe to be overstated for reasons enumerated in our statement, are even further below 1 to 1 than those presented last year. In fact, they are so far below 1 to 1 that the dams would not be economically justified even if the Bureau of Reclamation is alleged \$6 per kilowatt-year transmission costs were added to the cost of our nuclear alternatives.

All these conclusions relate to the projects proposed in bills now being considered by the committee, and not to those discussed earlier today by the Los Angeles Department of Water and Power. We will be happy to study these new ideas if and when detailed economic and cost studies should be made available to us.

Please note that the benefit-cost ratio for the Hualapai project shown in chart 2 is only 0.61 to 1 at 3½ percent.

Our third area of research was to analyze the only serious, publicly available attempt we know of that has appeared since last May that appears to contradict our 1966 findings. And even it, as we learned when we finally managed to obtain a copy, relates to only two paragraphs out of our 1966 statement. Specifically, we are referring to a study prepared by the Ralph M. Parsons Co., for the Arizona Interstate Stream Commission which unfavorably compares the revenue producing capabilities of nuclear alternatives with those of the Grand Canyon dams.

On analysis, Dr. Hoehn has found even this study's conclusions to be highly questionable. The most important of the reasons he holds this view are enumerated on chart 3.

He finds it difficult to take seriously a study which is based on an analysis which implies that nuclear powerplants taken by themselves, without transmission costs, cannot break even at any aggregate fixed charge rate above 6.1 percent. If true, this would imply that over the last few years, American private utilities have made a miscalculation unparalleled in the history of private sector investment decisions. The most important reasons for this unusual implied conclusion of the Parsons study, Dr. Hoehn feels, are listed in the remainder of chart 3.

In conclusion, I should like to emphasize that after careful analysis, our conclusion is that the benefit-cost ratio found for the Hualapai

project, the principal project now under consideration by the committee, is no more than 0.61 to 1 at $3\frac{1}{8}$ percent interest. In our professional judgment, this project is therefore economically unjustified beyond any reasonable doubt.

Mr. JOHNSON. That is your summary of your statement.

We want to thank you for your summary of your statement, which will appear in the record.

Chart 1

RECLAMATION'S ECONOMICALLY UNJUSTIFIED BENEFIT-COST PRACTICES
IN EVALUATING GRAND CANYON DAMS
(ISSUES OF ECONOMIC INTEREST)

- CHOICE OF "MOST LIKELY" RATHER THAN LEAST COST ALTERNATIVES
- USE OF HIGHER INTEREST RATES AND TAXES IN EVALUATING ALTERNATIVES
- INSISTENCE ON SAME TRANSMISSION COSTS FOR ALTERNATIVES AT LOAD CENTERS
- USE OF UNREALISTICALLY LOW INTEREST RATE FOR DAMS

Chart 2

BENEFIT-COST RATIOS USING NUCLEAR ALTERNATIVES

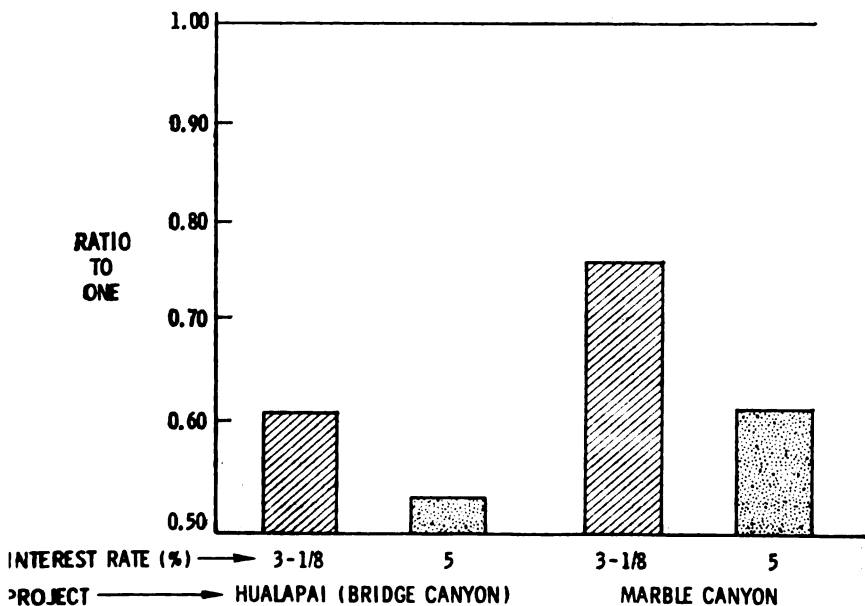


Chart 3

WHY PARSONS STUDY CONCLUSIONS ARE QUESTIONABLE

- IMPLY NUCLEAR POWER IS NOT COMPETITIVE, CONTRARY TO OBSERVED UTILITY BEHAVIOR
- STUDY OVERESTIMATES NUCLEAR COSTS
 - UNNECESSARY TRANSMISSION INVESTMENTS
 - CONSTRUCTION OF FOURTH NUCLEAR PLANT FOR UNNECESSARILY EXPENSIVE RESERVES
 - INFLATED NUCLEAR FUEL COSTS
 - UNNECESSARILY HIGH LAND COSTS
- STUDY UNDERESTIMATES NUCLEAR REVENUES
 - OFF-PEAK ENERGY VALUED AT ONLY 1.5 MILLS/KWH
 - NO CREDIT GIVEN FOR ADDITIONAL ON-PEAK GENERATION FROM NUCLEAR PLANTS

(The prepared statement follows:)

STATEMENT BY ALAN P. CARLIN AND WILLIAM E. HOEHN, ECONOMISTS

Mr. Chairman and members of the Committee. We are residents of Santa Monica, California, and come before you as private citizens not representing any organization. Since your hearings last May we have continued our studies of the economic justification for the proposed Marble Canyon and Hualapai Projects and wish to present the results of this new research to the Committee. We have not received financial compensation in any form for our work. Our qualifications in the field of economics include, in one case, a doctorate from the Massachusetts Institute of Technology and experience in project analysis, particularly in the water, power, and transportation fields, and in the other case, a doctorate in economics from Northwestern University and research over the last several years on the nuclear power industry. We both currently hold positions as Economists with The RAND Corporation, Santa Monica, California.

The new research we have undertaken since last May falls into three general categories. First we reviewed the various arguments presented by all parties in the May hearings to pick out the issues of basic economic interest and to relate these to the present guidelines used for evaluating Federal water resource projects. Secondly, we undertook a re-evaluation of the economic feasibility of both the Marble Canyon and Hualapai projects to bring our analysis up to date in light of changing costs and to reflect the increased importance of the Hualapai Project. Finally, we examined the technical merits of the only publicly available piece of substantive research we know of on the economic or financial aspects of the dams that has been sponsored by dam proponents since the hearings.

RECLAMATION'S QUESTIONABLE BENEFIT-COST PRACTICES

Our research on the first area suggested that the differences between the Bureau of Reclamation's analysis (and that of some other dam proponents, such as Representative Morris Udall) and our 1966 analyses resulted from a number of economically questionable procedures the Bureau had used in computing its benefit-cost ratios. Of these the most important from an economic standpoint were found to be as follows:

(1) Choice of the alleged "most likely" alternative rather than the least cost alternative in evaluating the power benefits from the proposed dams

(2) Use of higher interest rates and taxes in evaluating the alternatives than the projects

(3) Insistence that any alternative must distribute energy to exactly the same customers as would allegedly be served by the projects, without regard to the objective of minimizing the cost of meeting demand in a regional power system.

In addition, although our 1966 analyses did not make a major issue of it, we nevertheless objected to:

(4) The use of a rate of interest below even current costs of borrowing by the Federal Government and with no allowance for the economic risks of the projects.

Perhaps the easiest way to explain these differences is by turning directly to the paper written as a result of this research effort.

THE GRAND CANYON CONTROVERSY: LESSONS FOR FEDERAL COST-BENEFIT PRACTICES

(By Alan Carlin*)

(The RAND Corporation, Santa Monica, California)

Over the last decade the economics profession has devoted considerable energy to suggesting practical procedures for improving the evaluation of water resource projects.[†] It would be difficult, however, to find any area of public policy in which the profession's recommendations have been so nearly unanimous or met so little acceptance in practice. Few cases provide a better illustration of how little change has occurred than the bitter controversy that raged during the 89th Congress over the construction of two dams in the Grand Canyon. This probably represents the first time that a Federal water resource agency has had to make a serious public defense of its economic justification for a major project prior to its authorization as the result of an attack based on the improved procedures recommended by the profession.

The latest round¹ of the Grand Canyon controversy provides ample material concerning the deficiencies of the economic criteria currently used by Federal water resource agencies. It is the purpose of this article to review this material. Although the controversy over the dams has led to a reversal of the Administration's stand on them and some expressions by the leadership of the Interior Department of a desire to examine alternatives to these particular dams² and in the future to all projects before they are submitted to Congress,³ there is little indication that the Administration plans the major overhaul of the economic criteria and project review procedures that would be required to insure that the future development of water resources would be more in accord with economic principles.

* Any views expressed in this paper are those of the author. They should not be interpreted as reflecting the views of The RAND Corporation or the official opinion or policy of any of its governmental or private research sponsors.

I am indebted to Jack Hirschleifer, William E. Hoehn, and William A. Johnson of The RAND Corporation for their comments.

† For a fairly complete bibliography of this work, see A. R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey," *The Economic Journal*, No. 300, December 1965, pp. 731-735.

¹ The battles over the proposed Grand Canyon dams during the 89th Congress constitute something of a separate chapter in the long history of disputes over the Colorado River and the Central Arizona Project. For once, the proponents presented a united front, but faced the much more militant opposition of conservation groups and the Pacific Northwest. Although approved by the House Interior Committee, the Colorado River Basin Project died in the House Rules Committee, apparently because of fears as to what might happen to it if it reached the Floor. On February 1, 1967, Secretary of the Interior Stewart Udall announced a revised Administration plan for the development of the Lower Colorado that excluded both of the Grand Canyon dams.

² In September 1966, Secretary Udall proposed that nuclear power plants be substituted for the Grand Canyon dams in the Colorado River Basin Project.

³ Luther J. Carter reports in "Grand Canyon Dams: Interior to Ask, 'Are They Necessary?'" *Science*, Vol. 154, October 7, 1966, p. 134, that a speech in July 1966 by John A. Carver, then Under Secretary of the Interior, but reflecting Secretary Udall's views, amounted to a frank admission that the traditional approach [to water resource development planning] was faulty.

Carver said that Congress and the public should be informed of the alternatives to hydro-power as a means of financing water projects. "Present procedures," he said, "do not provide an adequate comparison of such alternatives." * * * Classically, legislation, whether it be for a project or a government policy, has been presented by the executive branch to the legislative branch as an act of advocacy, the best possible case for a particular course of action or a single project. The process of identifying alternatives—indeed of discovering whether any exist—is left to the arena of countervailing powers in the political process.⁴

BACKGROUND

The Grand Canyon controversy arose because of the proposal to build two dams in the Canyon as part of the proposed Colorado River Basin Project, one in Marble Gorge and the other in Bridge Canyon. Bridge Canyon Dam (now to be called Hualapai Dam as part of an agreement made with the Indian tribe of the same name) would be located 53 miles downstream from Grand Canyon National Monument while Marble Canyon Dam would be 12.5 miles above the boundary of Grand Canyon National Park. Backed by seven Southwestern States the Project was opposed primarily by conservationists (particularly the Sierra Club) and the Pacific Northwest.¹

The publicly stated purpose of the dams is to provide revenue to subsidize the Central Arizona Project (CAP) to bring Colorado River water to the Phoenix-Tucson area from the existing Lake Havasu impounded by Parker Dam. It has been shown, however (and admitted with certain reservations by the Bureau of Reclamation),² that the dams are not needed to finance the CAP at all³ and that their real but little publicized purpose is to build a fund for the possible future importation of water into the Colorado River⁴ (presumably from the Columbia River) if and when this should prove to be politically and economically feasible.

Briefly stated, the economic controversy over the Projects arose largely as a result of a study⁵ by Dr. William E. Hoehn and the author that concluded that the benefit-cost ratios for both projects are less than one-to-one when compared with nuclear alternatives. The differences between the various estimates are shown in Table 1.

TABLE 1.—Benefit-cost ratios estimated for Grand Canyon dams

[Ratio to one]			
Dam	Original	With added quantification	Bureau of Reclamation
	(1)	(2)	(3)
1. Marble Canyon.....	0.95	0.79	1.7
2. Bridge Canyon (Hualapai).....	.86	.....	2.3

NOTES ON LINES

1 Col. (1): Based on use of General Electric Co. nuclear plant and fuel costs, 10,550 kw acre-feet stream flow, 600 mw nuclear alternative, and 3½ percent interest. Use of lower plant and fuel costs and stream flow, and higher interest rates, all of which are probably more realistic, would lower the benefit-cost ratio below this base case. The figure given is from Alan P. Carlin and William E. Hoehn, "Is the Marble Canyon Project Economically Justified?", reprinted in U.S. Congress, House Committee on Interior and Insular Affairs, Lower Colorado River Basin Project, hearings before subcommittee, 89th Cong., 2d sess., serial No. 89-17, pt. II, May 9 to 18, 1966, p. 1510. This figure also overstates the benefit-cost ratio because it does not include various less easily quantified factors discussed in the paper that on balance are judged to favor the project. Col. (2): Includes additional minor unquantified costs of the alternative insisted upon by Representative Morris Udall as well as partial additional quantification of project costs, as derived in Alan P. Carlin and William E. Hoehn, "Mr. Udall's 'Analysis': An Unrepentant Rejoinder," hearings, p. 1534. This figure still overstates the benefit-cost ratio because of the presence of still other unquantified project costs and continued use of the generous assumption listed under col. (1). Col. (3): U.S. Department of the Interior, Bureau of Reclamation, Pacific Southwest Water Plan, Supplemental Information Report on Marble Canyon Project, Arizona, January 1964, p. 24.

2 Col. (1): Based on use of General Electric plant and fuel costs, project report stream flow, 3½ percent interest, and a combined 762 mw nuclear plant and 588 mw pumped storage plant, as derived in hearings, pp. 1511-1512. Col. (3): U.S. Department of the Interior, Bureau of Reclamation, Pacific Southwest Water Plan, Supplemental Information Report on Bridge Canyon Project, Arizona, January 1964, p. 22.

¹ See U.S. Congress, House, Committee on Interior and Insular Affairs, *Lower Colorado River Basin Project*, Hearings before Subcommittee, 89th Congress, August 23 to September 1, 1965 and May 9 to 18, 1966, Serial No. 89-17 (hereafter referred to as *Hearings*).
² *Hearings*, pp. 1378 and 1397.
³ Jeffrey Ingram, "Study of the Effect of Accelerating the Pay-Out of the Municipal and Industrial Costs: Lower Colorado River Basin Project," *Hearings*, pp. 1472-1474.
⁴ Representative Craig Hosmer, "The Battle of Grand Canyon," *Per Se*, Vol. 1, No. 4, Winter 1966, p. 28.
⁵ Alan P. Carlin, "Economic Feasibility of the Proposed Marble and Bridge Canyon Projects," *Hearings*, pp. 1497-1512. This includes Alan P. Carlin and William E. Hoehn, "Is the Marble Canyon Project Economically Justified?" originally printed as P-3802 by The RAND Corporation, February 1966.

BUREAU'S QUESTIONABLE BENEFIT-COST PRACTICES

In the course of the controversy,⁹ as the Bureau of Reclamation sought to defend its analysis, it developed that the differences resulted from a number of economically questionable procedures the Bureau had used in computing its benefit-cost ratios. Of these, the most important from the point of view of economic theory are as follows:¹⁰

- (1) Choice of what was claimed to be the "most likely" alternative rather than the least cost alternative.
 - (2) Use of higher interest rates and taxes in evaluating the alternative than the project.
 - (3) Insistence that any alternative must distribute energy to exactly the same customers as would allegedly be served by the project, without regard to the objective of minimizing the cost of meeting demand in a regional power system.
- In addition, although the Carlin-Hoehn study did not make a major issue out of it, we nevertheless objected to:
- (4) The use of a rate of interest below even current costs of borrowing by the Federal Government and with no allowance for the economic risks of the projects.

(1) AND (2) MOST LIKELY ALTERNATIVE AND HIGHER INTEREST RATES

The Bureau defended¹¹ its use of what it claimed to be the "most likely" alternative on the basis of a Senate Document.¹² This Document states that "The usual practice is to measure [electric power benefits] * * * in terms of achieving the same result by the most likely alternative means that would exist in the absence of the project."¹³ Further, the Document says that:

"When costs of alternatives are used as a measure of benefits, the costs should include the interest, taxes, insurance, and other cost elements that would actually be incurred by such alternatives rather than including only costs on a comparable basis to project costs as is required when applying the project formulation criteria under paragraph V-C-2(d)."¹⁴

In the case of the Grand Canyon dams, the Bureau obtained the costs of the "most likely" alternative from the Federal Power Commission, which interpreted the concept as follows:

The alternative to a hydroelectric project should be the lowest cost alternative that normally would be selected for the most economic growth of the regional power supply in the absence of the project. The alternative power costs should be based on the types of financing, public or private, that would be expected to apply to the alternative plant. In the case of the Marble Canyon project, we believe that the alternative cost should be based upon a weighting of the cost of power from private and non-Federal public sources in the area in proportion to the amount of power expected to be provided by these sources. With the exception of the TVA area, it has been the policy of Congress not to authorize the con-

⁹ The major published statements by each side besides "Economic Feasibility . . ." are Morris K. Udall, "Analysis of Alan P. Carlin's Testimony—'Economic Feasibility of the Proposed Marble and Bridge Canyon Projects, May 1966,'" Hearings, pp. 1516-1519; Bureau of Reclamation, "Analysis of Alan P. Carlin's Testimony—'Economic Feasibility of the Proposed Marble and Bridge Canyon Projects, May 1966,'" Hearings, pp. 1519-1521; Alan P. Carlin and William E. Hoehn, "Mr. Udall's 'Analysis': An Unrepentant Rejoinder," Hearings, pp. 1521-1535; Laurence I. Moss, "Considerations in the Use of Nuclear Power as Compared with Power from the Grand Canyon Dams," Hearings, pp. 1538-1563; Morris K. Udall, "Analysis of Laurence I. Moss's Testimony, 'Considerations in the Use of Nuclear Power as Compared with Power from the Grand Canyon Dams,' May 1966," Hearings, pp. 1548-1549; and L. I. Moss, "Comments on Morris K. Udall's Analysis of the Testimony of L. I. Moss," Hearings, pp. 1550-1551.

¹⁰ This by no means exhausts the list of differences; most of the others are items of less theoretical interest, such as the Bureau's omission of the value of water evaporated from the reservoirs and price increases since the Bureau made its estimates.

¹¹ "Analysis . . ." Hearings, *op. cit.*, p. 1520.

¹² U.S. Congress, Senate, *Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources*, Document No. 97, 87th Congress, 2nd Session, 1962.

¹³ *Ibid.*, p. 10.

¹⁴ *Ibid.*, p. 8.

struction of Federal thermal-electric plants. A federally financed nuclear plant is not, therefore, a reasonable alternative to hydroelectric power development outside the TVA area.¹⁵

This directly conflicts, it should be pointed out, with stated Commission policy with respect to projects that come before it for licensing under the Federal Power Act. In *Idaho Power Company*¹⁶ the Commission said that:

"When the comparative economics of two mutually exclusive plans are to be delivered, it is essential that all plans be compared on as similar a basis as is possible from the record, and this would include the use of the same assumed basis of financing, whether that be private financing or Federal financing."

Specifically, in computing the cost of the alternatives to the Grand Canyon dams, the FPC used the cost of power from five existing steam-electric plants "based on a combination of both private and non-Federal public financing in proportion to the electric power requirements of these groups in the market area."¹⁷ The Commission does not state exactly what average rate it effectively used for capital charges, but it was probably between 10 and 15 per cent.¹⁸ Ignoring differences in depreciation charges, this can be compared with the 3.17 per cent used by the Bureau.¹⁹

Whatever its legal standing may be, the trouble with the "most likely" alternative principle is that there is no economic justification for its use and no objective standards for its application. The "most likely" alternative is inherently a matter of judgment. Its faithful application would involve attempting to foresee whether a privately or publicly owned utility would build the marginal addition to a regional grid at some time in the future (due to the longer construction period generally required for a hydroelectric project) and to infer the type of plant, location, and cost of such a plant. The approximations inevitably involved in applying such a criterion have already been suggested by the FPC Memorandum. In this particular case, the rapid introduction of nuclear power for new projects in the last few years suggests that the application of the "principle" may have engendered particularly inaccurate forecasts of alternative costs.

But even assuming that the Bureau or FPC can divine what is the "most likely" alternative, the principle runs into theoretical problems because the hypothetical utility is very likely to face quite different factor costs (particularly for capital) and taxes in selecting the type of plant to be built as its marginal project, and in costing the marginal plant. The result is that the power benefits of the hydroelectric project are valued at the cost to the hydroelectrical alternative supplier rather than the cost to the nation, the relevant consideration in cost-benefit analysis. This means that benefits are inflated by the amount of federal, state, and local taxes and added capital costs the alternative supplier must pay. Taxes generally do not represent a real resource cost to the nation—just a politically acceptable way of raising revenue. Although the implicit interest rate used to derive the cost of the "most likely" alternative is probably close to that which pure economic theory would require the Project to use, the appropriate interest rate is subject to some dissent. Not subject to dissent, in the author's opinion, is that *the same interest rate must be applied to the evaluation of both the project and the alternative*.²⁰ To do otherwise is to value the resources used at different prices and hence to compare final cost estimates that are not comparable.

Senate Document 97 seeks to justify the use of the "most likely" alternative on the basis that this "standard affords a measure of the minimum value of such

¹⁵ Memorandum of May 11, 1966, to the Commission from F. Stewart Brown, Chief, Bureau of Power, on the subject of "Marble Canyon Project, Arizona" (unpublished), p. 1.

¹⁶ 14 F.P.C. 55, 63, as quoted in Federal Power Commission, "Decision, Arizona Power Authority, Project No. 2248, upon Application for License under Section 4(e) of the Federal Power Act (issued September 10, 1962)," p. 31.

¹⁷ Memorandum of May 11, 1966, *op. cit.*, p. 2.

¹⁸ The FPC states (*ibid.*, p. 2) that the five plants had capital costs of \$102 to \$120 per kw and that the computed cost of power was \$19.05 per kw-yr plus 3.37 mills per kwh. The fixed charge of \$19.05 is 17.3 per cent of \$110, but this no doubt includes other fixed costs besides capital charges on the generating plants.

¹⁹ U.S. Department of the Interior, Bureau of Reclamation, *Pacific Southwest Water Plan, Supplemental Information Report on Marble Canyon Project, Arizona*, January 1964, p. 23. This figure includes depreciation of 0.17 per cent. The assumed life of the Commission's steam plants was presumably less than the dams, so that depreciation would be higher and the two rates of interest not strictly comparable.

²⁰ Perhaps the best reference is Otto Eckstein, *Water-Resource Development*, Cambridge, Harvard University Press, 1958, p. 242.

benefits or services to the users."²¹ This, however, ignores the fact that in power development the choice is almost always between competing alternative sources rather than between power and no power in the area. The economic analysis should therefore also be directed at the same question. To attempt to enter the murky world of "value to the users" in order to decide which alternative is more economical is not only empirically difficult, but also irrelevant to the economics of power development.

(3) TRANSMISSION COSTS

The Bureau insists that transmission costs of \$6 per kw-yr be included in the cost of any alternative to Marble.²² This compares with \$6.68 per kw-yr used in their Marble calculations.²³ Representative Morris Udall, the leading Congressional advocate of the Colorado River Basin Project, explains²⁴ that:

"It is our contention, no matter where in the five States (California, Nevada, Arizona, New Mexico, and Utah) that a nuclear alternative or alternatives would be located, or even if you put one in Arizona and one in California, that substantially the same expenditure would be necessary to transmit the peaking power from the nuclear alternative to the same load centers as peaking power from the hydroplants will be delivered."

He then "demonstrates" the need for transmission facilities by showing the amounts of peaking power which, he claims (without supporting references), "will be required to be delivered to each load center." This includes about seven per cent for Utah and Northern New Mexico, despite the Federal Power Commission's statement that in its computations of the cost of the "most likely" alternative it assumed that "Arizona, Southern California, and Southern Nevada would be the [only] area in which power from the two hydroelectric projects would be marketed."²⁵ But even assuming that Mr. Udall was factually correct as to the proposed distribution of Marble and Bridge power, his claim that substantially the same distribution costs would be required can only be said to be highly dubious.

Even if one accepts Mr. Udall's assertion that the alternatives must serve exactly the same load centers as he alleges would be served by the dams, it does not follow that substantially the same costs would be involved. Nuclear alternatives can be placed much closer to load centers than the singularly remote Grand Canyon, and there is a marked difference between the costs of transmitting power east and west across Arizona and Southern California. By placing the alternative to Hualapai Dam near Los Angeles and the Marble alternative at Lake Havasu, most of Mr. Udall's alleged power distribution could be served with little additional transmission expenditures beyond a transmission line from Lake Havasu to Phoenix.²⁶

The marked difference between the cost of transmitting power east and west across Arizona and Southern California reduces, if not eliminates, the cost of serving the remaining bits and pieces of load that Mr. Udall claims outside the major metropolitan centers near Phoenix and Tucson and along the Southern California Coast. Because present and planned generating capacity in Northern Arizona and nearby areas of adjoining states greatly exceeds present and projected peakload demands in the same area, there are now and are expected to be in the foreseeable future substantial exports of power to Southern California.

²¹ *Op. cit.*, p. 8.

²² "Analysis . . ." Hearings, p. 1521.

²³ Based on U.S. Department of the Interior, *op. cit.*, pp. 18, 20, and 25. Interest and amortization charges of \$4.65 per kw-yr are computed on the basis of a 3.17 per cent return (2 per cent interest plus depreciation as used by the Bureau, p. 25), and 8.5 per cent allowance for interest during construction (as in Bureau calculations, p. 25). At 3¼ per cent interest, the equivalent cost is \$6.83 per kw-yr.

²⁴ "Analysis of Laurence I. Moss's Testimony . . ." Hearings, p. 1548.

²⁵ Memorandum of May 11, 1966, *op. cit.*, p. 2. It is interesting to note that no part of Utah is even shown in the "Power Market Areas" for either the Marble or Bridge Canyon Projects by the Bureau of Reclamation (see U.S. Department of the Interior, Bureau of Reclamation, *Pacific Southwest Water Plan, Supplemental Information Report on Bridge Canyon Project, Arizona*, January 1964, Drawing 65-314-28 and Marble Canyon Project Report, *op. cit.*, Drawing 65-314-25).

²⁶ This was included in the costs of the Carlin-Hoehn Lake Havasu alternative (see "An Unrepentant Rejoinder," *op. cit.*, Hearings, pp. 1532-1534). The costs of the alternative included generating off-peak power for the Central Arizona Project pumps, but could be adjusted for purely peaking operation.

Consequently, the cost of transmitting power eastward along present (and eventually planned) west-bound transmission routes from a Los Angeles-based alternative can be said to be *negative*. These savings are equal to the incremental costs of transmitting an equal amount of power in quantity and timing westward.²⁷ These savings should be enough to pay for a substantial part and perhaps all of the transmission facilities that may be included in the Bureau's estimates from existing and planned west-bound facilities to load centers allegedly to be served by the dams in Eastern California, Northern Arizona, Southern Nevada, and Southern Utah.

But in any case, there is no particular reason to believe Mr. Udall's statement as to the proposed distribution of Grand Canyon power is correct. Mr. Udall has not furnished any sources for his distribution, nor has the Bureau ever furnished a detailed analysis as to the length, voltage, or routes of proposed Bureau-financed transmission facilities. Since no contracts have been signed with potential users, this is hardly surprising. But even more important, it is really unimportant what the distribution would be since Mr. Udall is by no means correct in claiming that the alternatives to the dams must serve exactly the same customers. Perhaps the best theoretical formulation available is that recently suggested by A. R. Prest and R. Turvey:²⁸

"The (electric) supply system constitutes a unity which is operated so as to minimize the operating costs of meeting consumption. * * *

"If we now try to apply the principle of measuring benefits by the cost savings of not building an alternative station it follows from the system interdependence just described that the only meaningful way of measuring this cost is to ascertain the difference in the present value of total operating costs in the two cases and deduct the capital cost of the alternatives. * * * In general, * * * a very complicated exercise involving the simulation of the operation of the whole system is required."

It has not been possible for the author to carry out such a simulation, which would, in any case, be quite difficult given the lack of information on Bureau marketing plans. Nor has the Bureau made such a study available. However, because of the market-oriented nature of nuclear power plants, it is apparent that such a study would show that the transmission costs of the system with the nuclear alternatives would be substantially less than that of the system with resource-oriented dams that would be located far from any load center. In fact, given that the Bureau apparently plans to tie in its transmission system with that of WEST Associates, and to serve many of the same customers as WEST, and that the WEST System will exist with or without the dams, it would appear to be a safe assumption that a systems analysis would show that the transmission costs of the alternatives could be approximated by the cost of transmitting power to the nearest load center capable of absorbing the power. Where the alternative was assumed to be located in or very near a major load center, such as Los Angeles, the transmission costs were therefore assumed to be negligible in the Carlin-Hoehn study.

Such a systems analysis would result in much more than lower transmission costs for the system with the nuclear alternatives, however. It would also show very substantial savings in generation costs for the system including the nuclear alternatives compared to those implied by the Carlin-Hoehn study. These savings would result from the substitution of the lower cost nuclear plants for higher cost thermal generation during off-peak hours. In order to insure comparability with the dams, the Carlin-Hoehn study imposed the artificial handicap of using the alternative nuclear plants only for on-peak generation. Since they would have the lowest operating costs on the system, they would actually be used to displace conventional plants with higher operating costs.

²⁷ Where the westbound lines would otherwise all be used during both off- and on-peak hours, the savings would only amount to the transmission losses for an equivalent quantity of power during on-peak hours. But where particular westbound lines would otherwise have to be built and one or more lines are used only for transmitting peaking power, the savings would amount to the full annual cost of building and maintaining lines to carry an equivalent quantity of power, as well as the transmission losses. These larger savings would seem to apply at least as far east as Hoover Dam and the Colorado River.

²⁸ *Op. cit.*, p. 710.

which would then be relegated to peaking service. A rough computation suggests that a systems analysis might show a reduction in the system's cost of the nuclear alternative to Marble by as much as 25 per cent of annual Marble costs.²⁰

(4) ABNORMALLY LOW INTEREST RATES

The Bureau of Reclamation insisted that the correct interest rate to use in the computations was 3½ per cent. This claim once again rested on Senate Document 97, which prescribes that the interest rate to be used in cost-benefit studies is the average rate for outstanding U.S. Government securities of at least 15 years maturity at issue.²¹

There are several problems with this criterion for the selection of an interest rate. First of all, present interest rates would seem to offer a better guide to rates at the time of construction of a project now being considered than an average of past rates, particularly when the average may reflect a large representation from the 1930s when abnormally low rates prevailed. Secondly, the selection of rates from U.S. Government securities of at least 15 years maturity at issue is a biased sample of even past long-term interest rates because of the 4¼ per cent ceiling imposed by Congress on interest payable on Treasury bond issues maturing in more than five years. Whenever interest rates exceed this level, as in 1966, the Treasury is forced into short-term borrowing, which is not reflected in the averages computed according to the formula. Finally, even if the formula accurately represented the present cost of long-term Government borrowing, it does not include any allowance for the economic risks of the projects considered. Government bond rates are probably an accurate reflection of the cost of risk-free capital, but Federal water projects have proved to be far from economically risk-free.²² One careful study recommended a rate of at least 10 per cent at a time when long-term Treasury bond rates were about 4 per cent.²³ No doubt the authors would recommend somewhat more now.

The Carlin-Hoehn study made a major concession to dam proponents by using the Bureau's 3½ per cent interest rate, although it noted that the use of higher, more suitable interest rates would further weaken the economic case for the dams.

OTHER FAULTY EVALUATION PROCEDURES

Although the transmission dispute resolves around some of the more technical issues of benefit-cost analysis, it is already evident that most of the problems stem directly from the basic cost-benefit procedures currently used in the evaluation of water resource projects by the Bureau of Reclamation and other Federal agencies. Some of the faulty economics found in the present procedures have already been outlined. Others, such as the overly-generous treatment of second-

²⁰ By making a few reasonable assumptions, it is possible to make a rough order-of-magnitude estimate of the savings included. If it is assumed that a base loaded nuclear or thermal plant operates 85 per cent of the time and a peaking plant 40 per cent, the off-peak generation involved is 45 per cent. If the operating costs of the nuclear plant are 1.5 mills per kwh (as in the GE fuel costs shown in the Carlin-Hoehn nuclear alternatives to Marble) and 3 mills for thermal (certainly a lower bound for the least efficient base loaded plant in the Pacific Southwest—see, for example, U.S. Congress, Joint Committee on Atomic Energy, *AEC Authorizing Legislation, Fiscal Year 1966*, Part 3, Hearings, 89th Congress, 1st Session, March 11 to April 13, 1966, pp. 1570-1572), then the 560 mw nuclear alternative to Marble should be credited with savings of (550,000 kw) (8,760 hrs/yr) (45 per cent) (\$0.0015/kwh)=\$3.25 million. This is 24 per cent of quantified Marble costs of \$13.22 million (see Hearings, p. 1534).

²¹ *Op. cit.*, p. 12. The complete statement reads as follows:

The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs, or otherwise converting benefits and costs to a common time basis shall be based upon the average rate of interest payable by the Treasury on interest-bearing marketable securities of the United States outstanding at the end of the fiscal year preceding such computation which, upon original issue, had terms to maturity of 15 years or more. Where the average rate so calculated is not a multiple of one-eighth of 1 per cent, the rate of interest shall be the multiple of one-eighth of 1 per cent next lower than such average rate.

²² A thorough theoretical discussion of the whole interest rate question can be found in Jack Hirschleifer, James C. DeHaven, and Jerome W. Milliman, *Water Supply: Economics, Technology, and Policy*, University of Chicago Press, 1960, pp. 114-151.

²³ *Ibid.*, p. 146.

ary benefits, are not hard to find. It would not be difficult, in fact, to attack the cost-benefit ratio itself as a suitable criterion.²³

Perhaps the most serious of the faults with the present procedures that have not as yet been discussed in the permissive definition of secondary benefits as "the increase in the value of goods and services which indirectly result from the project as compared to those without the project. Such increase shall be net of any economic nonproject costs that need be incurred to realize these secondary benefits."²⁴ The abuses that such definitions can lead to have been repeatedly documented and analyzed.²⁵ Very generally speaking, such benefits should only be assumed when it can be shown that the factors involved in the production of these goods and services would otherwise be unemployed during the construction of the proposed project.

Another incorrect procedure prescribed in Senate Document 97 is that "prices used for project evaluation should reflect the exchange values expected to prevail at the time costs are incurred and benefits accrued,"²⁶ even though it has been repeatedly pointed out that both costs and benefits should be evaluated in the same prices.²⁷

After all that has been written about the evaluation of water projects, it would be naive to assume that the thinking represented by Senate Document 97 and its application to the Grand Canyon controversy results entirely from ignorance of economic principles; much more can be explained by the political realities of the situation. The most important of these realities is the mutuality of interest between members of Congress anxious to obtain projects beneficial to their constituents and Federal water agencies looking for more business. Loose evaluation criteria serve the ends of both,²⁸ as does the practice of having the agencies themselves apply these criteria to individual projects.

EVEN LOWER BENEFIT-COST RATIOS DEMONSTRATED FOR BOTH PROJECTS

This paper of February 1967 serves as a good introduction to the second area of research that we have pursued since the May 1966 hearings in that among other things it summarizes most of the 1966 arguments. There have, however, been some changes in the last year. To take these as well as some refinements in our own techniques into account, we have calculated entirely new benefit-cost ratios for both projects. This time, however, we have undertaken these calculations at both 3½ percent and 5 percent so as to show the effects of higher, more realistic interest rates on the benefit-cost ratios.

The results are even more unfavorable to the dams than those printed in the May 1966 hearings. At the Bureau of Reclamation's 3½ percent interest rate, the Hualapai project is found to have a benefit-to-cost ratio of only 0.61 to one while Marble Canyon has a ratio of 0.76 to one. And at a more realistic 5 percent rate, the ratios are 0.52 to one for Hualapai and 0.61 to one for Marble. It is our conclusion that in each case these represent overestimates of the ratios because of some assumptions made which are favorable to the dams.

In addition, it is pointed out that the benefit-cost ratios at 3½ percent interest would still be less than one-to-one *even* if the Bureau of Reclamation's alleged \$6 per kw-year transmission costs were added to the cost of the nuclear alternatives. There would therefore appear to be little possible doubt that either dam is anything except economically unjustified. To show how these conclusion were derived we now turn to the Carlin-Hoehn paper of March 1967.

²³ See, for example, Roland N. McKean, *Efficiency in Government through Systems Analysis*, New York, John Wiley, 1958, and Hirschleifer, *op. cit.*, pp. 137-138.

²⁴ Senate Document No. 97, *op. cit.*, p. 9.

²⁵ See McKean, *op. cit.*, pp. 154-163, and Hirschleifer, *op. cit.*, pp. 126-131.

²⁶ *Op. cit.*, p. 12.

²⁷ Hirschleifer, *op. cit.*, p. 142 and McKean, *op. cit.*, pp. 180-182 and 222.

²⁸ Interestingly enough, what was to become Senate Document 97 was originally signed by the Secretaries of the Army, Interior, Agriculture, and Health, Education, and Welfare, although no doubt prepared by their staffs (including the Bureau of Reclamation and the Corps of Engineers).

THE GRAND CANYON CONTROVERSY—1967: FURTHER ECONOMIC COMPARISONS OF NUCLEAR ALTERNATIVES, ALAN P. CARLIN AND WILLIAM E. HOEHN,¹ THE RAND CORP., SANTA MONICA, CALIF.

Since our 1966 papers² questioning the economic feasibility of the proposed Grand Canyon dams, the costs of the alternative nuclear power sources we used have been revised and the relative importance of the two dams in the over-all Colorado River Basin Project has been reversed. The purpose of this paper is to present new calculations incorporating revised cost estimates of the nuclear powerplant alternatives and reflecting the increased importance of one of the proposed dams, the Hualapai (formerly Bridge Canyon) Project. The new calculations also introduce several refinements on our earlier methods.

Late in 1966 the General Electric Company substantially revised its 1965 price list for nuclear generating plants, on which our 1966 calculations of alternative nuclear costs were largely based. The effect was to increase the list prices for the installation of nuclear boilers, to eliminate the turn-key prices for the complete installation of nuclear plants, and to reduce most fuel costs. In light of these changes and the upward trend in contract prices for nuclear plants during the last year, we have decided to base our new calculations on deliberately conservative (that is, overstated) assumptions as to nuclear costs. These (and other assumptions) have been made with a view to avoiding all controversy as to whether they might possibly understate nuclear costs.

In the spring of 1966 we foresaw little real possibility that Congress would give serious consideration to the (then) Bridge Canyon Project in light of the unfavorable decision on it by the Bureau of the Budget, and accordingly directed most of our attention to the other project, Marble Canyon. Subsequent events indicate that the present position is now just the reverse. For this reason we have undertaken much more detailed calculations on Bridge than those presented last year.³

We have also adopted a somewhat different approach to developing a lowest cost alternative to Hualapai. In the 1966 analysis we considered a lower cost alternative consisting of a 762 mw base loaded nuclear plant and a 588 mw pumped storage plant. Because of our decision to include energy value adjustments in our calculations (to be discussed shortly), nuclear plants alone become an even lower cost alternative. Use of an entirely nuclear alternative has the added advantage that it removes the possible uncertainty from the relationship between pumped storage costs and the geography and other peculiarities of particular sites. Unfortunately, it is not possible to evaluate this relationship without detailed engineering studies. Nuclear costs, on the other hand, are comparatively invariant with the particular site chosen, given reasonable care in avoiding geologically suspect areas and areas with extremely high land values.

The major innovation in our computational methods is the introduction of an energy value adjustment. In order to insure comparability with the dams in our 1966 papers we unfairly penalize our nuclear alternatives by assuming that they generated power only during the same hours as the dams, despite the fact that they would have the lowest operating cost of any non-hydro installations on the power systems concerned. This resulted in the *economically* unlikely assumption that the nuclear alternatives would stand idle⁴ during off-peak hours while conventional plants generated power at much higher incremental costs. The real life situation, of course, would be just the reverse. The nuclear plants would be base loaded and a corresponding amount of thermal capacity

¹ Any views expressed in this paper are those of the authors. They should not be interpreted as reflecting the views of The RAND Corporation or the official opinion or policy of any of its governmental or private research sponsors.

² Alan P. Carlin and William E. Hoehn, "Is the Marble Canyon Project Economically Justified?" The RAND Corporation, P-3302, February 1966, reprinted in Alan P. Carlin, "Economic Feasibility of the Proposed Marble and Bridge Canyon Projects," in U.S. Congress, House, Committee on Interior and Insular Affairs, *Lower Colorado River Basin Project*, Hearings before Subcommittee, Part II, 89th Congress, 2nd Session, May 13, 1966, pp. 1497-1512 (hereafter referred to as Hearings); Alan P. Carlin and William E. Hoehn, "Mr. Udall's Analysis: An Unrepentant Rejoinder," *ibid.*, pp. 1521-1535. The principal issues of economic interest arising out of the controversy over our 1966 papers are summarized in Alan Carlin, "The Grand Canyon Controversy: Some Lessons for Federal Cost-Benefit Practices," The RAND Corporation, P-3505, February 1967. A popularized summary of P-3505 is available as "The Grand Canyon Controversy or How Reclamation Justifies the Unjustifiable," The RAND Corporation, P-3541, February 1967.

³ See Alan P. Carlin, "Economic Feasibility . . ." *op. cit.*, Hearings, pp. 1511-1512.

⁴ Except for the overly-generous 10 percent fuel consumption we assumed merely to keep the plants up to operating temperatures for quick start-up.

would be relegated to peaking service. The Federal Power Commission's Technical Memorandum No. 1 recommends that under these circumstances the alternative be credited with the resulting savings when it is compared with a hydroelectric project.⁵ Or more accurately, it recommends that the alternative be credited with one-half the savings on the argument that the cost of energy from other conventional plants will fall over the life of the hydroelectric project. It seems unlikely, however, that the *operating costs* of nuclear and conventional thermal plants will narrow very rapidly or that the inventory of conventional plants yet to be relegated to peaking service will vanish for many years to come either. Nevertheless, in the interests of conservatism, we have adopted the procedures of the FPC Memorandum.

The second major innovation is that we have calculated the benefit-cost ratio not only at the Bureau's preferred interest rate of $3\frac{1}{2}$ percent, but also at 5 percent. Although even this does not adequately reflect the economic risks involved in Bureau of Reclamation hydroelectric projects, it does suggest the effect that higher, more realistic interest rates have on the benefit-cost ratios for the two dams.

It is important to point out that the use of either $3\frac{1}{2}$ or 5 percent does not imply anything about the type of financing that is assumed to be used in building either the dams or the alternatives. In an economic analysis of the benefits and costs of a project to the nation, the choice of interest rate should be based on the pure rate of interest for long-term investments plus an allowance for the economic risks of the project. This applies *regardless* of the type of financing that would actually be used if the project were built.

NEW CALCULATIONS

Table 1 shows average annual costs for nuclear alternatives to Hualapai and Marble Canyon dams under three sets of assumptions. The Hualapai alternative is assumed to be located on the ocean near Los Angeles and the Marble alternative on Lake Havasu near Parker Dam. The Marble alternative is assumed to supply 225 mw of power to the nearby Central Arizona Project pumps and to transmit the remainder to the Phoenix area over a 345 kv line (which is included in the costs).

Since our 1966 papers did not include an all-nuclear alternative to Hualapai, column (1) shows the costs of such an alternative using the assumptions as to its operating hours and interest rate used in our Marble alternative last year.⁶ Column (2) reflects the use of the energy value adjustment at the same $3\frac{1}{2}$ percent interest rate, while column (3) is costed at 5 percent. Only the energy value adjustment cases are shown for the Marble alternative, once again at $3\frac{1}{2}$ (column 4) and 5 percent (column 5).

Table 2 develops up-to-date capital costs for the two projects using Bureau of Reclamation indexes of project costs in 18 Western states and Alaska. The cost of an afterbay structure has also been added to the Marble costs (line 5).

The alternative costs developed in Table 1 and the project capital costs developed in Table 2 are then used to derive new benefit-cost ratios in Table 3. It is found that the Hualapai Project has a benefit-cost ratio of 0.78 to one without the energy value adjustment and 0.61 to one with it, while Marble has a ratio of 0.77 to one with the adjustment. At 5 percent interest the ratios are only 0.52 to one for Hualapai and 0.61 to one for Marble, thus suggesting that the ratios are quite sensitive to changes in the interest rate assumed.

But even the ratios at $3\frac{1}{2}$ percent interest imply that the Projects are not economically justified in terms of their costs and benefits to the nation. Furthermore, the ratios are so far below one-to-one that it appears most unlikely that the results would be reversed by still more detailed calculations. In fact, it can be shown that *even* if the Bureau's alleged \$6 per kilowatt were used for the transmission costs of the alternatives, the benefit-cost ratios would still be less than one-to-one at $3\frac{1}{2}$ percent interest.⁷

⁵ Federal Power Commission, Bureau of Power, *Instructions for Estimating Electric Power Costs and Values*, Technical Memorandum No. 1, Revised March 1960, pp. 9-11.

⁶ Except that only 5 percent of the full fuel cost is allowed for spinning reserve during off-peak hours, based on an analysis of decay-heat curves. The operating hours have, of course, been adjusted to fit the proposed Hualapai output.

⁷ As explained in P-3505, *op. cit.*, pp. 12-17, the Bureau of Reclamation makes the highly questionable assertion that transmission costs of \$6 per kw-yr should be charged against the alternatives (at least in the case of Marble and possibly Hualapai as well). This would add \$8.10 million (1350 mw at \$6,000 per mw) to Hualapai benefits, or \$26.5 million in all, and \$2.9 million (600 mw at \$6,000 per mw minus about \$0.7 million already included under line 6 of Table 1) to Marble benefits, or \$13.1 million in all.

In these calculations we have endeavored to quantify all reasonable but previously unquantified assumptions that have occurred to us¹⁸ which if left unquantified tended to bias the conclusions against the dams. We have, however, left unquantified a number of other items which if quantified would be unfavorable to the dams. The effect of these remaining unquantified assumptions, the most important of which we shall enumerate in the next section, is obviously to further weaken the economic case for the dams. In order to show that our benefit-cost ratios are underestimates, it would first be necessary to show that whatever upward revisions may be desired in our alternative costs are greater than the net effect of the remaining unquantified assumptions favorable to the dams.

ASSUMPTIONS FAVORABLE TO THE DAMS

1. Use of overstated nuclear costs

Nuclear costs in our previous papers were estimated from the 1965 edition of the General Electric Company pricing handbook.¹⁹ It is evident from contract awards during that time period that this represented a conservative basis, as discounting of actual bids from the price list was widespread. Since that time, however, General Electric has discontinued turn-key contracting, resulting in the elimination of complete plant price lists, and has twice revised upwards its price list for nuclear steam supply systems (and widened the scope of supply). At the same time, nuclear fuel scope of supply has been broadened with more comprehensive warranty provisions added, and costs have been adjusted. The net effect has been to lower nuclear fuel costs for first and second cores and to raise slightly third core costs. Since no comprehensive cost studies similar to the TVA and Oyster Creek analyses have been published recently, the appropriate capital cost levels in relation to the latest General Electric nuclear steam supply price list is not clear.

In March 1966 Philip Sporn, Chairman of the System Development Committee of the American Electric Power Company, presented an analysis of nuclear power costs to the Joint Committee on Atomic Energy based on recalculations of his 1964 analysis of the nuclear Oyster Creek and conventional Cardinal plants.²⁰ In that paper, he indicated that his original calculation of \$139 per kw for post-Oyster Creek class reactors was a "handbook-type" price, that would have to be reduced to correspond to a negotiated price. As a discounting factor, he used the percentage discount from the handbook price that Dresden II enjoyed. This results in an adjusted 605 mw(e) plant cost of \$128 per kw, a figure including switchyard costs. Our assumed plant costs for a 600 mw(e) net plant are \$150 per kw and \$155 per kw at 3½ percent and 5 percent respectively, excluding switchyard costs but including an additional \$2.50 per kw for field fabrication costs. Correcting for these differences, our plant costs represent a roughly 20 percent increase over the costs developed by Mr. Sporn, which is more than sufficient to cover increases in nuclear costs since that time.

For the twin unit plant of 1350 mw(e) net total capacity, the basic cost assumed for the first unit is \$149 per kw and \$154 per kw at 3½ percent and 5 percent respectively, including switchyard; a discount of \$10 per kw has been allowed for the second unit, based on low incremental land and site costs and on reported cost discounts for a second unit at a site.²¹ If the intent of this paper were to evaluate current nuclear power economics for private utilities, we would be prepared to endorse figures at least \$10 per kw lower than those used for the specific comparisons herein.

2. Exclusion of other Hualapai expenditures

In addition to the expenditures for the benefit of the Hualapai Indians included in line 5 of Table 2, H.R. 4671 (the Colorado River Basin Project considered by the 89th Congress), as revised, provided that the Government would "make available to the Hualapai Tribe up to twenty-five thousand kilowatts and up to one hundred million kilowatt-hours annually of power from the

¹⁸ And Representatives Morris Udall and Craig Hosmer, the Bureau of Reclamation, and other dam proponents.

¹⁹ *Atomic Power Equipment Handbook*.

²⁰ Philip Sporn, "Nuclear Power Economics: An Appraisal of the Current Technical-Economic Position of Nuclear and Conventional Generation" (March 17, 1966), in U.S. Congress, Joint Committee on Atomic Energy, *AEC Authorizing Legislation, Fiscal Year 1967*, Hearings, Part 1, 89th Congress, 2d Session, 1966, Appendix 14, pp. 561-571.

²¹ See, for example, *Nucleonics Week*, October 13, 1966, p. 4.

Hualapai unit at the lowest rate established by the Secretary [of the Interior] for the sale of firm power from said unit for the use of preferential customers."¹¹ We are unable to evaluate what the financial costs to the government of this provision would be. We note, however, that Representative Reinecke has stated that the Hualapai Tribe would receive \$60.8 million in non-cash benefits¹² under H.R. 4671. If \$12.3 million of this represents the Peach Springs-Diamond Point road, this would appear to leave \$48.5 million as the cost of the power benefits. Although this may be distributed over a number of years, it does not appear to be included in the project costs shown in the project report.

3. Use of Bureau cost indexes

After reviewing a variety of construction price indexes we find that the Bureau of Reclamation's index used in Table 2 is one of the lowest composite indexes available. Most others, such as the *Engineering News-Record* construction price index, are much higher. The ERN index, for example, is over 20 percent higher than in October 1961, versus about 10 percent for the Bureau index.

4. Exclusion of value of water in bank storage

No charge is made in Table 3 for the value of water that would be held in bank "storage" around the proposed Marble Canyon Reservoir. Unless the Reservoir can be filled during years when this water would otherwise run waste into the Gulf of California, an annual charge should be made for this water, which is unlikely to be recovered (as the Reservoir will eventually be filled with silt rather than emptied). This annual charge might be about \$0.6 million.¹³

5. Exclusion of effects on esthetic and other park values

No value has been attributed to what many conservationists believe will be the impairment of the natural scenic beauty of what is commonly acknowledged to be an unusually scenic canyon and of other park values in Grand Canyon National Park and Monument that will result from the construction of either dam. Although it is difficult to attach an exact monetary value to this cost, it is not negligible, judging by the public response to the appeal of the conservationists to defeat the dams and the many man-hours that have been voluntarily poured into this effort. If no afterbay structure were included in the Marble costs shown in Table 2, this effect would be substantially greater.

6. Exclusion of possible effect of Marble on boating expeditions

Table 2 assumes that the Marble Canyon Project includes an afterbay structure that would be capable of reducing the peak flows in the River resulting from the operation of the Project as a peaking plant from 30,800 cubic feet per second to 20,500 cubic feet per second. Even with the structure, there is some dispute whether boating expeditions down the River would still be possible through Grand Canyon National Park. At the very least, the length of such trips would be greatly reduced. If they were no longer possible, the cost in terms of producers' and consumers' surplus foregone might be about \$0.2 million per year.¹⁴

7. Use of stream flows assumed in project reports

We have assumed the same stream flows used in the 1964 Bureau project reports. More recent studies have suggested that stream flow past the dam sites may be somewhat lower. The effect of such a reduction would be to further lower the benefit-cost ratios for the dams.¹⁵

¹¹ U.S. Congress, House, *Colorado River Basin Project*, Report No. 1849, 89th Congress, 2nd Session, August 11, 1966, p. 5.

¹² *Ibid.*, p. 127.

¹³ Stewart Udall has stated that bank "storage" at Marble "could amount to between 300,000 and 400,000 acre-feet" (Hearings, p. 1403). At \$54 per acre-foot (see note to Table 1, line 7), 350,000 acre-feet would be \$0.59 million per year at 3½ percent interest.

¹⁴ According to the Sierra Club, National Park Service statistics show that 547 persons made the Canyon boat trip in 1965 and 1,067 in 1966 (see "Supplement to Petition of the Sierra Club for Leave to Intervene Pursuant to Rule 1.8 (d) before the Federal Power Commission in the Matter of Arizona Power Authority, Project No. 2248," January 30, 1967, p. 45). A conservative assumption would be that if Marble is not built, an average of at least 1,000 per year will make the trip over the next 100 years. If the average price paid is taken at \$300 and the producers' and consumers' surplus as \$175 per person, the net cost would be \$0.175 million per year.

¹⁵ See Alan P. Carlin, "Economic Feasibility . . .," *op. cit.*, Hearings, pp. 1510-1511.

b. Use of heavily subsidized interest rates

As the use of a 5 percent interest rate in Table 3 demonstrates, the use of higher, more realistic interest rates has a strong effect in lowering the benefit-cost ratios of the Projects. Use of even higher rates, which would be even more suitable from the standpoint of economic theory,¹⁰ would only further lower the ratios since the Projects are more capital intensive.

TABLE 1.—Average annual costs of alternative nuclear powerplants

	Hualapai (Bridge Canyon)			Marble Canyon	
	(1)	(2)	(3)	(4)	(5)
Alternative to:					
Interest rate (percent).....	3½%	3½%	5	3½%	5
Energy value adjustment.....	No	Yes	Yes	Yes	Yes
Capital.....	10.57	10.57	13.59	4.89	6.28
Fuel.....	7.33	2.22	2.61	1.43	1.59
Operating and maintenance:					
(a) Fixed.....	1.26	1.26	1.26	.84	.48
(b) Variable.....	.49	.49	.49	.23	.23
Special nuclear insurance.....	.52	.52	.52	.31	.31
Hydro adjustment.....	.59	.59	.74	.29	.36
Transmission and substations.....				.86	1.08
Make-up water for cooling towers.....				.41	.41
Reserves.....	1.35	1.35	1.35	.60	.60
Total.....	22.11	17.00	20.56	9.86	11.70

NOTES ON LINES

1. Columns (1) and (2): Capital costs of two 675 mw(e) net nuclear plants at 5.435 percent. The 5.435 percent is the sum of 3.125 percent interest, 0.25 percent for interim replacement, and 2.06 percent for depreciation (30-year sinking fund basis). The capital costs are computed on the basis of \$145 per kw plus \$4 per kw (for a switchyard) for the first 675 mw(e) unit and \$135 per kw plus (\$4 per kw for the second (or an overall average of \$144 per kw). The total cost of \$194.40 million includes \$5.4 million for a switchyard and \$4.9 million for marine lines. Column (3): Capital costs of \$201.15 million (based on an over-all average of \$149 per kw to account for the increased cost of interest during construction) at 6.755 percent. The 6.755 percent is the sum of 5.0 percent interest, 0.25 percent for interim replacement, and 1.505 percent for depreciation (30-year sinking fund basis). Column (4): Capital cost of one 600 mw(e) net nuclear plant at 5.435 percent. The capital costs are computed on the basis of \$150 per kw (excluding a switchyard). The total cost of \$90.0 million includes \$4.8 million for cooling towers and a \$1.5 million differential for field rather than shop fabrication of the pressure vessel. Column (5): Capital cost of \$93.0 million (\$155 per kw, representing higher interest during construction) at 6.755 percent.

2. Column (1): Annual generation of 4,933 billion kwh per year (Hualapai production minus transmission losses) at 1.40 mills per kwh plus 5 percent of full load fuel requirements during off-peak hours when the reactor is not shutdown. The 5 percent is an upper estimate of the additional fuel that would be required to keep the system at operating temperature during off-peak hours. Because a nuclear reactor continues after shutdown to produce large amounts of heat from fission product decay, no load fuel requirements to keep the system at hot operating temperature are minimal. Fuel consumption would probably be required only over the week-end period, as decay heat should be sufficient for daily carryover; the 5 percent used here allows an additional margin above that requirement, however. Column (2): Annual generation of 4,933 billion kwh per year at 0.45 mill per kwh. The 0.45 mill is the difference between the average fuel cost at 40 percent load factor (1.34 mills per kwh) and X, the energy value adjustment according to the following formula given in Federal Power Commission, Bureau of Power, *Instructions for Estimating Electric Power Costs and Values*, Technical Memorandum No. 1, March 1960, p. 11:

$$X = \frac{F_p - F_a}{F_p} \cdot \frac{I_a - I_e}{2},$$

where
X=adjustment in mills per kwh
F_a=average annual plant factor of alternative
F_p=average annual plant factor of hydro project
I_a=incremental cost in mills per kwh of alternative plants
I_e=incremental cost in mills per kwh of existing steam electric plants.

In this case, F_a=80 percent, F_p=41.7 percent, I_a=1.44 (equal to 1.34 mills per kwh for fuel plus 0.10 mill per kwh for variable operating and maintenance), and I_e=3.37 (the energy cost supplied by the FPC and used by the Bureau of Reclamation for their thermal alternatives to the Grand Canyon dams, as given in a Memorandum dated May 11, 1966 to the Commission from F. Stewart Brown, Chief, Bureau of Power, on the subject of "Marble Canyon Project, Arizona," p. 2). Column (3): Annual generation at 0.53 mills per kwh. In this case I_a=1.49 (corresponding to a fuel cost of 1.39 mills per kwh at a 5 percent interest rate). Column (4): Annual generation of 2,308 billion kwh (Marble production at site) at 0.62 mill per kwh. In this case F_a=43.9 percent and I_a=1.62 (equal to 1.34 mills per kwh for fuel plus 0.10 mill per kwh for variable operating and maintenance plus 0.18 mill per kwh for cooling water.) Column (5): Annual generation at 0.60 mill per kwh. In this case F_a=43.9 percent and I_a=1.67 (corresponding to a fuel cost of 1.39 mills per kwh).

¹⁰The interest rate question is discussed in P-3505, *op. cit.*, pp. 18-19.

3a. Assumes average fixed operating and maintenance costs (in addition to the interim replacement included in line 1) of \$1.40 per kw-year. This figure is taken from Atomic Energy Commission, Division of Reactor Development and Technology, Office of Civilian Power, "A Specific Comparison of Nuclear Electric Power and Hydro Electric Power—Bridge and Marble Canyon Projects" (February 1965), printed as U.S. Congress, House, Committee on Interior and Insular Affairs, *Lower Colorado River Basin Project*, Hearings before Subcommittee, Part II, 89th Congress, 2nd Session, May 12, 1966, p. 1373. For the two units in Los Angeles, a reduction of 33 percent has been taken to reflect savings resulting from a twin-unit plant.

3b. Assumes average variable operating costs of 0.1 mill per kwh, *ibid*.

4. Estimates for the Marble alternative are based on the premium paid by Commonwealth Edison Company for their Dresden plant, as shown in U.S. Congress, Joint Committee on Atomic Energy, Subcommittee on Legislation, *Selected Materials on Atomic Energy Indemnity Legislation*, 89th Congress, 1st Session, June 1964, pp. 17 and 66. Private nuclear liability insurance rates for Dresden are used for the first \$1 million of coverage. The remaining \$14 million of private insurance is taken at the rate of 2.5 percent of the base rate per \$1 million coverage. Price-Anderson Act insurance (to \$486 million) is computed at the rate of \$30/mw(t). These estimates are very conservative in that up to 75 percent of the private premium is maintained in a special fund which is earmarked for refund on the basis of the first ten years of experience. The Bridge estimate for the private insurer portion of coverage on the two units is taken to be one and a half time the estimated amount for a single unit, reflecting an economy of multiple unit siting.

5. Five percent of annual fixed (capacity) costs (line 1 plus line 3a), as suggested by FPC Technical Memorandum No. 1, *op. cit.*, pp. 7-9.

6. Cost of a sending switchyard at the plant, a receiving substation in Phoenix, and 130 miles of double circuit 345 kv line. Transmission line capital costs are taken as \$85,000 per mile (based on \$5,000/mile for right-of-way and clearing and \$80,000/mile for structures as given in FPC, *National Power Survey, Part II—Advisory Reports*, October 1964, p. 87). Capital costs of switchyard, substation, and associated transmission facilities are taken as \$5.0 million. Operating, maintenance, and interim replacement are based on FPC Technical Memorandum No. 1, *op. cit.*, pp. 45, 96, and 97. Also following the FPC, transmission lines are assumed to have a service life of 50 years and substations 35 years.

7. Value of 7,600 acre-feet per year required to make up evaporation losses from cooling towers at \$34 per acre-foot. This is based upon expected water costs of \$65 per acre-foot from the Metropolitan Water District's proposed water desalinization plant near Los Angeles (see *Nucleonics Week*, Sept. 15, 1966, pp. 1-2), minus marginal pumping costs for the Colorado River Aqueduct of about \$11 per acre-foot. The \$54 per acre-foot is thus the net cost to the Metropolitan Water District of replacing water no longer available from the Colorado River. Use of this figure assumes that any additional evaporation from the reservoirs will reduce the water available to the MWD by an equal amount. Although there may be some years of surplus flow on the River, these are expected to be few once the Central Arizona Project is built and even fewer once the Upper Basin states use their entire allotments. Although the desalinized water would be of somewhat better quality than the Colorado River water it would replace, the \$65 per acre-foot cost does not include the substantial subsidies that would be provided to the plant by the Federal Government under present plans.

TABLE 2.—Capital costs of Hualapai and Marble Canyon projects

[Figures in millions of dollars]

	Hualapai (Bridge Canyon)		Marble Canyon	
	(1)	(2)	(3)	(4)
Interest rate (percent)	3½	5	3½	5
1. Construction costs shown in project reports.....	\$511.3		\$238.7	
2. Prices as of.....	October 1961		October 1963	
3. Construction costs in October 1966 prices.....	\$560.5		\$259.3	
4. Less investigation costs.....	-1.7		-1.1	
5. Other construction costs not shown in project reports.....	18.5		34.0	
6. Construction costs	557.3		292.2	
7. Interest during construction.....	\$40.5	\$62.1	\$25.8	\$39.7
8. Total capital costs.....	617.8	629.4	318.0	331.9
9. Annual capital costs.....	20.23	32.21	10.42	16.72

NOTES ON LINES

1 and 2. Columns (1) and (2): As given in U.S. Department of the Interior, Bureau of Reclamation, *Pacific Southwest Water Plan, Supplementary Information Report on Bridge Canyon Project, Arizona*, January 1964, p. 18. Columns (3) and (4): *Ibid.*, *Supplementary Information Report on Marble Canyon Project, Arizona*, January 1964, p. 19.

3. Derived by applying Bureau of Reclamation cost indexes to each sub-item shown in the "Basic Estimate DC-1 Summary" for each project. The indexes used are those for October 1966 as given in *Engineering News-Record*, December 15, 1966, p. 101.

4. As shown in Bridge Canyon Project report, *op. cit.*, p. 23, and Marble report, p. 25.

5. Columns (1) and (2): Section 303 of H.R. 4671, 89th Congress, as revised provided for the payment of \$16,398,000 as "compensation" to the Hualapai Indians for the taking of "easements, rights-of-way, and other interests in land within the Hualapai Indian Reservation . . . for the construction, operation and maintenance of the Hualapai unit" (see U.S. Congress, House, *Colorado River Basin project*, Report No. 1849, 89th Congress, 2nd Session, Aug. 11, 1966, p. 5). This exceeds by \$8,283,000 the cost of "lands and rights" shown for Bridge Canyon Dam and Reservoir (see project report, *op. cit.*, p. 18). Assuming (charitably) that no payments would be made for other lands or rights for the project, it is evident that the project report underestimated this item by at least this amount. The

same section of H.R. 4671 also provided for Federal construction of a paved road from Peach Springs to Diamond Point (on the proposed reservoir). This road, which the Department of the Interior has estimated would cost \$12,260,000 (see U.S. Congress, House, Committee on Interior and Insular Affairs, *Lower Colorado River Basin project*, Hearings before subcommittee, Part II, 89th Congress, 2nd Session, May 12, 1966, p. 1411), does not appear to be included in the project report. Together, these items benefiting the Hualapai Indians add at least \$18.5 million to the cost of the Bridge Canyon project. Columns (3) and (4): Cost of an afterbay structure below Marble that would be capable of reducing the peak flows in the river from 30,800 cubic feet per second to 20,630 feet per second in order to preserve park values within Grand Canyon National Park and Monument and to improve the possibilities for boating expeditions down the Colorado through the park if Marble should be built. The cost figure is based on a preliminary estimate supplied by Floyd E. Dominy, Commissioner, Bureau of Reclamation, to Representative Ed Reinecke in a letter dated Sept. 6, 1966.

6. Line 3 minus line 4 plus line 5.

7. Derived by using the same percentage shown in the project reports for interest during construction as a percentage of construction costs, corrected for the differences in interest rates. The percentages for Hualapai are 7.01 at 3¼ percent and 10.77 at 5 percent. The corresponding Marble figures are 8.85 and 13.59 percent.

8. Columns (1) and (3): Line 7 at 3.276 percent (including depreciation of 0.15 percent on a 100 year sinking fund basis). Columns (2) and (4): Line 7 at 5.038 percent.

TABLE 3.—Benefits and costs of Grand Canyon dams

[In millions of dollars]					
Project.....	Hualapai (Bridge Canyon)			Marble Canyon	
Interest rate (percent).....	3¼ No	3¼ Yes	5 Yes	3¼ Yes	5 Yes
Energy value adjustment.....	(1)	(2)	(3)	(4)	(5)
1. Benefits:					
(a) Power.....	22.11	17.00	20.56	9.67	11.51
(b) Fish and wildlife.....	.66	.66	.66	.18	.18
(c) Recreation.....	.33	.33	.33	.16	.16
(d) Area redevelopment.....	.36	.36	.36	.15	.15
(e) Total.....	23.46	18.35	21.91	10.16	12.00
2. Costs:					
(a) Capital charges.....	20.23	20.23	32.21	10.42	16.72
(b) Operating costs.....	4.49	4.49	4.49	1.94	1.94
(c) Power purchases.....	.91	.91	.91	.39	.39
(d) Additional water evaporation.....	4.59	4.59	4.59	.54	.54
(e) Total.....	30.22	30.22	42.20	13.29	19.59
3. Benefit-cost ratio (ratio to 1).....	.78	.61	.52	.76	.61

NOTE.—Line 3 overstates the benefit-cost ratios in that they make the following assumptions favorable to the projects: (1) Use of overstated nuclear costs; (2) exclusion of other Hualapai benefits; (3) use of Bureau cost indexes; (4) exclusion of value of water in bank storage at Marble; (5) exclusion of effects on esthetic and other park values; (6) exclusion of possible effect of Marble on boating expeditions; (7) use of streamflows assumed in project reports; and (8) use of heavily subsidized interest rates.

Source:

1(a) Cols. (1) to (3): From line 9, table 1. Cols. (4) and (5): line 9, table 1 minus \$0.19 million representing the annual loss of revenue resulting from the reduction in energy generation from the Glen Canyon powerplant if the Marble Gorge project is built.

1 (b) and (c). ½ of the benefits shown by the Bureau of Reclamation in "Pacific Southwest Water Plan, Supplemental Information Report on Bridge Canyon Project, Arizona," January 1964, p. 22 and the "Supplemental Information Report on Marble Canyon Project, Arizona," January 1964, p. 24. The proposed reservoirs would be about equally far from major population centers as existing reservoirs, particularly Lake Powell and Lake Mead, which are by no means overcrowded. To the extent that recreational and fishing use of the proposed reservoirs would be likely to draw visitors away from the existing reservoirs, there would be no net increase in benefits to the Nation. Since there is no evidence that the Bureau has taken this into account in its estimates, it seems safe to assume that at least ½ of the use assumed by the Bureau would not contribute any net benefits.

1(d). From the Bridge and Marble Canyon project reports, ibid.

2(a). From table 2.

2 (b) and (c). From project reports, op. cit.

2(d). Additional evaporation resulting from construction of each reservoir as given by the Department of the Interior (see U.S. Congress, House, Committee on Interior and Insular Affairs, "Lower Colorado River Basin Project," hearings before subcommittee, pt. II, 89th Cong., 2d sess., May 12, 1966, p. 1403) valued at \$54 per acre-foot (see note to line 7, table 1).

DIFFICULTIES IN OBTAINING THE PARSONS REPORT

Since one of us last appeared before you there has been much said in the press by dam proponents concerning the economic and financial aspects of the proposed Grand Canyon dams. Perhaps the most significant of these statements con-

cerned a study carried out by the Ralph M. Parsons Company for the Arizona Interstate Stream Commission.¹⁷ Before going into a discussion of the merits of the study, we should like to outline how we learned of the study and ultimately obtained a copy of it because we believe this story says much concerning the communications problem we have faced in the last year with dam proponents.

We first learned of the existence of the study, dated July 20, 1966, on November 21, 1966 at a meeting of the Water and Power Committee of the Los Angeles Chamber of Commerce. At the meeting, Mr. Joseph Jensen, Chairman of the Metropolitan Water District of Southern California, made the following statement with regard to the study after Mr. Laurence Moss had outlined the results of our economic analysis of the dams:

Arizona paid the Parsons Company for making a careful analysis of these nuclear plants. . . . Now as to between his [Laurence Moss's] presentation and the Parsons presentation you can make your own decision as to whether Parsons is more right or whether he is more right.

Wishing indeed to make our own decision, one of us immediately sent the following letter to Mr. Jensen:

SANTA MONICA, CALIF., November 21, 1966.

Mr. JOSEPH JENSEN,
Metropolitan Water District of Southern California,
1111 Sunset Boulevard, Los Angeles, Calif.

DEAR MR. JENSEN: I was interested to hear you say today at the meeting of the Water and Power Committee of the Los Angeles Chamber of Commerce that a study by The Ralph Parsons Company had arrived at the opposite conclusion from the study by Dr. Hoehn and myself.

As the speaker, Mr. Laurence I. Moss, had pointed out earlier, our studies have shown that both the proposed Hualapai (Bridge Canyon) and Marble Canyon dams would have benefit-cost ratios lower than one-to-one when compared with nuclear alternatives costed on the basis of a recent General Electric price list. It was my understanding that you stated that a Parsons study had reached the conclusion that the proposed dams were economically justified compared to a nuclear alternative.

To the best of my knowledge no such study was presented at the House Interior Committee hearings on H.R. 4671 or even referred to during them. I would therefore appreciate it if you would send me a copy of the study or provide a more exact reference if it is publicly available elsewhere.

Very truly yours,

ALAN CARLIN.

We received the following letter in reply:

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA,
Los Angeles, Calif., November 30, 1966.

Mr. ALAN CARLIN,
1711 Ocean Avenue,
Santa Monica, Calif.

DEAR MR. CARLIN: Thank you for your letter of November 21 with regard to the Parsons study. I understand it has not yet been released by the Arizona Interstate Stream Commission, for whom the study was made. The Parsons Company is also making other studies for Arizona, but I do not know what these studies cover.

Too many of our engineering studies get the results that were wanted by the premises that they assume, so a nuclear plant based on your certain premises would not be popular with our privately run public utilities: whereas, if you work for a corporation that lives off government contracts, the argument will not appeal to you.

I am more impressed with the fact that a man like Sam Nelson of the Los Angeles Department of Water and Power says that the dams and hydroelectric power plants are worthwhile, than I am by either an engineering report you make or that Parsons makes. Further, it took an act of Congress to postpone for two years, the building of these dams. Too many agencies want to build the two dams to make your study impressive.

¹⁷ The Ralph M. Parsons Co., *Economic Analysis, Nuclear versus Hydroelectric Power Generation, Colorado River Basin Project*, Job Number 3874-1, Los Angeles, July 20, 1966.

The Arizona Interstate Stream Commission has recommended that the State of Arizona take all possible steps to obtain a license from the Federal Power Commission for the construction of a hydroelectric dam at Marble Canyon.

Very truly yours,

JOSEPH JENSEN, *Chairman.*

In response to Mr. Jensen's letter, one of us replied as follows:

SANTA MONICA, CALIF., December 5, 1966.

Mr. JOSEPH JENSEN,
Metropolitan Water District of Southern California,
1111 Sunset Boulevard, Los Angeles, Calif.

DEAR MR. JENSEN: Thank you for your letter of November 30.

This is just to emphasize the point that Laurence Moss tried to make in his talk November 21—after careful and we believe unbiased study, neither Dr. Hoehn, Mr. Moss, or I believe that construction of either of the two proposed dams in the Grand Canyon will advance the interests of Southern California or the Metropolitan Water District. The Arizona Power Authority and LADWP proposals have significant differences compared to those of the Bureau of Reclamation. Even if these other proposals were justified at the time they were filed, they are not necessarily justified at this time with the rapidly changing competitive conditions in the power market.

We would be delighted to review our calculations, assumptions, and conclusions with you, your staff, or Mr. Nelson at any time, in any degree of detail you may desire. I can assure you that all of us would prefer to make these points in the privacy of your office than through the mass media during the coming months. We welcome serious criticism of our findings, but have yet to find any that would shake our conclusions.

Very truly yours,

ALAN CARLIN.

We have not as yet received any reply to the letter of December 5.

During this exchange of correspondence with Mr. Jensen, we received a clipping from the November 20, 1966 issue of *The Daily Sentinel* of Grand Junction, Colorado summarizing the Parsons Study. This indicated that the study was concerned only with a financial comparison of the dams versus nuclear alternatives rather than the economic feasibility of the dams.

But to make a long story short, when Mr. Jensen declined to make available a copy of the report, we addressed letters to several other possible sources, including one to the Arizona Interstate Stream Commission, dated December 5, 1966. The other possible sources referred us to the Arizona Interstate Stream Commission, from whom we received no reply at all. Finally on January 11, 1967 one of us sent another request to Mr. Rich Johnson, Executive Director of the Commission by certified mail. This finally elicited a response and a copy of the study in question.

After careful study of the report, one of us undertook to write a reply to which we shall now turn.

WHAT THE PARSONS STUDY REALLY SAYS ABOUT NUCLEAR POWER ECONOMICS: THE GRAND CANYON CONTROVERSY

(By William E. Hoehn,* The RAND Corp., Santa Monica, Calif.)

The Ralph M. Parsons Co. was retained by the Arizona Interstate Stream Commission to "show the effect of substituting nuclear-fueled power generation facilities for proposed hydroelectric power generating plants at Hualapai Dam and Marble Canyon Dam on the Basin Account Consolidated Payout Schedule."¹ The principal conclusions of the Parsons study are:

- (1) Comparing nuclear alternatives with the hydroelectric plants on a peaking basis shows that the nuclear plants themselves will never pay out

¹ "Economics Analysis, Nuclear Versus Hydroelectric Power Generation, Colorado River Basin Project, Interstate Stream Commission, State of Arizona," The Ralph M. Parsons Co., Number 3874-1, July 20, 1966, p. 11; hereafter cited and referred to as the "Parsons Study."

* Any views expressed in this paper are those of the author. They should not be interpreted as reflecting the views of The RAND Corporation or the official opinion or policy of any of its governmental or private research sponsors.

since the annual interest payments are greater than the net revenues as demonstrated in the Consolidated Payout Schedules herein.²

(2) This study also compares the funds accumulation from a base-loaded nuclear plant with those accumulated from the hydroelectric plants. While this comparison accrues the most funds from the various nuclear alternatives considered in this study, the funds accumulated are substantially less than those accumulated from the hydroelectric plants.³

(3) Even at the federal financing interest rate of 3.222%, the baseloaded nuclear power plants could not repay their costs if it were not for the outside contributions to the combined fund of revenues from Hoover, Parker, and Davis Dams in later years of the analysis.

(4) Evaluating only the economics of nuclear energy production at the plants—by neglecting *all* transmission costs—the four nuclear plants, baseloaded, could not repay their costs if the aggregate fixed charge rate (including depreciation) were in excess of 6.1% per annum.

These latter implications are so astoundingly contrary to the overwhelming preponderance of evidence from the real world that the credibility of the related Parsons Study conclusions quoted in (1) and (2) above seems doubtful. With regard to conclusion (3), the Bureau of Reclamation (an outspoken proponent of the dams) has admitted:

There is little doubt, from a theoretical point of view, that a nuclear plant could be selected of a certain size and operational pattern to contribute as much or more to the Development Fund as would the Marble Canyon hydroplant.⁴

In the recent announcement that the Administration no longer favors construction of either of the dams as a feature of the Central Arizona Project, but favors the purchase of energy from thermal plants to be built by WEST Associates, Secretary of the Interior Stewart L. Udall described the new plan as "a victory for common sense."⁵

With respect to conclusion (4), in the last two years investor-owned (private) utilities, with overall fixed charge rates ranging from 10%–14% per annum, or roughly double the break-even figure of the Parsons Study, have placed orders for more than 20,000,000 kilowatts of new nuclear generating capacity. In fact, in 1966 more nuclear capacity than fossil-fueled capacity was ordered. If the implicit conclusion (4) of the Parsons Study were true, this would mean that these utilities through their independent evaluations of nuclear power economics, have committed themselves to an aggregate investment of well over two billion dollars that cannot be repaid even through baseloaded operation. If this were indeed the case, this would represent a miscalculation unparalleled in the history of private sector investment decisions, and one that would rank with only the most remarkable of past federal reclamation project miscalculations.

To verify that conclusion (3) is implicit in the Parsons Study, one need only refer to either Table S or Table W of the Parsons Study. Column 5 of those tables shows the unpaid balance of the (interest-bearing) investment in the plants by years. In each of the first 18 years, the unpaid balance increases, demonstrating that annual revenues are less than annual costs (including, of course, interest on invested capital).⁶ Only with Year 19 and following years,

² *Ibid.*, p. 12.

³ *Ibid.*, p. 12.

⁴ U.S. Congress, House Committee on Interior and Insular Affairs, *Lower Colorado River Basin Project*, Hearings before Subcommittee, Part II, 89th Congress, 2nd Session, May 13, 1966, p. 1520.

⁵ Quoted in the *Los Angeles Times* (Preview Edition), Thursday, February 2, 1967, p. 2.

⁶ In the Parsons Study, annual costs *except for interest charges* are developed for all alternatives. These interest-less "costs" are then deducted from gross nuclear revenues on one set of charts (Tables H–O of the Parsons Study) in which revenues from Hoover, Parker, and Davis Dams are commingled with nuclear gross revenues. The resulting series for each alternative (which bear the label "Consolidated Net Annual Revenues") are then carried over to another set of eight charts (Tables P–X of the Parsons Study) of "Consolidated Payout Schedules," where, under the Power section in the "Interest Bearing Investment" column, interest payments are finally applied. That is, under the Parsons Study procedures, revenues are first used to defray annual operating and maintenance costs; remaining revenues are used to defray the depreciation account (the Replacement Fund); any remaining revenues are then applied first to payment of annual interest charges and then to reducing the unpaid balance of the investment account. Thus an *increasing* unpaid investment account indicates that revenues are insufficient to meet even the total annual interest charges.

when revenues from Hoover, Parker, and Davis are incorporated into Column 1 of those tables (Net Operating Revenue), does the investment begin to decline.⁷ Somewhat more effort is required to verify conclusion (4). The Parsons Study evaluates no less than eight alternative cases—three plants in Los Angeles and one in Arizona versus four plants in Los Angeles, both baseloaded and peak-loaded, and all at both 3.222% interest and 4.5% interest—and the mass of data and proliferation of tables is more than sufficient to stun the casual reader. Accordingly, conclusion (4) will be verified herein only for the case of three plants at Los Angeles and one in Arizona, which most nearly corresponds to the proposed distribution of energy. Tables 1 and 2 reproduce, respectively, relevant portions of the Parsons Study capital cost and annual cost tables for this alternative location.⁸

The exclusion of transmission costs assumed in conclusion (4) permits us to discard Item 9 of Table 1, reducing investment in plant and equipment to the \$397 million of Line 8, and to discard Line 7 of Table 2, reducing annual costs before replacement and interest on investment from \$30.877 million to \$28.904 million. At the assumed overall fixed charge rate of 6.10%, the annual replacement (a form of depreciation accounting) and interest charges on the \$397 million investment would be \$24.217 million. Then total annual costs are \$53.121 million.⁹ Annual revenues in the Parsons Study fluctuate slightly from year to year; however, the sum of the Gross Nuclear Revenues over the 75-year period of analysis is \$3,983,239,000,¹⁰ so that the average annual revenue may be taken to be \$53.110 million. Thus, at a 6.1% fixed charge rate with no allowance for transmission costs, taxes or other private-utility costs, the four baseloaded nuclear plants incur losses of \$11,000 per year.¹¹ Moreover, at a typical private-utility fixed charge rate of 12% per annum, the deficit for the four units would be in excess of \$23.4 million per year under the Parsons Study cost and revenue assumptions, or an annual loss of \$5.95 million per nuclear plant! Thus, if the Parsons Study analysis is to be accepted, it follows that those private utilities that have ordered nuclear plants have not just made a minor error, but have indeed made a colossal miscalculation.

TABLE 1.—Parsons study capital cost assumptions, 3 units in Los Angeles and 1 unit in Arizona

[Dollar amounts in millions]		
Line	Item	Cost
1	Equipment and facilities	\$270.90
2	Land and land rights	7.60
3	Site development	16.70
4	Indirect capital	14.60
5	Subtotal, lines 1 to 4	309.80
6	Interest during construction	9.90
7	Working capital	77.30
8	Subtotal	397.00
9	Transmission facilities	141.00
10	Total	538.00

Source: Parsons study, *op. cit.*, table C, p. 52.

⁷ Tables J and N, in which Net Operating Revenues for Table S and W, respectively, are derived, show in Column 9 (Hoover, Parker, Davis Net Revenues) that Year 19 is indeed the first year in which outside revenue is added.
⁸ Parsons Study, *op. cit.*, Tables C and G.
⁹ The sum of \$28.904 million operating and \$24.217 million capital costs.
¹⁰ Parsons Study, *op. cit.*, Table N, Column 8, p. 89.
¹¹ This is, admittedly, a simplified analysis. The Parsons Study uses a combination interest charge and sinking fund rate, with a 100-year period on the items in Lines 1, 4, 6, and 7 of Table 1, 50-year on transmission (Line 9) and 100-year on land and site development (Lines 2 and 3); under this procedure, the break-even interest rate is 4.58%, with fixed charge rates (including sinking fund) of 6.197 for 30-year items and 4.633 on land. This, of course, closely approximates the overall 6.1% fixed charge rate used above.

TABLE 2.—Parsons study annual costs for baseloaded plants, 3 units in Los Angeles and 1 unit in Arizona

Line	Item	Cost
1	Operating and maintenance labor	\$1,500,000
2	General and administration expenses	200,000
3	Maintenance materials and supplies	100,000
4	Nuclear insurance	100,000
5	Nuclear fuel	1,000,000
6	Cooling water	100,000
7	Transmission maintenance	100,000
8	Total annual cost before replacement	\$2,900,000
9	Replacement fund (at 3.222 percent)	93,333
10	Total annual cost before interest on investment	\$2,993,333

Source: Parsons study, op. cit., table G, p. 61.

Now that it has been shown that the Parsons Study analysis implies certain unacceptable conclusions, it may be of interest to identify some of the more important points at which various estimates and assumptions have contributed to the unfortunate disparity between the Parsons Study and real-world nuclear power economics. We consider first those aspects dealing with nuclear power costs and revenues in the general case, and then some aspects of the particular comparison of nuclear and hydropower for the Development Fund.

NUCLEAR POWER COST ESTIMATION

Under this heading we will briefly consider the following items—powerplant selection and costs, land costs, and interest during construction.

Powerplant selection and costs.—The nuclear powerplant design assumed in the Parsons Study is the dual-cycle reactor of the Dresden I type. Unfortunately, the dual-cycle reactor type assumed in the study is no longer offered by any of the major U.S. reactor vendors, and was last offered as an alternative to the Oyster Creek and Nine Mile Point plants in 1963. In both cases, the utilities selected the single-cycle version because it entails lower initial investment and greater efficiency, and because developments such as variable flow recirculating pumps proved to be a more flexible method of handling load changes. In the Oyster Creek analysis,¹² the contract price of the single-cycle reactor was \$1.5 million less than the dual-cycle. Since the Oyster Creek reactor is roughly the size of each of the four reactors assumed in the Parsons Study, capital costs for plant and equipment would appear to be overstated by some \$6 million plus overheads, which represents an annual cost reduction of some \$330,000 at the 3.222% interest rate.

The Parsons Study also assumes a net capacity of 2450 electric megawatts (MWe) from the 2600 MWe gross capacity of the four units. For single-cycle plants of 650 MWe gross using ocean water cooling, auxiliary power requirements should not exceed 20 MWe, and for inland plants, because of cooling tower fan power requirements, auxiliary power should be about 30 MWe, so that the net rating of the three plants in Los Angeles and one in Arizona should be about 2510 MWe. This is somewhat academic, as the Parsons Study inadvertently used the gross power rating rather than net power in computing the annual nuclear generation of 18.22 billion kilowatt-hours (kwh) per year at baseload (80% load factor), which is the figure used throughout. This would result in adjusted annual energy production of 17.59 billion kwh.

In the absence of more detailed cost estimates it is not possible to comment on the accuracy or acceptability of the various estimates; the overall level of nuclear capital costs appears reasonably representative of costs as of the publication date of the study.

Land costs.—The Parsons Study based its estimate of land costs on a Bechtel study of alternative sites for the proposed power and desalting plants. Land costs are assumed to be \$25,000 per acre for "ocean frontage" and \$10,000 per

¹² Report on Economic Analysis for Oyster Creek Nuclear Generating Station; Jersey Central Power and Light Co., February 17, 1964; also reprinted in AEC Authorizing Legislation—1965, Part 2, Appendix 4.

acre for "land to the rear of the ocean frontage."¹³ Total land costs for the case of all four plants in Los Angeles is given as \$8.25 million for 400 acres.¹⁴ The only purchase consistent with these figures is 283½ acres of ocean frontage and 116¾ acres of land to the rear.

Since plants would be placed along the shoreline with the exclusion area to either side and inland, these oceanfront acres appear to be acquired as long thin strips.¹⁵

Quite as remarkable is the assumption that land costs fall from \$8.25 million to \$7.6 million for the case of three plants in Los Angeles and one in Arizona. Since the Los Angeles plants would be located immediately adjacent to each other, land savings for the deletion of a fourth unit at an oceanfront site would be negligible, while costs for acreage in Arizona would be added.

The proposed site is surely among the most expensive that could have been selected; alternatives not discussed in the Parsons Study would include avoiding the purchase of oceanfront land by locating slightly inland from the beach (as at Malibu), locating on government land (as at San Onofre), or even, considering the cost, of building on a man-made island as is planned for the power-desalting complex for Los Angeles.¹⁶

Interest during construction.—The amount of interest during construction appears to have been improperly estimated. The Parsons Study states:

On the basis of using federal financing and assuming that capital costs are expended at a uniform rate during construction, a factor of 3.2 per cent is applied against the sum of equipment and facilities, land and land rights, site costs, and indirect capital.¹⁷

This would, of course, be the appropriate figure for straight-line construction if the construction period were somewhat less than two years. The traditional procedure for estimating interest during construction assumes a sigmoid curve for construction expenditures; then interest during construction can be estimated from the relationship

$$IDC = \frac{iT}{100} (L + 0.45C),$$

in which i is the interest rate in percent, T is the duration of construction in years, L is land cost and C is construction cost; the factor 0.45 is a weighting factor indicating that construction expenditure is greater towards the end of the period than earlier.¹⁸

For the first four items of Table 1, adjusted as discussed above, interest during construction would amount to \$18.14 million rather than \$9.9 million.

FUEL CYCLE COSTS

Under this heading, we consider investment in fuel working capital, working capital charge rates, and nuclear fuel costs.

Investment in Fuel Working Capital.—Item 7 of Table 1 lists investment in working capital as \$77.3 million. The Parsons Study describes this as follows:

A total of \$9,820 per megawatt thermal of reactor rating was utilized for fuel inventory. A percentage factor of 0.25 per cent of the sum of equipment and facilities plus depreciable site costs was used to estimate the cost of maintenance materials.¹⁹

The 2600 MWe of reactor rating at an efficiency of 33.3% would correspond to a thermal rating of 7800 megawatts resulting in an average investment of \$76.6 million of the \$77.3 million in fuel working capital. The \$9800 per thermal megawatt corresponds then to an investment of \$29.40/kw of electric capacity. For comparison, the Oyster Creek study lists average annual investment in fuel of \$22 in Years 6–10, \$26 in Years 11–20, and \$24 in Years 21–30,²⁰ all of which

¹³ Parsons Study, *op. cit.*, p. 53.

¹⁴ *Ibid.*, p. 53 and Table B.

¹⁵ For a 6,000-foot ocean frontage, each "ocean frontage" acre has the unusual dimensions of 21 feet in width by somewhat over 2,050 feet in depth.

¹⁶ Most of the acreage required there is for the desalting plant flash evaporator trains, so that the size might be substantially reduced.

¹⁷ Parsons Study, *op. cit.*, p. 54.

¹⁸ See, e.g., Geller, Hogerton, and Stoller, "Analyzing Power Costs for Nuclear Plants," *Nucleonics*, Vol. 22, No. 7 (July 1964), pp. 64–72. The value of T should be 4 years, not 2.

¹⁹ Parsons Study, *op. cit.*, p. 54.

²⁰ Oyster Creek Analysis, *op. cit.*, Table 1.

are substantially below the value assumed in the Parsons Study. Improvements in core performance, reductions in fabrication cost, and a slight decrease in enrichment since the Oyster Creek Analysis suggest that current values are substantially lower. As an instance, PG&E's Diablo Canyon 1060 MWe pressurized-water reactor has an investment of about \$20/kw, or \$6380 per thermal megawatt.²¹ Assuming working capital at \$6500 per thermal megawatt, or \$19,500 per electric megawatt, the fuel working capital investment is reduced to \$50.7 million.

The preceding applies only to a consideration of baseloaded plants. For peaking plants, the average investment in fuel working capital is somewhat lower as fabrication and reprocessing occur less often, so that these costs are spread over a longer interval.²² Thus, for peaking plants, the appropriate figure might be more on the order of \$17,000 per electric megawatt. Of course, the annual interest on this amount is distributed over fewer kilowatt-hours per year, so that the fuel cost for the peaking plant lies above that for a baseloaded plant, as will be discussed subsequently. Inasmuch as the baseloaded plants produce about double the kilowatt-hours per year of the peaking plant, fuel cost differentials due to varying load factor should be considered. These considerations are nowhere discussed in the Parsons Study.²³

Working capital charge rates.—In addition to estimating a somewhat inflated value for fuel working capital investment, the Parsons Study further proceeds to levy a sinking fund charge (in addition to normal interest) against this amount. Working capital, of course, represents only a form of payment for expenses incurred in advance of revenues, and therefore the interest that could have been earned by alternative investment of these funds is added as an expense. The principal amount of the working capital investment is recovered in due course, and there is nothing whatever depreciable about this account. Therefore, the application of sinking fund charges against this account as is done in the Parsons Study is an unacceptable economic practice. Only the 3.222% interest rate should be applied to the average annual total.²⁴ Since the 30-year sinking fund charge rate (corresponding to 3.222% interest) is 2.027%, this represents an overcharge on the \$77.3 million assumed by the Parsons Study of \$1,567 million per annum.

Nuclear fuel costs.—In addition to inflating the value of fuel working capital investment and improperly charging depreciation against this account, the Parsons Study appears to add working capital costs in a second time under the nuclear fuel account. The Parsons Study on the subject of nuclear fuel costs states:

The third core for a 650 megawatt electrical reactor is quoted in a manufacturer's handbook at 1.38 mills per kilowatt hour . . . The factors which enter into the 1.25 mills quoted for the Tennessee Valley Authority nuclear power plant are not fully known and although we can expect some reduction in cost if the plant were on a bid basis, the most reasonable value to assume for fuel cost appears to be about 1.3 mills per kilowatt-hour which is 0.05 mills higher than the Tennessee Valley Authority cost and 0.08 mills lower than the handbook values.²⁵

We note first that 1.3 m/kwh times the 18.22 billion kwh per year generation assumed in the Parsons Study yields the fuel cost of \$23,687 million of Table 2. Therefore, the Parsons Study has used a fuel cost of 1.3 m/kwh *plus* working capital charges which, under the Parsons Study methods of calculation, amount to an additional 0.22m/kwh.

The reference to "a manufacturer's handbook" is evidently a reference to the 1965 General Electric Company pricing handbook, wherein the third core fuel cost for a 650 MWe *single-cycle* non-reheat nuclear powerplant is estimated to be as shown in Table 3.

²¹ Pacific Gas and Electric Application No. 49501 Before the Public Utilities Commission, State of California, filed December 23, 1966, Exhibit J.

²² For a more detailed treatment of this, see the now-classic article by John M. Valance, "Fuel Cycle Economics of Uranium Fueled Thermal Reactors," P/247, Geneva Conference on Peaceful Uses of Atomic Energy.

²³ Additionally, it should be noted that the replacement figures of Tables E and G are different although both tables pertain to the same plant; it has not been possible to reproduce either set of figures from the data and directions in the Parsons Study. The true figures do appear to lie within the ranges of those figures, however.

²⁴ See, e.g., Geller, Hogerton, and Stoller, *op. cit.*

²⁵ Parsons Study, *op. cit.*, p. 54.

TABLE 3.—650 MWe third-core fuel cost,²⁶ single-cycle, nonreheat
(Cost, millions of kilowatt-hours)

Component:	
Uranium depletion.....	0. 58
Pu credit.....	(. 21)
Recovery.....	. 21
Fabrication.....	. 48
Fuel cycle financing cost.....	. 32
Total.....	1. 38

²⁶ General Electric Co. Atomic Power Equipment Handbook, sec. 8805, Nuclear Fuel, May 24, 1965.
NOTE.—Figures in parentheses indicate credit.

Note that the fifth item in this handbook listing is the working capital charge, so that the manufacturer's handbook price of 1.38 m/kwh *includes* working capital costs.

The TVA report states:
The suppliers have warranted the cost (including the interest cost on the fuel inventory) of the heat produced, and therefore the evaluations include the interest cost on the fuel inventory as part of the cost of the fuel.
Fuel cost for the BWR units range from 1.57 mills per kwh in 1970 to 1.09 mills per kwh by the end of the warranty period.²⁷

Thus, both the G.E. and the TVA figures cited by the Parsons Study *included* working capital costs, whereas the Parsons Study assumed a fuel cost midway between those two figures, and then added in separately working capital costs resulting in a gross overestimate of fuel costs.

It should be noted that the G.E. figures on Table 3 assume working capital charge rates of 5% before irradiation and 9% during and after irradiation, whereas the TVA figures include working capital at only the 4.5% cost of money. Since the G.E. figures of Table 3 give an estimate of 1.06 m/kwh for fuel cost less working capital charges, and since the TVA charge rate is about half that assumed in the G.E. figures, adding half of the G.E. financing cost yields 1.22 m/kwh as an estimate of equivalent TVA third core costs (including financing charges on working capital) for a 650 MWe unit. In reality; the 1965 G.E. handbook fuel prices are based on less optimal design than is available to TVA or to new plants. The 1965 handbook was based on burnup of 20,000 megawatt days per short ton (MWD/T) of uranium, whereas present design burnup is 27,500 MWD/T.

Power density has also been increased by some 40%, coupled with a slight decrease in enrichment. All these factors suggest that even the assumption of 1.3 m/kwh for these plants based on the reports cited in the Parsons Study would have been somewhat on the high side even before working capital costs were added.

Since the Parsons Study was completed, G.E. has published a new fuel cost handbook, which revises upward several of the economic assumptions on which third core costs were based. For 600 MWe plants, third core costs are warranted at 13.87 cents per million BTU's and for 700 MWe plants, 13.83 cents per million BTU's.²⁸

Then, by interpolation, third core warranted costs for a 650 MWe plant would be 13.85 cents per million BTU's, or at a net heat rate of 10,400 BTU/kwh, 1.44 m/kwh including financing charges at 5% and 9% as discussed previously. If financing costs represent the same fraction of costs as in the 1965 listing, this 1.44 m/kwh consists of direct costs of 1.10 m/kwh direct costs and 0.34 m/kwh financing charges. At 3.222% interest rather than the 5% and 9% rates used in the G.E. figures, financing charges might amount to 0.15 m/kwh, for a total fuel cost, *including* working capital charges, of about 1.25 m/kwh. Since the effect of the various Parsons Study procedures is to use a rate of 1.52 m/kwh, this reduction of 0.27 m/kwh on the 18.22 billion kwh per year means total

²⁷ "Comparison of Coal-Fired and Nuclear Power Plants for the TVA System," Office of Power, Tennessee Valley Authority, Chattanooga, Tennessee, June 1966, p. 5. The end of the warranty period is 1982, so that the 1.09 m/kwh is roughly representative of TVA third core costs.
²⁸ General Electric Company, *Atomic Power Equipment Handbook*, Section 8803, Nuclear Fuel, Fuel Cycle Service, October 24, 1966, p. 11. Figures are for single-cycle non-reheat plants for 1972 initial operation at an 80% load factor.

annual fuel cost reductions of \$4.92 million per annum, or about \$369,000,000 over the 75 year period of analysis of the Parsons Study.

For peaking plants, fuel costs are probably about 1.35 m/kwh when the higher working capital costs for this mode of operation are added.

NUCLEAR PLANT REVENUES

The effect of the above changes (excluding possible reductions in land cost) is to reduce baseload nuclear generating costs (excluding transmission) by somewhat less than \$5,000,000 per year; this would be sufficient to permit these plants to pay out without the use of revenues from Hoover, Parker and Davis at an interest rate of 3.222% (but the payout period would be protracted) but not at an interest rate of 4.5%. Since the annual generating cost figures with this \$5,000,000 reduction are somewhat under 2.7 m/kwh neglecting transmission costs, this strongly suggests that the difficulties encountered by the Parsons Study's nuclear plants lie on the revenue side. As we have derived above, the average annual revenues to the baseloaded plants (18.22 billion kwh per year) are \$53.11 million under the Parsons Study revenue assumptions. This is equivalent to a minuscule 2.91 mills per kwh sales price. Now the Bureau of Reclamation proposes to market power from the dams (if built) at \$10 per kilowatt of capacity per year demand charge plus 3 mills per kwh for each kwh of energy generated.⁴⁹ From Table N of the Parsons Study, the hydro plants generate an average of 7.619 billion kwh per year and receive an average gross revenue of \$37,622 million per year, for an average sales price of 4.94 m/kwh. Under the Parsons Study methodology the nuclear plants are credited with the same revenue for the first 7.619 billion kwh per year, but all kwh from that point to the 18.22 billion kwh assumed baseload generation is assumed to receive only 1.5 m/kwh! Since, as we have noted above, the implicit baseload fuel cost including working capital is 1.52 m/kwh, it should not be surprising to find that these baseloaded nuclear plants are not much different than the peaking plants.

In justification of this extraordinarily low revenue assumption, the Parsons Study states:

In the future, the proportion of peak electrical energy supplied by thermal power plants will increase because sites for additional hydroelectric power plants will not be available. Consequently, as long as power systems demand large amounts of peaking energy, the thermal plants, normally baseloaded, which will supply this peaking energy will have large amounts of "dump" energy available at incremental costs. Incremental fuel cost estimates range from 1.25 to 1.30 mills per kilowatt-hours for nuclear power plants and from 1.6 mills to 3.0 mills per kilowatt-hour for fossil-fueled power plants. Over the period of time covered by this study, because of the competitive nature of the resources industries, these incremental costs will tend to converge. If the cost gap does not close, the "defender" alternative of power generation, fossil fuel will become obsolete and not be selected for a fuel when contrasted to the "challenger" nuclear fuel. Consequently, 1.5 mills per kilowatt-hour have been used over the life of the payout period as the value to attach to excess power from the nuclear alternative. Perhaps early years will yield slightly higher revenues for off-peak energy, but later years will result in much lower revenues. Investigation of economy-interchange agreements and elements of costs for thermal equipment rendered idle by the nuclear plant resulted in the conclusion that higher revenues for off-peak energy are not justified.⁵⁰

A line by line rebuttal to this might proceed along the following lines.

In the future, the proportion of peak electrical energy supplied by thermal power plants will increase because sites for additional hydroelectric power plants will not be available.

Quite true. The best hydro sites have already been developed, and additional sites tend to be less favorable from an economic standpoint.

⁴⁹ Utility rates are often expressed as a continued demand (\$1/kw-yr) and energy (m/kwh) charge. The capacity charge is, in effect, a fee paid to reserve a part of capacity output, and the energy of charge is an incremental charge. When a load factor is given, the demand charge can be allocated over the annual generation in kwh and added to the energy charge to derive an equivalent energy rate. Thus for a 40% factor for the dams, the \$10 per kilowatt-year capacity charge is equivalent to 2.85 m/kwh so that the equivalent sales price from the dams is 5.85 m/kwh.

⁵⁰ Parsons Study, *op. cit.*, pp. 77-78.

Consequently, as long as power systems demand large amounts of peaking energy, the thermal plants, normally baseloaded, which will supply this peaking energy, will have large amounts of "dump" energy available at incremental costs.

Not necessarily true. There are several forms of thermal plants which do not have "dump" energy available. Foremost of these are gas turbine peaking units, which have quite low capital costs and high fuel costs and are adapted to meet peak loads and occasional emergency power. Percentage increases in orders for this form of capacity have been greater in the last year than even that of nuclear plants. Another form is the pumped storage project, in which off-peak "dump" energy is used to refill the upper reservoir in preparation for the following day's peak load. Furthermore, there is no assurance that the divergent trend between peak and baseload will continue. Such developments as the electric automobile could in a relatively short period supply such a demand for "dump energy" for overnight recharging as to reduce the differences between peak and off-peak loads. This would, in turn, reduce the spread between peak and off-peak rates.

Incremental fuel cost estimates range from 1.25 to 1.30 mills per kilowatt-hour for nuclear power plants and from 1.6 to 3.0 mills per kilowatt-hour for fossil-fueled power plants.

Hardly the case. In testimony regarding the offer of the California Power Pool to supply energy to the California Water Project Pumps, the range of incremental fuel costs for the PG&E, Southern California Edison Company, and San Diego Gas and Electric Company, ranged from a low of 3.1 m/kwh to a high of 5.01 m/kwh.²¹

Also, the two most efficient steam plants in the central Arizona region had average incremental costs of 3.5 m/kwh.²² Quite apart from this point, the installation of new capacity is ordinarily undertaken to meet growth in both base and peak load, and unless the peak load increases more rapidly than the baseload increases, new capacity has no dump energy available. Dump energy is largely available only from less efficient and more expensive plants that will be relegated to peak load service. Their cost of producing "dump" energy is not competitive. The present situation with dump energy widely available in the Northwest is essentially a short-term phenomenon.

Over the period of time covered by this study, because of the competitive nature of the resources industries, these incremental costs will tend to converge. If the cost gap does not close, the "defender" alternative of power generation, fossil fuel, will become obsolete and not be selected for a fuel when contrasted to the "challenger" nuclear fuel.

This is sheer nonsense. The selection of fossil or nuclear capacity is based on overall production costs, *not* incremental costs. There is no reason either to expect the incremental cost gap to narrow or to expect one or the other form of capacity to vanish. So long as fossil fuel capital costs remain sufficiently far below nuclear capital costs, the resulting cushion will allow the use of a higher cost (fossil) fuel and fossil and nuclear plants can coexist. Incremental costs are used *only* in deciding the sequence in which a set of existing units should be brought on line, and not in deciding what kind of plant to build.

Consequently, 1.5 mills per kilowatt-hour have been used over the life of the payout period as the value to attach to excess power from the nuclear alternative. Perhaps early years will yield slightly higher revenues for off-peak energy, but later years will result in much lower revenues. Investigation of economy-interchange agreements and elements of costs for thermal equipment rendered idle by the nuclear plant resulted in the conclusion that higher revenues for off-peak energy are not justified.

To deal with the last point first, any capacity that is "rendered idle" by the nuclear plants will remain idle only until the load grows to accommodate the nuclear plants. Since the growth of peak load on the PG&E system alone is forecast to be in excess of 650 MWe per year,²³ the idling would extend at most

²¹ AEC Authorizing Legislation, Fiscal Year 1966, Part 3, Hearings Before the Joint Committee on Atomic Energy, Mar. 11, 18, 19, 24 and April 18, 1966, p. 1571; data are from 1964 FPC report FPC 8-146, *Steam-Electric Plant Construction Cost and Annual Production Expenses—1964*.

²² F.P.C. Report 8-171, *Steam-Electric Plant Construction Cost and Annual Production Expenses—1965*, March 1966.

²³ PG&E Application 49501, *op. cit.*, Exhibit G. Area load growth is in excess of 3000 MWe per year.

only four years. Crucial to the argument, of course, is the need to integrate the plants into the various utility networks. In this respect, the California Power Pool proposal is instructive; the proposal letter states:

However, should the State decide to install initially its own atomic generating facilities, the suppliers are willing, as we have indicated in previous meetings, to cooperate in contracting for the integration of such facilities into our interconnected systems and for the operation of the plant by one or more of the suppliers.³⁴

The Power Pool contract, incidentally, established 3 mills/kwh as the rate to the California project, and this is the lowest rate available to any of the Pool's customers, based on the large block required. By contrast the Metropolitan Water District, another large user, paid 5¼ mills/kwh for off-peak energy.³⁵ Thus we might infer that in the "early years" revenues will be substantially above 1.5 mills (not "slightly"); also since the floor is somewhere around 1.3 to 1.4 m/kwh representative of private utility incremental costs "later years" can hardly result in "much lower" revenues than the 1.5 m/kwh assumed. On balance, 1.5 m/kwh appears to be an extremely unlikely assumption as to off-peak revenues over the next 75 years. Even on an economy-interchange basis, revenues should easily be in the 2.25-2.5 m/kwh, and that is probably a minimum estimate. Needless to say, at higher revenues, the nuclear plants turn out to be quite effective contributors to a Development Fund.

NUCLEAR VERSUS HYDRO FOR THE COLORADO BASIN

The preceding discussion has for the most part focused on the economics of nuclear power in the abstract; the Parsons Study, however, is intended as a specific comparison of nuclear plants versus hydro plants as contributors to the Basin Development Fund. In evaluating this specific comparison, the Parsons Study has applied what, for want of a better term, might be described as "Robinson Crusoe Economics." The meaning of this will become plain when we consider how a "comparable" nuclear alternative was selected.

Hydro

The two dams have an aggregate rating at site of 2100 MWe, and the largest generating unit is 250 MWe, so the rating with one unit down is 1850 MWe at site. Hualapai at 1500 MW would primarily supply energy to Southern California, and Marble at 600 MW would primarily supply Arizona and the Central Arizona Project pumps at Lake Havasu.

The Parsons Study nuclear alternative

The Parsons Study selected a total of four 650 MWe nuclear plants, so that with one unit out of service, the aggregate rating would be 1950 MWe, or 100 MWe more than the dams.³⁶ They state that the fourth unit is intended primarily as backup. Also, transmission lines (at initial cost of \$141 million) are provided between Los Angeles and Phoenix; when all four plants are located at Los Angeles, this provides for the Arizona load; when 3 are in Los Angeles and one in Arizona, the lines "would still be required in order to provide the necessary reserve backup for the one unit in Phoenix."³⁷

On the revenue side, however, hydro revenues are computed on the basis of full rated capacity (not one unit out capacity), while the nuclear plants are credited *only* with the same generating hours and revenues as the dam with the additional capacity during peaking hours and the added availability at other hours given no credit. In the baseload case, all kilowatt-hours produced by the nuclear plants in excess of those generated annually by the dams are evaluated as off-peak despite the fact that 50% of the hours in a week by utility definition are on-peak hours, although the dams operate only 41% of the time. In addition, the deliverable capacity of Hualapai is only 1350 MWe and that of Marble is only 552 MWe due to losses in transmission from the remote dam sites to load centers. Since the nuclear alternatives are located at load, losses are negligible. These

³⁴ AEC Authorizing Legislation—1966, *op. cit.*, p. 1568. The suppliers are Southern California Edison, San Diego Gas and Electric, Los Angeles Department of Water and Power, and Pacific Gas and Electric.

³⁵ *Ibid.*, p. 1573.

³⁶ Or 1880 MW net with two at Los Angeles and one in Arizona on-line.

³⁷ Parsons Study, *op. cit.*, p. 41.

effects have not been evaluated in the Parsons Study. Thus for the nuclear alternative, peaking revenues are substantially understated.

The Parsons Study thus envisions a comparable alternative to the dams as a completely self-contained power generation system with its own full reserves, and with full backup interconnection among units. It is as though in the service area there were no other generating capacity, transmission lines, reserves, emergency, interchanges, and the like—hence the term “Robinson Crusoe Economics.”

However, the Parsons Study assumptions are not even least-cost “Robinson Crusoe Economics”, as the following example shows: For three plants in Los Angeles and one in Arizona, the \$141 million transmission line at 3.222% and 50 year depreciation has an annual cost of \$5.713 million plus annual operating and maintenance costs of \$1.973 million for a total annual cost of \$7.686 million. Four 140 MWe gas turbine peaking units could provide 560 MWe capacity (slightly more than the deliverable capacity of 552 MWe of Marble) for a total investment cost of \$44 million.²⁰ Since they would be used only for standby we might assume a 50 year service lifetime for these units, in which case the annual investment cost is only \$1.783 million, even assuming no credit for standby emergency service. Thus even in the Crusoe world of the Parsons Study the cost of the nuclear alternative has been overestimated by almost \$6 million per year. Much the same argument could be directed to the fourth nuclear plant. Since under the Parsons Study assumption, it never receives any peaking power revenue, but instead receives only 1.5 m/kwh, its replacement by five 140 MWe gas turbine peaking units would cost about \$55,000,000, or about \$2.229 million per year, which is less than the annual investment and operating cost minus the assumed baseload revenue of the fourth plant. Of course, for *realistic* revenue projections, the fourth nuclear unit would be preferred.

USE OF BUREAU OF RECLAMATION CALCULATIONS

A final point pertains to the estimates by the Bureau of Reclamation of annual costs and contributions to the Basin fund. The Parsons Study has used without modification the figures developed over the course of the past few years, which have been shown to be of limited accuracy. In particular, since costs for the dams were estimated some years ago, general price escalation during the intervening period has raised the cost of the dams by some ten to fifteen percent. Also, the calculations by the Bureau neglected certain other expenses, such as \$34 million for an afterbay on the river below Marble Canyon Dam to re-regulate the flow of the Colorado through the Grand Canyon, an undetermined amount as compensation to the Hualapai Indian tribe for encroachment on reservation lands,²¹ and a charge against power revenues for the amount of water evaporated by the dams.

Hydro fuel

With regard to this latter point, the Parson Study has (rightfully) charged the Arizona power plant with the cost of cooling water. The baseload plant is assumed to use 13,000 acre feet per year, and the peaking plant, 5,700 acre feet, charged at \$50 per acre foot. Parsons also makes much of the phrase “The nuclear plant requires fuel; the hydroelectric plant requires none.” In the ordinary sense of the word, perhaps not; but hydroelectric power *does* require impounded water, which is subject to evaporation and other losses. Evaporation is particularly critical in this instance since, as has been pointed out, the waters of the Colorado River are *already* over-allocated; thus every extra acre-foot evaporated behind a dam is an acre-foot lost to some beneficial consumptive user further downstream.*

When the purpose of a dam is flood-control or storage and diversion, the annual evaporation can with some justification be imputed to these items, but (since Lake Powell lies immediately above Marble Reservoir and Lake Mead immediately below Hualapai) neither flood-control nor storage and diversion can be claimed in this instance. Therefore, the annual reservoir evaporation in

²⁰ Prepared Testimony of Alexander Lurkis, Alexander Lurkis Associates, Consulting Engineers, before the Federal Power Commission, Project No. 2338 (Cornwall Project), 1966.

²¹ The Navajos apparently would not object to some compensation also.

*In this instance, to Southern California, since it currently withdraws from the Colorado more water than that to which it is entitled under the Supreme Court decision.

excess of that which would occur in the absence of the dams is in a very real sense a cost of the power produced. Although there is some uncertainty as to the actual extent of evaporation from the proposed reservoirs, the Bureau has admitted that at least 85,000 acre-feet per year from Hualapai and 10,000 acre-feet from Marble would be lost (over and above what is presently lost from the stretches of the river to be inundated).**

In summation, then, the Parsons Study contributes little to our understanding of either present nuclear power economics or the substitutability of nuclear power for dams in the Lower Colorado Basin.

CONCLUSION: VALIDITY OF PARSONS STUDY HIGHLY QUESTIONABLE

Briefly summarizing the major points of this final paper, we find that the Parsons Study has produced power cost and revenue projections that are sharply divergent from other predictions of the economics of nuclear power. In part this is due to a series of questionable if not erroneous procedures, such as the overestimation of nuclear fuel costs, the underestimation of interest during construction, and the unnecessarily high cost of land. In part, it is due to quite low off-peak revenue assumptions, especially since no allowance for reduced costs of replacement nuclear plants (i.e., breeders or advanced converters) is made under the Parsons Study procedures. One measure of any special-purpose study such as the Parsons Study is that it should yield reasonable predictions in the general case; yet the Parsons Study was shown to imply that nuclear plants (even with no transmission charges) cannot operate at a profit even at fixed charge rates only half as large as those presently used by private utilities. Since these utilities are in fact ordering nuclear plants at record rates, someone is surely wrong.

The usefulness of the Parsons Study is further impaired by its failure to select a least-cost nuclear alternative and failure to assume the operation of the alternative in an optimal manner. The selection of four nuclear plants plus a Los Angeles-Phoenix transmission line has been shown to be a needlessly expensive alternative even for an isolated utility system; beyond this, however, the nuclear plants are assumed to have an on-peak generation availability only equal to the dams, despite the fact that the dams do not operate throughout the peak period. Finally, the Parsons Study makes no effort to correct or update the Bureau of Reclamation calculations, although they had previously been shown to be understated. Inflation of dam construction costs alone increases their annual generating costs almost 10 percent even using the Bureau's construction cost index. Thus the nuclear alternatives, after a gross overestimation of costs and underestimation of off-peak revenues, is further compared to proposed projects for which costs are seriously understated. Under these circumstances, the result is predictable, but the validity of the conclusions is questionable.

Mr. JOHNSON. The gentleman from Arizona, Mr. Udall?

Mr. UDALL. Dr. Carlin, it is always enjoyable for me to have the benefit of your thinking on this legislation. Again, I want to tell you as I did last year that I certainly respect the sincerity that you bring to this work and the dedication that has led you to devote so much of your time to a problem of this sort.

I took your testimony home with me last night, you having provided copies in advance, and had a chance to go over it. I am thoroughly confused by the assertions of someone who has given so much time to it as you have, as contrasted with the assertions of the Bureau of Reclamation and someone like Mr. Goss who testified here today. It is obvious to me that someone is badly off base. And it is hard to believe that both of you are using the same mathematics and the same engineering and the same logic.

I don't want to take the subcommittee's time this afternoon to quarrel with your conclusions or to go into it in any great detail. But I

**At an imputed cost of \$50 per acre-foot—typical of municipal and industrial rates obtainable for water—the annual cost of the hydro "fuel" would be \$4.75 million.

do want you to know that I have read your presentation and to the best of my ability tried to understand it.

Mr. CARLIN. I should like to comment, if I may, that our studies as presented here relate only to the proposals made by the Bureau. We have not had time to evaluate, nor do we have the necessary information to evaluate, this new idea.

Mr. UDALL. I gathered that. I did not want to put you on the spot. Did you have any offhand reactions as to Mr. Goss' testimony? Do you see any gimmicks or loopholes in his arguments or presentation?

Mr. MOSS. I plan to cover that in my testimony, Mr. Udall.

Mr. CARLIN. I would prefer to defer to Mr. Moss, if I may.

Mr. UDALL. All right.

That is all I have, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer?

Mr. HOSMER. You mentioned the Ralph M. Parsons Co. What is their business?

Mr. CARLIN. It is my understanding that they are in the engineering and construction business, sir.

Mr. HOSMER. Do you know what their general reputation for professional competence is?

Mr. CARLIN. The only previous knowledge I have of the organization's work relates to the work they have done on the proposed North American Water and Power Alliance, and I have not had an opportunity to study that as thoroughly as I would like.

Mr. HOSMER. My question was do you know what their general reputation for professional competence is?

Mr. CARLIN. I have no further information on that subject than what I have just stated.

Mr. HOSMER. Based only, then, upon this complaint you make about their study for the State of Arizona, it would be necessary for you to qualify them as an incompetent organization?

Mr. CARLIN. I have not made that statement, and I would not like to be on record as making that statement.

Mr. HOSMER. You characterize their study as questionable?

Mr. CARLIN. Yes, sir.

Mr. HOSMER. And you have listed several reasons. For instance, it implies that nuclear power is not competitive contrary to observed utility behavior.

Now, in that connection, just what are you talking about? Peaking power, base load power, or what?

Mr. CARLIN. I believe that in Dr. Hoehn's calculations, in which he derived this implication from the study, he happened to use their cases using a base loaded nuclear alternative.

Mr. HOSMER. Base load.

Of course we are talking about peaking power, I suppose, on the dams?

Mr. CARLIN. Yes, sir; we are.

Mr. MOSS. I might comment on that.

Mr. HOSMER. You are not up on the witness stand. Just wait your turn.

Mr. CARLIN. I did ask that he be allowed to answer questions.

Mr. HOSMER. All right, go ahead.

Mr. JOHNSON. Yes. It was my understanding that Mr. Moss was to be the backup for Mr. Carlin. Mr. Moss, Mr. Carlin wants to defer to you on this question.

Mr. MOSS. In the Parsons study, the question of whether the revenue from the base-loaded nuclear plant as a substitute for Hualapai Dam would be greater or less was considered. So Mr. Hoehn, in analyzing the Parsons report, took the assumptions of the Parsons study, which was a base-loaded nuclear plant, as a revenue producer.

Now, the Parsons study assumed that offpeak power from the nuclear plant would be sold at only 1.5 mills per kilowatt hour, which is equal to the production cost. So no surplus revenue was earned by the nuclear plant during offpeak hours.

This is so low for the sale of offpeak power—I might mention it is half the cost of offpeak power being sold by the California Power Pool to the State of California, Department of Water Resources—that it puts into serious question the validity of the Parsons study with respect to the revenue from the nuclear plants.

Mr. HOSMER. What are you assuming—that the nuclear plant is going to be over in California, where you have a market for peaking power at that price, or that it is going to be over in Arizona someplace?

Mr. CARLIN. You are asking what we assumed in our studies?

Mr. HOSMER. I am asking Mr. Moss why he is complaining about—

Mr. CARLIN. I would like to clarify this. Are you asking—

Mr. HOSMER. Mr. Moss is answering the question right now.

Mr. MOSS. Mr. Hoehn assumed exactly what the Parsons company did, which is the nuclear plants in the cases he was considering would be located in southern California.

Mr. CARLIN. I don't think this is the case.

He looked, I believe, at one of many cases studied by Parsons in which three nuclear plants are in southern California, and one is in Arizona. But I might be mistaken.

Mr. HOSMER. That is right. Because there is a complaint about unnecessary transmission investments, which would imply that perhaps you put these nuclear plants in downtown New York or someplace like that, where you have a good high market. That is neither here nor there. Are you an engineer, Mr. Carlin?

Mr. CARLIN. No, sir; I am an economist.

Mr. HOSMER. Is Dr. Hoehn an engineer?

Mr. CARLIN. He is an economist who has spent the last 2 years or more studying the nuclear power industry.

Mr. HOSMER. I don't suppose either one of you have ever worked for a utility?

Mr. CARLIN. To the best of my knowledge, I don't think either of us have.

Mr. HOSMER. Thank you, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Burton?

Mr. BURTON of California. Dr. Carlin, I think that you and your colleagues are to be commended for the personal effort you have made on this matter. It is somewhat difficult for those of us that don't have special technical competence to judge which of alternative statements of fact or theory are, the more accurate. But I do think that

your effort is to be commended, in the highest tradition, I would think, of the involvement of private citizens in public policy questions of great moment.

That is all, Mr. Chairman.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. I appreciate your appearance here and the effort you have put in. I have no questions.

Mr. JOHNSON. Mr. Reinecke, the gentleman from California.

Mr. REINECKE. Thank you, Mr. Chairman.

Mr. Carlin, on page 25, you indicate that the Bureau of Reclamation calculations were used for all figures on the hydroplants in the Parsons study. Would you elaborate on that?

Mr. CARLIN. For all what?

Mr. REINECKE. On page 25, you say:

A final point pertains to the estimates by the Bureau of Reclamation of annual costs and contributions to the Basin Fund. The Parsons study has used without modification . . .

Indicating that Parsons apparently did not make any independent study of the hydroplants; is that right?

Mr. CARLIN. As I recall, they simply used the Bureau figures, most of which are available in the hearings, without any corrections; for example, to bring them up to date as a result of price increases since that time.

Mr. REINECKE. Do you know where they got their data for the nuclear figures that they used?

Mr. CARLIN. They got them from several sources, but the most important one was a study mentioned in our statement done several years ago in connection with a study they made of a possible nuclear plant or combination nuclear desalting plant here on the east coast.

Mr. REINECKE. One other question. I looked at the Parsons study today briefly myself, and one point that I saw—maybe it is right, maybe it is not—they charged \$50 per acre-foot, or in other words the M. and I. rate, for cooling water for the plant to be built in Phoenix. Offhand this sounds high to me, when you consider what they are really doing is shifting the subsidy from water over to power, or power to water.

Do you know what they are charging for the cooling water on the steamplant that they proposed up here at Page?

Mr. CARLIN. No; I do not have any information on it, but Mr. Moss might have.

Mr. Moss. The answer to that is they are charging \$6 per acre-foot for that cooling water.

Mr. REINECKE. \$6 for the steam and \$50 for the nuclear. Now, Parsons did not talk about the steamplant at Page.

Mr. CARLIN. No, sir.

Mr. REINECKE. This is not a reflection on Parsons in this case, but it is a question of where Parsons got the \$50 figure.

Mr. CARLIN. I don't remember in detail. But I would imagine that they took the figure from the proposed charges to be made by the Bureau for water from the Central Arizona project.

Mr. REINECKE. I realize this is asking a lot here, but do you know offhand what the total cooling water charge would be for the nuclear plant in the case of the Phoenix unit?

Mr. CARLIN. Offhand, I would not be able to give it to you. Maybe Mr. Moss could.

Mr. Moss. What is the capacity of the plant? Around 800 megawatts?

Mr. REINECKE. That is all right. I thought maybe you would have an order of magnitude. I wanted to know if the \$50 figure is not fairly high, how much of a difference this might make in the overall calculations.

Mr. Moss. For a nuclear plant of about 800 megawatts baseloaded, if you pay \$50 per acre-foot, the cost of that cooling water would be about a million dollars per year.

Mr. REINECKE. Thank you very much. No further questions.

Mr. JOHNSON. Just one question I would like to ask.

I understood Mr. Moss to say the Bureau of Reclamation had offered water from Lake Powell at \$6 an acre-foot?

Mr. Moss. I believe there are several steamplants, coal-burning steamplants, that have been proposed for construction, using water from the Colorado River, like the Kaparawitz plant near Lake Powell, and, of course, the plants in the four corners. And it is my understanding for at least one of those plants, the cost either contracted for or proposed was \$6 per acre-foot.

Mr. JOHNSON. That was not in the Page facility?

Mr. Moss. I doubt that the negotiations have proceeded to any degree on that particular one.

Mr. JOHNSON. I was trying to find out if you knew who was going to build the Page plant—that is, what group of utilities, public and private. I have not been able to find that out yet.

Mr. Moss. I don't know the answer to that.

Mr. JOHNSON. I doubt whether they have made any offers for cooling water from Lake Powell for the Page plant.

Mr. Moss. Not for the Page plant. But for similar plants near there.

Mr. McFARLAND. Mr. Chairman, I think the record should show the water you are discussing is water allocated to one of the States, and it is that State's decision to use the water in that way. So far as the water charge by the Bureau, it is really a charge for taking the water from the river. I just wanted to make that point.

Mr. JOHNSON. I was wondering—even to divert water from the river it is fairly costly in some places. Whether it would add up to \$6 an acre-foot or not I don't know.

We want to thank you, Mr. Carlin, for your testimony and your summary and your participating in the questions.

The next witness will be Mr. Laurence I. Moss, nuclear engineer.

Will you tell us for the record, Mr. Moss, who you are representing?

STATEMENT OF LAURENCE I. MOSS, NUCLEAR ENGINEER

Mr. Moss. Yes.

I am representing only myself at these hearings, Mr. Chairman, testifying as a private citizen.

Mr. JOHNSON. Who do you work for, Mr. Moss?

Moss. I am employed by Atomics International as an assistant manager. But I don't represent the company today.

JOHNSON. We have your statement here, Mr. Moss. It will be in the record in full. If you would summarize it for us, we greatly appreciate it.

Moss. Thank you very much, Mr. Chairman. I appreciate the opportunity to appear before the committee once again.

I would first like to talk about Hualapai Dam, formerly Bridge Dam, which surely must be one of the most remarkable dams proposed for authorization by this committee. I should also say it is one of the most quickly moving targets to attack, even though it must cost of many millions of tons of concrete.

At first we had the name changed from Bridge to Hualapai, which compounded the confusion. And now we have a proposed change in power capacity, from 1,500 megawatts to 5,000 megawatts.

I ought to make a distinction in my testimony today as to which Hualapai I am referring. Hualapai No. 1 will be the Bureau of Reclamation dam, and Hualapai No. 2 will be Mr. Goss' dam.

First I will talk about Hualapai No. 1.

This has been represented as the best damsite on the river. Many witnesses have testified to that. One would think that Hualapai No. 1 would probably be the best moneymaker since the invention of the printing press.

Why, then, does the Bureau say that there will be more money in the development fund in the year 2025—their figures are \$800 million versus \$768 million—if the construction of Hualapai is deferred 10 years from 1972 to 1982? And they also present similar figures—why did this last Tuesday—for the year 2047. That is, if the construction of Hualapai is deferred 10 years there will be \$2,400 million in the development fund versus \$1,850 million if it is constructed immediately.

For something which is supposed to be a great moneymaker, it seems surprising that the longer you wait to build it the more money it makes for you, and the more money is accumulated in the development fund.

There are two answers to that question.

The first is that the prepayment plan recently proposed by the Bureau to obtain power from coal-burning stations, or even if it was from nuclear plants, is a more economical way of obtaining power for the CAP pumps than from a dam at Hualapai, or at Marble, for that matter. And I say this even though the cost figures presented by the Bureau of Reclamation on the prepayment plan are extremely conservative.

If you take the figure they give of \$91.9 million for generation and transmission, and subtract from it the \$27.6 million allocated to transmission, you get an amount of \$64.3 million allocated to generation.

Now, this works out, if you divide it by the 400 megawatts capacity for which they are contracting, to an investment of \$161 per kilowatt generating capacity for their share of this large coal-burning plant.

This is exclusive of interest during construction.

The plants being built now by private utilities, roughly in the same area of the same general type, and of the same general size, cost

between \$100 and \$110 per kilowatt. So the Bureau has very conservatively estimated that the capital cost for their share will be 50 percent higher than that.

I think that if some corrections were made to their prepayment plan estimates, you would find that you might be able to use the prepayment plan, sell CAP water in central Arizona for the previously proposed prices of \$10 per acre-foot for irrigation water and \$50 per acre-foot for M. & I., and not need any ad valorem tax at all to pay off the project.

Now, the second reason——

Mr. HOSMER. Does that figure include interest on \$161?

Mr. MOSS. I don't believe it does, because there is a separate item in the Bureau's report for interest during construction, which is applied to the total amount of money that they previously state as capital costs.

Mr. HOSMER. That is a separate item, there is also interest on this prepayment during the period it is coming back.

Mr. MOSS. Well, what the Bureau proposes——

Mr. HOSMER. That undoubtedly would run up your figure.

Mr. MOSS. What the Bureau proposes is to advance money in stages as sections of the plant are completed. They would have to pay interest on construction between the time they begin advancing money and the time the plant goes into operation. And I believe that that is included in a separate set of figures, apart from the first set.

Mr. HOSMER. You have one sort of interest during the construction period and you have another interest during the period of pay out, which extends of course a great number of years longer. Since you prepaid for your power here, you have to generate your money from some place, which under present government, is by borrowing. And as a consequence you have to add that interest charge cost to your prepayment in order to achieve this figure for installed capacity?

Mr. MOSS. I am speaking only of interest during construction, not of interest during pay out. And the Bureau includes interest during construction as——

Mr. JOHNSON. Just a minute. Are you replying to the question of the gentleman?

Mr. MOSS. I think Mr. Hosmer's question is whether I have confused interest during construction with interest during pay out?

Mr. HOSMER. I am asking whether you have included interest after the construction period on the prepayment?

Mr. MOSS. Well, the Bureau has included it in their cost figures for the annual costs attributable to power production. All I am saying is that they have applied their interest cost to a higher capital investment than will probably be the case when they actually go into this arrangement.

Mr. HOSMER. Well, you don't see my point—the way you get \$161 is to realistically recognize that you are paying interest on this money. It is a hypothetical figure anyway. You are not paying for the plant itself.

Go ahead.

Mr. MOSS. Perhaps it might help clarify this if the chairman requested the Bureau to submit for the record whether the \$161 per kilowatt does include interest during construction or not.

Mr. HOSMER. I think the chairman is going to run his own committee.

Mr. Moss. Yes, sir.

The second reason that the development fund is larger when you defer construction of Hualapai Dam is that the dam makes little or no money by itself. It needs revenue from Hoover Dam to help pay off the large interest-bearing investment producing heavy fixed charges. These are the result of the costly investment needed to build Hualapai Dam. I would further point out, as one or two other witnesses have already mentioned, that all of the Bureau's calculations are based on a 3.2-percent interest rate, which, at least for the present, is subsidized. That is, it is less than the cost for the U.S. Treasury to go out and borrow money.

There has been some discussion about the controversy at the time of the authorization of Hoover Dam, to the effect that there were a lot of people then who said it probably would not be a good investment. I would point out that the investment in power production facilities at Hoover Dam is only \$127.5 per kilowatt. The investment in Hualapai is \$330 per kilowatt. And that difference produces a lot of the high cost in annual fixed charges which makes Hualapai Dam not economically justified.

There has also been discussion as to whether nuclear power can compete with power from Hualapai.

Now, in the past, power from dams could be generated and delivered at lower cost than with steamplant alternatives. In most cases in the United States this no longer is the case. A historic reversal of the relative costs of hydro versus steamplant power has occurred. The prior commitment of many of the most desirable hydropower sites, the gradual increase in the costs of heavy construction, and the imminent large-scale introduction of low-cost nuclear power have accomplished this reversal.

In 1965, 30 percent of all of the steamplant generating capacity ordered by utilities was for nuclear plants. In 1966 more than 50 percent was nuclear.

The total generating capacity of the nuclear plants ordered in just these 2 years is about 15 times the combined capacity of the two proposed Grand Canyon dams. The at-plant costs of power from most of these nuclear plants will range from about 3.5 to 4.0 mills per kilowatt-hour under conditions of financing by investor-owned utilities which, primarily because they must pay taxes, have typical capital charge rates of 12 percent, to less than 2.4 mills per kilowatt-hour with financing by public agencies such as TVA, with typical capital charge rates of 6 percent. These costs are based on complete amortization of the plant in a 30-35 year period. That is, after that period, you have enough money to go out and buy a brandnew plant, if you think it will reduce costs below that for continued operation of the old plant.

Moreover, since the costs of nuclear plants are relatively independent of location, they can be better situated with respect to load centers and transmission costs will be very much less than for hydropower dams.

The committee has heard a great deal of testimony on the subject of peaking power. Peaking power is, as you know, power generated

during those hours of the week when the demand for electricity is high. It can be supplied by hydro or steamplants operated during those high demand hours.

Paradoxically, the new nuclear plants will not generally be used to supply peaking power, even though they will be the lowest cost producers of all of the steamplants on the system of the typical utility.

The reason is that during the off-peak hours of the day, the utility chooses to shut down the higher cost producers—the coal-, oil-, and gas-fired plants—when the demand for power drops. So far as possible the nuclear plants are operated continuously.

There is no technical reason why nuclear plants cannot be operated to meet the same peaking power requirements as hydropower plants are at present designed to meet. Twenty years from now, when a large fraction of installed capacity will be nuclear, in all probability some of the nuclear plants—the older, less efficient ones—will be operated.

Hydropower installations designed for peaking power operation cannot operate continuously over a long period of time. The reason is that the water turbines are sized to use all the river's average annual flow when operating only about 20 to 45 percent of the time. Beyond that, there is no additional water to run through the turbines to generate power.

Because nuclear plants have no such limitation, they can provide savings not only during peak-demand hours but also during off-peak hours by displacing higher production cost coal, oil, and gas-fired steamplants. That is, since today's nuclear plants are added to utility systems in which the predominant source of generating capacity consists of more expensive fossil-fuel units, it is preferable to operate the new nuclear plants continuously and relegate some of the older fossil-fuel plants to operation only during peaking power hours. The result, in terms of system generation, is the same as if new plants, either nuclear or hydro, were operated for peaking power alone and the operation of the fossil-fuel units was not changed, but the overall system production costs are very much less.

Proponents of hydropower projects, when their projects have been shown not to be economically justified, have a propensity to wax eloquent over the supposed virtues of hydropower as compared with the supposed sins of thermal generation. Their acceptance of hydropower, regardless of cost, has a quality bordering on that of mystical revelation.

These proponents are welcome to their illusions. The facts, however, are as expressed by Philip Sporn, chairman of the System Development Committee, American Electric Power Co., in remarks presented to the New York Society of Security Analysts on April 2, 1966. In commenting on the cause and remedy for the Northeast power blackout, Mr. Sporn said:

The first statement was made by a major utility executive. He said, "What it boils down to is this: thermal units cannot respond quickly enough to sudden load demands, such as occurred on November 9th, to avoid a power failure. Nor can they be restarted as quickly as hydroelectric plants, should they shut down the power. This—as we found out the hard way on November 9th—is no means satisfactory!"

Now, my answer to this, and it's not an off-the-cuff answer, is that this is just not so. It's a complete misstatement of the facts. A well-designed thermal system operated so that the spinning reserve is properly distributed in the generating units at all times, and that is adequately interconnected with its neighboring system can—and by experience has proven so—be wholly reliable and capable of withstanding all manner of disturbances. It is not necessary to create uneconomic sources of hydro power in order to achieve a high degree of reliability.

This doesn't mean that hydro capacity cannot or should not be used, if it's economically sound. The two largest cities of the United States—everybody knows which they are—have for a period of 83 years in one case, and close to that in the other (I don't know when the other city really started its electric service, but it cannot have been more than a year after 1882) managed to give a high quality of service without any other generation in their system except thermal.

To condemn thermal generation after that sort of a record is to me unthinkable.

I would add that Mr. Sporn is often invited to present his views before the Joint Committee on Atomic Energy, and is usually well respected for them and admired for them.

Now, the more sophisticated among the proponents of the dams probably realize that they are not economically justified. But they know that if the dams are authorized and built it will always be possible to make sure that the basin account accumulates money. This would be done by passing legislation to assign a larger proportion of the investment in the dams to purposes which qualify for nonreimbursable and zero-interest funds. Elaborate rationalizations will be developed to justify the action. Most legislators, and certainly most members of the general public, will have little idea of the implications of the legislation. When it is passed, the finances of the dams, from the very beginning of the project, will be recalculated on the new basis. The effect will be to credit the basin account with an additional, and continuing, subsidy from the U.S. Treasury. Those who doubt the use of such mechanisms and the willingness of legislators to approve them are encouraged to examine the legislative history of other Federal dam projects.

The true purpose of the Grand Canyon dams is to provide a respectable front for the siphoning of hundreds of millions—even billions—of dollars from the U.S. Treasury to the basin account. Because the dams are not economically justified the cost to the U.S. Treasury will be far greater than if direct subsidies were made. Moreover, the national income will be lower than it would be if the dams were not built, and lower-cost alternatives were built instead, as would happen in the normal course of events. But all of this counts for little to the proponents of the dams, who believe that it is easier to raid the Treasury for more money, if the raid is disguised, than it is to obtain a direct, openly stated subsidy of the same net amount to the basin account. And they, of course, need not pay the bill. That will be the role of the docile U.S. taxpayer, who will have no understanding of the choice that has been made for him.

I would like to go on to another point.

This morning Governor Love said that if importation is made a reality, the first water imported should be used to satisfy the Mexican Treaty commitment. Any amount above and beyond should be subject to the provisions of the compact, and should be equally divided between the lower basin States and the upper basin States.

Now, no one, of course, has presented a detailed importation plan to this committee. But all of the discussion I have heard about possible importation plans involves bringing water into the Colorado Basin in the lower basin portion, not the upper basin portion—probably into Lake Mead. If this is done, and if the upper basin is to get a share of that water, it would be done by an exchange of water. That is, they would withhold more in the upper basin for their own use.

I would like to point out that all of the financial calculations of the Bureau of Reclamation are based on a minimum flow of 9.241 million acre-feet per year at Marble Dam, and 9.592 million acre-feet per year at Hualapai Dam. This is all the way out to the year 2075.

Now, if the upper basin withheld water through an exchange agreement as proposed, then the flow at those damsites would drop by the amount of water withheld.

In last year's bill, H.R. 4671, and in at least one of the bills before the committee this year, there is authorization to study an importation in which the allocation to the upper basin might be as much as 2 million acre-feet per year. That would mean the flows at the damsites would be reduced by about 21 percent. The power production capability would also be reduced by that same percentage.

That would mean that revenue from the dams would drop. I think this point should be made, particularly to the representatives of the upper basin States, who may be committing themselves to a dam which cannot pay off if their dreams for water importation are realized.

I want to go on now to comment on Mr. Goss' dam, Hualapai No. 2.

First, I would like to say that perhaps I should be pleased by this plan, because, as far as I know, I was the first witness before this committee to suggest the use of pump storage plants as alternatives to the Grand Canyon dams. This was in the May 1966 hearings. And I am glad that Mr. Goss has taken this idea and tried to develop it.

I was also interested to learn that Mr. Goss stated that the cost of the power from the Bureau of Reclamation's Hualapai Dam, in his mind, would be too expensive for the Los Angeles Department of Water and Power to purchase.

Mr. JOHNSON. I think that is rather a misstatement. The facilities that they propose—they would have control over how the facilities were operated, at what times they would take the power. But dealing with the Bureau, first the Bureau offered to them power out of their own generation, you had to take a fixed price and a certain amount of power.

So I think there is a great difference as to how you operate the facilities. I think Mr. Goss would take that into consideration.

Mr. MOSS. I believe that you are correct, Mr. Chairman, in that this was one basis for Mr. Goss' concern. I may have been mistaken when I thought he was also objecting to the price of \$10 per kilowatt and three mills per kilowatt-hour. If that is incorrect, then I stand corrected.

To return to pump storage: I wonder if Mr. Goss has considered the same idea at another location, closer to the load centers, which would require no additional investment in a new dam, and no additional investment in an afterbay dam. That would be a pump storage plant at Hoover Dam.

There are existing transmission lines at Hoover Dam as well.

Mr. JOHNSON. Well, I think the main cost there—if your pump facilities and generators are built right in the facility, you might say. Because the same generators that generate power are used for pumping purposes on the flow of water back into the reservoir. To remodel Hoover for pump storage you would have quite a job.

Mr. MOSS. I don't know enough about Hoover Dam to be able to say how costly the modification would be. It would probably not be necessary to remove the existing turbine installations as Mr. Goss implied. It would be necessary to add reversible pump turbine units, to provide the pumpback feature. And just how much new construction work would have to be done in widening the passages for water, and in expanding the powerhouse, is something that I am not acquainted with. Perhaps it should be brought to the consideration of the committee.

Mr. HOSMER. You don't know anything about high-lift, reversible-pump turbines, do you?

Mr. MOSS. I am not an authority on that.

Mr. HOSMER. That is what Mr. Goss was dealing with here. He made one slight reference to it. He said you would throw away the entire \$127 per installed kilowatt capacity you have at Hoover if you start all over again.

You take every single erg of energy that goes past that point where the Hualapai Dam is planned for, you take it out and you let people use it—during all these decades that it is otherwise dissipating, and nobody using it.

Mr. JOHNSON. I would like to say in connection with pump storage facilities, there are several under construction at the present time in my own State. And they are a rather integral part of the installation in the powerhouse facility. To utilize the advantage of pump storage in getting that water back, much of the facilities used for generation, they are all in the same community—it looks to me they are built right in.

I think that you get quite a remodeling job if you go in to remodel these existing facilities.

Mr. MOSS. I think we have to distinguish between a true pumpback storage plant, and a combination pumpback storage plant and conventional hydroelectric installation. There is an existing flow of water on the Colorado River which can be used to generate power and energy apart from the pumpback feature. This is not true of, say—

Mr. JOHNSON. You are using the same water and pumping it right back; you are not disbursing it down the river.

Mr. MOSS. It is reusing a portion of the water. Some of it is released because more water is coming in from up above. Over the average period you would let through just as much as came into the reservoir from above, less the evaporative losses from the reservoir.

Mr. JOHNSON. You are using it over.

Mr. MOSS. Part of it is used over.

Mr. JOHNSON. It is a reuse of the same water.

Mr. MOSS. Part of it is reused; some of it not. In the case of the San Luis project, for example, all of it is reused. There is no river-

flow there. What I am saying is that you could have a combination conventional hydrounit with the pump storage unit at Hoover Dam using existing conventional turbine units, along with new reversible pump turbine units. That is a suggestion which perhaps could be explored.

Now, I should point out that the chart that Mr. Goss showed before had an error in it. Here I am referring to where Mr. Goss, on his chart, referred to the Bureau of Reclamation's Hualapai Dam. If you divide the cost he gave—\$540 million—by the capacity—1,500 megawatts—you get \$360 per kilowatt, not \$234 per kilowatt as indicated on the chart.

Mr. HOSMER. Does that include the transmission lines?

Mr. Moss. Yes.

Mr. HOSMER. Mr. Goss' Hualapai does not.

Mr. Moss. Here I am referring only to the Bureau of Reclamation's dam—the set of figures he presented for that.

Mr. JOHNSON. This is the chart here, and all his figure here are for the bus bar.

Mr. Moss. No. The figures presented—

Mr. JOHNSON. He made that crystal clear. This computation is based upon the bus bar.

Mr. Moss. Some of his figures; yes. But I am not speaking of his analysis of his own project. I am speaking of his analysis of the Bureau of Reclamation's project, which includes transmission.

Mr. HOSMER. Mr. Chairman, I think the witness has been on quite a while. I don't like to cut anybody off. Perhaps he could make a point or two in such a fashion that we would get to the rest of the witnesses.

Mr. Moss. I would be able to complete my statement in 2 minutes. Mr. Chairman.

The real question is not whether we will have a use for more power. The question is, What would be the cost of supplying that power to meet the need? The investment in the Bureau of Reclamation's Hualapai Dam will be \$30 per kilowatt, or \$360 per kilowatt, if you use Mr. Goss' figures. If you use the Hualapai No. 2 Dam, Mr. Goss' pump storage feature, then the investment would be \$146 per kilowatt. But, of course, there would be a large energy cost associated with buying energy to pump the water back to the upper reservoir.

Comparing this with other pump storage projects: The Castaic project, according to Mr. Goss, cost about \$130 million and has a 1,200 megawatt capacity. This works out to \$109 per kilowatt, much less than the cost of his Hualapai Dam proposal.

Right near Denver, the Cabin Creek installation works out to about \$80 per kilowatt—also much lower in cost than this new proposal for Hualapai.

Perhaps \$146 per kilowatt may be all right for a municipality, which because it does not pay State and Federal taxes, has low capital charge rates.

Investor-owned utilities—with their higher 12-percent rates—are less likely to want to participate equally in this project. It is more likely that they would prefer to use their old fossil fuel plants or lower cost pump storage plants, for peaking power, rather than take the high fixed charges that a high investment cost would produce.

The real issue, as I see it, is not between continued development in the Southwest and an undammed Grand Canyon. It is simply whether we ought to abandon an outmoded reclamation policy which is no longer suited to the new conditions and the new technology of power generation, and go on to the kinds of economically rational policies which we would hope a national water commission such as has been suggested by members of this committee would study and recommend.

Thank you.

Mr. JOHNSON. Thank you, Mr. Moss, for the benefit of your testimony here.

The gentleman from Arizona, Mr. Udall?

Mr. UDALL. Mr. Moss, good to have you back again. I am troubled, as always. Here is Mr. Goss who has worked all his life in the biggest public utility serving customers in the country, who has hydroplants, nuclear plants, thermal plants. He says not only should we build a 1.5-million-kilowatt Hualapai, we ought to build a 5-million Hualapai, and they will gamble their money on it, knowing that it would be a complete disaster for his company, and personal disgrace for him, the end of his career, if he gives them bad advice. And I am sure you are a brilliant and very capable young man.

But is this committee supposed to believe that Moss is right and Goss is wrong? And if so, why? Why are you so sure he does not know what he is talking about—if what you told us today is right he is out of his cotton-picking mind, to use an expression.

Mr. Moss. First, I assure you if I did not think I was right, I would not have bothered to take the committee's time on all these matters.

Secondly, I think that perhaps Mr. Goss could be influenced by other considerations than the lowest cost of power obtained for the people of southern California. And in his questioning, Mr. Foley alluded to what some of those other considerations perhaps might be.

But I am not in a position to speculate on those matters.

Mr. UDALL. That will be all, Mr. Chairman.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer?

Mr. HOSMER. Mr. Philip Sporn, upon whom the witness relies as a considerable authority, has never put a nickel's worth of nuclear kilowatts in the American Electricity Power Co.'s lines. So if that is any recommendation to you, Mr. Moss, I have served my function this afternoon.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. Moss. May I comment, Mr. Chairman?

Mr. JOHNSON. Yes.

Mr. Moss. The comment of Mr. Sporn that I quoted, of course, did not have to do with—

Mr. HOSMER. It had to do with blackouts, and outages, which you took a lot of our time up with that you should not have taken anyway. It was a matter of poor judgment, I thought, to have that in your speech.

Mr. Moss. It had to do with the question of whether thermal generation was suitable for meeting all peaking power and emergency demands.

Mr. Sporn's utility happens to be in one of the lowest cost fossil fuel areas of the United States. So it has had less incentive than many

others to go nuclear. That may change, as the costs of nuclear power are now quite low.

Mr. Hosmer. While you are unscrambling things, you told us there was no technical reason why you could not use nuclear plants for peaking purposes. But there are a lot of economic reasons you overlooked.

Mr. Moss. The only economic reason I am aware of is that nuclear plants produce power for such a low incremental cost, such a low production cost, that the utility chooses to keep it operating during off-peak hours and shut down their higher cost producers first.

Mr. Hosmer. That is right. If you put in this kind of capacity for peaking purposes, the costs will be out of reason, because you have not only a heavy investment in generating capacity, nuts and bolts, but you have a tremendous investment in fuel, in the order of magnitude of about \$10 million, sitting around idle, too. You know darned well the economics of that kind of thing demand the base load use.

Mr. Moss. I think my statement may have been misunderstood.

Utilities now ordering nuclear plants will base load them for these economic reasons and get their peaking power capability by operating the higher cost fossil fuel plants less hours of the day. So the net production of power as a function of time, up and down during the day, will be the same, but the cost will be lower.

Mr. Johnson. I think the committee has had a pretty good education in the uses of power here recently. Those of us mixed up in the intertie have had a certain amount of education in the hydroelectric field. The private utilities in our State are willing to sign contracts to that effect—all of those stating they were going into nuclear power field were going to use those as base plants and operate them.

Now, the Bureau of Reclamation made quite a statement before the full committee in connection with their operation, and his statement as to hydroelectric power and the use of hydroelectric for peaking was a very top-notch statement. His statement concerned the outlook of the Bureau of Reclamation. In his statement he also listed Hualapai Dam as being one of those hydroelectric facilities that will add to the peaking capacity and be used. That was in his own statement when he appeared before the full committee, giving us the benefit of his knowledge as to the Bureau of Reclamation's program.

I think while nuclear power has its field—but to get that low-cost energy, you have to run it. You say that hydro is not looked at as being really full and beneficial for peaking purposes—I think that is a misstatement.

Mr. Moss. Mr. Chairman, as new capacity is ordered on a utility system, it has two ways of meeting the increased peaking power demand. The first way is to add units which are specifically adapted to providing that peaking power, like hydro.

The second way is to relegate their older, less efficient steamplants to operate fewer hours during the day.

Now, the second way is the way that has been used by most utilities in the history of the power industry in the United States—for one reason, because they found it cheaper to do so. I am not saying that that will always be the case. I am just saying that in the specific case of Hualapai Dam, we have analyzed the comparative economics, and found that the nuclear plants are the low-cost alternatives.

Mr. JOHNSON. The gentleman from Oregon, Mr. Wyatt.

Mr. WYATT. Thank you, Mr. Chairman, I have no questions.

Mr. JOHNSON. The gentleman from California.

Mr. REINECKE. Thank you, Mr. Chairman.

Just to point out to the committee that in the summary report given to us by the Bureau it does show project costs and, in one column, interest during construction, and another column which I believe bears out Mr. Moss' figures, shown on pages (i) and (iii) in the summary report.

No further questions. Thank you.

Mr. JOHNSON. I just want to ask one last question. As I understood you to say in your testimony, if Hualapai would be deferred for 10 years it would make a major contribution. Would you support it 10 years from now to be a good facility to build?

Mr. MOSS. The only reason it makes more money for the fund is because—

Mr. JOHNSON. I don't care about how much more it makes for the fund. But would you support its construction?

Mr. MOSS. No; I would not support its construction because it is not economically justified. The only reason it makes more money for the fund is because of a quirk in the way the subsidy works. The real cost to the Nation, even if measured only in dollars, is far greater than the economic benefits.

Mr. JOHNSON. No further questions. We want to thank you, Mr. Moss, for the benefit of your testimony. Your full statement will be placed in the record.

(The prepared statement of Mr. Moss follows:)

STATEMENT OF LAURENCE I. MOSS, NUCLEAR ENGINEER

IN SEARCH OF A SUBSIDY MACHINE: OR, WHY THE GRAND CANYON MUST BE DAMMED

In the American West of 1849 the preoccupation of the day was the search for gold. In the West of today, the search is for a very special kind of water. Although it looks the same, tastes the same, and feels the same as ordinary water, this water is different. It is subsidized water, the full cost of which need not be paid by the user of the water. And last year the search for subsidized water led a small group of men, the "water leaders" of the seven Colorado Basin states—with the help of the Bureau of Reclamation of the U.S. Department of the Interior—to the conclusion that the Grand Canyon must be dammed.

These architects of water policy and planning fashioned a document that became known, in the form in which it was submitted for the approval of Congress, as H.R. 4671. The various provisions of H.R. 4671 give a classic example of the lengths (some might say depths) to which the people who now formulate water policy are willing to go in their pursuit of subsidized water.

Why can't the people who use water pay the full cost of delivering it to them? More than 90% of the people can (and usually do). These are the users of water for municipal and industrial purposes. The users of water for agriculture, however, say that they cannot afford to pay the full cost, and in the Colorado Basin states they use more than 90% of all the water. If it is granted that subsidizing irrigation agriculture is of social value, it still remains necessary to scrutinize the efficiency of the methods.

How to subsidize water

The ways of subsidizing water are limited only by the ingenuity of men who seek private economic gain at the public expense. Four favorite methods are as follows:

(1) Charge municipal and industrial water users more than the cost of delivering water to them, and use the difference to help subsidize agricultural water

users. In H.R. 4671 it was proposed that municipal and industrial water be sold for \$50 per acre-foot and agricultural water for \$10 per acre-foot.

(2) Get the Federal government to pay for a portion of the project with funds that need not be repaid. In H.R. 4671, \$83 million of the costs were assigned to "recreation, fish, and wildlife" and were therefore non-reimbursable. Beyond that, H.R. 4671 set the stage for a multi-billion dollar grant of non-reimbursable funds for a massive importation of water from (presumably) the Columbia River. This was done by having the Federal government assume the obligation—previously an obligation of the Colorado Basin states—to deliver 1.5 million acre-feet of Colorado River water per year to Mexico. This would become a national obligation as soon as water began to be imported into the basin. H.R. 4671 also sought to establish the precedent that a state seeking to expand the capacity of an aqueduct need pay only the incremental costs of the expansion. The scenario is thus quite clear, though a bit expensive for the average U.S. taxpayer. At some future date it will be proposed that the Federal government build an aqueduct to transport 2.5 million acre-feet of water per year from the Columbia River to the Colorado River to satisfy the national obligation (1.5 million acre-feet for Mexico plus 1 million acre-feet for losses from evaporation and seepage along the way gives 2.5 million acre-feet). This project would qualify for non-reimbursable funds. Representatives of the Colorado Basin states would then come along and say: "How convenient it is that you are building all those dams, reservoirs, tunnels, canals and pumping stations. It just happens that we would like about 6 million acre-feet of Columbia River water for ourselves. Let's put a few more pumps in the pumping stations and widen the canals and tunnels a bit to handle the extra water. We will be glad to pay the incremental costs." The net result is that the Colorado Basin states would get 80% of the delivered water and the Federal government would pay most of the costs. These costs have been estimated to be about \$10 billion.

In the past, power from dams could be generated and delivered at lower cost than with steam plant alternatives. In most areas of the U.S. this no longer is the case. A historic reversal of the relative costs of hydro vs. steam plant power has occurred. The prior commitment of many of the most desirable hydropower sites, the gradual increase in the costs of heavy construction, and the imminent large-scale induction of low-cost nuclear power have accomplished this reversal.

In 1965 about 30% of all of the steam-plant generating capacity ordered by utilities was for nuclear plants. In 1966 more than 50% was nuclear.

The total generating capacity of the nuclear plants ordered in just these two years is about fifteen times the combined capacity of the two proposed Grand Canyon dams. The at-plant costs of power from most of these nuclear plants will range from about 3.5 to 4.0 mills per kilowatt-hour under conditions of financing by investor-owned utilities (which, primarily because they must pay taxes, have typical capital charge rates of 12 percent), to less than 2.4 mills per kilowatt-hour with financing by public agencies such as TVA (with typical capital charge rates of 6 percent). These costs are based on complete amortization of the plant in a 30-35 year period. Since the costs of nuclear plants are relatively independent of location, they can be better situated with respect to load centers, and transmission costs will be very much less than for hydropower dams.

Peaking power

"Peaking power" is power generated during those hours of the week when the demand for electricity is high. It can be supplied by either hydro or steam plants operated only during these high-demand hours.

Hydropower installations designed for peaking power operation cannot operate continuously over a long period of time. The reason is that the water turbines are sized to use all the river's average annual flow when operating only about 20-45% of the time. Beyond that, there is no additional water to run through the turbines to generate power.

Because nuclear plants have no such limitation, they can provide savings not only during peak-demand hours but also during off-peak hours by displacing higher production cost coal, oil, and gas-fired steam plants. That is, since today's nuclear plants are being added to utility systems in which the predominant source of generating capacity consists of more expensive fossil-fuel units, it is preferable to operate the new nuclear plants continuously and relegate

some of the older fossil-fuel plants to operation only during peaking power hours. The end result, in terms of system generation, is the same as if the new plants (either nuclear or hydro) were operated for peaking power alone and the operation of the fossil-fuel units was not changed, but the overall system production costs are very much less.

Proponents of hydropower projects, when their projects have been shown not to be economically justified, have a propensity to wax eloquent over the supposed unaccustomed virtues of hydropower as compared with the supposed sins of thermal generation. Their acceptance of hydropower, regardless of cost, has a quality bordering on that of mystical revelation.

These proponents are welcome to their illusions. The facts, however, are expressed by Philip Sporn, Chairman of the System Development Committee, American Electric Power Company, in remarks presented to the New York Society of Security Analysts on April 20, 1966. In commenting on the cause and remedy for the Northeast Power Blackout, Mr. Sporn said:

The first statement was made by a major utility executive. He said, "What it boils down to is this: thermal units cannot respond quickly enough to sudden load demands, such as occurred on November 9th, to avoid a power failure. Nor can they be restarted as quickly as hydroelectric plants, should they shut down the power. This—as we found out the hard way on November 9th—is by no means satisfactory!"

Now, my answer to this, and it's not an off-the-cuff answer, is that this is just not so. It's a complete misstatement of the facts. A well-designed thermal system, operated so that the spinning reserve is properly distributed in the generating units at all times, and that is adequately interconnected with its neighboring systems can—and by experience has proven so—be wholly reliable and capable of withstanding all manner of disturbances. It is not necessary to create uneconomic sources of hydro power in order to achieve a high degree of reliability.

This doesn't mean that hydro capacity cannot or should not be used, if it's economically sound. The two largest cities of the United States—everybody knows which they are—have for a period of 83 years in one case, and close to that in the other (I don't know when the other city really started its electric service, but it cannot have been more than a year or two after 1882) managed to give a high quality of service without any other generation in their system except thermal.

To condemn thermal generation after that sort of a record is to me unthinkable.

THE ECONOMICS OF THE GRAND CANYON DAMS

In the specific case of the proposed \$750 million Grand Canyon dams, the delivered cost of power, according to figures presented by the Bureau of Reclamation, would be 5.5 mills per kilowatt-hour. The Bureau's cost estimates are several years old and do not include items of additional cost stated by the Bureau to be either necessary or desirable, such as cash payments to the Hualapai Indians (\$16 million), an afterbay dam below Marble Dam to even out the flows in the river through Grand Canyon National Park (\$34 million), and a second road to the Hualapai Reservoir site. The Bureau's calculations, based on a total initial cost of \$750 million, should therefore be regarded as optimistic.

The same must be said of the Bureau's revenue projections, since they are based on the sale of power for the first 100 years of operation at a price of 6.0 mills per kilowatt-hour. Accepting these figures for the moment, and calculating the net revenue from the difference between selling price and cost, gives a total of \$3.5 million per year from both dams during the initial 50-year payout period. Parenthetically it should be noted that the initial cost of the interest subsidy for the dams, provided by the U.S. Treasury, would be five times as great—about \$17 million per year at current money-market rates. There is yet another hidden subsidy: The Bureau assigns zero value to water lost by evaporation (100,000 acre-feet per year) from the reservoirs behind the dams. If a value equal to the marginal cost (about \$70 per acre-foot) of importing this amount of water into the Colorado River basin is assigned, the subsidy amounts to an additional \$7 million per year.

The proponents of the projects say the proposed dams are necessary to provide a large accumulation of funds in a "Basin Account". This would be used to finance the long-distance importation of water into the Colorado River Basin.

How is it possible to accumulate massive sums of money in the Basin Account (the Bureau calculates \$900 million at the end of the initial 50-year period) if the Grand Canyon dams can contribute only \$3.5 million per year, even on a subsidized basis?

The trick is that surplus revenue from the existing Hoover, Parker, and Davis dams (all located on the lower Colorado) are put into the Basin Account, starting at the ends of the payout periods for each of those dams. These funds are then used to rapidly reduce the interest-bearing investment in the new dams. The result is to greatly exaggerate the importance of the new dams and to disguise the vital role of the existing dams. Actually, the amount of the Basin Account at the end of the 50-year period without the new dams would not be appreciably different from the amount with the new dams.

As previously stated, all of these calculations are based on a market value for the power of 6.0 mills per kilowatt-hour. At anything less than 5.5 mills per kilowatt-hour the revenue from the dams could not even cover the costs (even with the massive interest subsidies). Over most of the lifetime of the dams, their power will be sold in a market dominated by low-cost nuclear power. Already, even before the large-scale transition to nuclear power has taken place, the Bureau has not been able to sell the power generated at the new Glen Canyon Dam (just upstream from Grand Canyon) for 6.0 mills per kilowatt-hour. What will happen in the future is always a matter of some speculation, but it seems fair to say that no prudent investor would make a long-term commitment the success of which depended on obtaining a price of 6.0 mills per kilowatt-hour for the next 100 years.

The more sophisticated among the proponents of the dams probably realize that they are not economically justified. But they know that if the dams are authorized and built it will always be possible to make sure that the Basin Account accumulates money. This would be done by passing legislation to assign a larger proportion of the investment in the dams to purposes which qualify for non-reimbursable and zero-interest funds. Elaborate rationalizations will be developed to justify the action. Most legislators, and certainly most members of the general public, will have little idea of the implications of the legislation. When it is passed, the finances of the dams, from the very beginning of the project, will be recalculated on the new basis. The effect will be to credit the Basin Account with an additional (and continuing) subsidy from the U.S. Treasury. Those who doubt the use of such mechanisms and the willingness of legislators to approve of them are encouraged to examine the legislative history of other Federal dam projects.

The true purpose of the Grand Canyon dams is to provide a respectable front for the siphoning of hundreds of millions—even billions—of dollars from the U.S. Treasury to the Basin Account. Because the dams are not economically justified the cost to the U.S. Treasury will be far greater than if direct subsidies were made. Moreover, the national income will be lower than it would be if the dams were not built (and lower-cost alternatives built instead, as would happen in the normal course of events). But all of this counts for little to the proponents of the dams, who believe that it is easier to raid the Treasury for more money, if the raid is disguised, than it is to obtain a direct, openly stated subsidy of the same net amount to the Basin Account. And they, of course, need not pay the bill. That will be the role of the docile U.S. taxpayer, who will have no understanding of the choice that has been made for him.

Indications of Shifts in Attitudes

Recently, there have been some encouraging indications that shifts in attitudes are taking place. In a speech given in July 1966, John A. Carver, then Under Secretary of the Interior, as much as admitted that the traditional approach to the planning of water resource development was faulty. He stated that Congress and the public should be informed of the alternatives to hydropower as a means of financing water projects. He continued:

Present procedures do not provide an adequate comparison of such alternatives. . . . Classically, legislation, whether it be for a project or a government policy, has been presented by the executive branch to the legislative branch as an act of advocacy, the best possible case for a particular course of action or a single

project. The process of identifying alternatives—indeed of discovering if any exist—is left to the arena of countervailing powers in the political process.

In February 1967, Secretary of the Interior Stewart Udall announced that the Administration was no longer supporting the proposed Grand Canyon dams, though he did leave the door open for later reconsideration of one of them (Hualapai Dam). The Secretary was asked by a reporter if this was a victory for the Sierra Club, the group that led the fight against the dams. Quite aptly he replied: "This isn't a victory for anyone. It is a victory for common sense."

The victory has not yet been won. Powerful men still want one or both of the dams to be built, and they have not given up. Speeches of Mr. Floyd Dominy, the Commissioner of the Bureau of Reclamation, have indicated less-than-complete acceptance by the Bureau of the recent shifts in Administration policy. Congressman Wayne Aspinall, Chairman of the House Interior Committee, has announced his intention of reporting out a bill with one of the dams included. (Mr. Aspinall would solve the awkward problem of the infringement of Hualapai Reservoir on Grand Canyon National Monument and National Park by abolishing the National Monument and removing the westerly 13 miles from the National Park.) Senator Thomas Kuchel has introduced similar legislation in the upper house. Some of the California Congressmen have announced their support of a measure with one or both dams; Congressman Craig Hosmer has introduced a bill essentially identical to last year's H.R. 4671.

Not without reason, the most fervent of the pro-dam people are the same ones who are forming the major opposition to another piece of proposed legislation. That is the authorization of a National Water Commission, free of domination by agencies with vested interests in particular kinds of development. Congressman Aspinall gave his opinion of this on November 18, 1966, in a speech at the 35th Annual Convention of the National Reclamation Association in Albuquerque, New Mexico:

I have been concerned with respect to some of the recent statements and reports originating with Federal groups which are attempting to apply the scientific or theoretical approach to our national water problems. For instance, the Scientific Advisor to the President, Dr. Hornig, told the Senate Committee that the proposed National Water Commission would provide an overview of our national effort in water by some of the best thinkers and most experienced experts in the field, and provide for an independent evaluation of pressing problems beyond any commitment to state, local, or regional interests. How can an independent evaluation, free of state, regional, or local interests resolve complicated water issues involving water rights, interstate compacts, long-standing agreements, etc.? The recent report of the Committee on Water of the National Academy of Science, after discussing the changing objectives in the water field and the need for new policy, and after suggesting that perhaps the Reclamation program is outdated, concludes "that a review of the Federal reclamation policy, in the light of present and future competing needs for water and agricultural products, is a critical requirement." You can imagine what might happen to water development in the West if the decisions were left to a group such as this.

The damage that would be done

There is much more, of course, than the lack of any economic justification for the dams that motivates most of the people who oppose them. The water behind the dams would not fill the Grand Canyon to its brim, and no one has made that claim. But it would flood out 148 miles of living river and eventually destroy even more of it with sediment deposited as a result of the altered regimen of the intervening stream.

Some of the outstanding gems of the geological entity that is the Grand Canyon would be inundated, along with some of the most extraordinary river sculpture on earth. (It should be remarked that the Grand Canyon, as defined by all responsible authorities, including the U.S. Board on Geographic Names, extends from Lee's Ferry to the Grand Wash Cliffs below the head of Lake Mead. Only the central portion is presently contained within the borders of the National Park.) These include Vaseys Paradise, Redwall Cavern, the lower part of Havasu Creek, Lava Falls, and Travertine Grotto. Much of the plant and animal life that, through the ages, have become uniquely adapted to the living river, would perish. The last (and oldest) pages of what has been

called the greatest open book of the earth's history will be covered, first by water, and then (within a century or two) by mud. What has taken the river ten million years to create will take man a few years to destroy.

One of the favorite arguments of the proponents of the dams is that the depth of the reservoirs will be insignificant in the awesome depths of the canyon. That is very much a matter of one's point of view. From a vantage point on top of the Empire State Building it might not be too discomfiting if Manhattan Island were covered with water to a depth of ten feet (or even to a depth of 600 feet, the approximate height of Hualapai Dam). But the window display on Fifth Avenue would never be the same.

Many people will see the heart of the canyon, by trail and by boat, if it is left as it is. In 1966 more than a thousand took river trips through the canyon; the number has been increasing by about 70% each year. It is one of the great adventures available to the individual and with modern equipment and proper leadership it is safe for everyone from the teenager to the senior citizen. The cost, about \$15 per day including all expenses, is probably less than for a vacation in the city.

Many more people will never see the heart of the Grand Canyon, or the paintings in the Louvre, or the Taj Mahal. Yet the mere existence of such places is a source of satisfaction to them. They rejoice that not all of the natural and the man-made worlds are reduced to the monotony of the lowest common denominator.

If the heart of the Grand Canyon is ruined, its wholeness as an ecological and geological unit will be lost. It should remain, in its wild and natural state, as an example of man's love for the land and his determination that at least a few places should be saved. Future generations of Americans will need to know what the land was like before man's brief instant on the immense expanse of geological time. They will want to know the answers to questions not yet asked by us in our ignorance, answers to be found in the study of the natural world, if we let examples of it survive outside the overbearing influence of man. They will want to experience the wonders of this natural world for the recreation of the spirit that it can provide—for the insight into man's place in the universe.

The choice to be made

The crucial resource is not more water, nor is it more power, important though these may be. It is man's spirit. If the options were more water and power on the one hand and an intact Grand Canyon on the other hand, we should choose the canyon.

Many people, if that choice were put to them, would decide otherwise. They would prefer a continuation of the growth—usually devoid of form, style, and beauty—that is irrevocably altering the face of the American earth.

But the choice is not between growth and the canyon. Economically rational reasons for exploiting the Grand Canyon disappeared with the advent of new power technology. The motivations of the proponents of the dams have degenerated to the point where the only question being asked is: "Which course of action will best fool the American people into believing that there are no subsidies for the water projects?"

The choice is simply this: Shall we acquiesce in this attempted deception, or shall we insist that it be replaced by rational planning as a way of solving our national water problems?

Our next witness is Mr. Raushenbush, consultant to the National Parks Association.

We have your full statement here. Your statement will appear in the record.

MR. RAUSHENBUSH. It is the statement of Mr. Smith, sir, the president of the National Parks Association. My little contribution may come around the fourth page, when I am offering the committee a way to increase its development fund that even exceeds what Los Angeles offers today.

MR. JOHNSON. You may go ahead and summarize your statement.

STATEMENT OF STEPHEN RAUSHENBUSH, CONSULTING ECONOMIST, NATIONAL PARKS ASSOCIATION, ON BEHALF OF ANTHONY WAYNE SMITH, PRESIDENT, NATIONAL PARKS ASSOCIATION

MR. RAUSHENBUSH. My name is Stephen Raushenbush. I am consulting economist to the National Parks Association, 1300 New Hampshire Avenue NW., Washington, D.C. I have been a consultant to the association in a number of technical studies it has made during the last several years on Colorado River resources management problems. The president and general counsel of the association, Anthony Wayne Smith, has asked me to read this statement which he is submitting today on the current proposals for the development of the Colorado. I am well acquainted with the subject matter of this statement, and would be happy to comment on specific problems with which it deals or to answer questions which you may have on technical points.

Mr. Smith's statement is as follows:

My name is Anthony Wayne Smith. I am president and general counsel of the National Parks Association, 1300 New Hampshire Avenue N.W., Washington, D.C. I greatly appreciate the invitation which the subcommittee has extended to me to submit this statement today in regard to the protection of the Grand Canyon of the Colorado. It is a privilege to have this opportunity to appear before this distinguished body and offer these comments on this very important subject. I hope that I may be helpful to you in these deliberations of yours which have such a vital bearing on interests of the American Nation.

Then there is a description of the National Parks Association.

The position of the President of the United States in this matter, as I understand it, is that he would solve the problem of getting water into Arizona as rapidly as possible. He would do this by authorizing the Bureau of Reclamation to construct the necessary aqueducts and pumping plants to transport the water from the reservoirs behind Parker and Davis Dams on the Colorado River into central Arizona. They would be designed, I take it, to carry the water the Supreme Court has said Arizona is entitled to receive. The electric power for pumping water would be obtained by buying it from the new combination of publicly and privately owned utilities known as WEST.

I made a similar proposal to this subcommittee more than a year and a half ago on August 31, 1965. It is gratifying to find that these recommendations have received the firm stamp of approval of the President of the United States. I see no reason for changing these recommendations; I am of the opinion that the President's proposal in these respects is sound and that it would be in the public interest to carry it out. I submit for the record with considerable satisfaction a printed copy of the testimony before this subcommittee in which I made similar proposals previously.

We showed, for example, that Bridge Canyon Dam was and is unnecessary as a money earner for a basin account because the water which would be sold in central Arizona would earn much more money than the Bureau of Reclamation said it would earn.

We showed that Marble Canyon Dam was uneconomic for the production of firm power for pumping purposes because this power would

cost 4.2 mills or more while power produced by coal-fired thermal plants would cost from 3 to 4 mills or less, according to Commissioner Dominy of the Bureau of Reclamation.

We showed, furthermore, that peaking power produced at Marble or Bridge Canyons would be of doubtful profitability in competition with coal-fired steamplant power carried long distances to load center at Los Angeles or in competition with atomic power, coupled with pumped storage, at load center; certainly the repayment schedules and the representations made in behalf of these hydroelectric power projects with respect to the accumulation of funds for reinvestment were dubious in the extreme.

Our further studies have convinced us that if it is desirable to make provision at this time for a large basinwide fund for reinvestment in water supply facilities, the way to do it is to provide for a loan to a basin agency at $3\frac{1}{4}$ percent which could be reinvested at 5 percent for purposes of future construction. The fund which would be provided for reinvestment in this manner would become much larger than anything the two hydroelectric power dams and reservoirs could hope to produce, even if they turned out to be as profitable as the Bureau of Reclamation claims, which is highly doubtful. I have asked Mr. Raushenbush to submit an analysis of this proposal at this point and answer any questions you may have. For \$100 million, the Colorado Basin States can get more money in year 2047 than from a \$670 million plus investment in Bridge and Marble Canyons together. They can get \$1.75 billion instead of \$1.33 billion. The reference there, sir, is to what is called exhibit 3. I would appreciate very much if you would give your attention to that for just a minute.

This picks up from what Secretary Udall said the other day—that the administration would have no objection to a fund to develop—for the development fund, for the later uses of the basin States in getting more water from any one of several sources.

The possibility exists—and we simply wanted to call this to the attention of the committee, for their information and possible use—that if the committee should so choose, and Congress should so choose, it is possible to think of an active fund that is utilizing the differences between Government interest rates of say $3\frac{1}{4}$ percent, charged to reclamation, and the 5 percent that triple-A and double-A industrial and State revenue bonds have been bringing now for quite a while.

If you chose members from all the basin States or the lower basin States, and joined the top investment, bond investment bankers from Phoenix and Salt Lake City, and Los Angeles, as a marketing committee, and set them under strict regulations as to what they should do, confining them to triple-A and double-A bonds, and they were able, over these long years, to have a success at 5 percent. Now, these bonds in January were selling at $5\frac{3}{8}$, according to Standard and Poors. Now they are around 5.

But with the country booming, and the cost of everything going up, the cost of capital—there is a fair chance it will stay up around 5. In any case, I have used the 5-percent figure.

This brings us to exhibit 3, and this table shows how much more the Colorado Basin States can gain from a hundred million deferred construction loan, let's say voted as part of a central Arizona project,

which we favor, repayable in 50 years at $3\frac{1}{4}$ percent, if invested successfully in 5-percent interest-bearing industrial and State-guaranteed revenue bonds than they could from the \$670-million plus invested in Hualapai and Marble Gorge Dams and powerplants. And then I carry that through, as you will see, giving the information decade by decade.

It has an advantage over the construction of the physical dam, because it can start next year instead of waiting until perhaps 1975, when the rest of the project would be completed. It goes on, then, to these carriers of the Bureau of Reclamation of 2025, and 2047.

That loan, then, of only a hundred million, would produce \$604 million in the year 2025, which is 67 percent more than the dams in that year. It will produce \$1.747 billion, which is 30 percent more than the dams by the last year, 2047.

It will also provide the same \$184 million in irrigation that the Bureau plans.

Mr. Hosmer. Mr. Raushenbush, we have it before us. I think we can see the conclusions.

Mr. Raushenbush. I'm sorry.

Mr. Hosmer. We can use similar tables for the Government investing in some mutual fund, or just in the stock market, or in a casino operation. It is a matter of getting the Government in business. I think you have made your point. I appreciate it. But it is certainly not the type of thing that is acceptable to the public of the United States.

Mr. Raushenbush. That is not the Government in business. This would be the development fund acting to double the value. And you could put any kind of a limitation—not more than 1 percent, in any State revenue bond, of any one State. You could put a 2-percent limit in any amount.

Mr. Hosmer. We tried this with the SBIC's and it fell on its face. I don't suppose there would be much more luck here.

Mr. Raushenbush. I made this statement about Los Angeles, which asks for a Government participation of \$254 million, and perhaps because I said that, I simply have to carry that through—that in the year 2047, then, on this same basis, if you chose, instead of building the dam or participating with Los Angeles in that, to invest that \$254 million for the benefit of the fund, the lower basin State fund, it would then produce \$4.43 billion in that year.

That \$254 million, at 5 percent.

Whereas, the Bureau dams in that same period would produce \$1.33 billion.

So you can get three times as much for the fund out of that if you care to do that.

I am going on with Mr. Smith's statement, which is his, and which he asked me to read.

From the point of view of long-range good social policy it may be gravely doubted whether southern California will wish to concentrate many more millions of people in that region. I would like to suggest that if California were an independent nation, with control over its own immigration policy, it would even now be resisting the

heavy immigration which is taking place into the State, and the resulting congestion; in fact, it would probably resist such an invasion by force of arms if necessary. The notion that it is socially desirable for southern California to keep crowding itself to the scuppers is simply absurd.

However, assuming a continuance of these ludicrous drifts of policy, and assuming that Los Angeles will wish to urbanize its environment indefinitely, it now seems clear that the best way to provide the water will be by atomic desaltation plants. The cost of doing the job that way will almost certainly be less than the cost of bringing more water down from northern California, and even from the Columbia, and peradventure from Alaska, by aqueduct. The costs of atomic desaltation will be falling, over the years; those of dam and aqueduct construction will be rising.

Accordingly, if it is deemed desirable to create a large fund for deferred construction for development or for reinvestment, however you wish to describe it, for purposes of getting more water into southern California, the way to do it would be to lend the money to a basin agency now, at low interest, let it reinvest at the higher present going rates, and plan on using the fund in years to come for atomic desaltation.

The enormous dislocations involved in the grandiose water-diversion plants which have been unfolded by the Department of the Interior in recent years would be highly destructive. They would destroy the valleys in which the stupendous reservoirs would be created; that is, soil, forests, rivers, watersheds, wildlife, recreation, and communities. They would destroy the regions through which the aqueducts would be constructed. Countless local ecologies would be wrecked. Enormous losses of water by evaporation would result. The storage facilities would be of limited life duration. In all probability, considering the size of the storage facilities proposed, weather and climate would be affected over tremendous distances.

And for what? Water is available in the regions within which it now flows: it should be developed in those regions and people should be encouraged to go there. More space is available for them there, and there would be less of the intolerable congestion which is appearing in a few overcrowded major urbanized areas of the United States.

These are the long-range considerations in respect to water resources in the Pacific Southwest and the Pacific coast generally, as I see them. They militate against the construction of either Marble Canyon or Bridge Canyon Dams in favor of the high priority which conservationists have given to the protection of the entire Grand Canyon between Powell Reservoir and Mead Reservoir as either a national park or national monument.

The portions of H.R. 3300 which provide for importation of water into the Colorado River Basin are, in my opinion, in conflict with the principle of letting the people go to the place where the water is, which is the correct principle. In fact, from one point of view, H.R. 3300 is primarily a bill to lay hands upon the abundant water resources of the Pacific Northwest. It is not likely that the people of the Northwest will consent to part with these invaluable resources.

Any effort to hitch such water diversion plans to a program for getting Colorado River water into Arizona will only delay the solution of the Arizona water problem indefinitely. The way to get water into Arizona is to build aqueducts and pumping plants, buy the power, and start pumping.

The provisions in H.R. 3300 for the establishment of a National Water Commission are, in my opinion, inadvisable as part of legislation dealing specifically with the Colorado River. Moreover, in this instance, the Commission is made a mere adjunct to the Water Policy Council, and is handed a cut-and-dried plan, specified in part by the bill itself, and in part by programs to be developed for the Secretary of the Interior.

The idea of a National Water Commission considered independently is extremely important and high desirable. A distinguished group of Senators introduced S. 20 in the Senate to establish such a Commission and it has passed. The Bureau of the Budget has recommended in the past that the proposed Bridge Canyon Dam be reviewed by such a Commission, with the interests of the entire United States in mind, not merely one region. As proposed in S. 20, the Commission would cooperate with, but not be restricted by the Water Policy Council. These points are extremely important: to accomplish its purpose the National Water Commission must be truly national, must concern itself with national policy, and must be composed of persons not associated with the operating agencies, all of which agencies have axes to grind; by the same token it must not be subordinated to the Water Resources Council, which is merely an interdepartmental commission within which the conflicting interests of the operating agencies are theoretically adjusted. As it has developed, the Water Resources Council has been manned by representatives of the operating agencies; it is in no sense a genuine policy formulating agency in any significant sense of that term.

The President's proposal to protect the river and canyons between the present Grand Canyon National Park and Power Reservoir as a National Park is in the national interest. It is in more than the national interest. It is in the interest of the emerging worldwide culture. These canyons are a matter of concern to men of conscience and insight throughout the world, not merely in the United States.

The President could accomplish this purpose by Executive order, and we would urge him to do so; it would be desirable that Congress should give such protection the added emphasis and permanence which would be conferred by national park status. With status either as a national monument or a national park, protection would be given against the issuance of any license for the construction of hydroelectric power facilities in Marble Canyon by the Federal Power Commission. It is very clear that the highest use of the river in the vicinity of Marble Canyon is its protection in present condition, and not its development for electric power purposes. The door against licensing by a Federal Power Commission, in my opinion, should be securely closed and permanently locked.

The same in my judgment is to be said for the stretch of river between Mead Reservoir and Grand Canyon National Park, including

the portion bordered by the present Grand Canyon National Monument. The entire river and its canyon in that region, with ample margins along both sides, should be incorporated either into a national monument by Executive order or into a national park by action of Congress. Under no circumstances should be present national monument be abolished or restricted in any manner whatever.

The President has indicated that Congress should decide this issue: Congress should indeed decide the issue immediately by incorporating this reach of river into Grand Canyon National Park securely and forever. For the reasons noted above, Bridge Canyon Dam must be regarded as uneconomic, unlikely to compete successfully with alternative sources of power; it would waste water shamelessly by evaporation in a water-hungry region of the Nation; it would impair for all time scientific, scenic and recreational values of nationwide and worldwide significance. The construction of the proposed Bridge Canyon Dam, misnamed Hualapai Dam for propaganda purposes, would be an act of cultural barbarism. It would also be an economic blunder of the first magnitude, completely improvident from a business and financial point of view.

H.R. 3300 contains a declaration which, in my opinion, represents an untenable conclusion of law; namely, the last sentence in section 302 which is a declaration that the construction of Bridge Canyon Dam, misnamed Hualapai Dam, authorized by the bill, is consistent with the act of February 26, 1919, creating Grand Canyon National Park. Section 7 of that act states that whenever consistent with the primary purposes of Grand Canyon Park the Secretary of the Interior is authorized to permit the utilization of areas therein which may be necessary for the development and maintenance of a Government reclamation project. Bridge Canyon Dam, in the first place, is not a reclamation project; it is a power project; nor is it necessary for the development and maintenance of any reclamation project, either in terms of any need for electric power for such a project or in terms of building up an investment account for any such project. Moreover, the project is not consistent with the primary purposes of the park, which are scenic and scientific protection. The declaration contained in H.R. 3300 is contrary to any rational conclusion of law.

I would raise an objection to one feature of the current administration proposals: the reservoir which would be formed by the proposed Hooker Dam and rise into the Gila Wilderness. Congress has only recently enacted the Wilderness Act whereby this area among many others was given supposedly permanent protection in natural condition free from the works of man. Approval of the proposed reservoir in the Gila Wilderness would contradict this action taken but recently by Congress itself. Grave doubt would be cast for the future on the security of other wilderness areas protected by congressional action. This particular provision appears to be in fundamental conflict with the beneficial protective proposals of the administration plan, and should be omitted. We recognize that the President is authorized by the Wilderness Act on a finding of higher use to authorize reservoir in wilderness areas, but the President has not thus far formulated such findings; the proposed legislation anticipates them; the matter should be left to the President; we hope he would be open to suasion against

creating such an early precedent looking toward wilderness impairment.

There may be some doubt as to the need for the special revenue measures included in the administration proposal with respect to the sale of water in Arizona. It has been our impression that a much larger proportion of sales would be for municipal and industrial purposes than the Bureau of Reclamation stated originally and that very large revenues would result, permitting the accumulation of a sizable fund for reinvestment, on the basis of normal M. & I. charges. We see no reason to doubt these conclusions in their general purport; on the other hand, water is a very valuable commodity and special charges or taxes on users may well be desirable.

I suggest that the problem before the Nation is to get water into central Arizona promptly and to preserve the scientific, cultural, and scenic resources of the entire Grand Canyon between Mead Reservoir and Powell Reservoir permanently. The proposals made by the President subject to the few comments I have made on particular points, and with the possible addition of a \$100 million deferred construction loan, accomplish these purposes. They will have an unusually wide endorsement by a very broad consensus; and could move ahead very rapidly.

Again let me say to the chairman of the committee, the chairman of the subcommittee, and the members of the subcommittee, that I greatly appreciate the invitation given to me to present this statement here today, this opportunity to offer my views, and the courtesies which have been extended to me.

Mr. Chairman, he hoped that you would include after his statement these three excerpts that he sent along.

Mr. JOHNSON. We are very happy to have you read this statement. Mr. Smith is a very fine person, interested in the national parks. He has been with the association for a long time. The balance of his material will appear in the file.

These are speeches that come out of various periodicals.

Mr. RAUSHENBUSH. Will the table referred to be in the text, Mr. Chairman?

Mr. JOHNSON. Yes, the table will be in the record.

Are there any questions of Mr. Raushenbush?

No questions.

We want to thank you.

Mr. RAUSHENBUSH. Thank you very much, at this late hour.

(Exhibit 3, the table referred to, follows:)

EXHIBIT 3

CENTRAL ARIZONA DEFERRED CONSTRUCTION LOAN

(This table shows how much more the Colorado Basin States can gain from a \$100 million deferred construction loan, repayable in 50 years at 3.25%, invested successfully in 5% interest-bearing industrial and state-guaranteed revenue bonds, than they could from \$670 million invested in Hualapai and Marble Gorge dams and powerplants.

(1) That loan will produce \$604 million, 67% more than the dams by Year 2025.

(2) It will produce \$1,747 million, 30% more than the dams by Year 2047; also

(3) It will provide the same \$184 million in irrigation aid for CAP by Year 2025.

Capital accumulation

Calendar year	Year of loan life	Interest component	Accumulated capital (millions)
1968.....	1	0.05 percent.....	\$10.0 1.40
Total.....			10.0
1977.....	10	0.551 percent (9 years).....	12.0 4.0
Total.....			12.0
1987.....	20	0.628 percent (10 years).....	28.0 4.0
Total.....			28.0
1997.....	30	0.628 percent (10 years).....	20.0 4.0
Total.....			20.0
2007.....	40	0.628 percent (10 years).....	64.0 4.0
Total.....			64.0
2017.....	50	0.628 percent (10 years).....	*1,000.0 4.0
Total.....			1,000.0
Repayment.....			-500.0
Total.....			500.0
2025 (key year).....	58	0.477 percent (8 years).....	75.0 * -184.0
Total.....			* 62.0
2027.....	60	0.1025 percent available (2 years).....	65.7 4.0
Total.....			65.7
2037.....	70	0.628 (10 years).....	1,077.0 4.0
Total.....			1,077.0
2047 (key year).....	80	0.628 available.....	* 1,745.1

¹ A \$4,000,000 operations charge is deducted at the beginning of each 10 year period.
² Year of repayment with interest.
³ Identical with Bureau's aid to Central Arizona project year 2025.
⁴ Bureau's dams, \$361,300,000.
⁵ Bureau's dams, \$1,335,500,000.

Mr. JOHNSON. Our next witness is Mr. Stewart Brandborg, the executive director of the Wilderness Society.

STATEMENT OF STEWART M. BRANDBORG, EXECUTIVE DIRECTOR THE WILDERNESS SOCIETY

Mr. BRANDBORG. Mr. Chairman, I am Stewart M. Brandborg, executive director of the Wilderness Society, a national, nonprofit conservation organization with some 36,000 members. Our headquarters are at 729 15th Street N.W., Washington, D.C. The broad purpose of the Society is to increase knowledge and appreciation of wilderness and to support measures for its protection and appropriate use.

I requested permission to testify at this time because the bills now under the committee's consideration contain new proposals and provisions upon which we have not testified.

The Society's interest in the bill before this committee to authorize the Lower Colorado River Basin project has centered on the consideration of the impact upon park and wilderness lands of the proposed Marble Gorge and Bridge Canyon Dams. In our study of these proposals we have been keenly aware of the critical water needs of states in the Lower Colorado River Basin, and it is our hope that these may be met with alternative projects and programs that do not impinge upon the wilderness lands of either the national park system or the national wilderness preservation system.

Last May, and also at the time of the committee's hearings in September, 1965, I expressed the society's opposition to provisions of the legislation which would authorize Bridge Canyon and Marble Gorge dams. A number of the present bills before this committee have eliminated the authorization for the Marble Canyon unit and have changed the name of the Bridge Canyon unit to Hualapai Dam and Reservoir. Our previous opposition to Bridge Canyon Dam can be applied to the Hualapai project.

In earlier testimony we expressed concern for the water needs of the people of the Southwest. We wish to reemphasize our concern about these needs and to encourage alternative programs to meet these requirements without the construction of dams within the Grand Canyon that would violate the integrity of the national park system. If the National Water Commission, as proposed in bills before this committee, can function as outlined, it is hoped that Congress may find it unnecessary to authorize any dam which would invade the boundaries of any dedicated lands of either the national park or the national monument. The society supports the proposal for the National Water Commission and urges that its studies be comprehensive and of national scope and that they fully consider recreational, scenic, fish and wildlife, esthetic, and wilderness values.

The Society does not oppose proposals for the Central Arizona project (except for the high dams in the Grand Canyon) if there can be a definite prospect of downstream alternatives to the Hooker Dam in New Mexico. The Wilderness Society's interest in the proposed Hooker project stems from a continuing concern for protection of the Gila Wilderness Area and primitive area. Establishment of the Gila Primitive Area in 1924 marked the beginning of the preservation of American wild lands in the national forests. In 1964, upon passage of the Wilderness Act, the Gila Wilderness Area became a unit of the national wilderness preservation system. Against this background we have attempted to evaluate the Hooker Dam proposal and alternatives about which relatively little information is presently available.

Our latest information is that the proposed site for Hooker Reservoir would displace a strip of the primitive area about one-half mile wide to the west of the Gila Wilderness Area. Water backed up in the Gila River by the Hooker Dam (98,000-acre-feet capacity—a structure rising 220 feet above the stream bed) would flood this strip of primitive area and over 3 miles of the canyon within the wilderness area proper.

The Hooker Reservoir would also back into Turkey Creek and into the wilderness area within its watershed. Provisions of bills before the committee would authorize subsequent enlargement of the dam to a 215,000-acre-foot capacity that would back water approximately 6 miles into the wilderness area.

These intrusions of the reservoir upon the wilderness area would set an undesirable precedent for disregarding wilderness designations and wilderness boundaries in the future and would represent erosion of the protection assured these areas by the Wilderness Act. It is our strong recommendation, therefore, that there be full study and exploration by the committee of alternative sites downstream from the proposed Hooker site, including but not limited to the following:

1. The Redrock Canyon, or Conner, damsite has been suggested as a site which would enable the dam to interrupt floodwaters from Mangas Creek and Duck Creek and from the tributary canyons in Redrock Canyon. Waters from these sources are reported to have caused serious damage to the communities of Virden and Redrock. In this respect the Conner site appears to have an advantage over that of the present proposal.

2. The "Canador" site, in section 19, R. 19-W, T-19S, at river elevation 3,878 feet.

3. The "Cliff" site, in section 33, R. 17-W, T. 17-S, at river elevation 4,200 feet.

There is indication that these downstream reservoir sites would yield appreciably improved public access and greater recreational benefits than the Hooker reservoir. We urge that they be fully studied to determine their flood control, reclamation, recreation, and other benefits as a practical and acceptable means of preventing intrusion upon the Gila Wilderness Area. We would also recommend that the Committee request impact studies on the Hooker Project from the Department of Agriculture to show the effect of this project upon the wilderness area.

Thank you for the privilege of presenting this statement.

Mr. JOHNSON. Thank you, Mr. Brandborg.

Mr. HOSMER. No questions.

Mr. REINECKE. No questions.

Mr. JOHNSON. We want to thank you for your statement and your appearance here today.

I have a unanimous consent to ask for the next witness who could not remain here—Mr. Max Linn of Albuquerque, "Save the Grand Canyon"—I ask unanimous consent that his statement be placed in the record at this point.

(The prepared statement of Mr. Max Linn follows:)

STATEMENT OF MAX LINN, REPRESENTING A COMMITTEE FROM NEW MEXICO

My name is Max Linn. I represent a committee from New Mexico which was formed last summer, just after this subcommittee held its hearings in May. My purpose is to provide you with information that there is very substantial support for extending the boundaries of the Grand Canyon National Park. The committee I represent is the Save The Grand Canyon Committee, a steering committee formed largely of representatives from well-known organizations. I

would like to name these organizations because it is this list that constitutes my chief credential for appearing before this committee.

The Wilderness Society.
Wildlife and Conservation Association.
New Mexico Ornithological Society.
Rio Grande Chapter of the Sierra Club.
New Mexico Mountain Club.
The University of New Mexico Mountaineering Club.
The Los Alamos Outdoor Association.
The Albuquerque Veterinarian Association.
The Humanist Association.
The Thunderbird Trailer Club.
The Albuquerque White Water Club.
Sportsman's Legislative Action Committee.
Isaac Walton League.

All of these organizations have taken a firm position endorsing extension of the boundaries of the present Grand Canyon National Park and opposing dams in the Grand Canyon.

A typical statement follows:

"The Board of the New Mexico Ornithological Society, on advisement from its state-wide membership, is on the record as unanimously opposing the building of dams in the Grand Canyon area, and supporting the extension of the Grand Canyon Park to include Marble Canyon."

I submit that this group of organizations and the people they represent amount to a considerable body of opinion in New Mexico to the effect that this country must preserve the Canyon as it is.

But the question of preserving the canyon has aroused not only these organizations; it has evoked considerable notice in state government. During last fall's election campaign, both political parties in New Mexico passed similar resolutions in their party platform conventions.

The following statement is quoted from the resolution of the Bernalillo County Democratic Party. A virtually identical resolution was adopted at the State Democratic Platform Convention.

"Resolution #9 Conservation Paragraph 2. Bridge and Marble Canyon Dams. Since the Bureau of Reclamation proposes to build two dams in the Grand Canyon of the Colorado, and since these dams would not provide water for irrigation but would waste water through seepage and evaporation, and since the proposed dams are not necessary to the Central Arizona Project or other irrigation water works, and since cheaper power could be generated from fossil and nuclear fuels, and since construction of these dams would forever destroy natural features of the Grand Canyon, it is hereby resolved that the Bridge and Marble Canyon dams are a needless waste of our precious natural resources. Alternate means of financing the Central Arizona Project should be instituted. The Grand Canyon National Park boundaries should be expanded to provide protection to portions of the Grand Canyon outside of the Park boundaries. Further, no private utilities should be allowed to build hydroelectric power plants at dam sites which would destroy the wonders of the Grand Canyon."

Also following is a key statement from the resolution adopted unanimously by some 1200 delegates at the State Platform Convention of the Republican Party.

"Resolution: Whereas The Bureau of Reclamation proposes to build two dams in the Grand Canyon of The Colorado, and Whereas these dams would not provide water for irrigation but would waste water, and Whereas the proposed dams are not necessary to the Central Arizona Project or other irrigation water-works in the Lower Colorado River Basin, and Whereas lower power costs would result from fossil fueled or nuclear power plants, and Whereas construction of these dams would do irreparable harm to the natural features of the Grand Canyon, it is hereby resolved that the Bridge Canyon and Marble Canyon Dams are a needless waste of taxpayer's money. It is further resolved that alternate means of financing the Central Arizona Project should be pursued and that favorable action be taken on proposals which would increase the size of the Grand Canyon National Park to provide needed protection to portions of the Grand Canyon presently outside of the National Park boundaries."

Furthermore, Governor David F. Cargo of New Mexico has recently written the chairman of the committee I represent a letter including the following statement:

"I would very much like to discuss with your group the impairment of the Grand Canyon. I am still opposed to the building of dams in the Grand Canyon." Letter dated February 24, 1967.

Other witnesses before this committee have raised technical questions about the dams and the Central Arizona Project and have questioned the economic arguments which have been used to support construction of dams. I am not here to do that, but I am authorized by my committee to make this concluding statement.

New Mexico is a neighbor state of Arizona, the Grand Canyon State, but we feel that the Canyon is a possession of our nation, not of Arizona, nor even of the Southwest, and we remain unconvinced that regional, industrial or agricultural development should always have priority over considerations of national interest.

Mr. JOHNSON. Our next witness will be Mr. Carl Chafin, from Tucson.

STATEMENT OF CARL CHAFIN, TUCSON, ARIZ.

Mr. CHAFIN. Mr. Chairman, my name is Carl Chafin. I live in Pima County, Ariz., just outside Tucson. That area is Mr. Udall's district, and I must say that I am proud that we have such a talented and distinguished Representative in these Chambers.

Unfortunately, I do not agree with him on the matter which is before the committee this week. After an intensive private study of Arizona's water problem, which I began in 1950, I am convinced that the Central Arizona project as stated in H.R. 3300 and related bills is not in the best interests of the majority of Arizona's citizens. Indeed, as I shall endeavor to show, it is not even in the best interests of the agricultural community, which it initially purports to help the most.

In the first place I vigorously deny that there is a water shortage in Arizona. We use 4,700 gallons of water per person per day. This amount is three times the average for the United States, and makes us Arizonans the seventh largest water users in the Nation on a per capita basis. The water crisis in Arizona is not as widespread or as critical as some would have you believe.

Our annual supply of water is about 3 million acre-feet, of which two-thirds comes from surface-water flow and the balance from ground water recharge. Our annual consumption is around 6.5 million acre-feet. Obviously, we are taking 3.5 million acre-feet of water out of the water stored beneath the earth's surface that is not being replenished each year. Naturally, there has been concern about this overdraft. However, competent geologists have estimated that there are still around 600 million acre-feet of economically recoverable ground water. At the current rate of use, we could continue overpumping for at least the next century. As more water is removed from the ground than is replaced, the depth to readily available water increases, and the costs of energy and pumping plants rise accordingly.

Crop irrigation accounts for over 90 percent of the water consumed each year in Arizona. All other uses—all manufacturing, thermal generation of electricity, mining and smelting, livestock watering, timber products, recreation, municipal, and household use—together use only one-half million acre-feet of the 6.5 million acre-feet used. Of the water used on cropland irrigation, 2.5 million acre-feet are used on high-value intensive crops, such as cotton, vegetables, field fruits, and citrus, which produce almost 80 percent of all income from crop sales in Arizona. The remaining water used—3.5 million acre-

feet—is used to irrigate low-value extensive crops, feed grains, and forages, that produce only about 20 percent of all crop income and only about 1.5 percent of personal income in the entire economy of the State. I would like to repeat that. Almost 55 percent of our water is used to produce less than 2 percent of the personal income of the State economy.

Water consumption is high, but most of this consumption is in relatively unproductive uses in terms of income generated. Exactly where, then, does Arizona's water problem lie? Most of the attention has been focused on the continuing deficit in the ground water account and the resulting plight of farmers in areas relying on pumped ground water for irrigation. There have been charges that large acreage of irrigated farmland have gone out of production due to lack of water or to high costs of pumping. We are all familiar with some of these areas. They are known today as Phoenix, Scottsdale, Tempe, and Mesa. Here is an example of such land that has gone out of cultivation. On that land is now located Arizona State University at Tempe. Not far away is the birthplace of Arizona's senior Senator, the Honorable Carl Hayden, who has served his State faithfully since its inception in 1912.

A study at the University of Arizona in 1964 by Dr. M. M. Kelso comparing the changes in the amount of in-crop production in a sample of lands supplied by pumped water in central Arizona between 1957 and 1963 actually found a net increase in irrigated land. Furthermore, the general figures on total lands cropped in Arizona over the last two decades fail to support the disaster thesis. There has been a 50-percent increase in irrigated acreage in Arizona from 1945 to 1965.

I am not trying to imply that all is rosy for the future of Arizona's farmers. Serious problems do exist. They are faced with rising costs and shrinking markets. However, the high water costs as proposed under the Central Arizona project are hardly the answer. Perhaps it is not commonly realized that the \$17.83 per acre-foot of water which the farmer will have to pay at his canalside or farm road gate, under the Central Arizona project is more than he is paying, in most cases, for water now. Since his net returns will decline more rapidly with the high-cost project water than with pumped water, the net result will be to force the farmers out of business much sooner than if the contract for CAP water had not been made in the first place.

It would seem more reasonable for the Government to raise the farmers' crop price-supports and/or subsidize cheap pumping power than to spend almost \$1 billion in order to convey higher priced water to the farmer and slowly drive him to bankruptcy.

Turning to the case of the municipal and industrial uses of water, it is well known that the population of central and southern Arizona's major metropolitan areas have grown very rapidly since 1945. The present population of 1.5 million represents a doubling since 1950. I can still remember the propaganda of that earlier era when the present State water engineer and the Central Arizona Project Association forecast gloom and disaster if imported water were not immediately forthcoming to sustain water-famished developments and to restore economic prosperity to Arizona. But that, of course,

was 17 years ago, when the population was only 749,000 and the irrigated acreage was about 50-percent less than today. Fortunately, the resulting demand for water in the cities was not large relative to the economy as a whole.

The Phoenix area has, in part, been able to absorb the increasing demand by virtue of the agricultural water rights gained as farmland was converted into urban uses. Out of a total use of about 125,000 acre-feet, Phoenix now obtains 80,000 acre-feet annually from the Salt River project at less than \$2 per acre-foot. It is obvious that cities would not be acting in the best interests of their citizens were they to contract for Colorado River water at \$50 per acre-foot, when, in most cases, they have readily usable surface and ground water supplies available.

A recent study at the University of Arizona indicates that irrigation wells produce water for a total cost at the pump of about 3 cents per acre-foot per foot of lift. Thus, even when pumping lifts reach 500 feet, water would cost no more than \$15 per acre-foot. My hometown area of Tucson, which relies entirely on ground water, is moving farther and farther from the city in developing new well fields. It is apparent, however, that cities can establish their well fields at a considerable distance away and still have ground water at a net cost less than the \$50 to \$55 acre-foot charge contemplated under the central Arizona project.

Tucson uses only about 55,000 acre-feet of water annually. Last year water rates were increased 25 percent and already this year water usage has declined 10 percent. Under these circumstances, it is exceedingly kind of the U.S. taxpayers to consider a scheme which will build two aqueducts, 341 and 70 miles long, in order to dump an additional 112,000 acre-feet of water on us. I am not sure that we want to turn into another Los Angeles. Many of us in Arizona are already refugees from that unique area.

Since I am not too enthusiastic about the present central Arizona project, you may wonder about what alternatives I propose. Like the famous report of Mark Twain's premature demise, reports of our "water crisis" are greatly exaggerated. In part, our problem is resolving itself. The water is being slowly reallocated to more productive uses.

Our inexpensive surface waters are used by agriculture—where return per acre-foot is relatively low—until they are needed for municipal and industrial use. These users can purchase the water from agriculture as needed since they can afford to pay a much higher price per acre-foot. We have seen this process occur as the Phoenix area cities have expanded throughout the Salt River project.

Our ground water reserves are presently being mined in considerable excess of their recharge. It is this overdraft and the consequent lowering of the ground water table that has made some people believe that there is a water crisis in Arizona. It is for this reason that the central Arizona project is being proposed. But, as we have seen, even at the beginning of the proposed project when the maximum amount of Colorado River water would be available, the central Arizona project would cancel only one-third of the overdraft. Two-thirds of the overdraft would remain, the ground water level would continue

to fall, and the basic "water crisis" would still be with us. The cancellation of the one-third overdraft would be a Pyrrhic victory, which would be gained by charging municipalities higher prices for water than they can expect to pay for many years for pump water, in order to bring in water that farmers in pump areas could not afford to buy and farmers in irrigation districts do not particularly need.

Also, there seems to be little logic in transporting water from another basin and selling it for irrigation use at a price below what it actually cost in the original basin for similar uses.

What about our 1.2 million acre-feet of water from the Colorado River? We all seem to recognize that there just isn't that much water actually left over for Arizona. So, perhaps, we can take 0.5 million acre-feet of water out of the Colorado River on our western boundary, and start a "western Arizona project" on about 100,000 acres adjacent to the river. A great deal of investigation needs to be done, particularly in locating and examining soils suitable for agriculture. Also, we need to know the cost of delivering water to the "western Arizona project." However, I feel sure that the Bureau of Reclamation will be happy to furnish a feasibility report.

In conclusion, I would like to reaffirm my belief that economic growth can continue in Arizona without importation of water.

Thank you for this opportunity to explain my water policy for Arizona.

In conclusion, I would like to read a statement from a paper which appeared this month in the Arizona Review, a publication of the University of Arizona. It has an interesting article by Prof. William E. Martin and Robert A. Young, both in the Agricultural Department at the University of Arizona. The article is entitled "The Economics of Arizona's Water Problem." This is the conclusion of their report, which I thoroughly support:

If the water problem is reviewed simply in terms of the ground water overdraft, the obvious solution is to import surface water from other river basins. However, if the problem is to obtain maximum economic benefit for the State, this water must generate benefits in excess of cost of transporting and distributing it. Since this is not the case, reallocation of available water becomes the preferred solution.

Thank you for the opportunity.

I would like to submit this in the record. If not, in the file.

Mr. JOHNSON. Mr. Chafin, the two pamphlets you have there will be made a part of the file.

We want to thank you for your statement.

We will now hear from the gentleman from Arizona, Mr. Udall.

Mr. UDALL. I am afraid there are a lot of my farmers in Pinal County particularly who will be amazed to learn there is no water crisis.

Carl, I notice your testimony followed rather closely the article of Drs. Martin and Young that you referred to. Are you acquainted with these gentlemen? Have you worked with them in the development of their thesis?

Mr. CHAFIN. No, I have not worked with them. I have been studying this problem for the last year in Arizona. I naturally came across them, since we had similar views.

Mr. UDALL. If your policy and theirs were adopted, in essence, the result would be that tens of thousands of acres in Pinal County and other pump areas of the State would gradually and rather quickly be squeezed out of production. The water that is available, you suggest, would be used for other, and what you consider, higher uses.

Mr. CHAFIN. In the city the water is worth about \$50 an acre-foot. In growing hay it is worth about \$13. So the generation of income within Arizona would rise if this water were reallocated on a more economic use.

Mr. UDALL. I understand the contentions made in the article and the contentions you make here today. You agree, of course, that the price we would have to pay in Arizona for a policy of this kind would be to put into bankruptcy or put out of business several thousand farmers in these pump areas, and in the process seriously damage the economy of such cities as Eloy and Casa Grande. You would have a complete readjustment of the economy in those areas.

Mr. CHAFIN. The Government could just as easily raise the price of cotton supports or actually subsidize electricity. They complain about the pumping charge, not about the lack of water within the earth. If the ground table is falling they can continue to pump this.

As I pointed out, the ground table will last for 171 years. If we could somehow subsidize electrical energy for pumping for them, they still would have water. This is not the problem.

Mr. UDALL. I understand your position. I respect your sincerity and the strength of your beliefs.

Mr. Chairman, due to the hour, I shan't take any more time.

I obtained unanimous consent some time ago, several days ago, when this article was referred to by another witness, to have the State engineer and our experts prepare a memo responding to some of the allegations made. And I won't want my failure to pursue this line of examination at this late hour at night to suggest that the Arizona people fully agree with the thesis that has been expounded here.

Mr. JOHNSON. The gentleman from California.

Mr. HOSMER. Just one question, Mr. Chafin. If we delete the central Arizona features from this bill, you have no objection to its passing.

Mr. CHAFIN. No, sir. To be perfectly honest, I have not studied the entire bill. I am not familiar with Colorado's water problem; therefore, I could not positively support it. But I would have to study that portion. I have studied Arizona's, because I have lived there 3 years.

Mr. HOSMER. Thank you.

Mr. JOHNSON. The gentleman from California.

Mr. REINECKE. Mr. Chafin, this is very interesting. I have been trying to advocate better management of our water supplies for some time.

I believe I understand correctly that there will be no agricultural or no irrigation pumping allowed within the service area of the central Arizona project; is that right?

Mr. CHAFIN. What do you mean?

Mr. REINECKE. No pumping from the water table.

Mr. CHAFIN. They would continue to pump. The water is being currently reallocated. If the farmer cannot afford to grow hay,

he lets his farm go out of production, or this is encroached upon, taking over by the cities. The water is then used by the cities.

Mr. REINECKE. The farmer will have the option of its contracting for CAP water at \$17 a foot—

Mr. CHAFIN. He is getting it from the Salt River project, for \$2 an acre-foot or less, now. And his pumping is probably less than \$10 an acre-foot. It will be many years before he will contemplate paying close to \$20 an acre-foot. He is being forced out of business right now by declining cotton prices—not the price of water so much as rising cost and declining cotton prices.

Mr. REINECKE. Is there a real question in your mind as to whether many farmers would take the CAP water?

Mr. CHAFIN. Yes; I have grave reservations whether they would even want it, if we realized what they are going to have to pay for it. In fact, this was brought out at the State hearings here on the State CAP bill, and the legislature last month in Phoenix, the city manager of Phoenix said that the cities had not even been contacted about this water, and he didn't want to be called a traitor at a later date if they refused to take \$55 an acre-foot water if they had plenty of \$2. So a lot of people have not been consulted about these contracts.

Mr. REINECKE. I might point out to the committee that I saved for the city of Tucson some 43 percent on all their water used to irrigate their park system when I sold an automatic lawn sprinkler control system.

Mr. CHAFIN. We pay less for water in Tucson than many of my friends around the country. A typical water bill might be less than \$10. So they raised the rates, and the water usage fell. I suggest we double them again.

Mr. UDALL. The citizens of Tucson belatedly thank you for your great generosity.

Mr. JOHNSON. Any further questions?

We want to thank you, Mr. Chafin, for the benefit of your paper and your testimony.

That concludes the list of witnesses.

(The following letter from Mr. W. T. Pecora, Director, Geological Survey, Department of the Interior, to Hon. Wayne N. Aspinall, dated March 24, 1967, relates to the testimony of Mr. Chafin.)

U.S. DEPARTMENT OF THE INTERIOR,
GEOLOGICAL SURVEY,
Washington, D.C., March 24, 1967.

HON. WAYNE N. ASPINALL,
Chairman, Committee on Interior and Insular Affairs,
House of Representatives,
Washington, D.C.

DEAR MR. CHAIRMAN: Your letter of March 18 asks for an explanation of language in Geological Survey Water-Supply Paper 1648, "Arizona Water," relating to ground-water storage and availability. The statement in question, on page 11, points out that the alluvium in Arizona's desert basins (the southwestern three-fifths of the State; the northeastern two-fifths is in the water-poor Colorado Plateau) once stored some 4½ billion acre-feet of ground water. It estimates that perhaps about 700 million acre-feet of this was economically recoverable for use by man, of which about 100 million had been withdrawn from storage—that is, withdrawn in excess of replenishment.

Presumably your question is as to the need for the Central Arizona Project, if the bulk of 700 million acre-feet of water remains "economically recoverable for use by man."

Perhaps the water-supply paper should have pointed out more clearly that "economically recoverable for use by man" refers to both fresh and saline water and to uses for all purposes. Irrigation, the chief use of ground water in Arizona, depends on water of acceptable quality and relatively low cost. Hence, a part—perhaps a large part—of the remaining water might be economically recoverable for uses that could tolerate higher recovery and treatment costs, but not for irrigation. It was in an attempt to make this point that the water-supply paper said that the water already pumped was the most easily and cheaply available part, and that readily available storage is more significant than total storage.

There is no question but that the "cream" of Arizona's desert-basin ground water has already been taken. Additional water will require deeper and more expensive wells and more of them, will involve higher pumping lifts, and will be of poorer quality. These facts are so because with depth the alluvium becomes progressively less permeable and the quality of the water worsens, and because water levels in the principal irrigated areas have already been drawn tens to hundreds of feet below their original levels and will decline further as pumping continues. In places water is being lifted several hundred feet. Only a few decades ago 50 feet was regarded as the maximum pumping lift tolerable for irrigation. Only improved techniques of well construction, improvements in pumps, and reduction of power costs, along with crop prices that are higher than they were when the 50-foot standard prevailed, have made it possible to lift water so high for irrigation. But conditions are gradually becoming economically marginal in progressively larger areas.

It is important to point out that Water-Supply Paper 1648 discusses Arizona's alluvial aquifers as a whole. The Alluvial Basins ground-water region occupies about three-fifths of Arizona, or roughly 65,000 square miles. After taking out mountains and areas of bare rock or unsaturated alluvium, there remains about 22,000 square miles of water-bearing alluvium, and it is this that contained the estimated 700 million acre-feet of available ground water. Of the 22,000 square miles, the Central Arizona Project covers only about 3,500 square miles in western Pinal and eastern Maricopa Counties, of which about 1,250 square miles is irrigated. Hence, the ground water available to the Project area is only a minor fraction of the total, yet the bulk of the withdrawal has been in the Project area—some 80 million acre-feet in 1923-64, inclusive. Water levels are declining as much as 20 feet per year in the heavily pumped localities, and in 1964 they were 150 to 350 feet, averaging 250 feet, below the land surface in most of the area.

The Geological Survey has recently built an electric analog model of the ground-water reservoirs of the Project area, as a part of its studies in cooperation with State agencies, in order to be able to predict future storage changes. According to the model, if the present regime of pumping continued there would be an additional decline of 150 to 300 feet in the most heavily pumped areas in the next 20 years; the average decline over the whole irrigated area would be about 100 feet. Thus, at the end of the 20 years, static water levels would be more than 600 feet below the surface in the areas of greatest decline; pumping levels would be an additional 50 to 100 feet lower. Obviously, lifts of this magnitude are impractical for irrigation of most crops. Hence, either a supplementary water supply or a reduction in irrigation withdrawal will be necessary.

The Geological Survey of course has no opinion for or against the Central Arizona Project. It is our responsibility, however, to point out situations determining the availability and quality of water, in order that those responsible for making decisions about future water developments may do so on the basis of the best available information on the water resources themselves.

I hope that these comments will be helpful to you.

Sincerely yours,

W. T. PICORA, *Director.*

Mr. JOHNSON. I have several items submitted for the record and I ask unanimous consent that they be included. We have a resolution from Mr. Philip P. Smith, secretary-engineer, the Colorado River Water Conservation District.

(The resolution referred to follows:)

CERTIFICATE OF RESOLUTION

The undersigned, being the duly appointed Secretary-Engineer of The Colorado River Water Conservation District certified that at a regular meeting of the Board of Directors of said District on January 17, 1967, held in accordance with statutes and by-laws pertaining to said District with a quorum present, the following Resolution was adopted:

Whereas the Colorado River Water Conservation District is a body corporate formed by act of the legislature and comprising geographically, all of twelve (12) counties and portions of three (3) counties in Northwestern and West Central Colorado; and

Whereas such geographic area includes the entire drainage of the Gunnison River, and those portions of the Yampa, the White and the Colorado Rivers in Colorado, and a portion of the drainage of the Dolores River in Colorado; and

Whereas the Colorado River Water Conservation District was formed as the appropriate agency for the conservation, use and development of the water resources of the Colorado River and its principal tributaries, and was therefore granted appropriate powers to safeguard for Colorado, all waters to which the state is entitled under the Colorado River Compact; and

Whereas during the 2nd Session of the 89th Congress of the United States, the Committee on Interior and Insular Affairs of the House of Representatives favorably reported on a bill (H.R. 4671) denominated "The Colorado River Basin Project"; and

Whereas said legislation did not pass the 89th Congress, and several bills relating to a part or all of the subject matter of H.R. 4671 in the 89th Congress of the United States have been introduced in the 90th Congress of the United States; and

Whereas the Board, in accordance with its purposes, and in the exercise of its powers, is in favor of such legislation and urges its passage, if it contains and incorporates certain matters vital to the State of Colorado in its use of its entitlement from the Colorado River: Be it therefore

Resolved by the Board of Directors of The Colorado River Water Conservation District:

1. That this Board wholeheartedly endorses the Colorado River Basin Project and urges its passage by the 90th Congress of the United States, providing, and only in the event, it contains the following features:

(a) Substantially the matters and things adopted and set forth in Report of the Committee on Interior and Insular Affairs, House of Representatives, 2nd Session, 89th Congress of the United States (except for the section denominated Section 501(e), Title V, which should be deleted as not being germane) and with the changes, adopted by The Colorado Water Conservation Board at its meeting in Denver, Colorado, on January 12, 1967.

2. This endorsement is conditioned upon such legislation containing, as a necessary minimum protection of Colorado's entitlement from the Colorado River:

(a) The five Colorado Federal reclamation projects, namely, Animas-LaPlata, Dallas Creek, Dolores, San Miguel and West Divide:

(b) Recognition of the right of the Upper Basin of the Colorado River to store water in reservoirs to meet the allocations and requirements of Article III, paragraphs (a), (c)—if chargeable against the Upper Basin,—and (d) of the Colorado River Compact; and

(c) Provide for study and report on methods and means of supplementing or augmenting the flow of the Colorado River.

Dated in the City of Glenwood Springs, Colorado, this 18th day of January, 1967.

PHILIP P. SMITH,

Secretary-Engineer, The Colorado River Water Conservation District.

Mr. JOHNSON. We have a letter here and a position taken by Mr. Robert W. Kean, Jr., president of the National Water Company Conference.

(The documents referred to follow:)

NATIONAL WATER COMPANY CONFERENCE,
March 7, 1967.

HON. WAYNE N. ASPINALL,
*Chairman, Committee on Interior and Insular Affairs,
 Rayburn House Office Building,
 Washington, D.C.*

DEAR MR. CHAIRMAN: The National Water Company Conference is an organization of investor-owned, regulated water supply utilities. Some 3500 such companies serve water daily to more than twenty million Americans in 4500 communities. We support the principle that investor-owned enterprise such as ours has an obligation to participate actively in solving the problems of national development.

The advantage of a National Water Commission, composed of non-governmental members representing business and professional expertise in the field of water resources, is in its mission to submit a thorough and complete analysis of water resources problems. This analysis, which will focus the most experienced, constructive and imaginative "thought resources" of the nation, and subsequent recommendations, will hopefully lead to sound, adequate water resources programs to assure this country of an endless supply of its most vital natural resource.

We heartily endorse the establishment of a National Water Commission as proposed in Section 1 of HR 3300 and S 20, and ask that our position become a part of the permanent hearing record.

Cordially yours,

ROBERT W. KEAN, JR., *President.*

MR. JOHNSON. We have a telegram here stating the results of a poll taken by the Arizona Academy of Science. They took a poll upon the position of their membership concerning the development of the Arizona project, Grand Canyon Dams—637 members, and they had replies from 234 members. They had five questions. Their results are complete here. They have made a request by Mr. Russell Nidey, the president of the Arizona Academy of Science, to have them placed in the record.

(The telegram referred to follows:)

TUCSON, ARIZ., *March 15, 1967.*

HON. WAYNE N. ASPINALL,
Chairman, Committee on Interior and Insular Affairs, Washington, D.C.:

DEAR MR. ASPINALL: On the behalf of the executive board of the Arizona Academy of Science, I wish to submit the following interim report for inclusion in the current hearing record on the Lower Colorado River development. The report has been prepared by an ad hoc committee of the academy, the Grand Canyon study committee, appointed to assemble information in that part of the Colorado River between Lees Ferry and Lake Mead that might be affected by new dam construction. The final report of this committee including recommendations will not be available until after March 23. Meanwhile, the interim report giving the results of a questionnaire sent to the 637 members of the Arizona Academy of Science should be included in the record of the hearing.

Though most members of the academy do not have personal field or research experience in the Grand Canyon, we do believe that this segment of the community is better acquainted with the scientific significance of this area than most other groups in the region and that our members are well aware of the plans for regional economic development, including the central Arizona project. As of this date 234 members have responded to 5 questions as follows:

1. Have you conducted field work or scientific research at any time in the Grand Canyon (between Lees Ferry and Grand Wash Cliffs)? If so, please describe briefly, citing the source, if results are published: Yes, 41; no, 192.
2. Whatever your answer to question one, please describe briefly any scientific features of direct interest to you (biological, geological, prehistoric, other) which might be lost or altered if one or several dams are built in the Grand Canyon.

Quotable information on scientific features of direct interest to respondent received from 86 members.

3. Do you (A) favor (B) oppose (C) have no opinion regarding construction of Hualapai (formerly Bridge) Canyon Dam? 66, favor; 149, oppose; 19, no opinion or no answer.

4. Do you (A) favor (B) oppose (C) have no opinion regarding construction of Marble Canyon Dam? 66, favor; 150, oppose; 18, no opinion or no answer.

5. Do you (A) favor (B) oppose (C) have no opinion regarding an expansion of Grand Canyon National Park, to include the full length of the Colorado River through the canyon (Lees Ferry to Lake Mead)? 142, favor; 64, oppose; 28, no opinion or no answer.

In brief, a majority of our members responding to the questionnaire (about $\frac{3}{4}$ rds) oppose the construction of dams at Hualapai and Marble Canyon sites and favor an extension of the Grand Canyon National Park between Lees Ferry and Grand Wash Cliffs.

Respectfully submitted.

RUSSELL NIDEY,
President, Arizona Academy of Science.

Mr. JOHNSON. We have a statement here from the National Rural Electric Cooperative Association, submitted by Mr. Gary Tabak.

(The statement referred to follows:)

STATEMENT OF NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION, PRESENTED
BY GARY TABAK, ASSISTANT STAFF COUNSEL-ENGINEER

My name is Gary Tabak. I am Assistant Staff Counsel-Engineer of the National Rural Electric Cooperative Association, which is the national trade and service organization of nearly 1000 rural electric systems in 46 of the United States. Approximately 95 per cent of all REA borrowers comprise the membership of NRECA. Such membership is entirely voluntary.

As you will recall in the last session of Congress, NRECA testified in support of H.R. 4671. The rural electric cooperatives believed then, and believe now, that the water supply problem in the Southwest is fast approaching a critical point and that immediate action is needed to alleviate an impending water shortage. In fact, nearly everyone is in agreement that the irrigation portion of the Central Arizona Project should be authorized as soon as possible. The question remains, however, as to the most desirable method for financing the irrigation project.

At this year's Annual Meeting in San Francisco, the delegates, with knowledge of the basic provisions of H.R. 9, H.R. 3300 and other recently introduced bills, and also the Administration proposal set forth by Secretary Udall, unanimously passed the following resolution:

Whereas NRECA has long adhered to the principle of orderly natural resources development to better serve all people nationally; and

Whereas this Association believes in a just and reasonable balance between the benefits of such development for all people and true wilderness conservation, but deprecates the rigid sacrifice of resources for the occasional pleasure of the few; and

Whereas NRECA traditionally takes a position of strong support for Federal multi-purpose reclamation projects in the interests of the consumer; and

Whereas the economics and benefits to the consumer of the Colorado River Basin Project Bill (H.R. 4671) before Congress were investigated by this Association; and

Whereas this Association advised its members last July of its favorable position on H.R. 4671; and

Whereas there still exists a severe water shortage in the economy of the Lower Basin states of the Colorado River Basin, especially in Arizona where three-quarters of the total supply comes from rapidly-depleting underground reserves; and

Whereas the Colorado River Basin Project would contribute water and low-cost power to the growth of the economy in this vital segment of the Nation; Now, therefore, be it

Resolved, that NRECA supports the multi-purpose development of the Lower Colorado River and passage of pending legislation substantially in accordance with the principles of H.R. 9 before Congress.

The task of the rural electric cooperatives is to bring electric service to the more remote areas of the country, where economic operation is severely hampered by low consumer densities and difficult terrain. In so doing, they have created a \$1.25 billion a year market in rural areas for electrical appliances and equipment which has benefited the entire nation's economy. In order to continue to serve those portions of rural America which have electric service (approximately 98% are served today) and to provide service to the unserved areas it is necessary that our members be able to purchase low cost wholesale energy when available, to offset the ever present handicaps faced by rural electric cooperatives.

The above-mentioned handicaps are especially severe in the Southwest, making it imperative that low cost wholesale energy be available to our member systems in this area of the country. In New Mexico energy purchased by cooperatives averaged 8.0 mills per kwh; in Nevada 6.7 mills; and in Utah 6.5 mills per kwh. These figures compare favorably to the national average of 6.5 mills per kwh for wholesale power purchased by rural electric systems in fiscal year 1965. This favorable comparison is due in great part, we believe, to the direct and indirect effect of power purchased from Federal multi-purpose projects in the Southwest. The preferential right of consumer-owned systems to purchase power from multi-purpose projects excess to the needs of the Federal Government is of vital importance to the continued existence of the rural electric cooperatives. For this, and other reasons, we advocate the authorization of Hualapai Dam to serve as the "cash register" for the Central Arizona Project. This is not to minimize the very real benefits that flow from the construction of such dams in terms of flood control, irrigation, water supply, navigation and recreation.

Our members recognize the controversy surrounding the inclusion of Hualapai Dam in the Central Arizona Project, yet we feel that common sense and economic considerations dictate the inclusion of Hualapai Dam as the means for paying for all the reimbursable features of the project. In contrast, the Administration has presented a proposal whereby the requisite pumping power for the project (400 megawatts) will be obtained from a coal-fired powerplant built by private entities through a prepayment arrangement. It is to this proposal, as contrasted to the inclusion of a hydroelectric dam, that we respectfully direct our comments.

The Administration proposal exhibits an initial cost of \$719 million as compared to an initial cost of \$1156 million for the project including Hualapai Dam. Although there is a sizable cost saving in terms of plant investment, the net return flowing into the development fund (an item not specifically included in the Administration proposal) by the year 2047 would be \$677 million more if Hualapai Dam was included in any resulting legislation. Economics, therefore, dictate the inclusion of a hydroelectric dam at what is considered to be the best hydro site on the Colorado River.

Not only is the resulting balance in the development fund drastically reduced under the Administration's proposal but, in addition, the water users in Arizona would either have to submit to an ad valorem taxation plan or else pay \$6 more per acre-foot for municipal and industrial water usage. This additional cost to the water users seems unwarranted in view of the available revenue that would be supplied by the dam.

As stated previously, the rural electric cooperatives and other consumer-owned systems have relied on the excess energy from Bureau of Reclamation dams for a source of low-cost energy. Although the Bureau of Reclamation's policy toward the building of dams should not remain inflexible, we feel that the present proposal set forth by the Department of Interior to use steam instead of hydro energy is of such future importance as to warrant consideration in its own right, rather than as an ancillary matter to another piece of legislation. This is not to say that the idea of the Federal Government becoming a participant in a steamplant is unwise or unwarranted, but that such a course of action should be undertaken only after sufficient inquiry into the proposition on its merits, rather than, as it appears to be in this instance, an attempt to delete a controversial portion of a bill in order to secure passage of much-needed legislation.

We continue to feel that the benefits of including a hydro-electric dam in the Central Arizona Project far outweighs any harm, if any, which could conceivably be inflicted upon the scenic beauty of the Grand Canyon. In fact, Hualapai

dam would in no way change the main gorge of the Grand Canyon National Park. As stated in our resolution "this Association believes in a just and reasonable balance between the benefits of (orderly natural resource) development for all people and true wilderness conservation."

We respectfully recommend authorization of the Colorado River Basin Project, substantially in accordance with H.R. 9, including authorization of Hualapai Dam.

Mr. HOSMER. I have no objection.

Mr. JOHNSON. Now, we have here a statement by Hon. Edward J. Patten, of New Jersey. I ask that his statement be placed in the record at the proper place along with the other Members of the Congress. (See p. 185.)

Do I hear any objections to any of the requests that have been made? Hearing none, so be it ordered.

Now, as the committee adjourns this afternoon the hearings will be concluded. The record will be held open for 10 days for the submission of any other materials that properly go into the record.

If there are no further witnesses to be heard, the committee hearings will stand adjourned.

(Subsequent to completion of the hearings the following material was received and accepted for the record:)

STATEMENT OF HON. THOMAS G. MORRIS AND HON. E. S. JOHNNY WALKER,
REPRESENTATIVES IN CONGRESS FROM THE STATE OF NEW MEXICO

The Hooker Dam and Reservoir will be located on the Gila River in New Mexico as an essential part of the Central Arizona Project, central feature of all of the proposed bills for Lower Colorado River development. Our purpose in submitting this statement is to reply to statements which have been made during the course of hearings by representatives of the Wilderness Society and the Sierra Club in opposition to this dam.

H.R. 3300 and associated bills, among their other purposes, authorize construction of the Hooker Dam and Reservoir to a capacity of 98,000 acre feet, with provisions that would permit its ultimate enlargement to a capacity of 215,000 acre feet, if necessary, to provide additional storage to effect certain exchanges of water that might be necessary in order to achieve the most efficient use of water in the Gila River basin, in accordance with the provisions of the U.S. Supreme Court decree in the case of Arizona vs. California. While provision for ultimate enlargement is necessary and must be included in the bill so as not to foreclose any opportunity for water conservation in this arid area, the larger capacity reservoir is not authorized by the bills, and therefore, does not enter into consideration at this time.

An examination of the physical circumstances involved in the Hooker Dam proposal shows that the dam itself will be almost seven miles from the boundary of the wilderness area. The reservoir would extend 3.9 miles into the Gila Wilderness area and would inundate only about 130 acres of canyon land. In addition, a strip of the Gila Primitive area would be flooded. In order to put this into the proper perspective, it should be pointed out that the Gila Wilderness area in the Gila National Forest contains a total of 438,360 net acres of land and the Gila Primitive area contains an additional 129,630 acres. Furthermore, the Black Range Primitive area, which is also included within the Gila National Forest, contains an additional 169,196 acres. Other areas, classified as wilderness, wild, or primitive, in the National Forests in the state of New Mexico, bring the gross total of land so classified up to over one million acres. Thus, we are talking in terms of a little over 1/100 of 1% or about one-tenthousandth of the total area of such lands in New Mexico. This is so far less than the traditional "drop in the bucket," that it could, for all practical purposes, be ignored.

Hooker Dam will be a multiple purpose structure, providing benefits for flood control, recreation, fish and wild life conservation, and river regulation for agricultural, municipal, and industrial purposes. There can be no question but that

the monetary benefits to any one of these proposals will far exceed any possible calculable decrease in wilderness values. Furthermore, the tongue of water backed up a short way into the boundary portion of the wilderness area will provide a natural gateway to the area by water, and will vastly increase the value of the entire wilderness area as a recreational resource to the people of the United States.

The Hooker Dam has been a part of the Central Arizona Project ever since the original report of the Bureau of Reclamation was prepared in 1947. Through all these years, the Bureau of Reclamation has worked closely with the Forest Service, submitting drafts of the proposed report, and maintaining a close consultative relationship. It is our understanding that the Forest Service has agreed with the necessity of including this dam in the project. This agreement goes back far before the recent enactment of the Wilderness Act. The Hooker Dam, thus, must be considered under a "grandfather clause" when its effect on the wilderness area is considered.

When the facts are completely known by those spokesmen of conservative agencies who suggest that there will be no need for the Hooker Dam once the ultimate phase of the San Juan-Chama Project is constructed to bring additional water into New Mexico, we are sure that they will agree on the need for the Hooker Dam. For one thing, the ultimate stage is not authorized, and there may never be enough water for it. In the second place, its effect on this part of New Mexico will be very small indeed.

For these reasons, we find ourselves in direct opposition to the position taken by the Wilderness Society, and the Sierra Club, and urge that the provision of H.R. 3300 pertaining to this project be retained in the authorization for the Central Arizona Project.

NATIONAL RECLAMATION ASSOCIATION.
Washington, D.C., March 16, 1967

Congressman WAYNE N. ASPINALL,
Chairman, House Interior and Insular Affairs Committee,
Longworth House Office Building,
Washington, D. C.

DEAR CONGRESSMAN ASPINALL: Yesterday afternoon the Board of Directors of the National Reclamation Association directed me to submit, for the record of current hearings on the Lower Colorado River, the enclosed resolution applicable to Bridge Canyon Dam. This resolution (No. 66-7 titled "Multi-Purpose Concept") was adopted at Albuquerque in November of 1966 by the full convention, and states the policy of the Association to support multi-purpose concepts of development as opposed to single-purpose uses.

Sincerely,

CARL BRONN, Executive Director

RESOLUTION No. 66-7

MULTIPURPOSE CONCEPT

Whereas the wise conservation and use of our natural resources is an integral part of the continuing philosophy of the National Reclamation Association and is better served by well planned multi-purpose projects than through single purpose conservation efforts; and

Whereas reclamation projects, being local or regional, have local or regional support while the single purpose preservationist groups is now being directed at proposed large and small multi-purpose projects in various parts of the nation; and

Whereas many proposed multi-purpose projects of great potential benefit become the targets of organized opposition from "single purpose preservationist" groups even though such projects offer vitally needed benefits to the Nation; Now therefore, be it

Resolved, That the National Reclamation Association continues to support the multi-purpose concept of development and conservation of our natural resources and urges elected and appointed officials to give full consideration to the total benefits offered by proposed reclamation and conservation projects, and not be dissuaded by the self-serving protests of the single purpose preservationist groups who seek to preserve all natural resources inviolate in their natural state.

COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF HEALTH,
Harrisburg, March 23, 1967.

HON. HAROLD T. JOHNSON,
Chairman, Subcommittee on Irrigation and Reclamation, House Committee on
Interior and Insular Affairs, Longworth Office Building, Washington, D.C.

MY DEAR MR. JOHNSON: I understand that your subcommittee has recently completed hearings on Senate Bill No. 20 which would establish a National Water Commission, but that written statements concerning the bill are still being accepted. The Pennsylvania Sanitary Water Board, at its most recent meeting, endorsed the general principle of the establishment of the National Water Commission.

It is our understanding that the proposed National Water Commission would be an advisory group to the President, somewhat like the Water Pollution Advisory Board. In this role there would appear to be no need for the confirmation of the members of the Commission by the Senate. It is, therefore, the Sanitary Water Board's recommendation that the bill be amended to provide that the Commission members be appointed by the President and that the stipulation requiring consent of the senate for the appointment be removed from the legislation.

In its support of the establishment of the Commission the Board strongly urged that such a Commission give equal consideration to eastern and western water problems.

Sincerely,

THOMAS W. GEORGES, JR., M.D.

NORTHWEST PUBLIC POWER ASSOCIATION,
Vancouver, Wash., March 20, 1967.

HON. WAYNE ASPINALL,
Chairman, Committee on Interior and Insular Affairs,
House Office Building, Washington, D.C.

DEAR MR. CHAIRMAN: By resolution the membership of the Northwest Public Power Association endorses enactment of S. 20 to create a temporary National Water Commission.

We relate this subject also to our resolution urging a joint United States-Canada study on the feasibility of diverting Arctic-flowing rivers of Alaska and Canada southward and eastward.

It would be appreciated if this letter might be included in the hearings record. Thank you for your many courtesies.

Sincerely,

GUS NORWOOD, Executive Secretary.

STATEMENT OF DEFENDERS OF WILDLIFE

Defenders of Wildlife has already testified at two previous hearings relating to Colorado River Basin projects (Aug. 23-Sept. 1, 1965 and May 9-13, 1966). We wish to reaffirm our position and to recommend this earlier testimony to the Committee as being still relevant to bills currently under consideration. This present statement adds further objections to present plans for dams in Grand Canyon and to authorization of the five reclamation projects in Colorado.

A. The dams in Grand Canyon constitute an invasion of consecrated ground. Whether or not the actual flood waters encroach on Grand Canyon Park or Grand Canyon National Monument, any hydrologist would have to admit that significant changes would occur in the natural qualities of the Park and Monument if Marble Dam or either a high or low Bridge Canyon dam were constructed. It may be argued that legal provision for this kind of intrusion exists, but that does not justify the intrusion. It might be legal to paint Mount Vernon purple, but that does not mean that it would be the right thing to do.

B. We do not believe in putting any natural system into an ecological straight-jacket. Room must remain for natural processes to operate. Man must have some flexibility of choice in the management of the river. On the Colorado River tolerances are already so narrow that they leave little room for adaptation to

long-term changes such as the present declining total flow. We believe that further development should await extensive long-term studies of projects already built, those building, and those authorized. Large reservoirs and redistribution of river flows in arid areas may have much greater hydrological and meteorological effects than we presently imagine. Ecological studies of these effects have hardly begun.

C. Nearly every change envisioned for the river will increase the salinity problem, already acute on the lower river. The total salinity picture has never been detailed in these hearings (unless in the current hearings which the undersigned could not attend due to their unfortunate coincidence with the North American Wildlife and Natural Resources Conference in San Francisco).

D. We do not believe that the phreatophyte problem has been adequately explored in relation to the proposed developments on the river. Every previous project in the southwest has been followed by a proliferation of water-using vegetation, a problem for which no solution seems to be forthcoming. We can confidently predict that the building of the Grand Canyon dams, the construction of the five Colorado projects, the importation of new waters into the basin, and existing plans for diversions out of the basin will all influence phreatophyte growth. As an example, the five Colorado projects, once operating in conjunction with other upper basin projects already authorized, will cause a cessation of annual floods. These floods have been one of the chief natural controls on phreatophyte growth through the processes of submergence, scouring, and building of deep sand deposits. At the same time, the flow of relatively clear water capable of picking up and transporting sediments will be reduced, but the sediment load will remain essentially the same, since headwater reservoirs play only a minor role in sediment removal. Sediments added to the Colorado system by uncounted muddy or sandy tributaries will be too heavy a load for the reduced spring flows and upper Colorado River valleys will develop meandering, obstructed channels and rising water tables. Combined with increasing additions of nutrients from irrigation and urban developments, vegetative development will eventually provide another phreatophyte and channelization problem. Cost estimates for the five Colorado projects do not take this into consideration.

E. The five Colorado projects are essentially an addendum to the Central Arizona Project, and appear to have been added as the price for Colorado's cooperation. We do not feel that this constitutes true "Basin-wide" planning, but is merely political opportunism. It is no better and may be worse than piece-meal water development. It is not based on any concern for the total river.

F. It would appear that if there is sufficient water at present to construct both the Central Arizona Project and the five Colorado projects then there should still be enough water for the five projects if only the CAP were built. If it proved that there were not enough water left for the five projects after CAP construction, then it would be most fortunate that they were not built.

G. If importation of water is considered a prerequisite for construction of the five Colorado projects, it would appear that the better part of common sense would dictate that their authorization should be postponed until such time as importation appeared feasible. The difficulty then would be to prove that Colorado could use the water as effectively as other areas through which the imported water would have to pass, and it is doubtful that Colorado's high-altitude agriculture could compete—a consideration which no doubt plays a strong part in the present demand for immediate authorization.

H. Each Colorado project should be approved on the basis of its own merits and not because it happens to be one of a bundle of five. Examination of the plans for the West Divide Project (one of the five) shows some very questionable benefits, a basic lack of sincerity in stated objectives, absurd expenditures per acre of irrigated land, and an unnecessary sacrifice of a beautiful valley. Examination of this one project in detail makes one doubtful of the others.

I. Before any further projects are authorized for the state of Colorado, we feel that a complete examination of Colorado Water Law is mandatory. Our own study of this law and of its operation at the local level indicates many points at which the constitutionality of processes of Conservation and Conservancy District formation might be challenged—and are being challenged. In particular, it is almost impossible to stop a small group of irrigated landowners from forming a district strictly for their own benefit. Cases are on record where districts exist which have virtually no chance of ever getting rights for

waters they propose to develop. An oil company recently attempted to stop the formation of a district and discovered that there was no provision in the law for its intervention, even though it would be the chief tax payer. A recent hearing in the Pueblo, Colorado, District Court was concerned with the efforts of a group of water users to gain access to Conservancy District records so that they could examine expenditures made for lobbying and "legislative" expense. The District Judge, who had appointed the Conservancy District board members, refused to be disqualified as the presiding judge, and denied the intervenors access to the records. At least one case is on record where a District Judge has not only lobbied with aid of Conservancy District funds, but used district funds to entertain members of the present committee at his Colorado ranch. This same judge appointed the board members of two of the conservancy districts which are promoting the five Colorado projects. Under new legislation, district judges are themselves appointed rather than elected, so that the people have virtually no voice in water affairs.

J. Colorado water conservancy districts are admittedly promotional in nature. Both tax funds and contributions from private parties are used in lobbying efforts. Since the conservancy district is a legal subdivision of the state, such private gifts are tax-deductible. The district thus serves as a perfect tax foil for the private interest that wishes to influence legislation for his own benefit. Meanwhile the conservation organization that attempts to influence legislation, such as the Sierra Club, is penalized by a loss of its tax-deductibility status. This inequality demands attention, for the conservation organization which serves a vital public interest through the introduction of alternative solutions to resource problems, and the study of possible consequences of national projects, should certainly enjoy the same advantages as the water district which all too often represents only those that stand to benefit from the project.

In addition to an equalization of tax status, we also feel that water districts should be obliged to publish complete information on all monies used for promotion and lobbying.

While these matters may seem to be a matter of state concern, they have become a matter of national concern since much of this promotional money is being used to gain authorization of the Lower Colorado River Basin Project. Since practically all of this money is being raised by water conservancy or water conservation districts in Mr. Aspinall's Congressional District we should think that the Chairman might wish to insert into the record a complete report of monies, both tax and gift, used in promotion of the five Colorado projects as well as the rest of the Colorado River Basin legislation.

K. Many recent changes in the Frying Pan-Arkansas Project in Colorado indicate the deficiencies in recent Bureau of Reclamation planning. "Post Authorization Studies" as they are called have revealed that original plans were in error and would not pay out in fifty years. Alterations in the electrical installation are required and increased appropriations will be needed. In addition, the dam site has proven to be a poor choice and excessive amounts of cement have been required to seal cracks and faults. The Bureau had been advised of this probability well before the commencement of construction. This project, consummated under intense political pressure, has contained many flaws. In view of this fact, and the many others included in this statement, we feel that the five Colorado projects should not be authorized as a part of any Arizona project.

STATEMENT OF THE EXECUTIVE COMMITTEE OF THE EEL RIVER FLOOD CONTROL AND WATER CONSERVATION ASSOCIATION

This statement is filed on behalf of the counties of Marin, Contra Costa, Yolo, Solano, Napa, Sonoma, Mendocino, Lake, Humboldt, Trinity, and Del Norte, acting under a joint exercise of powers agreement as The Eel River Flood Control and Water Conservation Association. These counties represent California's North Coast, the "area of origin", which is the source of 40% of the total fresh water resources of the State, principally in the Eel, Trinity and Klamath Rivers. These are the last major undeveloped water resources in California.

The Association respectfully recommends that the House Interior and Insular Affairs Committee consider California's North Coast as the initial source of water to be developed to offset the prospective shortages in the Lower Colorado River Basin occasioned by the Mexican Water Treaty and the limitations of the

Colorado River Compact, recognizing that other sources would have to be developed later to satisfy all of the anticipated water requirements of the Basin. All of these sources could be integrated into a phased regional system for the benefit of the western states at substantial savings in cost.

The reasons are as follows:

First, the North Coastal streams have surplus water, and the region does not object to the export of this water so long as its own water development needs are met in conjunction therewith.

Second, extensive studies have been and are being made by the Corps of Engineers, the Bureau of Reclamation and the California Department of Water Resources for developing North Coastal water to meet future needs in central and southern California. Thus a major portion of the investigational work has been done.

Third, although all of these studies show that development of North Coastal streams must begin no later than the 1980-90 decade to meet California's internal needs, water in excess of California needs will certainly be available for many years in the future.

Fourth, it is anticipated that the Federal Central Valley Project will be expanded soon with the addition of the Eastside Division. At relatively small additional cost, the Eastside Canal could be enlarged and extended for conveyance of North Coast water as part of the long-range system to provide for Lower Colorado River Basin needs, as well as providing for the ultimate needs of the Eastside Division service area, and future needs in Southern California.

Fifth, the North Coast urgently needs flood control. The December 1954 floods caused the loss of 20 lives and \$200 million in damages. A catastrophe of nearly the same magnitude also occurred in December 1955. Construction of multipurpose water facilities would alleviate the threat of floods.

Sixth, works to export water from the North Coast to offset shortages in the Lower Colorado Basin could be in operation much sooner than those to export water from any other major sources, such as the Columbia River, which undoubtedly could not be completed by the time the shortages begin to be felt.

In view of the foregoing, it is our belief that this proposal offers a logical first step for future Western Interstate water development.

STATEMENT BY PAUL S. TAYLOR IN OPPOSITION TO H.R. 9 PROPOSING AUTHORIZATION OF THE COLORADO RIVER BASIN PROJECT, MARCH 1967, HOUSE COMMITTEE ON INTERIOR

My name is Paul S. Taylor, and I reside in Berkeley, California. Between 1943 and 1952 I served as consultant in the Department of the Interior. This statement represents my individual views. In making this statement I refer as background to my statement of August 30, 1965 on a similar proposal, H.R. 4672, printed in the hearings on that bill.

1. An appeal for public financial support for further reclamation in the Colorado Basin, such as H.R. 9, must be viewed in light of widespread failure of the Department of the Interior and Bureau of Reclamation under previous authorizations to require law observance by large landowners in the Colorado Basin, and of their apparent unwillingness to comply with law once they have obtained water under the law. Their record in the past offers no assurance that the law controlling water monopoly and speculation will be observed in the future under H.R. 9 or any other authorization of a Colorado Basin Project.

2. The attack on the Central Arizona Project in 1949 by Republican Congressman Donald L. Jackson of California is as valid today as when his words were first uttered:

"True, the Bureau of Reclamation says that the 160-acre law will be enforced if the Arizona project is built. But we know that this law never has been enforced there. There is no reason to believe it will be enforced in the future. Rather, there is every reason to believe it will not be enforced." 95 Cong. Rec. 10128.

3. Elsewhere in the Colorado River Basin it is much the same. It is only now that the Secretary of the Interior says the acreage limitation law will be enforced in Imperial Valley, California, under the Boulder Canyon Act, and large landowners there are resisting strongly.

4. The Chief Counsel of Imperial Irrigation District, Reginald L. Knox, is reported to have said that "If the (Imperial Valley) opinion of Solicitor Frank Barry is correct, it also applies to all areas receiving water from the Colorado River, including land in the Metropolitan Water District which supplies water to some extremely large holdings on the coast. According to Knox, there has never been any reference to that area, but if the opinion is correct, it would necessarily apply there also." Imperial Irrigation District News, Feb. 1965, Vol. XXVI, No. 9, p. 1. Apparently the Secretary of the Interior has made no move to apply the law to lands receiving water from the Colorado River under the Boulder Canyon Act through the Metropolitan Water District of Southern California.

5. The language of H.R. 9 apparently opens the door to further circumvention of reclamation law. Sec. 504 states that the Secretary of the Interior shall be governed by reclamation law "Except as otherwise provided in this Act." What these provisions may be is unclear, but in light of past demonstrated ability by officials of the Interior Department to discover "fine print" to support wholesale circumvention of the law (e.g., Secretary Barry's opinion, M-36635, December 26, 1961, 108 Cong. Rec. 5712) Congress would do well to discover in advance of authorization of the Colorado Basin Project, by direct inquiry of the Solicitor of the Interior or Legislative Reference Service of the Library of Congress, precisely what these "exceptions" are, in special reference to the water monopoly and speculation control provisions of reclamation law.

6. There are other objections to H.R. 9, e.g., failure to include a provision authorizing government purchase of excess lands, a sound proposal made recently by the Secretary of the Interior, and assignment of a special priority in studies of water shortage by a national water commission to the Colorado Basin over other needy areas. It should be made abundantly clear either in the language of the bill or in the legislative record, that Sec. 202, (a) (2), in referring to the "impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values" the bill means specifically to emphasize those "institutional arrangements" represented by water monopoly and speculation.

THE NATIONAL CONFERENCE ON STATE PARKS,
Washington, D.C., March 30, 1967.

HON. WAYNE N. ASPINALL,
Rayburn House Office Building,
Washington, D.C.

DEAR WAYNE: The enclosed Resolution 8, urging that power dams not be built in the Grand Canyon between the head of Lake Mead and Glen Canyon Dam and that suitable other means of financing needed water development projects for the arid Southwest be used, was adopted by the Board of Directors of the National Conference on State Parks at its March 17 meeting.

The Board hopes that this resolution will be helpful to the Congress in considering pending legislation to provide water for the Southwestern states.

Sincerely,

CONRAD L. WIRTH,
Chairman of the Board.

[Enclosure]

RESOLUTION 8

Whereas there is widely recognized need for additional water for the burgeoning communities in the arid Southwest; and

Whereas there have been proposals to finance needed water development projects by earmarking revenue from the sale of hydroelectric power to be generated by building dams in the Grand Canyon of the Colorado River that would flood significant portions of Grand Canyon National Monument, Grand Canyon National Park and Marble Canyon, comprising the finest remaining unspoiled portion of the Grand Canyon and possessing scenic and inspirational qualities of great and irreplaceable value: Now, therefore, be it

Resolved, That the National Conference on State Parks at the meeting of its Board of Directors at Washington, D.C. March 17, 1967 urges that dams not be constructed in the Grand Canyon between Lake Mead and Glen Canyon Dam and that suitable other means of financing needed water development projects for the arid Southwest be used.

STATE OF NEW MEXICO.
Santa Fe, April 6, 1967.

Mr. HAROLD T. JOHNSON,
Chairman, Subcommittee on Irrigation and Reclamation, Committee on Interior
and Insular Affairs, House of Representatives, Washington, D.C.

DEAR MR. JOHNSON: At the March 13-17, 1967 hearings of your subcommittee on the Central Arizona Project you received a statement from Mr. Stewart M. Brandborg, Executive Director, The Wilderness Society. Mr. Brandborg recommends that there be a full study and exploration of alternative sites downstream from the proposed Hooker unit of Central Arizona Project, because the reservoir created by Hooker Dam would back water into a small segment of the Gila Wilderness and Gila Primitive areas.

Hooker Dam would be located in Section 18, Township 14 South, Range 16 West. The dam site and all but a small part of the reservoir area would be outside both the Gila Wilderness and Gila Primitive areas. A table showing pertinent information for reservoir capacities of 98,000 acre feet and 265,000 acre feet follows:

Capacity acre-feet	Reservoir area-acres at spillway elevation			Reservoir length-miles at spillway elevation		
	Total	Primitive	Wilderness	Total	Primitive	Wilderness
98,000.....	1, 130	77	110	9.7	0.6	1.0
265,000.....	2, 250	141	480	13.7	.6	6.0

These small areas are near the southwest corner of the Gila Wilderness area. The Gila Wilderness area consisting of about 438,000 acres and Gila Primitive area consisting of about 130,000 acres are within the 2,700,000 acre Gila National Forest in New Mexico.

The Hooker site has long been considered in planning for development of the land and water resources of the Gila River as evidenced by its withdrawal under Water Power Designation No. 1, dated August 7, 1916. The Gila Wilderness area was not established until 1924.

During the consideration of the Wilderness Act of 1964, the Hooker Project along with others was brought to the attention of the Congress and was in part responsible for the language in the Act which permits the construction of water resources works within wilderness areas where such works in a specific area would better serve the interests of the people of the United States than will the denial of such works.

Several investigations to determine feasible dam and reservoir sites on the Gila River in New Mexico have been made. The three sites specifically mentioned by Mr. Brandborg and other sites have been investigated by the Bureau of Reclamation and the Hooker site has been found to be the most efficient for the development of the water resources of the area.

The Lower Cliff site in Section 33, Township 17 South, Range 17 West, below Mangas Creek and about 25 river miles downstream from the Hooker site was investigated by the Bureau of Reclamation during their 1930 investigation of the Upper Gila River. A dam at this location would flood a part of the Cliff-Gila Valley, a highly developed farming community and the largest single area of irrigated land on the Gila River in New Mexico. The Connor site in Section 13, Township 18 South, Range 18 West, and about 6 miles downstream from the Cliff site, was also investigated. A dam at this site would inundate less of the developed area in the Cliff-Gila Valley. The Bureau's report found that the cost of dams at the Connor site and the lower Cliff site were comparable; the right of ways costs at the Cliff site would be larger because of the greater amount of developed area inundated; and that water loss by evaporation at the average operating level of the Cliff site would be slightly larger than at the Connor site. Thus, the Connor site is clearly preferable to the Cliff site.

The Bureau's 1930 report also investigated the "Canador" site in Section 19, Township 19 South, Range 19 West, 17 miles downstream from the Connor site,

just below the mouth of Blue Creek and about 15 miles upstream from the State line. The Bureau found that for equal storage a reservoir at the Connor site would be cheaper and concluded that the Canador site is materially inferior to the Connor site and not worthy of further consideration. Construction of a reservoir at the Canador site, suggested by Mr. Brandborg, would inundate about 1400 acres of presently irrigated land in the Red Rock area.

Thus, the Bureau has found the Connor site preferred over both the lower Cliff and Canador sites.

The Bureau of Reclamation in their 1963 investigation of the Upper Gila, in cooperation with the State of New Mexico, investigated the Hooker and Connor sites. The report found Hooker to be the most favorable storage site in terms of cost per acre foot of firm yield. A reservoir at the Connor site would require about twice the reservoir storage capacity for sediment control because of the intervening high-yield sediment area.

The total evaporation loss from the Connor reservoir was estimated by the Bureau to be about twice as large as the evaporation loss from the reservoir at the Hooker site for about the same yield.

A dam at the Hooker site would provide flood and sediment protection to the developed area of the Cliff-Gila Valley which would not be provided by a dam at the Connor site downstream from the Valley.

Since the Hooker site is at a higher elevation than the Connor site, pumping costs for M & I water supplied to Silver City and Tyrone would be less if the Hooker site is developed.

Thus, the Bureau investigations have shown that the Hooker site is better than any of the downstream alternatives, including the Connor site.

A reservoir at the Hooker site will create a clear lake and provide seasonal water temperatures cooler than present stream water temperatures in the area. Thus, fishery in the reservoir area, as well as stream fishery downstream from the Hooker dam site for a considerable distance, would be improved over present conditions.

The recreation and fishing benefits that Hooker reservoir would create in southwestern New Mexico would more than offset the small infringement on the Gila Wilderness and Gila Primitive areas. The small portions of the Gila Wilderness and Gila Primitive areas in this project involve a narrow canyon on the Gila River. The lake created within this narrow canyon section would offer attractive fishing and canoeing water not now available in the area.

In summary, the investigation of alternative sites recommended by Mr. Brandborg already has been made with the result that the Hooker site has been found the most feasible. Development at the Hooker site would provide substantial benefits, including increased opportunity for recreation, with little effect on wilderness values. The Wilderness Society seems concerned principally with the possible precedent setting implications of development at the Hooker site. This concern seems ill-founded when it is borne in mind that the site was withdrawn for water resources development about eight years prior to the administrative designation of the Gila Wilderness area in 1924 and that the Wilderness Act of 1964 permits water resources works within wilderness areas under circumstances such as those surrounding the proposed development at the Hooker site.

I respectfully request that this letter be made a part of the record of the March, 1967 hearing on legislation to authorize the Central Arizona Project.

Yours truly,

S. E. REYNOLDS, *State Engineer.*

SPORT FISHING INSTITUTE,
Washington, D.C., April 10, 1967.

HON. WAYNE N. ASPINALL,
Chairman, House Committee on Interior and Insular Affairs,
U.S. House of Representatives, Washington, D.C.

DEAR CONGRESSMAN ASPINALL: Sport Fishing Institute is greatly interested in various House Bills that have been introduced during the first part of the 90th Congress to establish a National Water Commission. We note that H.R. 1252 (Ryan), H.R. 1460 (Ullman), H.R. 3298 (Foley), and H.R. 5308 (Blatnik), all deal with this general provision though in varying degrees. In addition, we viewed with alarm the fact that establishment of a National Water Commission

was included in the authorization bill concerning the Colorado River Basin project (H.R. 4671 and others), which hearings have recently been held.

The Sport Fishing Institute is in complete opposition to incorporation of a National Water Commission within the proposed legislation involving Colorado River waters. This leaves "out in the cold" the many other major river basins of vital concern to many Americans. We feel that legislation proposing a National Water Commission is important enough that it should stand on its own merits and be resolved as a separate piece of legislation.

We would go on record favoring such legislation, as contained basically in the above-noted four bills, that would provide for comprehensive review of national water resource problems and programs. We feel that such legislation could enable further progress in natural resource agencies' programs that would help manage the tremendous national water resources needs for the future. An identification of these needs would be most important in the conservation of our natural renewable resources in helping to create more and better aquatic environment for our fish life. The President's message of February 23, 1966, emphasized the complexity of the nation's inter-related water problems which involve not only too much water in some places but the antithesis in others: drought, and the befouling of our waterways by man. A planning commission for water, operating under broad parameters could help guide the myriad of departments, bureaus, and other agencies in their vital concern with one of our most valuable resources.

The Water Resources Planning Act of 1965 would be augmented by the establishment of a National Water Commission, and the subsequent planned establishment of a Water Resources Council in coordination with state and federal government projects would be equally beneficial. An independent judgment, such as would be exerted by the Commission, would enable the development of a knowledgeable water resource development plan that could take into account all needs and provide sources of solution to such problems as might conceivably arise.

Therefore, Sport Fishing Institute would like to be included in any record of hearings held on this topic favoring the establishment of a National Water Commission with regard to H.R. 1252, H.R. 1460, H.R. 3298, and H.R. 5308. We also would like to be included in the records of hearings of H.R. 4671 and others as opposing inclusion of a National Water Commission there.

Sincerely,

PHILIP A. DOUGLAS.
Executive Secretary.

(Whereupon, at 5:45 p.m., the subcommittee adjourned, subject to the call of the Chair.)

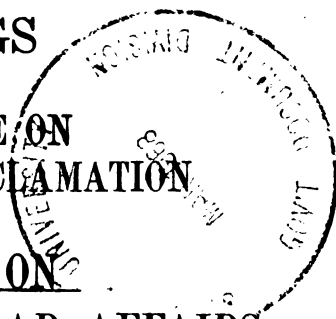
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COLORADO RIVER BASIN PROJECT

PART II

90-2

HEARINGS
BEFORE THE
SUBCOMMITTEE ON
IRRIGATION AND RECLAMATION
OF THE
COMMITTEE ON
INTERIOR AND INSULAR AFFAIRS
HOUSE OF REPRESENTATIVES
NINETIETH CONGRESS
SECOND SESSION



ON

H.R. 3300

TO AUTHORIZE THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE COLORADO RIVER BASIN PROJECT, AND FOR OTHER PURPOSES

S. 1004

TO AUTHORIZE THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE CENTRAL ARIZONA PROJECT, ARIZONA-NEW MEXICO, AND FOR OTHER PURPOSES

JANUARY 30, FEBRUARY 1 AND 2, 1968

Serial No. 90-5

Printed for the use of the Committee on Interior and Insular Affairs



U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 1968

89-657

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NOTE.—The chairman, Hon. Wayne N. Aspinall, and the ranking minority member, Hon. John P. Saylor, are *ex officio* members of each subcommittee.

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COLORADO RIVER BASIN PROJECT

Part II

TUESDAY, JANUARY 30, 1968

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:50 a.m., in room 1324, Longworth House Office Building, Hon. Harold T. Johnson (chairman of the subcommittee) presiding.

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation will come to order.

The purpose of our hearing this morning is to hold further hearings on H.R. 3300, by Mr. Aspinall and others, to authorize construction, operation, and maintenance of the Colorado River Basin project, and for other purposes. S. 1004 passed the Senate on August 7, 1967.

Hearings were held in the subcommittee both morning and afternoon, March 13, 14, 16, and 17, 1967. Printed hearings are before each member of the committee.

The hearing today has been scheduled to hear the Secretary of the Interior in response to the committee's request by letter of December 29 for specific information. The hearing will be confined to that and to matters that are of interest to members of the committee and to the Secretary and his staff.

Since that time, I do want to mention that California has introduced a new bill, H.R. 14834 and H.R. 14835, which was coauthored by most all of our delegation. The matter has not been assigned to a committee.

Our first witness this morning will be the Secretary of the Interior, who will give us the necessary information that was requested in the letter of December 29, by the chairman of the full committee.

Mr. SAYLOR. Mr. Chairman, before we proceed any further—

Mr. ASPINALL. Mr. Chairman?

Mr. JOHNSON. The Chair recognizes Mr. Aspinall, the chairman of the full committee.

Mr. ASPINALL. I think it very appropriate that the letter to the Secretary of the Interior be made a part of the record at this point so that it will appear in the record preceding the Secretary's testimony. I ask unanimous consent that it be done.

Mr. JOHNSON. Any objection?

Mr. SAYLOR. Reserving the right to object, Mr. Chairman, all I wanted was to get the letter of the Secretary into the record. The Secretary has been called up here to testify, and I want to be sure the

record is complete and so that we know what the Secretary has been asked to testify to.

I withdraw my reservation.

Mr. JOHNSON. I want to say if I had had a copy of it I would have placed it in the record. Having received a copy, it is now placed in the record.

(The material referred to follows:)

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
OFFICE OF THE CHAIRMAN,
Washington, D.C., December 29, 1967.

Hon. STEWART L. UDALL,
Secretary of the Interior,
Department of the Interior,
Washington, D.C.

DEAR MR. SECRETARY: The Irrigation and Reclamation Subcommittee is resuming its consideration of the Colorado River Basin project legislation on January 30 and the remainder of that week.

As you know, the Committee has completed public hearings on this legislation. However, because of events that have taken place since these hearings, there are several matters on which the Committee needs additional or up-to-date information as well as the Department's position. A few of these matters are discussed hereinafter.

I hope that you can be present on January 30 along with members of your staff to furnish the Committee the required information and answer the Committee's questions.

The one really new matter on which the Committee has received no testimony is your Department's proposal for prepurchase of a block of thermal generating capacity to meet the pumping requirements of the Central Arizona Project. The Committee will need a full statement on this proposal, showing its advantages over other means of supplying the necessary power and energy, and outlining the Department's plan for marketing energy which is in excess of the needs for project pumping.

In view of the likelihood that both of the Colorado River dams will be eliminated from the legislation, the Committee needs information on the financial assistance that might be available from a Lower Colorado River Basin Development Fund which is accumulated from other sources. The Department's statement on this matter should include the Department's recommendations as to what other sources should be considered and what part of the fund, if any, should be available for assistance to the Central Arizona Project.

As you know, Mr. Secretary, there has been considerable disagreement on the water supply that will be available for the Central Arizona Project and other Lower Basin projects from the Colorado River. Several Members of the Committee have indicated that they are somewhat confused because of the different figures that have been given them. Since there is no appreciable differences of opinion with respect to the physical data for the River System, and the differences in the water supply figures given are primarily the result of assumptions made in various operation studies, there is no reason why the Committee should not have a clear understanding of the Colorado River water situation and what factors cause the difference in the figures. Thus, it is important that you have your best water experts at the forthcoming meetings.

As you know, I believe the Department is being unrealistic in using streamflow records prior to 1922 in estimating the availability of water from the River. The Department itself has conceded this in the past.

Also, in my opinion, the Department study showing that a major portion of the Central Arizona Project water supply will come from Upper Basin spills is not realistic in view of the fact that the study itself shows that the only spills during the 60-year study were interspersed in the 24 years prior to 1929 and that the study shows no spills during the last 37 years. In addition, the reservoir operating principles that have been agreed upon and included in the legislation would negate to a great extent the use of spilled water.

The other point in connection with water supply which, as you know, I have disagreed with the Department on, has been the rate of Upper Basin development and the corresponding stream depletion. The Bureau's estimate of Upper Basin

stream depletion for 1975 is about 4.2 million acre-feet and for the year 2030 is 5.8 million acre-feet. In comparison, the Upper Colorado River Commission records indicate that the Bureau's 1975 depletion figure will be exceeded by about 400,000 acre-feet as soon as presently authorized projects are completed and by about 800,000 acre-feet if the Upper Basin projects in this bill are authorized. The addition of non-Federal projects under active consideration could cause Upper Basin depletions to exceed the Bureau's estimate by more than 1,000,000 acre-feet in 1975.

The Department's position and reply to these questions relating to water supply will be among those sought during the forthcoming hearings.

Other information which the Committee would like to have relates to the amount of water which might be made available through conservation programs and improved uses of existing supplies within the Basin.

Also, the Committee needs to have the latest thinking of the Department with respect to studies for augmentation of the water supplies of the Colorado River. In this connection, we would like to be brought up to date on the studies which the Department has been conducting with respect to augmentation by desalination and weather modification.

Water quality in the Colorado River Basin is another matter we are interested in, particularly in view of the recent announcement by your Water Pollution Control Administration on water quality standards in the Colorado River Basin. Someone of your staff should discuss these standards in relationship to future development in the Basin.

The Committee would like to be brought up to date on any promising power developments incorporating pumped-back storage. We would also like to have a discussion of the Indian rights under the Supreme Court decree, *Arizona vs. California*, including the amounts of water involved for each State and the Department's responsibility for protecting the Indian water rights.

Lastly, we would like to have a statement of the Department's interpretation of its responsibilities under the authority and direction given in this legislation for operating all of the facilities on the River. I am referring, of course, to the criteria which must be established by the Secretary, in consultation with the States, in accordance with the specific requirements set out in the legislation.

There may, of course, be additional requests for information before or during the Subcommittee meetings.

With best wishes for the New Year, I am

Sincerely,

WAYNE N. ASPINALL,
Chairman.

Mr. JOHNSON. We are ready to hear from the Secretary.

STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY KENNETH HOLUM, ASSISTANT SECRETARY FOR WATER AND POWER, AND FLOYD E. DOMINY, COMMISSIONER, BUREAU OF RECLAMATION

Secretary UDALL. Thank you, Mr. Chairman.

I think the record should show that we are using the 3-3-3 defense here this morning.

I would also like to say before beginning my statement that Chairman Aspinall's letter, as far as I am concerned, covered the waterfront, raised all the issues, and we have tried to be responsive to it. I can assure you we have spent a great deal of time preparing this statement for today.

In the interest of saving time, I am going to read the first 17 or 18 pages. I do not plan to read the entire statement—I will summarize highlights with regard to the final phase of this statement, if that is satisfactory with the committee. But I, of course, would like it to appear in the record in its entirety.

In our report of February 15, 1967, and in our testimony of March 14, 1967, before this subcommittee, we presented in detail our position with respect to H.R. 3300 and other pending Colorado River Basin project legislation. Our basic position as presented last year remains unchanged. I shall, therefore, limit my prepared statement to the information and discussions requested by Chairman Aspinall in his letter to me of December 29, 1967.

Before responding to the specific items mentioned in that letter, I would like to point out two recent changes we have made in our analyses of the Colorado River Basin project.

The first concerns the basic period of record of Colorado River runoff. Last year our testimony was based on the 60-year period 1906 through 1965. Since 1965 the Colorado River has experienced 2 years of runoff averaging about 25 percent below the average for that 60-year period. Consistent with our position of using the longest period of hydrologic record as the basis for our analyses, we have brought our previous studies up to date by extension of the runoff record through the 1967 water year. The estimated average annual virgin runoff at Lee Ferry, based on the 62-year period of record ending in 1967 is 14,963,000 acre-feet as compared with the estimated average of 15,063,000 acre-feet for the 60-year period ending in 1965, a reduction of seven-tenths of 1 percent.

The second change concerns the projected initial date of operation of the central Arizona project. Heretofore we have anticipated that Colorado River water would first be diverted to the central Arizona area in 1975. This date no longer appears realistic. Our present projection anticipates start of construction in fiscal year 1970 and initial delivery of water in fiscal year 1979.

The physical effect of these two changes is to decrease slightly the estimated average water supply available to the central Arizona project over its payout period. The effect of the changes on financial payout, however, is insignificant. Under our analysis, the central Arizona project retains its strong justification, both economically and financially.

Unless indicated otherwise, our most recent figures are used in the remainder of my statement. Because of those adjustments, they will differ slightly from comparative figures given in previous testimony.

Turning now to the information requested, the first item concerns our proposal for prepayment arrangements to secure a block of thermal generating capacity and energy to meet the pumping requirements of the central Arizona project.

The studies for the central Arizona project plan which we presented in February of 1967 indicate that 400,000 kilowatts of capacity would be required for project pumping with the Granite Reef aqueduct sized at 2,500 cubic feet per second as we proposed. For a 3,000-cubic-feet-per-second aqueduct, as called for in S. 1004 as passed by the Senate last session, the amount would be increased to 470,000 kilowatts.

Under our proposal the Secretary of the Interior would make arrangements with non-Federal interests to acquire the right to a portion of capacity and associated energy from the output of a large thermal generating powerplant in the amount to serve required project pumping purposes.

The Government would acquire the capacity entitlement by advancing funds to the plant owners from time to time during the construction period in a ratio not to exceed the ratio of the Federal capacity entitlement acquired to the total plant capacity.

In addition to the payments associated with construction, the Government would also pay annually a commensurate portion of the operation and maintenance costs, including such items as advances for working capital, and replacement costs as they occur. The United States would not participate in such costs as interest, financing charges, property taxes, franchise fees, or other similar items.

Transmission of power and energy to points of project use would be provided both by Federal construction of some of the transmission lines and by prepayment for capacity in lines jointly used by the plant owners and the Government, through the Government advancing a portion of the costs of such dual-use lines, again in a ratio not exceeding the ratio of the capacity requirement of the Government to the total capacity of such facilities.

The agreement between the Government and the non-Federal interests would be drawn, of course, to provide security for the Government's investment. In addition, there would need to be contractual arrangements for exchanges of power to assure backup and continuation of essential pumping during periods of equipment outages.

By means of the proposed prepayment arrangement, the project would obtain assured power for pumping at low cost reflecting the economy of large thermal electric powerplants; shared economical, high-capacity, extra-high-voltage transmission facilities; and the benefits of Federal financing. The Federal costs would become costs of the central Arizona project to be repaid by the project beneficiaries as are other reimbursable costs, following long-established reclamation policies.

On the basis of our discussions, I anticipate no difficulty in negotiating arrangements consistent with these principles with the members of the WEST planning group that are prospective participants in the project. Members of the WEST group are currently planning a large thermal powerplant in the vicinity of Page, Ariz., the location which was used as a basis for estimating costs for the report which we presented to the committee last session.

We estimate that through prepayment arrangements power will be made available for central Arizona project for project pumping at a rate of 3 mills per kilowatt-hour for irrigation water—reflecting the interest-free financing provisions of reclamation law—and 5 mills per kilowatt-hour for municipal and industrial water. The average cost of power and energy delivered to the loads over the repayment period is about 3.5 mills per kilowatt-hour.

Capacity and energy sufficient for project pumping when a full water supply is available will be acquired. The central Arizona project pumping requirements will be irregular and dependent on water conditions during a particular year or series of years. On the other hand, the 400-megawatt output available to the central Arizona project from the Page plant will be dependable throughout the year and the full output will be present at least 85 percent of the time regardless of water conditions.

Even during the earlier years when project pumping is heavy, it is expected that there will be dry periods when low river flow will decrease the pumping requirements. We plan to balance this supply against the requirements through banking arrangements—this, of course, is a common and very excellent working arrangement that has been tested and tried in other areas—with other entities which have need for additional power during the same dry periods and are willing to return the power at such times as the respective needs of the central Arizona project have increased. The banking arrangement would be particularly feasible in the Arizona area, since, to the extent the central Arizona project pumping requirement decreases due to low river flow, the deep well irrigation pumping will tend to increase, and vice versa. The exchange arrangement would include suitable compensation for transmission services and losses, of course.

In the event the river's flows are not augmented, as we remain confident they will be, the average water supply for the central Arizona project will decrease due to the increased upstream depletions. In that event power excess to project needs would become available for other disposition, in gradually increasing amounts, although in relatively small quantities, particularly before 1990. Of course, diminution in overall water will also reduce hydrogeneration at the main stem plants, while ground water pumping requirements are increasing. The Salt River project, one of the prospective participants in the Page plant and a public agency, has already indicated that it could utilize such excess power in the event the central Arizona project pumping requirements are diminished. Any excess energy can, of course, be used in periods of low water flow to support capacity of the Upper Basin hydroelectric plants. Any such use would aid the upper basin development fund through a savings in the cost of purchased power.

With regard to the possible alternative means of obtaining pumping power for the project, the most obvious would be direct purchase of commercial power on the open market. We have previously presented testimony in which we stated that such power could be expected to cost an average of 6.5 mills per kilowatt-hour, as compared with the figures I gave a moment ago. This rate estimate is based upon the Bureau of Reclamation's experience in purchasing power in the Pacific Southwest with appropriate adjustments for anticipated reductions in rates in the future.

The higher cost of power purchased from utilities in the commercial market compared to power obtained under prepayment arrangements is the result of three major factors.

First, utility rates are based upon overall costs of the utility system which include a number of older, less efficient plants.

Second, such rates reflect the amortization of capital investments at interest rates higher than those of Federal financing. And third, private utility charges include allowances for profit and for Federal and State taxes.

Another alternative to prepayment would be contract arrangements to obtain power from a specific powerplant built for others with capacity included for this specific purpose. This type of arrangement would permit the Government to obtain the economic advantage of a modern, efficient, large size powerplant. Unlike the proposed prepayment plan, however, the rates in such a case would reflect costs of

non-Federal financing, taxes, insurance, and an increment of costs due to capital risk.

We have estimated the results of obtaining pumping power for the central Arizona project if we entered into such an agreement with the non-Federal utilities planning to construct a thermal electric powerplant at Page, Ariz. If the Page plant were financed entirely by non-Federal, publicly owned utilities, the average cost of energy to the central Arizona project would be increased about 30 percent over the cost under the prepayment plan. If such arrangements were made for a plant entirely financed by private utilities, the average cost would be increased about 60 percent over the cost under prepayment.

LOWER COLORADO RIVER BASIN DEVELOPMENT FUND

In our current proposal for the central Arizona project, involving the prepaid power arrangements I have just discussed, repayment of project costs is predicated on the use of project revenues only. As we reported last year, payout assistance from a development fund would not be necessary under our proposal. This is still our position. Should the Congress desire to establish a Lower Colorado River Basin development fund to provide financial assistance for future water projects, the administration offers no objections. Appropriate sources of revenue for such a development fund would include the following:

Source	Average annual contribution
Hoover-Parker-Davis power revenues after payout.....	\$14, 500, 000
Revenues from the Arizona-Nevada portion of the Pacific Northwest-Southwest Intertie after payout.....	5, 200, 000
Central Arizona project revenues after payout (\$56 M. & I. water)...	18, 300, 000
Total average annual contributions.....	\$38, 000, 000

Based on these contributions, surplus revenues that would accumulate in a development fund by the year 2029 are estimated as \$597 million and by the year 2050 as \$1,384 million.

ESTIMATE OF WATER SUPPLY

Estimates of future water supply available to the lower basin are influenced by three basic assumptions, each a matter of judgment. The first relates to the magnitude of virgin runoff that will occur in the future. The second concerns the rate of increase and the ultimate magnitude of Upper Basin depletions. The third involves the magnitude of future net losses along the Lower Colorado River.

Let us discuss all three of these items.

The traditional method of forecasting future runoff is to base the estimate on past records. The question posed in the Colorado Basin is what period of past runoff should be taken as most representative of the future. The following three periods represent typical variations involved:

[In thousands of acre-feet]

Period	Characteristic	Average virgin runoff at Lee Ferry
1931 to 1967.....	Critical period.....	12, 990
1922 to 1967.....	Actual record at Lee Ferry.....	13, 750
1906 to 1957.....	Longest reliable period of record on Colorado River.....	14, 960

The larger estimate of future virgin runoff at Lee Ferry, the larger will be the estimate of water supply for the lower basin, although not in direct proportion. With a 4.4 million acre-foot California priority the magnitude of the central Arizona project water supply is more sensitive to the estimate of future virgin flow at Lee Ferry.

I would like to discuss the proposal that we ignore the streamflow records of the Colorado River prior to 1922 as a basis for water supply projections. Our understanding of the basis for this proposal is that the earlier records are unrealistic and that actual recorded runoff at Lee Ferry has been measured only since 1922.

Our projections of virgin runoff of the Colorado River consistently have been based on the longest period of runoff record on the Colorado River which we have identified as starting in 1906 and continuing through today.

Continuous records since 1906 are available at points upstream from Lee Ferry which measure over 70 percent of the runoff which reaches Lee Ferry, and continuous records since 1906 are available at points downstream from Lee Ferry which reflect primarily the runoff at Lee Ferry. By correlating the actual flows at Lee Ferry during the period 1922 to date with these other records, the unmeasured flow at Lee Ferry for the period 1906 to 1922 can be estimated with confidence. Thus, based on reliable records, we believe there can be no serious question that the average virgin runoff of the Colorado River during the period 1906-22 was significantly higher than in the period since 1922.

The purpose of selecting any period of record as the basis of analysis is to guide the projection of the water supply available to a project during its effective life. All reliable data available are normally used for making this projection. There is no more justification for casting out high years because they occurred early in a period than there would be for ignoring low years for the same reason. Rejection of any part of a long-term record would be justified only if there were a question of its accuracy or if there were an identifiable change in conditions that rendered it no longer appropriate.

It is obvious that the runoff of the Colorado River has been less since 1930 than in the preceding 25 years. We do not know the reason. However, changes in runoff sequences have occurred frequently in the past. The available runoff records of the Colorado River show that generally drought conditions prevailed during the year 1896-1903, inclusive, and that this was followed by a major wet cycle from 1904 to 1930, inclusive. Since 1930, the 37 years have been generally ones of drought. The question naturally arises: how long will this major drought last?

On October 1, 1963, Mr. Samuel F. Turner, consulting geologist and engineer, Phoenix, Ariz., presented to the Senate Subcommittee on Irrigation and Reclamation an interesting chart entitled "Accumulated Departure From Average Growth as Indicated by Tree Rings in Colorado River Basin Above Lee Ferry." This chart extended back through the year 1250. For the years prior to 1904, Mr. Turner identified on the chart five major drought cycles, which had durations varying from 48 years (the great drought of Hohokam time) to 24 years. The average length of the five major droughts prior to 1904 identified on Mr. Turner's chart was about 34 years.

The chart also shows that major droughts in the past always have been followed by major wet cycles. For the years prior to 1904, the

chart by Mr. Turner identified six major wet cycles. The average length of these major wet cycles was about 24 years.

In addition to major wet and dry cycles, the chart prepared by Mr. Turner shows a large number of minor wet and dry cycles. The chart also shows the current drought starting in 1930. The major conclusion that can be drawn from Mr. Turner's chart is that major droughts in the past have averaged about the length of our present drought and have been followed by major wet cycles.

A study of the runoff since 1906 of other major rivers in the West—the Missouri, Columbia, and Sacramento—indicates no general or unusual trends or reasons for discarding the period of record from 1906 to 1922. The chart back here shows the trends in these basins and in the Colorado and I think it is interesting that the dips and the bends are similar.

In our analyses of lower basin water supply, the abnormally high releases from Glen Canyon during the high runoff periods are, for the most part, stored and regulated in Lake Mead for use in the lower basin. A significant part of the water supply we have projected for the central Arizona project is derived from these abnormally high releases, or upper basin spills. The availability of such spills would not be affected by the reservoir operating criteria included in H.R. 3300 and in S. 1004 as passed by the Senate.

All of our reservoir operation studies have followed closely the principles of these criteria, differing only in minor details which have but an inconsequential effect in estimating water supplies.

We believe that to base water supply projections for the Lower Basin on the longest period of runoff record is not only technically correct but also the most logical and defensible procedure.

Mr. Hosmer. Mr. Chairman, are you working on the 14.9 assumption, figure?

Secretary Udall. This is our current figure, brought up to date.

Mr. Hosmer. That is the one you are discussing here and the one on which the document is based?

Secretary Udall. That is so.

There appears to be substantial agreement as to the extent of present upper basin depletions. There is disagreement, however, as to the rate at which future upper basin depletions will occur. There is disagreement as to the extent of responsibility, if any, of the upper basin to meet a part of the Mexican water treaty obligations.

The basic differences in projection of upper basin depletions are as follows:

[In thousands of acre-feet]

Year	Bureau of Reclamation estimate	Tipton report estimate
1965.....	2,787	2,777
1975.....	4,220	4,513
1990.....	5,100	16,342
2000.....	5,430	17,351
2030.....	5,800	17,891

¹ Tipton report demonstrates that upper basin's art. III(d), Colorado River compact obligation, limits assured supply for upper basin to 6,300,000 acre-feet annually, exclusive of its Mexican treaty obligation, if any.

We agree that land and other resources in the upper basin could be physically developed to deplete water at the rate the upper basin estimates. However, it does not appear likely in the judgment of our

experts that projections which would completely dedicate the upper basin's total remaining unused Colorado River water supplies to specific areas or uses would be developed at rates commensurate with upper basin projections.

It seems more likely that some reserves will be withheld for future municipal and industrial growth. Also influencing our judgment is the uncertainty as to whether the upper basin is obligated to meet part of any Mexican water treaty deficiencies. Until that issue is resolved, we doubt that projects dependent on the contested water supply, as a practical matter, would be authorized or undertaken.

To the extent that weather modification, desalting, or other measures provide water for additional use, we would expect that the rate of future upper basin depletions would increase accordingly. In the interim, we believe that our estimates of future upper basin depletions are realistic.

NET WATER LOSSES ALONG LOWER COLORADO RIVER

The third broad category where projection or assumption is necessary to estimate future lower basin water supply involves estimating the future net water losses along the Lower Colorado River. Our proposal for the Colorado River Basin project include works to salvage some 680,000 acre-feet of Colorado River water that have constituted river losses in the past. With these salvage works in operation, we estimate that there will remain some 590,000 acre-feet of net losses along the lower river, primarily from evaporation and evapotranspiration from nonbeneficial vegetation. For comparative purposes, other estimates of future net losses are as follows:

<i>Source</i>	<i>Estimate, acre-feet</i>
Bureau of Reclamation.....	590, 000
Upper Basin (Tipton).....	810, 000
Colorado River Board of California.....	1, 000, 000

The magnitude of the future losses would affect significantly the residual water supply for the central Arizona project.

Again, we believe our estimates are realistic. Senator Wash Reservoir is now in operation and preventing overdeliveries to Mexico. We are confident that water losses can be reduced through eradication and control of phreatophytes and through further channelization. We know that we can salvage water through ground-water recovery.

WATER SUPPLY FOR THE CENTRAL ARIZONA PROJECT

The effect of varying assumption in the three broad aspects of water supply I have just discussed—virgin runoff, upper basin depletions, and lower river losses—is as follows and as shown graphically on the chart before you.

(The material referred to follows:)

WATER FOR CENTRAL ARIZONA PROJECT¹

[in thousand acre-feet]

Condition	Year 1979	Year 1990	Year 2000	Year 2030	Average 50-year period
USBR projections:					
60-year period, 1906-65.....	1,650	1,255	1,026	676	1,045
62-year period, 1906-67.....	1,650	1,239	1,005	626	1,019
46-year period, 1922-67: USBR projections of upper basin depletions.....	1,650	900	430	284	622
46-year period 1922-67: Tipton projections of upper basin, depletions ²	1,105	500	360	284	450
46-year period 1922-67: Tipton projections of upper basin depletions; Tipton estimate of lower basin salvage ³	890	285	145	77	237

¹ Aqueduct capacity, 2,500 c.f.s.; 4.4 m.a.f. priority for California.

² Tipton projections on basis that upper basin would be required to provide $\frac{1}{2}$ of Mexican water delivery. If upper basin were not so required, water supply for CAP would drop to zero about 1985 on basis of Tipton projections.

Secretary UDALL. Only time will tell which assumptions are the more nearly correct. There is no way of guaranteeing or proving with certainty any given assumption today. The only positive solution, therefore, lies in programs which will supplement Colorado River runoff at least sufficiently to guarantee 7.5 million acre-feet for consumptive use by the lower basin States. If this is accomplished, the assumptions as to virgin flow, upper basin depletions, and river losses become academic insofar as lower basin water supply is concerned.

Mr. Chairman, the remaining portion of the statement, again responsive to the chairman's letter, as responsive as we can make it, covers things I am going to discuss briefly rather than read my prepared statement, if I may, in order to save time.

Mr. JOHNSON. I might say, Mr. Secretary, your complete statement will appear in the record.

Secretary UDALL. The remainder of my statement covers water supplies which we think can be made available through water conservation programs. I think I can say to the committee that we have made some significant progress on this front in the last 2 or 3 years, particularly since the very low water year we had, I believe in 1964, when the Imperial Irrigation District was very cooperative and instituted water saving programs.

We also cover in the statement the current studies on desalting and its potential. We also bring the committee up to date on the work that is presently being done on the foreseeable potential of weather modification as we see it now.

We also have a section in the statement which discusses the Indian water rights on the river in response to the questions of the chairman.

We have outlined for you what I would describe as a preliminary reconnaissance study showing what the prospects are with regard to pumped storage projects along the Colorado.

We also conclude the statement with a section that concerns the operation of the River and the associated problems.

I should like to add, Mr. Chairman, if I may, mention of one other problem that is not in the statement. I apologize to the committee for this and I take personal responsibility for our tardiness in acting on this problem.

There is one additional problem that I hope we can resolve within the administration and can present language to you which will achieve the desired end. The reason that we did not get this problem in sharp focus until very late in our preparations is that there has been uncertainty with regard to the Orme Reservoir damsite which is the proposed small regulating reservoir near Phoenix where the water will be pumped and stored before it goes out into the irrigation systems. This reservoir, if located at the site we anticipate, would have a very beneficial impact on one Indian reservation and a very harmful one on a second Indian reservation.

The latter is the Fort McDowell Mohave-Apache Indian community. This is a small Indian group, one of the few I know that does not have a lawyer. When they do not have a lawyer, I end up as their lawyer and I am afraid that up to the moment, I have not done my job right—I want to be frank with the committee about it. This tribe is interested in the same thing that other Indian tribes are interested in under like circumstances. This reservoir would take nearly two-thirds of the land of the Indian reservation.

Mr. HALEY. Mr. Secretary, would you share some of that responsibility with the junior Senator from New York? I have noticed recently he has become quite interested in the Indian problems.

Secretary UDALL. We have a lot of help these days, Mr. Chairman.

The problem is a simple one. I am not throwing this at the committee as some new idea. In the earlier bills that had the Hualapai Dam in it there were three pages of language to cover the rights of the Hualapai Indians. These Indians would like to have some additional land. They want to keep their land base. I think this can be worked out.

I spent a substantial part of yesterday with the Department of Agriculture people, with the Bureau of Land Management people, and with the Bureau of the Budget people. I think we can work up an amendment that although it will not enable them to retain the same land base, it will provide, by exchange, an appropriate Indian reservation land base. We also would propose the same thing that we did at Yellowtail and which was proposed for Hualapai—to give recreational development rights to the Indians whose land is being taken.

So we are working on this. I would hope, Mr. Chairman, that by the time the subcommittee gets to markup, we can present an administration amendment and then submit it to the committee and the committee can give it its usual attention. This committee has been, and I think very wisely, generous with Indian tribes in all parts of the country when their land was taken, when their damsites were taken. The proposals in the earlier bills with regard to Hualapai Reservations I think were very generous and I think appropriately so. So I think in this pattern, we can work something out and we will be working very strenuously on it in the next few days.

So I want to make it plain that this is not a controversial matter that I am raising. I think it is a matter for us to decide on an appropriate amendment and then submit it to the committee and the committee can give it its usual attention. This committee has been, and I think very wisely, generous with Indian tribes in all parts of the country when their land was taken, when their damsites were taken. The proposals in the earlier bills with regard to Hualapai Reservations I think were very generous and I think appropriately so. So I think in this pattern, we can work something out and we will be working very strenuously on it in the next few days.

Mr. JOHNSON. Could you give us an idea of the size of the reservoir and the amount of land that is involved?

Secretary UDALL. The amount of land that would be taken is about 15,000 acres, which is about two-thirds of the reservation. They would like to have possibly 5,000 additional acres to keep their reservation of substantial size. I think this can be worked out on the basis of our discussions yesterday with all parties concerned.

That, Mr. Chairman, completes my statement.

(The unread portion of Secretary Udall's statement follows:)

WATER AVAILABLE THROUGH WATER CONSERVATION PROGRAMS

Our proposals for the Colorado River Basin Project include measures which we consider will obtain the greatest water salvage practicable along the lower Colorado River. These comprise:

<i>Measure</i>	<i>Annual water salvage (acre-feet)</i>
River channelization (underway)-----	190, 000
Senator Wash Reservoir (completed)-----	170, 000
Ground water recovery-----	220, 000
Phreatophyte eradication-----	100, 000
Total -----	680, 000

Extensive canal lining already has been installed in the Central Arizona area and is continuing. Highly efficient irrigation practices are in use. Urban waste from Tucson and Phoenix is being reused for agriculture or is being returned to recharge round water. Watershed treatment practices are common over much of the Salt River watershed. We are confident that there are no major opportunities for water salvage in Arizona that are not now being developed.

Insofar as the Lower Basin is concerned, we believe that our proposals for water salvage along the lower Colorado River, together with advanced conservation practices already under way, constitute the maximum practicable contribution that water salvage can make to the solution of Colorado River water shortages.

The major known opportunities for future salvage of water in the Upper Basin are through the adoption of more efficient irrigation practices. While the Bureau has not made a detailed survey of these possibilities, it is known that opportunities exist. In the report of the Engineering Advisory Committee to the Upper Colorado River Compact Commission dated November 29, 1948, the average annual total consumptive uses at the sites of use were estimated to be about 1,923,000 acre-feet. Of this amount, a total of about 815,000 acre-feet annually was identified as consumptive use from noncropped areas located adjacent to irrigated cropped lands. As the future demands for water in the Upper Basin become more acute, a considerable percentage of this use by noncropped areas could be salvaged for use on cropped lands or for other beneficial purposes.

DESALTING

The Bureau of Reclamation, assisted by the Atomic Energy Commission and the Office of Saline Water, has just completed a reconnaissance appraisal of the potential for augmenting the runoff of the Colorado River by desalting sea water as requested and financed by the Congress in action on the 1968 Public Works appropriation bill. As the Committee knows, a related study (due to be completed this summer) is being made by the United States and Mexico under the chairmanship of the International Atomic Energy Agency. Data developed in the course of this international study was, of course, available to the Bureau of Reclamation.

The two studies indicate that, as the technology continues to develop, desalting is one of the potential methods of supplementing Lower Basin water that merits careful consideration.

We expect, of course, that the proposed National Water Commission will review these potentials as they consider the problems of the Colorado. Commissioner Dominy is prepared to provide the Committee with detailed information about this reconnaissance study.

ATMOSPHERIC WATER RESOURCES DEVELOPMENT IN THE COLORADO RIVER BASIN

From the onset of the Bureau of Reclamation's research program to increase water supplied by weather modification, the Colorado River Basin has been a major area of research efforts. The very first contract in the program was made with the University of Wyoming to study increasing the water supply by cloud seeding for Reclamation projects in Wyoming. To date, we have invested over one-third of the program funds on research projects for developing precipitation enhancement techniques in the Colorado River Basin.

This year, three major "Project Skywater" field activities are being conducted for the Colorado River Basin. The University of Wyoming is studying methods for obtaining more snowfall from mountain cap clouds. Present experiments are being conducted at Elk Mountain, an isolated peak just outside the Basin drainage. Experimental cloud seeding is being continued in the Park Range by E. Bollay Associates with ground-based generators using silver iodide. Field support for the Park Range experiment is being provided by the Soil Conservation Service, the Geological Survey, and the Forest Service through formal agreements with the Bureau of Reclamation. At Flagstaff, Arizona, Meteorology Research, Inc., is developing modification techniques to increase precipitation from summer cumulus clouds. Techniques perfected at Flagstaff will be particularly significant in enhancing precipitation over the Lower Basin and in the lower elevations of the Upper Basin.

In total, the Bureau of Reclamation has 11 organizations involved in Colorado River precipitation modification research—4 university groups, 2 private research firms, and 5 Federal agencies.

Detailed planning is now beginning for a large-scale pilot operation in the Upper Colorado River Basin. Knowledge gained through our comprehensive efforts and those financed through the National Science Foundation gives a firm basis for planning an undertaking of this magnitude. This first pilot project could be logically initiated as early as 1969 or 1970.

We believe it reasonable to anticipate that within 10 years a firm capability to augment Upper Basin streamflow by about 1,900,000 acre-feet annually could be developed. A justifiable large-scale operation could then be started involving:

Seeding with in well-defined and localized target areas by remote controlled ground-based generators using silver iodide.

Seeding susceptible winter storms at high elevations to increase winter snowpack.

Modification of winter precipitation in lower or middle elevations of the Upper and Lower Basin and summer precipitation throughout the region are further potentials that could be realized by 1985.

Primary target areas for initial large-scale operations can be identified where precipitation and runoff are sufficient to warrant modification and where temperatures are suitably cold during reasonably long periods. With these fundamental considerations, 14,200 square miles of major primary target areas have been tentatively identified. These areas are generally above 9,500 feet where settlement is sparse and, except for the skiing enthusiasts, activity is reduced in the winter-time. The best seeding season will normally be November through April when an average of 19.4 inches of precipitation occurs.

We believe it safe to assume that a 15-percent increase in the average winter precipitation is likely within 10 years. Recognizing that indicated precipitation increases by current cloud seeding operations and experiments are generally in the 10-to-20-percent range and that considerably expanded knowledge and improved systems should be available by the mid-1970's, a 15-percent increase seems conservative.

Although the average annual streamflow augmentation of about 1,900,000 acre-feet will occur during the spring runoff, regulation provided by the large storage capacity built in the Colorado River Basin will make virtually all the increase usable water supply.

The total annual cost of a full-scale cloud seeding operation in the prime target areas is estimated at \$2,650,000. This estimate includes amortized initial installation and replacement costs, supplies, maintenance, and a continuing analysis of results and any effects on ecological regimes.

The unit cost of producing 1,000,000 acre-feet of new water by cloud seeding is thus estimated as about \$1.50 per acre-foot. The estimated cost is probably on the high side, representing an upper boundary for costs. Once more is known, careful planning may reduce unit costs to as low as \$1.00 per acre-foot.

A 9-year, \$25 million comprehensive development program will be needed before the large-scale operation described above can begin. Reducing the development time or costs may endanger opportunities to achieve a full success in utilizing such a new and complex technology as weather modification.

The regional research and development effort for the Upper Basin will be the first such undertaking in weather modification by the Bureau of Reclamation. Much of what is learned here will aid similar projects for other areas throughout the Nation.

WATER QUALITY STANDARDS

The Colorado River is the only major river of the world that is virtually completely controlled. With the existing system of large storage reservoirs it is possible to plan, for all practical purposes, on complete utilization of the river's runoff with no utilizable water escaping to the sea. This means that the limited water supply in the Colorado River Basin must be used and reused and then used again for a wide variety of purposes. In this complete utilization of runoff, the Colorado Basin is unique.

The River is unique also with respect to the number and extent of the institutional constraints on the division and use of the Basin's water which include an international treaty, two interstate water compacts, Supreme Court decisions, Indian water rights, State water laws, and Federal law.

These two aspects, in turn, make the problem of setting numerical mineral quality standards for the Colorado River not only unique but extremely complicated. Before discussing this problem further, I would like to state that salinity standards will not be established until we have sufficient information to assure that such standards will be equitable, workable, and enforceable.

The principal water uses in the Basin include irrigated agriculture, municipal and industrial water supply, fish and aquatic life, and recreation. Salinity in the Colorado River has no significant effect on instream or nonconsumptive water uses such as hydroelectric power generation and water-oriented recreation. However, ever-increasing levels of salinity do have an adverse impact on the consumptive uses of water for both irrigated agriculture and municipal and industrial water supply.

Further development and depletion of water allocated to the Upper Basin States will raise the salinity of water downstream.

Salinity standards must be so framed that they will not impede the growing economy of the Colorado River Basin and yet not permit unwarranted degradation of water quality. This is the hard dilemma which is the core of the problem of establishing equitable salinity standards.

A decision not to set salinity standards at this time does not and will not preclude getting started with programs to study and demonstrate the feasibility of controlling and alleviating the Basin's salinity problem. Promising methods of attacking this problem include (1) control of natural sources by such methods as suppression or diversion of mineral springs; (2) control of municipal and industrial wastes by lagooning or injection into deep geological formations; (3) reduction of salt loads from irrigated lands by such measures as rejection of areas of saline soils in new developments, improved irrigation practices, and control of drainage water; (4) alleviation of water losses through reduction of evaporation and evapo-transpiration, and control of phreatophytes; and (5) removal of salts by desalting.

Water quality also can be improved by measures to increase water supplies such as weather modification and augmentation by desalted sea water which I have previously discussed. These potentials for improving water quality are being explored. The Colorado River Basin Water Quality Control Project of the Federal Water Pollution Control Administration will complete by the end of 1968 a comprehensive report describing the mineral quality of the Basin's waters, delineating the causes of salinity and future increases thereof, assessing the effects of salinity on beneficial water uses and evaluating the economic impact of existing and future mineral quality. The Bureau of Reclamation, for several years, has been giving greater attention to salinity problems as they are related to and influenced by water resources development. Also, the Bureau has just recently embarked on reconnaissance studies to identify possibilities for controlling salinity and to identify specific studies that should be taken to assess control measures at a few select salinity sources. We hope to expand activities of this type in the years ahead, and in this context I can report that we are moving ahead with programs that we expect will lay the foundation for setting workable salinity standards.

Although the salinity problems of the Colorado River are difficult, I am confident that they can and will be resolved.

INDIAN WATER RIGHTS

In *Arizona v. California*, 1908 (378 U.S. 546), claims of the United States on behalf of five Indian reservations in Arizona, California, and Nevada, to main-stream Colorado River water were sustained. The Indian reservations are the Chemehuevi, the Cocopah, the Yuma, the Colorado River, and the Fort Mohave. The Supreme Court held that water in quantity sufficient to irrigate all the acreage practicable of irrigation on the reservations was reserved; that the United States had reserved such water rights for the Indians; and that such rights are "present perfected rights" with priorities as of the dates the reservations were established. The Department, by reason of its responsibilities over Indian matters, has the obligation to protect and conserve these Indian water rights, and to aid in their use and development.

Article II of the Decree entered March 9, 1964 (376 U.S. 340), quantified for each Indian reservation both a maximum annual diversion from the main stream and the number of irrigable acres. The Decree provides an annual measure of the rights for each Indian reservation. That measure is the lesser of two alternatives: (1) the diversion quantity specified for the reservation or (2) the amount necessary to supply the consumptive use required for irrigation of the number of acres specified for the reservation plus satisfaction of related uses.

Article VI of the Decree required the three States and the Secretary of the Interior to present to the Court a list of their claims of "present perfected rights" as a preliminary to the determination of such rights either by agreement or by further proceedings. In March of 1967 the Solicitor General of the United States filed the following list of claimed Indian "present perfected rights":

PRESENT PERFECTED RIGHTS FOR INDIAN RESERVATIONS IN WATERS OF THE MAIN STREAM OF THE COLORADO RIVER

Indian reservation	State	Present perfected rights ¹		
		Diversion, acre-feet	Net acres	Priority date
Yuma.....	California.....	51,616	7,743	Jan. 9, 1908
Fort Mojave.....	Arizona.....	27,969	4,327	Sept. 18, 1908
	do.....	68,447	10,589	Feb. 2, 1911
	California.....	13,688	2,119	Sept. 18, 1920
	Nevada.....	12,534	1,939	Dec. 1, 1920
Chemehuevi.....	California.....	11,340	1,900	Feb. 2, 1921
Cocopah.....	Arizona.....	2,744	431	Sept. 27, 1921
Colorado River.....	do.....	358,400	53,768	Mar. 3, 1925
	do.....	252,016	37,808	Nov. 22, 1925
	do.....	51,986	7,799	Nov. 16, 1927
	California.....	10,745	1,612	Nov. 22, 1927
	do.....	40,241	6,037	Nov. 16, 1927
	do.....	3,760	564	May 15, 1928
		905,496	136,636	

¹ According to the terms of the decree, the quantity of water in each instance is measured by (i) diversions or (ii) consumptive use required for irrigation of the respective acreage, and for satisfaction of related uses, whichever of (i) or (ii) is less.

This list presented in tabular form the Indian water rights as specified in Article II of the Decree.

Since in each case substantial quantities of water diverted from the main stream will be returned to the Colorado River, the controlling figures in determining the amounts of water involved for each State are the "consumptive use" as that term is defined in the Decree—diversions from the main stream minus return flows available for other consumptive use in the United States or in satisfaction of the Mexican Treaty obligation.

These consumptive uses have been estimated by the Department for planning purposes to be 4 acre-feet per acre for the acreages specified in the Decree. This is a reasonable, rounded figure. On this basis, consumptive uses for the Arizona reservations upon full development are as follows :

Arizona	Acres	Annual consumptive use (acre-feet)
Cocopah Indian Reservation.....	431	1,724
Colorado River Indian Reservation.....	99,375	397,500
Fort Mohave Indian Reservation.....	14,916	59,664
Total.....	114,722	458,888

The consumptive uses for the Indian lands in California and Nevada, under full development using the same assumption of 4 acre-feet per acre of annual consumptive use, are as follows :

	Acres	Annual consumptive use (acre-feet)
California:		
Yuma Indian Reservation.....	7,743	30,972
Fort Mohave Indian Reservation.....	2,119	8,476
Chemehuevi Indian Reservation.....	1,900	7,600
Colorado River Indian Reservation.....	8,213	32,852
Total.....	19,975	79,900
Nevada: Fort Mohave Indian Reservation.....	1,939	7,756

In summary, of the 905,496 acre-feet of water diversion decreed by the Supreme Court to the various Indian reservations along the Lower Colorado River, a total of about 547,000 acre-feet will be used consumptively under full development of Indian lands, leaving about 358,000 to be returned to the river.

POTENTIAL PUMPED STORAGE HYDROELECTRIC PLANTS

In the course of the reanalysis of the Central Arizona Project, which was performed in late 1966, and other reconnaissance grade investigations, the Bureau of Reclamation has made preliminary examinations of a number of potential pumped storage, hydroelectric plants in Arizona. The plan which appeared most favorable, based upon available data, was the Mohave Pumped Storage plan which is located in Arizona adjacent to Lake Mohave about 21 river miles downstream from Hoover Dam. Lake Mohave would serve as the lower reservoir, and the upper reservoir would be constructed on a high bench called Malpais Mesa.

The Mohave generating facilities could be constructed to a capacity of 5,100 megawatts or more. This would be an offstream plant and would generate no energy exclusive of the pumped storage returns. It, therefore, would provide capacity only for reserves and peaking power.

The capital cost of the pumped storage facilities would be about \$664,000,000. Consolidated with a Lower Colorado River Basin Development Fund, and with capacity sold at the rate of \$7 per kilowatt per year, the 5,100-megawatt plant could contribute about \$100 million by year 2025 and \$750 million by year 2047 to the Development Fund.

Other favorable pump storage sites in Arizona identified by the Bureau include the Buckskin-Mesa site on the Bill Williams arm of Lake Havasu, the White Tanks Mountain site adjacent to the Granite Reef Aqueduct in Central Arizona, the Montezuma site southwest of Phoenix, and the Horse Mesa pump storage site adjacent to the Salt River Canyon some 40 miles east of Phoenix, Arizona.

As additional large, efficient, thermal-electric powerplants are added to the power systems of the Pacific Southwest, the need for additional efficient, quick-starting peaking power capacity to meet hourly and daily peak loads will become critical. Pumped storage plans such as the Mohave plan would provide an attractive source of peaking power. If such installations were integrated with the Lower Colorado River Basin Development Fund, the surplus revenues from power sales would improve the financial feasibility of augmentation projects.

OPERATION OF THE RIVER UNDER SECTION 602, H.R. 3300

The Secretary of the Interior now has the authority to operate the lower Colorado River from Lake Mead downstream and deliver water from the river system to various users under contract with the United States. In the Upper Basin the Secretary is charged with operating and maintaining the Colorado River Storage Project in compliance with the Colorado River and Upper Colorado River Basin Compacts. Section 602 of H.R. 3300 and Section 11 of S. 1004 as passed by the Senate establish certain criteria for the operation of reservoirs in both the Upper and Lower Basins.

We believe the language in both instances is generally clear and specific, and we anticipate no great problems in providing criteria to supplement their provisions. In this respect, I refer you to the detailed statement by the Bureau of Reclamation on this subject beginning on page 1358 of the printed record of the hearings in May of 1966 before this subcommittee on H.R. 4671 and similar bills. The criteria which will require the most careful consideration involve the language of Section 602(a)(3) of H.R. 3300 and Section 11(a)(3) of S. 1004, which provides for the storage of water in the Upper Basin to the extent the Secretary shall find to be reasonably necessary to assure deliveries to the Lower Basin without impairment of annual consumptive uses in the Upper Basin pursuant to the Colorado River Compact. The words "reasonably necessary" imply that this is a matter of judgment to be exercised by the Secretary after consultation with the Basin States. Since the Secretary will be involved in and responsible for major developments in both basins, it is our view that the establishment of operating criteria for this purpose will involve extensive consultation and review by all the Basin States to achieve criteria which will adequately protect the interests of both basins and the United States. We believe a reasonable consensus can be achieved in this regard.

We note that both Section 602 of H.R. 3300 and Section 11 of S. 1004 leave open the question of whether the Upper Basin is obligated to meet a portion of any Mexican Treaty deficiency. If and when this becomes an issue affecting the actual operation of the river system, it will, of course, have to be resolved either by agreement or by litigation.

This concludes my prepared statement, which I hope adequately responds to the Chairman's request for information. We will be happy to answer any questions you may have.

Mr. JOHNSON. We want to thank you for being here, Mr. Secretary, and giving us the benefit of your answers to the questions that were raised in the letter of December 29 from the chairman of the full committee.

The chairman of the full committee, Mr. Aspinall, is now recognized.

Mr. ASPINALL. Mr. Chairman, the San Rafael conference report will not be on the floor this afternoon. In consultation with the gentleman from Pennsylvania, Mr. Saylor, we carried it over until next week. Accordingly, we shall try to get permission to sit during debate this afternoon.

Mr. Chairman, I wish to preface my remarks by stating that no one wishes the authorization, construction, and operation of a feasible Colorado River project, including the central Arizona project, any more than the chairman of the full committee, the gentleman from Colorado now speaking. I have lived with this legislation and problems attendant upon it ever since January of 1949. That was the first

month that I was in the Congress. As I question the Secretary and those with him today, I have no intention at all of being argumentative and I shall simply try to write the record so that, when we go to write up this bill, we will have before us different thinking that has to do with the proposed project. The letter to the Secretary was written for the sole purpose of getting the additional information that seemed to me to be necessary after the other body had passed the central Arizona project as such in the form of S. 1004 and because of the additional problems that have arisen since last year.

Mr. Secretary, first I want you to know and those associated with you that I consider your statement this morning to be fully responsive to my letter of December 29. I am particularly pleased that you brought into the discussion this matter of the additional problem that has to do with the Indian reservation. I do, however, have some questions, of course, to clarify the record with respect to the information furnished.

I have already asked of the chairman that the letter be placed in the record.

Mr. Secretary, before asking the questions I have which are directly related to your statement, I have a few general questions which I think are appropriate.

First, Mr. Secretary, do you now support the principles of H.R. 3300?

Secretary UDALL. My answer to your question, Mr. Chairman, is that we support in principle those aspects which are consistent with our report to the committee.

Mr. ASPINALL. What is your present position as it relates to the Senate-passed bill, S. 1004?

Do you support also that bill in its entirety?

Secretary UDALL. Yes. The difficulty is that I do not want to commit myself to every detail, but in principle and with regard to its main provisions, the answer is "Yes," Mr. Chairman.

Mr. ASPINALL. Mr. Secretary, I would like to show the timing of the change of the Department's position with respect to the construction of dams on the Colorado River. I know that you appeared before the committee of the other body in connection with its consideration of a Southwest water plan in support of both dams on the river. When was that?

Secretary UDALL. It was either 1964 or 1965. I think it was the 89th Congress.

Mr. ASPINALL. In the 89th Congress, you appeared before us with a recommendation of only one dam; is that correct?

Secretary UDALL. That is correct.

Mr. ASPINALL. Do you have the date of that appearance before this committee?

Secretary UDALL. August of 1965, I believe, Mr. Chairman.

Mr. ASPINALL. Last year in the 90th Congress, you appeared with a recommendation that there be no dams built at all.

Do you have the date of the adoption of this position by your Department?

Secretary UDALL. This was in mid-March last year.

Mr. ASPINALL. The reason that I ask this, of course, is that I want the record to be perfectly clear that the position of supporting dams on the Colorado River came from the Department. It did not come from any individual of this committee. We accepted the Department's position and tried to further legislation in that respect. It makes no difference to me personally whether or not there are any dams on this river. This is in territory outside of my own personal jurisdiction, or, for that matter, outside of any area where I have any responsibility as far as the Colorado River is concerned.

But there have been a lot of inferences, a lot of things said about dams on the Colorado River and in the Grand Canyon. This was not a matter that was suggested by the members of this committee and it was not suggested by any particular individual of this committee. Some individuals of this committee took umbrage at the fact that these dams were suggested. They had a right to do so. Now, it is clear that there are no dams to be built on the river as far as the present position of the Department and the Administration, as I understand—that is correct, is it not, Mr. Secretary?

Secretary UDALL. Yes; our position has evolved and I think we have to take the responsibility you have suggested.

Mr. ASPINALL. And the position at the present time of the administration is that there will be no dams built?

Secretary UDALL. That is correct.

Mr. ASPINALL. That is all there is to it, as far as that is concerned.

Now, turning for a moment to your proposal for prepurchase of the thermal generating capacity, which is the first matter covered in your statement, there are several points I would like to have clarified.

First, Mr. Secretary, as I understand your proposal, the Federal Government would not actually own a part of the proposed large thermal generating plant but would only acquire the right to the power and energy from a portion of the plant. As I understand it, this proposal was made only after preliminary negotiations with non-Federal interests. I believe you said the WEST planning group; is that correct?

Secretary UDALL. That is correct.

Mr. ASPINALL. Can you advise the committee as to the present status of these negotiations?

Secretary UDALL. Mr. Chairman, we had extensive negotiations about a year ago, prior to our first hearing. We have, of course, touched all of our bases since then. This project is needed in the region. I think it will move forward on schedule—in other words, it will be one of the early projects, large thermal projects to be built. The main entities that are interested include such private power companies as Southern California Edison and the Arizona Public Service Co., and such public power companies as Salt River project. They maintain the position they did previously, that they would construct and own the plant. You are quite right, we do not propose to own any part of the plant.

Mr. ASPINALL. And you have included all non-Federal entities that are involved in your negotiations so far?

Secretary UDALL. That is correct.

Mr. ASPINALL. Have the negotiations included the matter of marketing the excess energy from the Federal capacity; that is, energy which will not be needed for project pumping?

Secretary UDALL. Yes; we have discussed this problem. As I have indicated in the statement, there are two things that we can do. One is this banking arrangement that we think will enable us to preserve our rights to a high degree and to have a flexible arrangement with our partners in this endeavor. With regard to surpluses, the Salt River project, in all likelihood, I am told, will be the operating agent for the plant. That is the way the WEST group operates. One agency is the operator for the group and, in this instance, it could and would use such surpluses as might exist and would agree to do so.

Mr. ASPINALL. In other words, you have answered my next question, which has to do with the disposition of this energy, which would be to the Salt River organization?

Secretary UDALL. That is what we presently contemplate, Mr. Chairman.

Mr. ASPINALL. Would it be on a preference basis?

Secretary UDALL. No; it would be on the basis that the agency which actually constructs and operates the plant, financed in the manner that we have indicated, would, we think, be the logical agency to take care of whatever surpluses there might be, if any. We do not anticipate any large surpluses, as we have indicated.

Mr. ASPINALL. Now, would you explain to some members of this committee who do not know what you meant by the term "the banking operation"?

Some members of this committee, in my mind, do not understand that term as used here.

Secretary UDALL. The banking arrangement, with which the chairman of the subcommittee is most familiar because his own fertile mind has helped devise it for the Central Valley of California, would mean that in those years, particularly the early years, when our power needs would fluctuate and are not even, we would let others use our power when in surplus. That would give us a banking account credit from which we could draw back power in the years when we needed it. This arrangement is very familiar to the electric power industry. It works very well, and it is very practical.

Mr. ASPINALL. I yield to my friend from California now for the purpose of any question he has relative to this particular matter.

Mr. HOSMER. It is as to the economics of banking, rather than attempting to sell the power at a time when it is in excess of project needs. As I understand it, your prepayment into the powerplant comes from money that the Government borrows.

Would it not be better to get revenues for these kilowatts at an earlier stage so that some of this money can be paid back and interest reduced rather than banking the power?

Secretary UDALL. I would think, Congressman, since you bank both ways, you see, there will be some years where we use more power than others, and this is really a kind of way of evening out the peaks and valleys.

Mr. Hosmer. Was your estimate, then, that the surpluses of power might probably occur in the earlier years of the project than in the later years?

Secretary Udall. It would be the other way around, we think. It would depend on water availability.

I think it is much better and involves much less controversy if we use the banking approach, rather than selling power in the low years and buying it in the high years.

Mr. Hosmer. Are you satisfied from the economic standpoint that this would be more advantageous to the Government—that is, banking—than selling and rebuying?

Secretary Udall. I think we can say that it is our view that it very definitely would be more advantageous.

Mr. Hosmer. Thank you.

Mr. Aspinall. The present understanding is that there would be both banking arrangements and the selling of surplus energy?

Secretary Udall. That is correct.

Mr. Aspinall. Mr. Secretary, before I ask this next question, please accept my own personal opinion.

At the present time, I happen to be one of those who believe that the Bureau of Reclamation should be given some general, perhaps limited, power for the operation of thermal electric plants. Now, I just ask you this question:

I preface it by saying that I have been somewhat bothered by the proposal for prepurchase of the capacity because it looks like a back-door approach to getting the Bureau into the business of constructing and operating thermal electric generating plants.

Would you say this might be the first step in that direction?

Secretary Udall. I don't see it that way at all, Mr. Chairman. You used the word "constructing." We don't propose to construct anything. You used the word "operating." We don't propose to operate anything.

I agree there are those who hold the view the chairman expressed. However, I think our proposal to obtain central Arizona pumping power is a direct and not a back-door approach.

Mr. Aspinall. Do you have any instances in Reclamation history which could be considered as a precedent for what you propose in this particular legislation?

Secretary Udall. None—the commissioner says none that he knows of. The chairman may be interested in knowing where we got the idea. The chairman of the subcommittee is familiar with this. It is similar to the arrangement we worked out with the Canadian Government on the Columbia River. We borrowed the idea from there, thinking that it would be useful here.

Mr. Aspinall. Of course, that is not Reclamation law. That is all I am trying to show at this time.

Secretary Udall. That is correct.

Mr. ASPINALL. Mr. Secretary, it is my understanding that the cost of 3 mills per kilowatt-hour for pumping energy under this prepurchase is based upon amortizing the Federal cost on an interest-free basis. Is that correct?

Secretary UDALL. Yes, as far as irrigation is concerned. This is customary.

Mr. ASPINALL. Of course, this is an irrigation proposal as far as this project is concerned.

Secretary UDALL. That is right.

Mr. ASPINALL. Does this cost of 3 mills also take into account repayment assistance from revenues from the marketing of the excess energy?

Mr. DOMINY. To a very minor degree, Mr. Chairman.

Mr. ASPINALL. I do not understand the use of the word "minor" there. It either does or does not. The question is how much excess power there is.

Mr. DOMINY. The rates are different, of course, for the municipal water pumping and the irrigation pumping. This is primarily because interest is charged on that part of the pumping costs related to pumping the M. & I. water. We do not charge interest on those costs associated with pumping irrigation water.

Mr. ASPINALL. Mr. Chairman, if the Department and the Bureau wish to make additional responses to this question, I would like to have unanimous consent that it be placed in the record at this point.

Mr. JOHNSON. Do I hear objection?

(No response.)

Mr. JOHNSON. It is so ordered.

(The material referred to follows:)

Bureau of Reclamation studies show that the rate for irrigation pumping sales which would be required to pay operation and maintenance costs and repay without interest the cost of power facilities associated with irrigation pumping energy would be 3.14 mills/kwh. The proposed rate for irrigation pumping energy is 3 mills/kwh which results in a deficiency in meeting irrigation pumping energy costs of \$8,200,000 during the 50-year payout period. This minor deficiency would be made up from M. & I. pumping and commercial energy sales which are at a rate in excess of cost.

Mr. ASPINALL. Mr. Secretary, what is the planned life of the large thermal powerplant in which the Federal Government will participate?

Secretary UDALL. A 50-year-payout basis.

Mr. ASPINALL. What is the plan for meeting the pumping energy needs beyond the life of this particular plant?

Mr. DOMINY. The thermal units, Mr. Chairman, will be replaced about every 35 years. This is characteristic of these high-temperature, high-speed units.

Mr. ASPINALL. Not necessarily in the same location, because if you run out of coal, you have to move your plant.

Mr. DOMINY. As I understand, the coal reserves are adequate.

Mr. ASPINALL. You do not have a complete geological survey on the coal, as to the amount of coal that surrounds this particular plant, do you?

Secretary UDALL. Mr. Chairman, the coal for this would come from the Black Mesa from the Navaho-Hopi Indian Reservation.

Mr. ASPINALL. Mr. Secretary, in your statement you mentioned potential pumped storage hydroelectric plants.

Did you consider this as a possible alternative to your prepurchase proposal?

Secretary UDALL. Mr. Chairman, I think I can say very flatly we do not consider them as an alternative. I think the whole region, with the WEST approach used, is going to need the type of good peaking facilities that nature apparently has provided for us there. This is not a viable alternative for pumping power because we need baseload energy for pumping, not peaking capacity.

Mr. ASPINALL. Then you suggest that it is in addition to the prepurchase plan, is that correct?

Providing it is going to be peaking?

Secretary UDALL. I think when one looks down the road beyond this project to development funds, to augmentation plans, that pump storage facilities might very well enter into the overall plan.

Mr. ASPINALL. Mr. Secretary, assuming that a large thermal power plant is built at Page, Ariz., in the vicinity thereof, in which the Federal Government shares the capacity, is it the Department's understanding that the water for this plant would come from Arizona's 50,000 acre-feet of the upper basin water?

Secretary UDALL. This is what we contemplate.

Mr. ASPINALL. If so, would you expect that such an estimate would result in any controversy or conflict with Indian water rights in Arizona?

Secretary UDALL. I know of none, Mr. Chairman. We went into this rather thoroughly with everyone involved.

Mr. ASPINALL. You do know the provisions of the decree?

Secretary UDALL. Yes.

Mr. ASPINALL. Mr. Secretary, I am interested in your statement that the Department continues to take the position that payout assistance for the central Arizona project from a development fund would not be necessary. This is correct?

Secretary UDALL. This is our firm position.

Mr. ASPINALL. As I remember, in your proposal, this assistance would be given by either increasing the municipal water rate from \$50 to \$56 an acre-foot or an ad valorem tax?

Secretary UDALL. This is correct.

Mr. ASPINALL. In view of the fact that this was rejected by the other body, I assume it was not well received in Arizona.

Is this a correct assumption on my part?

Secretary UDALL. Mr. Chairman, it is our understanding that the Senate legislation did not accept or reject either. When we get down to working out a repayment contract it is going to be up to the customers, the Arizona people, to decide whether they want to have a high industrial-municipal rate or whether they want to have a medium municipal rate with a small ad valorem tax or a low industrial-municipal rate and a high ad valorem tax. This can be resolved by the people in the State at the time we sit down to get repayment contracts in order.

Mr. ASPINALL. Would it be better if we provided some of the revenue from the Hoover-Davis-Parker complex to which the State of Arizona might be entitled?

Secretary UDALL. Mr. Chairman, we would have no objection to a development fund being established if that were the wisdom of the committee. I do not think this interferes at all. It might be useful. But we feel basically that the central Arizona project is a sound proposal which will carry its own weight.

Mr. ASPINALL. Mr. Secretary, your statement indicates that you take no position whatsoever with respect to establishing a development fund. Yet you have recognized the need for augmenting the flows of the Colorado River. Would you not agree that the establishment of a development fund and provision for dependable sources of revenue is the most important single factor in attaining future augmentation of the river?

Secretary UDALL. I would certainly agree with that statement, yes.

Mr. ASPINALL. I wonder, Mr. Secretary, if the committee could be furnished repayment tables regarding the development contributions set out in your statement?

Secretary UDALL. We would be very happy to do so.

Mr. ASPINALL. Mr. Chairman, I would ask unanimous consent to have that information placed in the record at this place.

Mr. JOHNSON. Is there any objection to the chairman's request?

Hearing none—

Mr. HOSMER. Reserving the right to object, may I understand that the figures requested are those figures which will come into the development fund under the present contracts or is there some other—

Mr. ASPINALL. Not under present contracts, because the present contracts will expire. These will be under new contracts that will be entered into for the sale of power involved.

Mr. HOSMER. And these tables will be broken down by source of revenue?

Mr. ASPINALL. That is right.

Mr. HOSMER. I withdraw my reservation.

Mr. JOHNSON. It is so ordered.

(The material referred to follows:)

ESTIMATED REVENUES AVAILABLE FOR LOWER COLORADO RIVER BASIN DEVELOPMENT FUND, 1991-2050¹

Year	Hoover ²	Parker-Davis	Intertie	CAP ³	Cumulative balance
1991.....	12,592				12,592
1992.....	12,592				25,184
1993.....	12,592				37,776
1994.....	12,592				50,368
1995.....	12,592				62,960
1996.....	12,592				75,552
1997.....	12,592				88,144
1998.....	12,592				100,736
1999.....	12,592				113,328
2000.....	12,592				125,920
2001.....	12,080				138,000
2002.....	12,080				150,080
2003.....	12,080				162,160
2004.....	12,080				174,240
2005.....	12,080	3,793			190,113
2006.....	12,080	3,793			205,996
2007.....	12,080	3,793			221,859
2008.....	12,080	3,793			237,732
2009.....	12,080	3,793			253,605
2010.....	12,080	3,793			269,478
2011.....	11,740	3,793			285,011
2012.....	11,740	3,793			300,544
2013.....	11,740	3,793			316,077
2014.....	11,740	3,793			331,610
2015.....	11,740	3,793			347,143
2016.....	11,740	3,704			362,587
2017.....	11,740	3,704			378,031
2018.....	11,740	3,704			393,475
2019.....	11,740	3,704			408,919
2020.....	11,740	3,704			424,363
2021.....	11,420	3,704			439,487
2022.....	11,420	3,704	5,200		459,811
2023.....	11,420	3,794	5,200		480,135
2024.....	11,420	3,704	5,200		500,459
2025.....	11,420	3,704	5,200		520,783
2026.....	11,420	3,643	5,200		541,046
2027.....	11,420	3,643	5,200		561,309
2028.....	11,420	3,643	5,200		581,572
2029.....	11,420	3,643	5,200		601,835
Subtotal.....	466,900	93,335	41,600	0	601,835
2030.....	11,260	3,643	5,200	18,300	640,238
2031.....	11,260	3,643	5,200	18,300	678,641
2032.....	11,260	3,643	5,200	18,300	717,044
2033.....	11,260	3,643	5,200	18,300	755,447
2034.....	11,260	3,643	5,200	18,300	793,850
2035.....	11,260	3,643	5,200	18,300	832,253
2036.....	11,260	3,624	5,200	18,300	870,637
2037.....	11,260	3,624	5,200	18,300	909,021
2038.....	11,260	3,624	5,200	18,300	947,405
2039.....	11,260	3,624	5,200	18,300	985,789
2040.....	11,260	3,624	5,200	18,300	1,024,173
2041.....	11,260	3,624	5,200	18,300	1,062,557
2042.....	11,260	3,624	5,200	18,300	1,100,941
2043.....	11,260	3,624	5,200	18,300	1,139,325
2044.....	11,260	3,624	5,290	18,300	1,177,709
2045.....	11,260	3,624	5,200	18,300	1,216,093
2046.....	11,260	3,624	5,200	18,300	1,254,477
2047.....	11,260	3,624	0	18,300	1,287,061
2048.....	11,260	3,624	0	18,300	1,320,845
2049.....	11,260	3,624	0	18,300	1,354,029
2050.....	11,260	3,624	0	18,300	1,387,213
Total.....	703,360	169,553	130,000	384,300	1,387,213

¹ Based on 1906-65 hydrologic record.
² Hoover rate assumed to be 4 ml/ls per kilowatt-hour; \$600,000 annual in lieu of taxes payments not deducted.
³ Assumes no surplus prior to 2030; \$56 per acre-foot M. & I. rate after payout.
⁴ Differs slightly from figures in text of statement due to using rounded averages in original calculations.

Mr. ASPINALL. Mr. Secretary, what is the interest rate used in your financial studies of the central Arizona project?
Secretary UDALL. 3.225.

Mr. ASPINALL. What is the present interest rate under the interest formula that we have been using for the past several years relative to the acquisition of—

Mr. DOMINY. The present one, Mr. Chairman, that has been certified by the Treasury, is 3.253.

Mr. ASPINALL. Do you not think it would be better to update your studies and bring it in accordance with our present-day interest rates?

Secretary UDALL. I think it would. I am told that this is a new figure and we have not had time, apparently, to update

Mr. ASPINALL. Mr. Secretary, what is the date of the cost estimates you furnished us last year and what has been the increase in costs since those estimates were made?

Mr. DOMINY. October 1963, for the cost estimates that are in the reports we submitted to Congress. We can give you an updated figure.

Mr. ASPINALL. If you do not have it there—

Mr. DOMINY. We will provide it for the record if that is satisfactory.

Mr. ASPINALL. You give me an up-to-date record as of the last possible date of all the projects included in this testimony.

Mr. Chairman, I would ask that it be placed in the record at this point.

Mr. JOHNSON. Do I hear any objection?

Mr. HOSMER. Reserving the right to object, would that require a recomputation of the interest rate?

Mr. DOMINY. As I understand the chairman's request, he merely asks us to update the costs to the current levels.

Mr. HOSMER. I understand, however, that there is no construction contemplated before fiscal year 1970 and the completion of the project is projected for about 1979.

Would not those figures be more pertinent for our purposes than the this-year figures, Mr. Chairman?

Mr. ASPINALL. I cannot figure out 1979. I do not know whether it is going to go up or down. But I do think we ought to have up-to-date figures as far as our present thinking is concerned when we get to mark up this legislation.

Mr. HOSMER. Yes, but I say this project will commence in 1970. That bothers me about the interest rate, too, because we may be at the peak of interest rates at the present time and possibly the projected 1970 rates might be more pertinent than the ones for the current year.

If it is at all possible, I would hope that some explanation or additions to what the chairman has requested would be included to spell out these points.

Secretary UDALL. Congressman, we will give you the very latest figures that we can give you under the procedures we have always followed. We can only give you current data and we cannot project.

Mr. HOSMER. Well, you project the escalation in construction costs. I am sure that the Treasury Department must have some feeling about interest rates and so on. All I was asking is that if there is any elucidating material that might be applied to the actual construction period, it be furnished along with the figures that have been requested.

Secretary UDALL. We will do the best we can.

Mr. HOSMER. With that, I withdraw my reservation.

Mr. JOHNSON. You will furnish that to the committee?

Secretary UDALL. Yes; we will give you the best figures we can.

Mr. SAYLOR. Reserving the right to object, I would like to observe at this point that if we projected into the future and called upon the Department, I do not look for any decrease in interest rates, because anybody familiar with the 15-year formula will realize that the Government borrowed money at some of its lowest rates in 1953, 1954, and 1955 and that the increases which would occur thereafter if we expect to project this will not lower the interest rate on a 15-year average, but will increase it.

I withdraw my reservation.

Mr. HALEY. Reserving the right to object.

Mr. JOHNSON. The gentleman from Florida?

Mr. HALEY. Mr. Secretary, do you not think that in order to give a clear picture of what is involved here, we should have also included in your figures the present interest rate that the Federal Government is paying? After all, putting this over a 15-year period when interest rates were low, we know what they are today and the money you are going to have to borrow somewhere. I never quite understood where you got the figures—rather than figuring the interest on a 15-year security, you do not have the money, you borrow it today so you pay it at the present day's interest rate. I think you ought to have included in these figures, Mr. Chairman, the present interest rate we are paying today.

Secretary UDALL. We will be very happy to provide the latest current figures.

Mr. HALEY. I withdraw my reservation.
(The material referred to follows:)

CONSTRUCTION COSTS FOR POTENTIAL COLORADO PROJECTS INDEXED TO 1967 PRICE LEVELS
[In thousands of dollars]

Project	Construction cost	
	Feasibility report estimate	Indexed to 1967 price levels
Lower basin: Central Arizona project.....	719,217	779,050
Upper basin:		
Animas-La Plata.....	109,493	115,880
Dolores.....	46,643	53,850
San Miguel.....	67,815	73,140
West Divide.....	99,800	106,580
Dallas Creek.....	37,687	42,310

Based on the formula contained in the Water Supply Act of 1958, interest rates for the last five years are as follows:

	Interest rate
1964	3.046
1965	3.137
1966	3.222
1967	3.225
1968	3.253

Such rates have no effect on construction costs but have been used in demonstrating the financial feasibility of recent project proposals. We are unaware of any data that would permit the projection of such rates into the future.

Mr. JOHNSON. The gentleman from Colorado.

Mr. ASPINALL. Now, Mr. Secretary, we come to the hydrologic picture, the matter of water supply for the central Arizona project. That is what your estimate is based upon as far as that is concerned.

As I indicated to you in my letter, members of the committee have been confused by the different figures given them with respect to water supply. As you point out in your statement, these differences come about because of the differences in the three broad judgment assumptions that must be made—the magnitude of the runoff, the schedule of upper basin development, and the water losses along the river.

I think it is important that this record explain the differences in assumptions that make a difference in the central Arizona project water supply so that the members may judge for themselves which assumptions are more appropriate for use in planning additional development in the basin, the Bureau of Reclamation study or the Tipton study, and we have other studies.

As you know, Mr. Secretary, this committee for the past 20 years, since the gentleman from Pennsylvania and I have been members of the committee, has always insisted upon the demonstration of economic and fiscal feasibility for all projects we have approved. This committee has never approved a project where there was a serious question concerning availability of water. If this legislation is to be approved—and I hope it is—and taken to the floor, our most important single requirement is to have a full disclosure of the water supply situation so that our actions may be taken with all the facts in front of us. I am sure that you agree with me.

Secretary UDALL. I could not agree more, Mr. Chairman, with that statement.

Mr. ASPINALL. The use of water from the Colorado River system is governed by an international treaty, by the interstate compacts, by numerous judicial decisions, operating criteria, and agreements. The restrictive legal requirements and severe hydrologic limitations make it imperative that either the use of water be kept within the capability of the river's supply or that proposals for additional development be accompanied by immediate steps to augment the water supply.

Do you agree with this?

Secretary UDALL. I think that is also a fair statement.

Mr. ASPINALL. Before asking several questions with respect to the three assumptions in your statement, I would like to ask two in order to refresh the committee's recollection with respect to the central Arizona water supply.

First, what annual average amount of water is necessary to make the central Arizona project a success during its 50-year repayment period?

Mr. DOMINY. As we have testified previously, Mr. Chairman—

Mr. ASPINALL. I just want the amount.

Mr. DOMINY. It can go down to a very low figure in later years of the payout period when most of it would be used for municipal and industrial purposes. The critical requirement is to not reduce delivery at Lee Ferry below $8\frac{1}{4}$ million acre-feet per year on the average.

Mr. ASPINALL. Of course, Mr. Dominy, you are not going to get any members of this committee or the Congress by stating you are going to keep from the people of Arizona the amount of water that is necessary and that it is necessary for them to use. That is all I am asking as far as

this particular project is concerned. If you have a table there that you want to put into the record, we will put the table in. I do not want to argue with you. I just want the information in the record.

Secretary UDALL. Mr. Chairman, I think we should submit the information for the record at this point. I think your question is very precise and we will give you as precise an answer as we can.

Mr. ASPINALL. Mr. Chairman, I ask that this information be made a part of the record when it is received and I hope it will be received very soon.

Mr. JOHNSON. Is there objection?

Mr. HOSMER. Reserving the right to object, will that table include case A, B, C, D, and so forth?

Secretary UDALL. Yes, if necessary.

Mr. HOSMER. Depending upon what the changing assumed ratios of M. & I. and agriculture are?

Secretary UDALL. I think we should make it as complete as possible, anticipating the questions that have been foreshadowed here.

Mr. HOSMER. I withdraw my reservation.

Mr. BURTON of Utah. Reserving the right to object, we will not object, but I wonder if the Secretary can give us an indication when we might have this?

Hopefully, we are going to mark this bill up and do something with it this week.

Mr. ASPINALL. Let us refrain from setting any dates. The chairman will take that up later.

Mr. BURTON of Utah. I said "hopefully," Mr. Chairman. But I would like before we advance into the final stages, to have this information available to the committee.

Mr. ASPINALL. That is the reason I asked for it as soon as possible.

Secretary UDALL. If I may respond, our purpose is not to delay the committee in its deliberations in the slightest. We will give this a very high priority.

Mr. BURTON of Utah. I withdraw my reservation.

Mr. JOHNSON. Any other reservations?

You will get that information up so we may have it as soon as possible.

Secretary UDALL. Very shortly.

(The material referred to follows:)

The minimum average annual amount of water necessary to the economic and financial feasibility of the Central Arizona Project is about 450,000 acre-feet. This is the amount of water that would be available based on Colorado River runoff for the 46-year period 1922-1967, based on Mr. Tipton's projection of Upper Basin depletions, and assuming that the Upper Basin would contribute 750,000 acre-feet toward meeting Mexican water deliveries. The average water supply by years would be:

Year:	Acre-feet (1,000)
1979.....	1. MC
1990.....	570
2000.....	300
2030.....	284
Average 50-year period.....	450

A minimum delivery of 8,250,000 acre-feet annually at Lee Ferry is essential to the feasibility of CAP under the assumption of a 4.4 million acre-foot priority for California.

With the above water supply, the benefit-cost ratio for CAP, based on 100 years and total benefits, would be 1.3 to 1.0. A rate of \$63 per acre-foot for M&I water would be necessary without financial assistance from the Development Fund. With financial assistance from the Development Fund limited to Arizona's share, the M&I rate required would be \$57 per acre-foot.

Mr. ASPINALL. What average annual amount of water, Mr. Secretary, is necessary from the main stream for all lower basin uses in order to make the central Arizona project a success?

Secretary UDALL. Let us include this in the record rather than try to answer it at this time. We can give you the figure.

Mr. ASPINALL. I would ask unanimous consent to insert it here.

Mr. JOHNSON. It is so ordered.

(The material referred to follows:)

The average annual amount of water and the minimum annual amount of water needed from the main stream for all Lower Basin uses in order to make the Central Arizona Project feasible are both of the same general order of magnitude. At least 8,250,000 acre-feet annually are required. This amount would serve the following requirements:

Use	Amount
Delivery to Mexico-----	1,500,000
California-----	4,400,000
Nevada-----	246,000
Arizona main stem-----	1,230,000
Central Arizona project-----	1284,000
Net losses below Hoover Dam-----	590,000
Total-----	8,250,000

¹ This plus 50,000 acre-feet of other project water supply developed by CAP would be a firm supply to meet the revenue-producing M. & I. sales.

Inasmuch as net inflow between Lee Ferry and Lake Mead just about equals evaporation from Lake Mead, this means that the minimum regulated flow at Lee Ferry would need to be 8,250,000 acre-feet. With average runoff, the regulated flow at Lee Ferry will exceed 8,250,000 acre-feet for a number of years, at least into the 1980's. Thus, the average Lower Basin water supply would exceed the minimum required by a small amount due to early years of excess.

Mr. ASPINALL. Mr. Secretary, in your statement, you discussed first the matter of virgin runoff, pointing out that your estimates are based on the longest period of runoff on record which you have identified as the period starting in 1906 and continuing through today.

You show the average virgin runoff at Lee Ferry for this period as 14,965,000 acre-feet.

At the same time, you point out that the average virgin flow for the period since the signing of the Colorado River Compact in 1922 to the present time has been only 13,750,000 acre-feet. These figures themselves indicate the period 1906 to 1922 was a period of very high runoff.

Since the assumption you have made to include this period in your operations study is critical to the water supply of the central Arizona project, as I shall bring out later, I believe we need to examine further the Department's decision to include it.

Your statement supports the conclusion only by saying that you normally use the longest period of runoff for which you have records.

As I understand it, your records between 1906 and 1922 are based upon the stations on the San Juan River at Bluff and, on the Green River at Green River, Utah, and on the Colorado someplace around Cisco. Is this correct?

Mr. DOMINY. We have had measurements at Yuma on the lower river since 1903. We have had measurements at the points you mentioned on the upper river since 1906, although they are not continuous at all stations.

Mr. ASPINALL. You also had measurements on the river, did you not, Mr. Dominy, from 1896 to 1906?

Mr. DOMINY. Yes, at various places, but not complete enough, in our judgment, to—

Mr. ASPINALL. The 1906-67 period is not a conservative one. An earlier starting continuous period of greater average flow than the period starting in 1906 and including all following years' record is not to be found. Estimates are available by correlation that would have given an average of 14.8 million acre-feet for the longer 1896-1967 period, which, of course, is less than the average for 1906-67.

The water records for stations upstream from Lee Ferry are not continuous records. Several have been, themselves, derived partially by correlation estimates. For example: U.S. Geological Survey records for the San Juan River near Bluff, Utah, are for years 1915-18 and for 1927-67, and for the Colorado River near Cisco, Utah, only for years 1912-18 and 1923-67. The periods of missing records have been filled by estimates derived from statistical processes. Those partially synthesized records have again been used as sources of data in estimating part of the record of virgin flow at Lee Ferry.

But all of this water, as far as the supply of the river between 1896 and 1922, is based upon the correlated projection that you have made, is it not?

Mr. DOMINY. That is correct in relation to estimates of virgin runoff at Lee Ferry.

Mr. ASPINALL. Do you feel, Mr. Secretary, that the records you have for these early years are dependable?

Secretary UDALL. I think it obvious from the discussion here, that we feel the figures from 1906 are quite reliable, highly reliable. We have some figures for earlier years which we do not think are sufficiently reliable to use. I think that is a good way to put it.

Mr. ASPINALL. Are they as dependable as the records that you have since 1922?

Secretary UDALL. I think we would have to say that they are not.

Mr. ASPINALL. Are they as dependable—is either one of these three—1896 to 1906, 1906 to 1922, 1922 to 1929—are these records as dependable as the records you have since 1929?

Mr. DOMINY. I would like to say this, Mr. Chairman, that since we have definite recordings at Lee Ferry since 1922 and we have been able to go back and collate the old records back to 1906 as compared to the actual records since 1922 at the lower and upper stations, we have enough reliability in the figures from 1906 to 1922 to justify their inclusion in this long-term hydrologic record.

Mr. ASPINALL. According to the Department's 1947 report, "the Colorado River"—and I am placing this in not for argumentative purposes, but just to make a record—I quote from that report:

For the years 1902 to 1921, inclusive, the estimate (Lee Ferry) considered both tributary flows and flows of downstream gauging stations with due allowance for both measured and unmeasured gains and losses between Lee Ferry and the point of measurement. When basing the estimate on the Yuma records, allowances were made for the flow of the Gila River at its mouth for diversion by the Yuma Project.

That was in 1947.

As far as your memory is concerned, Mr. Dominy, that was the position of the Bureau at that time, was it not?

Mr. DOMINY. Yes, sir.

Mr. ASPINALL. All I am trying to do is get the record. You see, what bothers some of us on the committee, Mr. Secretary, and the members of the committee staff, is that when we begin to talk about a project authorization we also have the best information possible in favor of the project. I want this project to be a success. I want it to serve the area and not disturb other users on the Colorado River in the future. As far as I am concerned, I just want to be sure we know what we are doing.

Mr. Secretary, can you imagine spilling an average of more than a million acre-feet of water annually from a completely full Lake Powell, water which, as I understand your operation study, the upper basin would not get credit for? That in fact is what the summary of your operation study shows, is it not?

This is the guts of this whole matter and I want a straightforward answer. If you want to have permission to change your answer or modify it before the final record is printed, this will be all right with me.

Secretary UDALL. Mr. Chairman, this issue is so important, I would like Mr. Riter, who is one of our specialists, to answer the question. I also would like to put in an explicit and exact answer to this question so that as far as the Department is concerned, there is nothing left uncertain.

Mr. ASPINALL. I would ask unanimous consent that the Secretary's request be granted.

I would also like to hear from Mr. Randy Riter. On the other hand, I want to hear from the Department.

Mr. JOHNSON. Is there objection?

Mr. HOSMER. Reserving the right to object, would the Chairman restate the question so we have it firmly in mind?

Mr. ASPINALL. The question is as follows:

Can you imagine spilling an average of more than a million acre-feet of water annually from a completely full Lake Powell, water which, as I understand the operation study, the upper basin would not get credit for?

In other words, they base the future of the central Arizona project now proposed on the spillage of a million acre-feet of water from Lake Powell starting sometime in the future and continuing annually thereafter. I wanted the answer and we will get it completely as far as that is concerned, with the promise of the Secretary and now from Mr. Riter.

Mr. HOSMER. I withdraw my reservation.

Mr. JOHNSON. The reservation is withdrawn.

Are you ready to testify, Mr. Riter?

Mr. RITER. Yes.

I am quoting from page 236 of the hearings before this subcommittee, dated from August 23 to September 1, 1965. This shows the following average annual spills which are averages for a 60-year period of study.

Mr. ASPINALL. Whose projections are these?

Mr. RITER. These are projections of the Bureau of Reclamation.

Mr. ASPINALL. I just wanted this committee to know that.

Mr. RITER. The table on page 236 of the 1965 hearings shows that the spills from Lake Mead as of year 1975 average 653,000 acre-feet for the year 1990, the spills from Lake Mead average 269,000 acre-feet per year, for the year 2000, the spills from Lake Mead are shown to be 148,000 acre-feet per year, and for the year 2030, these spills are listed as averaging 158,000 acre-feet per year. These all reflect average conditions.

I would like also to qualify them to this extent: these computations assumed a 60-year runoff cycle—1906 through 1965, inclusive. In each one of these studies, we repeated this hydrologic cycle for the projected level of development of the year involved.

If you examine the details year by year, you will find a good many years when there was no spill. Values shown are averages for a 60-year period.

Mr. ASPINALL. Mr. Chairman, I would ask unanimous consent that complete operation studies be placed in the record at this place.

Mr. BURTON of Utah. May I reserve the right to object, please!

Mr. JOHNSON. The gentleman from Utah.

Mr. BURTON of Utah. The spillage Mr. Riter has told us about is over a 60-year period and embraces a period when by and large, the upper basin projects were not operative.

Is this correct?

Mr. ASPINALL. This is correct.

Mr. BURTON of Utah. So the million acre-feet that is being spilled on a yearly basis would largely be upper basin water.

Is that not a correct assumption?

Mr. ASPINALL. I think this is correct. On the other hand, they will furnish the information for us to take up in committee.

Mr. BURTON of Utah. I just wanted to have that clear in my mind, Mr. Chairman.

Mr. ASPINALL. I think the gentleman is correct.

Mr. BURTON of Utah. I withdraw my reservation.

Mr. HOSMER. Further reserving the right to object, the Secretary introduced a factor of 24- and 48-year historic dry cycle on the river and the historic average of a 24-year wet cycle. If you take the mean 24- and 48-year historic dry cycle at 36 years plus 24 years wet cycle, that gives you a 60-year full cycle. As this averaging has been done on a 60-year cycle, does this take cognizance of these wet and dry cycles in the sense that there might be a better time to start the cycle as an independent calculation, assuming that we are now at some point in the cycle, and work out the years ahead on that basis, rather than just averaging out as you have done?

Secretary UDALL. Congressman, that is an interesting question. The reason we included the tree-ring studies, which I think are considered scientifically sound, is to show what the real long-term trend has been.

The interesting thing about this 60-year period is we have had both an unusually extended dry cycle and a major wet cycle embraced within it.

Now, this does not mean necessarily that we are going into a major wet cycle. We might go into a minor wet cycle, or a minor dry cycle.

Mr. ASPINALL. What I am trying to get at is that there are alternative ways of using this information that could give us comparative figures for different assumptions.

Would that be of any value in trying to estimate this water supply over the particular period of time rather than an arbitrary 60 years that starts some place and ends some place depending on who happened to start keeping records at the particular time in 1922?

Secretary UDALL. You can use any assumptions you want. If one wants to be optimistic, he can use certain assumptions or if he wants to be pessimistic, he can use others. But we have tried in our calculations to stick to the knowns as much as possible in terms of the calculations that we have made.

Mr. ASPINALL. That give you the most optimistic figure possible?

Secretary UDALL. No, I do not think it does. Since we are in the end of a long and severe dry cycle.

Mr. ASPINALL. There is no way to average it any higher than 14.96.

Mr. DOMINY. If you use the whole period of record, that is it. But some people are arguing that we should use records only since 1922 and throw out the period 1906 to 1922, which was the period of high runoff. If you are going to argue that way, why not leave out the last 5 or 6 years that have been a period of low runoff?

Yet we have added in these last years to be consistent. We believe the longest period of major record is the right period to use in projections of stream flow runoff.

Mr. ASPINALL. If it does in fact coincide with these long-range wet and dry cycles.

Mr. HOSMER. I withdraw my reservation.

Mr. JOHNSON. Any further reservations?

(No response.)

Mr. JOHNSON. If not, Mr. Secretary, you will get that to the committee also?

Secretary UDALL. Yes.

(The material referred to follows :)

SUMMARY OF OPERATIONS—LAKE POWELL								
1975 CONDITIONS								
[Unit—1,000 acre-feet]								
Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
(1)	Unregu- lated (2)	Regulated by upstream reservoir (3)		Sched- uled (5)	Other (6)			
1906.....	15,093	14,072	422	9,550	0	0	18,976	3,631
1907.....	18,837	17,625	547	9,550	0	0	26,504	3,682
1908.....	9,553	9,557	607	9,550	0	0	25,904	3,671
1909.....	18,851	18,027	641	9,550	3,178	1,415	29,147	3,686
1910.....	10,793	10,710	668	9,550	492	0	29,147	3,686
1911.....	12,362	12,438	670	9,550	1,774	444	29,147	3,686
1912.....	16,316	15,956	673	9,550	3,178	2,555	29,147	3,686
1913.....	10,985	10,872	669	9,550	653	0	29,147	3,686
1914.....	16,952	16,795	674	9,550	3,178	3,393	29,147	3,686
1915.....	10,582	10,859	668	9,550	641	0	29,147	3,686
1916.....	15,136	14,598	672	9,550	3,178	1,198	29,147	3,686
1917.....	19,414	19,292	676	9,550	3,178	5,888	29,147	3,686
1918.....	11,764	11,606	669	9,550	1,110	277	29,147	3,686
1919.....	9,233	9,841	662	9,550	0	0	28,776	3,685
1920.....	17,584	17,169	675	9,550	3,178	3,395	29,147	3,686
1921.....	18,547	17,989	675	9,550	3,178	4,586	29,147	3,686
1922.....	14,362	14,261	672	9,550	3,178	861	29,147	3,686
1923.....	14,328	14,157	672	9,550	3,178	787	29,147	3,686
1924.....	10,752	10,696	668	9,550	478	0	29,147	3,686
1925.....	9,722	9,555	660	9,550	0	0	28,492	3,686
1926.....	12,182	12,320	668	9,550	1,158	289	29,147	3,686
1927.....	14,614	14,174	672	9,550	3,162	790	29,147	3,686
1928.....	13,486	13,384	671	9,550	2,530	633	29,147	3,686
1929.....	17,115	17,080	674	9,550	3,178	3,678	29,147	3,686
1930.....	11,377	11,137	669	9,550	918	0	29,147	3,686
1931.....	5,070	6,031	614	9,550	0	0	25,014	3,672
1932.....	13,428	13,163	618	9,550	0	0	28,009	3,681
1933.....	8,236	8,573	626	9,550	0	0	26,406	3,682
1934.....	3,183	4,226	549	9,550	0	0	20,533	3,642
1935.....	8,429	8,603	478	9,550	0	0	19,108	3,631
1936.....	10,375	9,710	462	9,550	0	0	18,806	3,630
1937.....	10,323	10,146	460	9,550	0	0	18,942	3,630
1938.....	13,702	13,221	500	9,550	0	0	22,113	3,653
1939.....	7,971	8,005	504	9,550	0	0	20,064	3,630
1940.....	5,784	6,567	448	9,550	0	0	16,633	3,612
1941.....	14,234	13,921	459	9,550	0	0	20,545	3,642
1942.....	15,080	14,779	547	9,550	0	0	25,227	3,673
1943.....	9,763	9,200	580	9,550	0	0	24,297	3,669
1944.....	11,606	11,216	584	9,550	0	0	25,379	3,675
1945.....	10,044	10,074	593	9,550	0	0	25,310	3,674
1946.....	7,403	7,180	560	9,550	0	0	22,380	3,656
1947.....	11,877	10,970	543	9,550	0	0	23,257	3,662
1948.....	11,994	11,922	568	9,550	0	0	25,064	3,672
1949.....	12,687	12,678	612	9,550	0	0	27,577	3,688
1950.....	9,599	8,577	618	9,550	0	0	25,886	3,671
1951.....	8,633	8,476	585	9,550	0	0	24,327	3,663
1952.....	16,442	16,299	624	9,550	1,044	261	29,147	3,686
1953.....	7,618	7,825	641	9,550	0	0	26,781	3,684
1954.....	4,958	5,445	568	9,550	0	0	22,108	3,653
1955.....	6,314	6,899	489	9,550	0	0	18,968	3,631
1956.....	7,705	7,343	431	9,550	0	0	16,330	3,613
1957.....	15,954	15,123	463	9,550	0	0	21,440	3,643
1958.....	12,743	12,858	542	9,550	0	0	24,206	3,668
1959.....	5,810	6,161	524	9,550	0	0	20,293	3,640
1960.....	8,153	8,744	471	9,550	0	0	19,016	3,620
1961.....	5,670	6,727	427	9,550	0	0	15,786	3,606
1962.....	13,508	13,041	432	9,550	0	0	18,825	3,630
1963.....	5,625	6,447	423	9,550	0	0	15,299	3,602
1964.....	7,169	7,450	360	9,550	0	0	12,859	3,578
1965.....	13,500	11,333	346	9,550	0	0	14,276	3,583
Total:								
1953-64.....	101,227	104,063	5,771	114,600	0	0	-16,308	.....
1931-64.....	327,090	327,600	17,903	324,700	1,044	261	-16,308	.....
1906-65.....	690,530	683,703	34,543	573,000	45,710	30,450	0	.....
Average:								
1953-64.....	8,435	8,672	481	9,550	0	0	-1,359	.....
1931-64.....	9,621	9,634	526	9,550	31	7	-480	.....
1906-65.....	11,509	11,395	576	9,550	762	507	0	.....

SUMMARY OF OPERATIONS—LAKE POWELL
1990 CONDITIONS
[Unit—1,000 acre-feet]

Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet)
	Unregu- lated	Regulated by upstream reservoir		Sched- uled	Other			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906	14,108	13,266	419	8,750	0	0	17,380	3,628
1907	17,714	16,607	537	8,750		0	24,700	3,682
1908	8,730	8,810	609	8,750	0	0	24,151	3,678
1909	17,765	16,654	641	8,750	3,056	764	27,594	3,698
1910	9,942	9,907	674	8,750	483	0	27,594	3,698
1911	11,455	11,604	674	8,750	1,744	436	27,594	3,698
1912	15,277	14,836	674	8,750	3,553	1,859	27,594	3,698
1913	10,120	9,969	674	8,750	545	0	27,594	3,698
1914	15,894	15,737	674	8,750	3,553	2,760	27,594	3,698
1915	9,731	10,078	674	8,750	654	0	27,594	3,698
1916	14,130	13,522	674	8,750	3,278	820	27,594	3,698
1917	18,266	18,144	674	8,750	3,553	5,167	27,594	3,698
1918	10,876	10,718	674	8,750	1,035	259	27,594	3,698
1919	8,429	9,098	670	8,750	0	0	27,272	3,696
1920	16,502	16,172	670	8,750	3,553	2,877	27,594	3,698
1921	17,431	16,728	674	8,750	3,553	3,751	27,594	3,698
1922	13,380	13,279	674	8,750	3,084	771	27,594	3,698
1923	13,346	13,175	674	8,750	3,001	750	27,594	3,698
1924	9,901	9,923	674	8,750	499	0	27,594	3,698
1925	8,899	8,810	670	8,750	0	0	26,984	3,693
1926	11,275	11,488	670	8,750	1,165	291	27,594	3,698
1927	13,627	13,190	674	8,750	3,013	753	27,594	3,698
1928	12,541	12,232	674	8,750	2,246	562	27,594	3,698
1929	16,053	15,993	674	8,750	3,553	3,016	27,594	3,698
1930	10,497	10,271	674	8,750	847	0	27,594	3,698
1931	4,402	5,424	635	8,750	0	0	23,633	3,674
1932	12,483	12,290	622	8,750	0	0	26,551	3,692
1933	7,455	7,859	639	8,750	0	0	25,021	3,683
1934	2,576	3,807	562	8,750	0	0	19,516	3,645
1935	7,648	7,751	487	8,750	0	0	18,030	3,635
1936	9,528	8,946	468	8,750	0	0	17,758	3,633
1937	9,476	9,375	468	8,750	0	0	17,915	3,635
1938	12,753	12,352	502	8,750	0	0	21,015	3,656
1939	7,204	7,308	495	8,750	0	0	19,078	3,642
1940	5,088	5,972	460	8,750	0	0	15,840	3,618
1941	13,266	12,981	467	8,750	0	0	19,604	3,645
1942	14,074	13,851	552	8,750	0	0	24,153	3,677
1943	8,936	8,261	588	8,750	0	0	23,076	3,670
1944	10,722	10,412	588	8,750	0	0	24,150	3,678
1945	9,334	9,238	600	8,750	0	0	24,038	3,676
1946	6,652	6,631	567	8,750	0	0	21,352	3,659
1947	10,989	10,093	551	8,750	0	0	22,144	3,664
1948	11,092	11,060	579	8,750	0	0	23,875	3,675
1949	11,766	11,632	618	8,750	0	0	26,139	3,689
1950	8,776	7,854	628	8,750	0	0	24,615	3,680
1951	7,882	7,329	592	8,750	0	0	22,602	3,667
1952	15,393	14,912	622	8,750	548	0	27,594	3,698
1953	6,867	7,175	654	8,750	0	0	25,365	3,685
1954	4,290	4,855	580	8,750	0	0	20,890	3,655
1955	5,595	6,256	498	8,750	0	0	17,898	3,634
1956	6,943	6,685	440	8,750	0	0	15,393	3,614
1957	14,914	14,099	466	8,750	0	0	20,276	3,651
1958	11,817	12,005	550	8,750	0	0	22,981	3,670
1959	5,114	5,501	538	8,750	0	0	19,194	3,643
1960	7,372	7,665	480	8,750	0	0	17,629	3,631
1961	4,983	5,903	430	8,750	0	0	14,352	3,605
1962	12,563	11,894	420	8,750	0	0	17,076	3,627
1963	4,938	5,939	420	8,750	0	0	13,845	3,600
1964	6,426	8,901	365	8,750	0	0	11,631	3,577
1965	12,563	10,761	359	8,750	0	0	13,283	3,595
Total:								
1953-64	91,822	94,878	5,841	105,000	0	0	-15,963	
1931-64	299,317	300,216	18,131	297,500	548	0	-15,963	
1906-65	637,769	631,186	34,834	525,000	46,516	24,836	0	
Average:								
1953-64	7,652	7,906	487	8,750	0	0	-1,330	
1931-64	8,803	8,830	533	8,750	16	0	-470	
1906-65	10,629	10,519	580	8,750	775	414	0	

CHLORINE ENTER BASIN PROJECT
SUMMARY OF OPERATIONS—LAKE POWELL
NEW CONDUITS
Post-1906-1907

Year	Inflow		Outflow	Power output		Net	Total
	Q	ft		Q	ft		
1906							
1907							
1908							
1909							
1910							
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1964							
1965							
Total:							
1953-64	88,261	90,518	5,403	102,960	0	0	-17,845
1931-64	288,605	288,804	17,765	291,720	0	0	-20,681
1906-65	617,928	611,473	34,919	514,800	40,493	21,261	0
Average:							
1953-64	7,355	7,543	450	8,580	0	0	-1,487
1931-64	8,488	8,494	523	8,580	0	0	-608
1906-65	10,299	10,191	582	8,580	675	354	0

SUMMARY OF OPERATIONS—LAKE POWELL
2030 CONDITIONS
[Unit—1,000 acre-feet]

Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
	Unregu- lated	Regulated by upstream reservoir (3)		Sched- uled	Other			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906	13,508	12,868	332	8,230	0	0	10,190	3,596
1907	16,816	15,735	483	8,230	0	0	17,212	3,656
1908	8,078	8,177	563	8,230	0	0	06,596	3,650
1909	16,895	15,746	637	8,230	0	0	23,475	3,695
1910	9,261	9,294	717	8,230	115	0	23,707	3,698
1911	10,732	10,905	724	8,230	1,561	390	23,707	3,698
1912	14,449	14,036	724	8,230	3,794	1,288	23,707	3,698
1913	9,432	9,082	724	8,230	128	0	23,707	3,698
1914	15,052	14,895	724	8,230	3,794	2,147	23,707	3,698
1915	9,050	9,420	724	8,230	466	0	23,707	3,698
1916	13,330	12,735	724	8,230	3,015	766	23,707	3,698
1917	13,353	17,198	724	8,230	3,794	4,450	23,707	3,698
1918	10,167	10,009	724	8,230	1,000	55	23,707	3,698
1919	7,791	8,475	712	8,230	0	0	23,240	3,695
1920	15,639	15,346	712	8,230	3,794	2,143	23,707	3,698
1921	16,547	15,843	724	8,230	3,794	3,095	23,707	3,698
1922	12,601	12,458	724	8,230	2,803	701	23,707	3,698
1923	12,567	12,396	724	8,230	2,754	688	23,707	3,698
1924	9,221	9,268	724	8,230	314	0	23,707	3,698
1925	8,247	8,178	708	8,230	0	95	22,947	3,693
1926	10,552	10,793	708	8,230	1,000	23,707	23,707	3,698
1927	12,841	12,382	724	8,230	2,742	686	23,707	3,698
1928	11,790	11,421	724	8,230	1,874	593	23,707	3,698
1929	15,204	15,219	724	8,230	3,794	2,471	23,707	3,698
1930	9,802	9,527	724	8,230	573	0	23,707	3,698
1931	3,869	5,013	677	8,230	0	0	19,813	3,673
1932	11,732	11,452	663	8,230	0	0	22,372	3,688
1933	6,838	7,259	674	8,230	0	0	20,727	3,679
1934	2,092	3,444	584	8,230	0	0	15,357	3,642
1935	7,031	7,043	503	8,230	0	0	13,667	3,628
1936	8,854	8,293	478	8,230	0	0	13,252	3,625
1937	8,802	8,720	473	8,230	0	0	13,269	3,625
1938	11,995	11,614	506	8,230	0	0	16,147	3,648
1939	6,594	6,615	517	8,230	0	0	14,015	3,630
1940	4,533	5,439	445	8,230	0	0	10,779	3,604
1941	12,494	12,022	447	8,230	0	0	14,124	3,632
1942	13,274	13,071	545	8,230	0	0	18,420	3,664
1943	8,277	7,624	587	8,230	0	0	17,227	3,656
1944	10,020	9,730	582	8,230	0	0	18,145	3,662
1945	8,535	8,457	590	8,230	0	0	17,782	3,660
1946	6,054	6,160	552	8,230	0	0	15,160	3,638
1947	10,280	9,616	531	8,230	0	0	16,015	3,646
1948	10,376	10,251	555	8,230	0	0	17,481	3,657
1949	11,036	10,921	597	8,230	0	0	19,575	3,672
1950	8,124	7,328	604	8,230	0	0	18,069	3,662
1951	7,284	6,863	563	8,230	0	0	16,139	3,648
1952	14,556	13,664	597	8,230	0	0	20,976	3,681
1953	6,269	6,703	629	8,230	0	0	18,820	3,670
1954	3,757	4,447	555	8,230	0	0	14,482	3,633
1955	5,026	5,811	464	8,230	0	0	11,599	3,610
1956	6,339	6,210	395	8,230	0	0	9,184	3,584
1957	14,093	12,882	420	8,230	0	0	13,416	3,626
1958	11,079	11,385	509	8,230	0	0	16,062	3,647
1959	4,559	5,171	498	8,230	0	0	12,505	3,618
1960	6,755	6,854	428	8,230	0	0	10,701	3,601
1961	4,435	5,264	359	8,230	0	0	7,376	3,562
1962	11,812	11,058	348	8,230	0	0	9,856	3,592
1963	4,388	5,404	338	8,230	0	0	6,692	3,551
1964	5,837	6,220	255	8,230	0	0	4,427	3,518
1965	11,804	9,922	235	8,230	0	0	5,884	3,538
Total:								
1953-64	84,349	87,409	5,198	98,760	0	0	-16,549	
1931-64	276,999	278,008	17,468	279,820	0	0	-19,280	
1906-65	595,728	589,336	34,859	493,800	41,109	19,568	0	
Average:								
1953-64	7,029	7,284	433	8,230	0	0	-1,379	
1931-64	8,147	8,177	514	8,230	0	0	-567	
1906-65	9,929	9,823	582	8,230	685	326	0	

¹Includes 15 percent bank storage but excludes the portion of the original storage capacity impaired by sediment encroachment.

SUMMARY OF OPERATIONS—LAKE POWELL
2000 CONDITIONS
[Unit—1,000 acre-feet]

Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
	Unregu- lated (2)	Regulated by upstream reservoir (3)		Sched- uled (5)	Other (6)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906.....	13,723	13,254	361	8,580	0	0	12,224	3,582
1907.....	17,286	16,205	490	8,580	0	0	19,359	3,652
1908.....	8,798	8,897	564	8,580	0	0	19,112	3,640
1909.....	17,350	16,201	628	8,580	0	0	26,105	3,685
1910.....	9,618	9,651	704	8,580	0	0	26,472	3,687
1911.....	11,110	11,283	707	8,580	1,527	382	26,559	3,688
1912.....	14,883	14,470	707	8,580	3,631	1,552	26,559	3,688
1913.....	9,793	9,443	707	8,580	156	0	26,559	3,688
1914.....	15,492	15,335	707	8,580	3,631	2,417	26,559	3,688
1915.....	9,406	9,776	707	8,580	489	0	26,559	3,688
1916.....	13,748	13,153	707	8,580	3,093	773	26,559	3,688
1917.....	17,831	17,676	707	8,580	3,631	4,758	26,559	3,688
1918.....	10,538	10,380	707	8,580	1,000	93	26,559	3,688
1919.....	8,125	8,809	705	8,580	0	0	26,083	3,685
1920.....	16,091	15,798	705	8,580	3,631	2,406	26,559	3,688
1921.....	17,010	16,306	707	8,580	3,631	3,388	26,559	3,688
1922.....	13,008	12,865	707	8,580	2,862	716	26,559	3,688
1923.....	12,975	12,804	707	8,580	2,814	703	26,559	3,688
1924.....	9,576	9,623	707	8,580	336	0	26,559	3,688
1925.....	8,588	8,519	704	8,580	0	0	25,794	3,684
1926.....	10,930	11,171	704	8,580	1,000	122	26,559	3,688
1927.....	13,252	12,793	707	8,580	2,805	701	26,559	3,688
1928.....	12,183	11,814	707	8,580	2,022	505	26,559	3,688
1929.....	15,648	15,663	707	8,580	3,631	2,745	26,559	3,688
1930.....	10,165	9,890	707	8,580	603	0	26,559	3,688
1931.....	4,149	5,245	660	8,580	0	0	22,564	3,673
1932.....	12,124	11,891	648	8,580	0	0	25,227	3,688
1933.....	7,161	7,582	650	8,580	0	0	23,579	3,688
1934.....	2,345	3,649	587	8,580	0	0	18,061	3,645
1935.....	7,355	7,414	515	8,580	0	0	16,380	3,635
1936.....	9,208	8,647	488	8,580	0	0	15,959	3,635
1937.....	9,155	9,073	497	8,580	0	0	15,955	3,635
1938.....	12,391	12,010	522	8,580	0	0	18,863	3,640
1939.....	6,914	6,935	528	8,580	0	0	16,680	3,635
1940.....	4,823	5,681	470	8,580	0	0	13,321	3,602
1941.....	12,897	12,471	472	8,580	0	0	16,740	3,632
1942.....	13,692	13,489	552	8,580	0	0	21,097	3,681
1943.....	8,622	7,969	586	8,580	0	0	19,900	3,686
1944.....	10,387	10,097	582	8,580	0	0	20,835	3,682
1945.....	8,883	8,805	587	8,580	0	0	20,473	3,680
1946.....	6,366	6,424	557	8,580	0	0	17,760	3,640
1947.....	10,652	9,940	538	8,580	0	0	18,582	3,645
1948.....	10,750	10,719	562	8,580	0	0	20,159	3,657
1949.....	11,417	11,302	595	8,580	0	0	22,286	3,672
1950.....	8,465	7,621	603	8,580	0	0	20,724	3,662
1951.....	7,596	7,127	569	8,580	0	0	18,702	3,647
1952.....	14,992	14,195	594	8,580	0	0	23,723	3,688
1953.....	6,582	6,968	625	8,580	0	0	21,486	3,686
1954.....	4,036	4,678	562	8,580	0	0	17,022	3,634
1955.....	5,324	6,061	480	8,580	0	0	14,023	3,600
1956.....	6,655	6,478	420	8,580	0	0	11,501	3,585
1957.....	14,524	13,499	443	8,580	0	0	15,977	3,635
1958.....	11,465	11,671	518	8,580	0	0	18,550	3,646
1959.....	4,849	5,313	507	8,580	0	0	14,776	3,635
1960.....	7,078	7,124	444	8,580	0	0	12,976	3,590
1961.....	4,722	5,451	382	8,580	0	0	9,385	3,583
1962.....	12,205	11,351	373	8,580	0	0	11,763	3,583
1963.....	4,677	5,545	358	8,580	0	0	8,370	3,540
1964.....	6,144	6,379	291	8,580	0	0	5,878	3,532
1965.....	12,196	10,890	277	8,580	0	0	7,911	3,522
Total:								
1953-64.....	88,261	90,518	5,403	102,960	0	0	-17,845	.....
1931-64.....	288,605	288,804	17,765	291,720	0	0	-20,681	.....
1906-65.....	617,928	611,473	34,919	514,800	40,493	21,261	0	.....
Average:								
1953-64.....	7,355	7,543	450	8,580	0	0	-1,487	.....
1931-64.....	8,488	8,494	523	8,580	0	0	-609	.....
1906-65.....	10,299	10,191	582	8,580	675	354	0	.....

SUMMARY OF OPERATIONS—LAKE POWELL
2030 CONDITIONS
[Unit—1,000 acre-feet]

Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
	Unregu- lated (2)	Regulated by upstream reservoir (3)		Sched- uled (5)	Other (6)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906.....	13,508	12,868	332	8,230	0	0	10,190	3,596
1907.....	16,816	15,735	483	8,230	0	0	17,212	3,656
1908.....	8,078	8,177	563	8,230	0	0	06,596	3,650
1909.....	16,895	15,746	637	8,230	0	0	23,475	3,695
1910.....	9,261	9,294	717	8,230	115	0	23,707	3,698
1911.....	10,732	10,905	724	8,230	1,561	390	23,707	3,698
1912.....	14,449	14,036	724	8,230	3,794	1,288	23,707	3,698
1913.....	9,432	9,082	724	8,230	128	0	23,707	3,698
1914.....	15,052	14,895	724	8,230	3,794	2,147	23,707	3,698
1915.....	9,050	9,420	724	8,230	466	0	23,707	3,698
1916.....	13,330	12,735	724	8,230	3,015	766	23,707	3,698
1917.....	13,353	17,198	724	8,230	3,794	4,450	23,707	3,698
1918.....	10,167	10,009	724	8,230	1,000	55	23,707	3,698
1919.....	7,791	8,475	712	8,230	0	0	23,240	3,695
1920.....	15,639	15,346	712	8,230	3,794	2,143	23,707	3,698
1921.....	16,547	15,843	724	8,230	3,794	3,095	23,707	3,698
1922.....	12,601	12,458	724	8,230	2,803	701	23,707	3,698
1923.....	12,567	12,396	724	8,230	2,754	688	23,707	3,698
1924.....	9,221	9,268	724	8,230	314	0	23,707	3,698
1925.....	8,247	8,178	708	8,230	0	0	22,947	3,693
1926.....	10,552	10,793	708	8,230	1,000	95	23,707	3,698
1927.....	12,841	12,382	724	8,230	2,742	686	23,707	3,698
1928.....	11,790	11,421	724	8,230	1,874	593	23,707	3,698
1929.....	15,204	15,219	724	8,230	3,794	2,471	23,707	3,698
1930.....	9,802	9,527	724	8,230	573	0	23,707	3,698
1931.....	3,869	5,013	677	8,230	0	0	19,813	3,673
1932.....	11,732	11,452	663	8,230	0	0	22,372	3,688
1933.....	6,838	7,259	674	8,230	0	0	20,727	3,679
1934.....	2,092	3,444	584	8,230	0	0	15,357	3,642
1935.....	7,031	7,043	503	8,230	0	0	13,667	3,628
1936.....	8,854	8,293	478	8,230	0	0	13,252	3,625
1937.....	8,802	8,720	473	8,230	0	0	13,269	3,625
1938.....	11,995	11,614	506	8,230	0	0	16,147	3,648
1939.....	6,594	6,615	517	8,230	0	0	14,015	3,630
1940.....	4,533	5,439	445	8,230	0	0	10,779	3,604
1941.....	12,494	12,022	447	8,230	0	0	14,124	3,632
1942.....	13,274	13,071	545	8,230	0	0	18,420	3,664
1943.....	8,277	7,624	587	8,230	0	0	17,227	3,656
1944.....	10,020	9,730	582	8,230	0	0	18,145	3,662
1945.....	8,535	8,457	590	8,230	0	0	17,782	3,660
1946.....	6,054	6,160	552	8,230	0	0	15,160	3,638
1947.....	10,280	9,616	531	8,230	0	0	16,015	3,646
1948.....	10,376	10,251	555	8,230	0	0	17,481	3,657
1949.....	11,036	10,921	597	8,230	0	0	19,575	3,672
1950.....	8,124	7,328	604	8,230	0	0	18,069	3,662
1951.....	7,284	6,863	563	8,230	0	0	16,139	3,648
1952.....	14,556	13,664	597	8,230	0	0	20,976	3,681
1953.....	6,269	6,703	629	8,230	0	0	18,820	3,670
1954.....	3,757	4,447	555	8,230	0	0	14,482	3,633
1955.....	5,026	5,811	464	8,230	0	0	11,599	3,610
1956.....	6,339	6,210	395	8,230	0	0	9,184	3,584
1957.....	14,093	12,882	420	8,230	0	0	13,416	3,626
1958.....	11,079	11,385	509	8,230	0	0	16,062	3,647
1959.....	4,559	5,171	498	8,230	0	0	12,505	3,618
1960.....	6,755	6,854	428	8,230	0	0	10,701	3,601
1961.....	4,435	5,264	359	8,230	0	0	7,376	3,562
1962.....	11,812	11,058	348	8,230	0	0	9,856	3,592
1963.....	4,388	5,404	338	8,230	0	0	6,692	3,551
1964.....	5,837	6,220	255	8,230	0	0	4,427	3,518
1965.....	11,804	9,922	235	8,230	0	0	5,884	3,538
Total:								
1953-64.....	84,349	87,409	5,198	98,760	0	0	-16,549	-----
1931-64.....	276,999	278,008	17,468	279,820	0	0	-19,280	-----
1906-65.....	595,728	589,336	34,859	493,800	41,109	19,568	0	-----
Average:								
1953-64.....	7,029	7,284	433	8,230	0	0	-1,379	-----
1931-64.....	8,147	8,177	514	8,230	0	0	-567	-----
1906-65.....	9,929	9,823	582	8,230	685	326	0	-----

¹ Includes 15 percent bank storage but excludes the portion of the original storage capacity impaired by sediment encroachment.

LOWER COLORADO RIVER BASIN OPERATION STUDY
DEVELOPMENT CONDITIONS, 1975
[Period of record, 1906-65. Units, 1,000 acre-feet]

Year	Lake Mead operation					Distribution of scheduled release							
	Glen Canyon release	Net gain, Glen Canyon-Lake Mead	Total inflow, Lake Mead	Evaporation, Lake Mead	Scheduled release, Hoover Dam	Spill, Hoover Dam	End of year content, Lake Mead	Nevada-Mexico losses	California entitlement	Arizona entitlement	Available to CAP	Diversion limited to 1,200	Diversion limited to 2,500
1906	9,550	796	10,350	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
1907	9,550	796	10,350	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
1908	9,550	796	10,350	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
1909	14,143	796	14,940	770	9,650	0	18,150	2,140	4,555	2,955	1,935	1,200	1,935
1910	10,042	796	10,840	840	9,650	0	18,500	2,140	4,555	2,955	1,935	1,200	1,935
1911	11,765	796	12,560	880	9,650	0	20,530	2,140	4,555	2,955	1,935	1,200	1,935
1912	15,283	796	16,080	970	10,780	0	24,860	2,140	5,120	3,520	2,500	1,200	2,500
1913	10,203	796	11,000	1,020	10,780	0	24,860	2,140	5,120	3,520	2,500	1,200	2,500
1914	16,121	2,098	18,220	1,040	10,780	4,560	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1915	10,121	2,538	12,700	1,070	10,780	930	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1916	13,926	1,504	15,430	1,070	10,780	3,580	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1917	18,616	1,135	19,750	1,070	10,780	6,630	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1918	10,937	389	11,330	1,060	10,780	0	23,390	2,140	5,120	3,520	2,500	1,200	2,500
1919	9,550	709	10,260	1,030	10,780	0	23,840	2,140	5,120	3,520	2,500	1,200	2,500
1920	16,123	2,397	18,520	1,040	10,780	4,640	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1921	17,314	2,377	19,690	1,070	10,780	5,090	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1922	13,589	2,358	15,950	1,070	10,780	4,100	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1923	13,485	1,740	15,240	1,070	10,780	3,390	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1924	10,028	1,653	11,680	1,060	10,780	0	23,750	2,140	5,120	3,520	2,500	1,200	2,500
1925	9,550	629	10,180	1,040	10,780	0	24,110	2,140	5,120	3,520	2,500	1,200	2,500
1926	10,997	560	11,560	1,020	10,780	0	24,170	2,140	5,120	3,520	2,500	1,200	2,500
1927	13,502	778	14,280	1,040	10,780	439	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1928	12,713	367	13,080	1,070	10,780	1,230	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1929	16,408	67	16,470	1,070	10,780	4,620	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1930	10,468	480	10,950	1,060	10,780	0	23,010	2,140	5,120	3,520	2,500	1,200	2,500
Subtotal, 1906-30	313,605	24,199	337,830	24,530	262,720	39,200	11,380	53,500	124,610	84,610	59,110	30,000	59,110
Average 1906-30	12,344	968	13,313	981	10,509	1,568	435	4,360	4,985	3,384	2,364	1,200	2,364
1931	9,660	536	10,190	1,020	10,780	0	23,300	2,140	5,120	3,520	2,500	1,200	2,500
1932	9,660	1,181	10,860	960	10,780	0	22,540	2,140	5,120	3,520	2,500	1,200	2,500

COLORADO RIVER BASIN PROJECT

[illegible]

Note: Scheduled release. Minimum 9,650, maximum 10,780; to maximize yield from Lake Mead for a 2,500 diversion to central Arizona project. Distribution: Losses, 540; Mexico, 1,500; Nevada, 100; California, 4,400 plus $\frac{1}{4}$ surplus; Arizona, 2,800 plus $\frac{1}{4}$ surplus; and CAP, Arizona less 1,020 mainstream uses.

Mr. DOMINY. We have had measurements at Yuma on the lower river since 1903. We have had measurements at the points you mentioned on the upper river since 1906, although they are not continuous at all stations.

Mr. ASPINALL. You also had measurements on the river, did you not, Mr. Dominy, from 1896 to 1906?

Mr. DOMINY. Yes, at various places, but not complete enough, in our judgment, to—

Mr. ASPINALL. The 1906-67 period is not a conservative one. An earlier starting continuous period of greater average flow than the period starting in 1906 and including all following years' record is not to be found. Estimates are available by correlation that would have given an average of 14.8 million acre-feet for the longer 1896-1967 period, which, of course, is less than the average for 1906-67.

The water records for stations upstream from Lee Ferry are not continuous records. Several have been, themselves, derived partially by correlation estimates. For example: U.S. Geological Survey records for the San Juan River near Bluff, Utah, are for years 1915-18 and for 1927-67, and for the Colorado River near Cisco, Utah, only for years 1912-18 and 1923-67. The periods of missing records have been filled by estimates derived from statistical processes. Those partially synthesized records have again been used as sources of data in estimating part of the record of virgin flow at Lee Ferry.

But all of this water, as far as the supply of the river between 1896 and 1922, is based upon the correlated projection that you have made, is it not?

Mr. DOMINY. That is correct in relation to estimates of virgin runoff at Lee Ferry.

Mr. ASPINALL. Do you feel, Mr. Secretary, that the records you have for these early years are dependable?

Secretary UDALL. I think it obvious from the discussion here, that we feel the figures from 1906 are quite reliable, highly reliable. We have some figures for earlier years which we do not think are sufficiently reliable to use. I think that is a good way to put it.

Mr. ASPINALL. Are they as dependable as the records that you have since 1922?

Secretary UDALL. I think we would have to say that they are not.

Mr. ASPINALL. Are they as dependable—is either one of these three—1896 to 1906, 1906 to 1922, 1922 to 1929—are these records as dependable as the records you have since 1929?

Mr. DOMINY. I would like to say this, Mr. Chairman, that since we have definite recordings at Lee Ferry since 1922 and we have been able to go back and collate the old records back to 1906 as compared to the actual records since 1922 at the lower and upper stations, we have enough reliability in the figures from 1906 to 1922 to justify their inclusion in this long-term hydrologic record.

Mr. ASPINALL. According to the Department's 1947 report, "the Colorado River"—and I am placing this in not for argumentative purposes, but just to make a record—I quote from that report:

For the years 1902 to 1921, inclusive, the estimate (Lee Ferry) considered both tributary flows and flows of downstream gauging stations with due allowance for both measured and unmeasured gains and losses between Lee Ferry and the point of measurement. When basing the estimate on the Yuma records, allowances were made for the flow of the Gila River at its mouth for diversion by the Yuma Project.

That was in 1947.

As far as your memory is concerned, Mr. Dominy, that was the position of the Bureau at that time, was it not?

Mr. DOMINY. Yes, sir.

Mr. ASPINALL. All I am trying to do is get the record. You see, what bothers some of us on the committee, Mr. Secretary, and the members of the committee staff, is that when we begin to talk about a project authorization we also have the best information possible in favor of the project. I want this project to be a success. I want it to serve the area and not disturb other users on the Colorado River in the future. As far as I am concerned, I just want to be sure we know what we are doing.

Mr. Secretary, can you imagine spilling an average of more than a million acre-feet of water annually from a completely full Lake Powell, water which, as I understand your operation study, the upper basin would not get credit for? That in fact is what the summary of your operation study shows, is it not?

This is the guts of this whole matter and I want a straightforward answer. If you want to have permission to change your answer or modify it before the final record is printed, this will be all right with me.

Secretary UDALL. Mr. Chairman, this issue is so important, I would like Mr. Riter, who is one of our specialists, to answer the question. I also would like to put in an explicit and exact answer to this question so that as far as the Department is concerned, there is nothing left uncertain.

Mr. ASPINALL. I would ask unanimous consent that the Secretary's request be granted.

I would also like to hear from Mr. Randy Riter. On the other hand, I want to hear from the Department.

Mr. JOHNSON. Is there objection?

Mr. HOSMER. Reserving the right to object, would the Chairman restate the question so we have it firmly in mind?

Mr. ASPINALL. The question is as follows:

Can you imagine spilling an average of more than a million acre-feet of water annually from a completely full Lake Powell, water which, as I understand the operation study, the upper basin would not get credit for?

In other words, they base the future of the central Arizona project now proposed on the spillage of a million acre-feet of water from Lake Powell starting sometime in the future and continuing annually thereafter. I wanted the answer and we will get it completely as far as that is concerned, with the promise of the Secretary and now from Mr. Riter.

Mr. HOSMER. I withdraw my reservation.

Mr. JOHNSON. The reservation is withdrawn.

Are you ready to testify, Mr. Riter?

Mr. RITER. Yes.

I am quoting from page 236 of the hearings before this subcommittee, dated from August 23 to September 1, 1965. This shows the following average annual spills which are averages for a 60-year period of study.

Mr. ASPINALL. Whose projections are these?

Mr. RITER. These are projections of the Bureau of Reclamation.

Mr. ASPINALL. I just wanted this committee to know that.

Mr. RITER. The table on page 236 of the 1965 hearings shows that the spills from Lake Mead as of year 1975 average 653,000 acre-feet, for the year 1990, the spills from Lake Mead average 269,000 acre-feet per year, for the year 2000, the spills from Lake Mead are shown to be 148,000 acre-feet per year, and for the year 2030, these spills are listed as averaging 158,000 acre-feet per year. These all reflect average conditions.

I would like also to qualify them to this extent: these computations assumed a 60-year runoff cycle—1906 through 1965, inclusive. In each one of these studies, we repeated this hydrologic cycle for the projected level of development of the year involved.

If you examine the details year by year, you will find a good many years when there was no spill. Values shown are averages for a 60-year period.

Mr. ASPINALL. Mr. Chairman, I would ask unanimous consent that complete operation studies be placed in the record at this place.

Mr. BURTON of Utah. May I reserve the right to object, please?

Mr. JOHNSON. The gentleman from Utah.

Mr. BURTON of Utah. The spillage Mr. Riter has told us about is over a 60-year period and embraces a period when by and large, the upper basin projects were not operative.

Is this correct?

Mr. ASPINALL. This is correct.

Mr. BURTON of Utah. So the million acre-feet that is being spilled on a yearly basis would largely be upper basin water.

Is that not a correct assumption?

Mr. ASPINALL. I think this is correct. On the other hand, they will furnish the information for us to take up in committee.

Mr. BURTON of Utah. I just wanted to have that clear in my mind, Mr. Chairman.

Mr. ASPINALL. I think the gentleman is correct.

Mr. BURTON of Utah. I withdraw my reservation.

Mr. HOSMER. Further reserving the right to object, the Secretary introduced a factor of 24- and 48-year historic dry cycle on the river and the historic average of a 24-year wet cycle. If you take the mean 24- and 48-year historic dry cycle at 36 years plus 24 years wet cycle, that gives you a 60-year full cycle. As this averaging has been done on a 60-year cycle, does this take cognizance of these wet and dry cycles in the sense that there might be a better time to start the cycle as an independent calculation, assuming that we are now at some point in the cycle, and work out the years ahead on that basis, rather than just averaging out as you have done?

Secretary UDALL. Congressman, that is an interesting question. The reason we included the tree-ring studies, which I think are considered scientifically sound, is to show what the real long-term trend has been.

The interesting thing about this 60-year period is we have had both an unusually extended dry cycle and a major wet cycle embraced within it.

Now, this does not mean necessarily that we are going into a major wet cycle. We might go into a minor wet cycle, or a minor dry cycle.

Mr. ASPINALL. What I am trying to get at is that there are alternative ways of using this information that could give us comparative figures for different assumptions.

Would that be of any value in trying to estimate this water supply over the particular period of time rather than an arbitrary 60 years that starts some place and ends some place depending on who happened to start keeping records at the particular time in 1922?

Secretary UDALL. You can use any assumptions you want. If one wants to be optimistic, he can use certain assumptions or if he wants to be pessimistic, he can use others. But we have tried in our calculations to stick to the knowns as much as possible in terms of the calculations that we have made.

Mr. ASPINALL. That give you the most optimistic figure possible?

Secretary UDALL. No, I do not think it does. Since we are in the end of a long and severe dry cycle.

Mr. ASPINALL. There is no way to average it any higher than 14.96.

Mr. DOMINY. If you use the whole period of record, that is it. But some people are arguing that we should use records only since 1922 and throw out the period 1906 to 1922, which was the period of high runoff. If you are going to argue that way, why not leave out the last 5 or 6 years that have been a period of low runoff?

Yet we have added in these last years to be consistent. We believe the longest period of major record is the right period to use in projections of stream flow runoff.

Mr. ASPINALL. If it does in fact coincide with these long-range wet and dry cycles.

Mr. HOSMER. I withdraw my reservation.

Mr. JOHNSON. Any further reservations?

(No response.)

Mr. JOHNSON. If not, Mr. Secretary, you will get that to the committee also?

Secretary UDALL. Yes.

(The material referred to follows :)

SUMMARY OF OPERATIONS—LAKE POWELL								
1975 CONDITIONS								
[Unit—1,000 acre-feet]								
Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
	Unregu- lated	Regulated by upstream reservoir (3)		Sched- uled	Other			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906.....	15,093	14,672	422	9,550	0	0	18,976	3,631
1907.....	18,837	17,625	547	9,550	0	0	26,504	3,682
1908.....	9,553	9,557	607	9,550	0	0	25,904	3,673
1909.....	18,851	18,027	641	9,550	3,178	1,415	29,147	3,680
1910.....	10,793	10,710	668	9,550	492	0	29,147	3,680
1911.....	12,362	12,438	670	9,550	1,774	444	29,147	3,680
1912.....	16,316	15,956	673	9,550	3,178	2,555	29,147	3,680
1913.....	10,985	10,872	669	9,550	653	0	29,147	3,680
1914.....	16,952	16,795	674	9,550	3,178	3,393	29,147	3,680
1915.....	10,582	10,859	668	9,550	641	0	29,147	3,680
1916.....	15,136	14,598	672	9,550	3,178	1,198	29,147	3,680
1917.....	19,414	19,292	676	9,550	3,178	5,888	29,147	3,680
1918.....	11,764	11,606	669	9,550	1,110	277	29,147	3,680
1919.....	9,233	9,841	662	9,550	0	0	28,776	3,685
1920.....	17,584	17,169	675	9,550	3,178	3,395	29,147	3,680
1921.....	18,547	17,989	675	9,550	3,178	4,586	29,147	3,680
1922.....	14,362	14,261	672	9,550	3,178	861	29,147	3,680
1923.....	14,328	14,157	672	9,550	3,148	787	29,147	3,680
1924.....	10,752	10,696	668	9,550	478	0	29,147	3,683
1925.....	9,722	9,555	660	9,550	0	0	28,492	3,680
1926.....	12,182	12,320	668	9,550	1,158	289	29,147	3,680
1927.....	14,614	14,174	672	9,550	3,162	790	29,147	3,680
1928.....	13,486	13,384	671	9,550	2,530	633	29,147	3,680
1929.....	17,115	17,080	674	9,550	3,178	3,678	29,147	3,680
1930.....	11,377	11,137	669	9,550	918	0	29,147	3,680
1931.....	5,070	6,031	614	9,550	0	0	25,014	3,672
1932.....	13,428	13,163	618	9,550	0	0	28,009	3,681
1933.....	8,236	8,573	626	9,550	0	0	26,406	3,682
1934.....	3,183	4,226	549	9,550	0	0	20,533	3,642
1935.....	8,429	8,603	478	9,550	0	0	19,108	3,631
1936.....	10,375	9,710	462	9,550	0	0	18,806	3,630
1937.....	10,323	10,146	460	9,550	0	0	18,942	3,630
1938.....	13,702	13,221	500	9,550	0	0	22,113	3,653
1939.....	7,971	8,005	504	9,550	0	0	20,084	3,638
1940.....	5,784	6,567	448	9,550	0	0	16,633	3,612
1941.....	14,234	13,921	459	9,550	0	0	20,545	3,642
1942.....	15,080	14,779	547	9,550	0	0	25,227	3,673
1943.....	9,763	9,200	580	9,550	0	0	24,297	3,669
1944.....	11,606	11,216	584	9,550	0	0	25,379	3,675
1945.....	10,044	10,074	593	9,550	0	0	25,310	3,674
1946.....	7,403	7,180	560	9,550	0	0	22,390	3,654
1947.....	11,877	10,970	543	9,550	0	0	23,257	3,682
1948.....	11,994	11,922	568	9,550	0	0	25,084	3,672
1949.....	12,687	12,678	612	9,550	0	0	27,577	3,680
1950.....	9,599	8,577	618	9,550	0	0	25,886	3,678
1951.....	8,633	8,476	585	9,550	0	0	24,327	3,669
1952.....	16,442	16,299	624	9,550	1,044	261	29,147	3,680
1953.....	7,618	7,825	641	9,550	0	0	26,781	3,684
1954.....	4,958	5,445	568	9,550	0	0	22,108	3,651
1955.....	6,314	6,899	489	9,550	0	0	18,888	3,631
1956.....	7,705	7,343	431	9,550	0	0	16,330	3,614
1957.....	15,954	15,123	463	9,550	0	0	21,440	3,680
1958.....	12,743	12,858	542	9,550	0	0	24,206	3,680
1959.....	5,810	6,161	524	9,550	0	0	20,283	3,640
1960.....	8,153	8,744	471	9,550	0	0	18,016	3,630
1961.....	5,670	6,727	427	9,550	0	0	15,786	3,605
1962.....	13,508	13,041	432	9,550	0	0	18,825	3,638
1963.....	5,625	6,447	423	9,550	0	0	15,289	3,602
1964.....	7,169	7,450	360	9,550	0	0	12,889	3,578
1965.....	13,500	11,333	346	9,550	0	0	14,276	3,583
Total:								
1953-64.....	101,227	104,063	5,771	114,600	0	0	-16,308	.....
1931-64.....	327,090	327,600	17,903	324,700	1,044	261	-16,308	.....
1906-65.....	690,530	683,703	34,543	573,000	45,710	30,450	0	.....
Average:								
1953-64.....	8,435	8,672	481	9,550	0	0	-1,359	.....
1931-64.....	9,621	9,634	526	9,550	31	7	-480	.....
1936-65.....	11,509	11,395	576	9,550	762	507	0	.....

SUMMARY OF OPERATIONS—LAKE POWELL
1990 CONDITIONS
[Unit—1,000 acre-feet]

Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet)
	Unregu- lated	Regulated by upstream reservoir (3)		Sched- uled	Other			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906.....	14,108	13,266	419	8,750	0	0	17,380	3,628
1907.....	17,714	16,607	537	8,750		0	24,700	3,682
1908.....	8,730	8,810	609	8,750	U	0	24,151	3,678
1909.....	17,765	16,654	641	8,750	3,056	764	27,594	3,698
1910.....	9,942	9,907	674	8,750	483	0	27,594	3,698
1911.....	11,455	11,604	674	8,750	1,744	436	27,594	3,698
1912.....	15,277	14,836	674	8,750	3,553	1,859	27,594	3,698
1913.....	10,120	9,969	674	8,750	545	0	27,594	3,698
1914.....	15,894	15,737	674	8,750	3,553	2,760	27,594	3,698
1915.....	9,731	10,078	674	8,750	654	0	27,594	3,698
1916.....	14,130	13,522	674	8,750	3,278	820	27,594	3,698
1917.....	18,266	18,144	674	8,750	3,553	5,167	27,594	3,698
1918.....	10,676	10,718	674	8,750	1,035	259	27,594	3,698
1919.....	8,429	9,098	670	8,750	0	0	27,272	3,696
1920.....	16,502	16,172	670	8,750	3,553	2,877	27,594	3,698
1921.....	17,431	16,728	674	8,750	3,553	3,751	27,594	3,698
1922.....	13,380	13,279	674	8,750	3,084	771	27,594	3,698
1923.....	13,346	13,175	674	8,750	3,001	750	27,594	3,698
1924.....	9,901	9,923	674	8,750	499	0	27,594	3,698
1925.....	8,899	8,810	670	8,750	0	0	26,884	3,693
1926.....	11,275	11,486	670	8,750	1,165	291	27,594	3,698
1927.....	13,627	13,190	674	8,750	3,013	753	27,594	3,698
1928.....	12,541	12,232	674	8,750	2,246	562	27,594	3,698
1929.....	16,053	15,993	674	8,750	3,553	3,016	27,594	3,698
1930.....	10,497	10,271	674	8,750	847	0	27,594	3,698
1931.....	4,402	5,424	635	8,750	0	0	23,633	3,674
1932.....	12,483	12,290	622	8,750	0	0	26,551	3,692
1933.....	7,455	7,859	639	8,750	0	0	25,021	3,683
1934.....	2,576	3,807	562	8,750	0	0	19,516	3,645
1935.....	7,648	7,751	487	8,750	0	0	18,030	3,635
1936.....	9,528	8,946	468	8,750	0	0	17,758	3,633
1937.....	9,476	9,375	468	8,750	0	0	17,815	3,635
1938.....	12,753	12,352	502	8,750	0	0	21,015	3,656
1939.....	7,204	7,308	495	8,750	0	0	19,078	3,642
1940.....	5,088	5,972	460	8,750	0	0	15,840	3,618
1941.....	13,266	12,981	467	8,750	0	0	19,604	3,645
1942.....	14,074	13,851	552	8,750	0	0	24,153	3,677
1943.....	8,936	8,261	588	8,750	0	0	23,076	3,670
1944.....	10,722	10,412	588	8,750	0	0	24,150	3,678
1945.....	9,334	9,238	600	8,750	0	0	24,038	3,676
1946.....	6,652	6,631	567	8,750	0	0	21,352	3,659
1947.....	10,989	10,093	551	8,750	0	0	22,144	3,664
1948.....	11,092	11,060	579	8,750	0	0	23,875	3,675
1949.....	11,766	11,632	618	8,750	0	0	26,139	3,689
1950.....	8,776	7,854	628	8,750	0	0	24,615	3,680
1951.....	7,882	7,329	592	8,750	0	0	22,602	3,667
1952.....	15,393	14,912	622	8,750	548	0	27,594	3,698
1953.....	6,867	7,175	654	8,750	0	0	25,365	3,685
1954.....	4,290	4,855	580	8,750	0	0	20,890	3,655
1955.....	5,595	6,256	498	8,750	0	0	17,898	3,634
1956.....	6,943	6,685	440	8,750	0	0	15,393	3,614
1957.....	14,914	14,099	466	8,750	0	0	20,276	3,651
1958.....	11,817	12,005	550	9,750	0	0	22,981	3,670
1959.....	5,114	5,501	538	8,750	0	0	19,194	3,643
1960.....	7,372	7,665	480	8,750	0	0	17,629	3,631
1961.....	4,983	5,903	430	8,750	0	0	14,352	3,605
1962.....	12,563	11,894	420	8,750	0	0	17,076	3,627
1963.....	4,938	5,939	420	8,750	0	0	13,845	3,600
1964.....	6,426	6,901	365	8,750	0	0	11,631	3,577
1965.....	12,563	10,761	359	8,750	0	0	13,283	3,595
Total:								
1953-64.....	91,822	94,878	5,841	105,000	0	0	-15,963	.....
1931-64.....	299,317	300,216	18,131	297,500	548	0	-15,963	.....
1906-65.....	637,769	631,186	34,834	525,000	46,516	24,836	0	.....
Average:								
1953-64.....	7,652	7,906	487	8,750	0	0	-1,330	.....
1931-64.....	8,803	8,830	533	8,750	16	0	-470	.....
1906-65.....	10,629	10,519	580	8,750	775	414	0	.....

SUMMARY OF OPERATIONS—LAKE POWELL								
2000 CONDITIONS								
[Unit—1,000 acre-feet]								
Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
	Unregu- lated	Regulated by upstream reservoir (3)		Sched- uled	Other			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906.....	13,723	13,254	361	8,580	0	0	12,224	3,582
1907.....	17,286	16,205	490	8,580	0	0	19,359	3,652
1908.....	8,798	8,897	564	8,580	0	0	19,112	3,640
1909.....	17,350	16,201	628	8,580	0	0	26,105	3,695
1910.....	9,618	9,651	704	8,580	0	0	26,472	3,697
1911.....	11,110	11,283	707	8,580	1,527	382	26,559	3,698
1912.....	14,883	14,470	707	8,580	3,631	1,552	26,559	3,698
1913.....	9,793	9,443	707	8,580	156	0	26,559	3,698
1914.....	15,492	15,335	707	8,580	3,631	2,417	26,559	3,698
1915.....	9,406	9,776	707	8,580	489	0	26,559	3,698
1916.....	13,748	13,153	707	8,580	3,093	773	26,559	3,698
1917.....	17,831	17,676	707	8,580	3,631	4,758	26,559	3,698
1918.....	10,538	10,380	707	8,580	1,000	93	26,559	3,698
1919.....	8,125	8,809	705	8,580	0	0	26,083	3,685
1920.....	16,091	15,798	705	8,580	3,631	2,406	26,559	3,698
1921.....	17,010	16,306	707	8,580	3,631	3,388	26,559	3,698
1922.....	13,008	12,865	707	8,580	2,862	716	26,559	3,698
1923.....	12,975	12,804	707	8,580	2,814	703	26,559	3,698
1924.....	9,576	9,623	707	8,580	336	0	26,559	3,698
1925.....	8,588	8,519	704	8,580	0	0	25,794	3,694
1926.....	10,930	11,171	704	8,580	1,000	122	26,559	3,698
1927.....	13,252	12,793	707	8,580	2,805	701	26,559	3,698
1928.....	12,183	11,814	707	8,580	2,022	505	26,559	3,698
1929.....	15,648	15,663	707	8,580	3,631	2,745	26,559	3,698
1930.....	10,165	9,890	707	8,580	603	0	26,559	3,698
1931.....	4,149	5,245	660	8,580	0	0	22,564	3,673
1932.....	12,124	11,891	648	8,580	0	0	25,227	3,689
1933.....	7,161	7,582	650	8,580	0	0	23,579	3,680
1934.....	2,345	3,649	587	8,580	0	0	18,061	3,642
1935.....	7,355	7,414	515	8,580	0	0	16,380	3,629
1936.....	9,208	8,647	488	8,580	0	0	15,959	3,625
1937.....	9,155	9,073	497	8,580	0	0	15,955	3,625
1938.....	12,391	12,010	522	8,580	0	0	18,863	3,648
1939.....	6,914	6,935	528	8,580	0	0	16,690	3,632
1940.....	4,823	5,681	470	8,580	0	0	13,321	3,602
1941.....	12,897	12,471	472	8,580	0	0	16,740	3,632
1942.....	13,692	13,489	552	8,580	0	0	21,097	3,683
1943.....	8,622	7,969	586	8,580	0	0	19,900	3,655
1944.....	10,387	10,097	582	8,580	0	0	20,835	3,682
1945.....	8,883	8,805	587	8,580	0	0	20,473	3,658
1946.....	6,366	6,424	557	8,580	0	0	17,760	3,640
1947.....	10,652	9,940	538	8,580	0	0	18,582	3,645
1948.....	10,750	10,719	562	8,580	0	0	20,159	3,657
1949.....	11,417	11,302	595	8,580	0	0	22,286	3,672
1950.....	8,465	7,621	603	8,580	0	0	20,774	3,661
1951.....	7,596	7,127	569	8,580	0	0	18,702	3,647
1952.....	14,992	14,195	594	8,580	0	0	23,723	3,699
1953.....	6,582	6,968	625	8,580	0	0	21,486	3,686
1954.....	4,036	4,678	562	8,580	0	0	17,022	3,634
1955.....	5,324	6,061	480	8,580	0	0	14,023	3,606
1956.....	6,655	6,478	420	8,580	0	0	11,501	3,585
1957.....	14,524	13,499	443	8,580	0	0	15,977	3,625
1958.....	11,465	11,671	518	8,580	0	0	18,550	3,646
1959.....	4,849	5,313	507	8,580	0	0	14,776	3,615
1960.....	7,078	7,124	444	8,580	0	0	12,976	3,600
1961.....	4,722	5,451	382	8,580	0	0	9,365	3,593
1962.....	12,205	11,351	373	8,580	0	0	11,763	3,598
1963.....	4,677	5,545	358	8,580	0	0	8,370	3,546
1964.....	6,144	6,379	291	8,580	0	0	5,678	3,512
1965.....	12,196	10,890	277	8,580	0	0	7,911	3,542
Total:								
1953-64.....	88,261	90,518	5,403	102,960	0	0	-17,845	.....
1931-64.....	288,605	288,804	17,765	291,720	0	0	-20,681	.....
1906-65.....	617,928	611,473	34,919	514,800	40,493	21,261	0	.....
Average:								
1953-64.....	7,355	7,543	450	8,580	0	0	-1,487	.....
1931-64.....	8,488	8,484	523	8,580	0	0	-609	.....
1906-65.....	10,299	10,191	582	8,580	675	354	0	.....

SUMMARY OF OPERATIONS—LAKE POWELL
2030 CONDITIONS
[Unit—1,000 acre-feet]

Water-year	Inflow		Evapo- ration	Power releases		Spill	Reservoir content end of year ¹	Water surface elevation end of year (feet) (9)
	Unregu- lated	Regulated by] upstream reservoir		Sched- uled	Other			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906.....	13,508	12,868	332	8,230	0	0	10,190	3,596
1907.....	16,816	15,735	483	8,230	0	0	17,212	3,656
1908.....	8,078	8,177	563	8,230	0	0	06,596	3,650
1909.....	16,895	15,746	637	8,230	0	0	23,475	3,695
1910.....	9,261	9,294	717	8,230	115	0	23,707	3,698
1911.....	10,732	10,905	724	8,230	1,561	390	23,707	3,698
1912.....	14,449	14,036	724	8,230	3,794	1,268	23,707	3,698
1913.....	9,432	9,082	724	8,230	128	0	23,707	3,698
1914.....	15,052	14,895	724	8,230	3,794	2,147	23,707	3,698
1915.....	9,050	9,420	724	8,230	466	0	23,707	3,698
1916.....	13,330	12,735	724	8,230	3,015	766	23,707	3,698
1917.....	13,353	17,198	724	8,230	3,794	4,450	23,707	3,698
1918.....	10,167	10,009	724	8,230	1,000	55	23,707	3,698
1919.....	7,791	8,475	712	8,230	0	0	23,240	3,695
1920.....	15,639	15,346	712	8,230	3,794	2,143	23,707	3,698
1921.....	16,547	15,843	724	8,230	3,794	3,095	23,707	3,698
1922.....	12,601	12,458	724	8,230	2,803	701	23,707	3,698
1923.....	12,567	12,396	724	8,230	2,754	688	23,707	3,698
1924.....	9,221	9,268	724	8,230	314	0	23,707	3,698
1925.....	8,247	8,178	708	8,230	0	0	22,947	3,693
1926.....	10,552	10,793	708	8,230	1,000	95	23,707	3,698
1927.....	12,841	12,382	724	8,230	2,742	686	23,707	3,698
1928.....	11,790	11,421	724	8,230	1,874	593	23,707	3,698
1929.....	15,204	15,219	724	8,230	3,794	2,471	23,707	3,698
1930.....	9,802	9,527	724	8,230	573	0	23,707	3,698
1931.....	3,869	5,013	677	8,230	0	0	19,813	3,673
1932.....	11,732	11,452	663	8,230	0	0	22,372	3,688
1933.....	6,838	7,259	674	8,230	0	0	20,727	3,679
1934.....	2,092	3,444	584	8,230	0	0	15,357	3,642
1935.....	7,031	7,043	503	8,230	0	0	13,667	3,628
1936.....	8,854	8,293	478	8,230	0	0	13,252	3,625
1937.....	8,802	8,720	473	8,230	0	0	13,269	3,625
1938.....	11,995	11,614	506	8,230	0	0	16,147	3,648
1939.....	6,594	6,615	517	8,230	0	0	14,015	3,630
1940.....	4,533	5,439	445	8,230	0	0	10,779	3,604
1941.....	12,494	12,022	447	8,230	0	0	14,124	3,632
1942.....	13,274	13,071	545	8,230	0	0	18,420	3,664
1943.....	8,277	7,624	587	8,230	0	0	17,227	3,656
1944.....	10,020	9,730	582	8,230	0	0	18,145	3,662
1945.....	8,535	8,457	580	8,230	0	0	17,782	3,660
1946.....	6,054	6,160	552	8,230	0	0	15,160	3,638
1947.....	10,280	9,616	531	8,230	0	0	16,015	3,646
1948.....	10,376	10,251	555	8,230	0	0	17,481	3,657
1949.....	11,036	10,921	597	8,230	0	0	19,575	3,672
1950.....	8,124	7,328	604	8,230	0	0	18,069	3,662
1951.....	7,284	6,863	563	8,230	0	0	16,139	3,648
1952.....	14,556	13,664	597	8,230	0	0	20,976	3,681
1953.....	6,269	6,703	629	8,230	0	0	18,820	3,670
1954.....	3,757	4,447	555	8,230	0	0	14,482	3,633
1955.....	5,026	5,811	464	8,230	0	0	11,599	3,610
1956.....	6,339	6,210	395	8,230	0	0	9,184	3,584
1957.....	14,093	12,882	420	8,230	0	0	13,416	3,626
1958.....	11,079	11,385	509	8,230	0	0	16,062	3,647
1959.....	4,559	5,171	498	8,230	0	0	12,505	3,618
1960.....	6,755	6,854	428	8,230	0	0	10,701	3,601
1961.....	4,435	5,264	359	8,230	0	0	7,376	3,562
1962.....	11,812	11,058	348	8,230	0	0	9,856	3,592
1963.....	4,388	5,404	338	8,230	0	0	6,692	3,551
1964.....	5,837	6,220	255	8,230	0	0	4,427	3,518
1965.....	11,804	9,922	235	8,230	0	0	5,884	3,538
Total:								
1953-64.....	84,349	87,409	5,198	98,760	0	0	-16,549	-----
1931-64.....	276,999	278,008	17,468	279,820	0	0	-19,280	-----
1906-65.....	595,728	589,336	34,859	493,800	41,109	19,568	0	-----
Average:								
1953-64.....	7,029	7,284	433	8,230	0	0	-1,379	-----
1931-64.....	8,147	8,177	514	8,230	0	0	-567	-----
1906-65.....	9,929	9,823	582	8,230	685	326	0	-----

¹ Includes 15 percent bank storage but excludes the portion of the original storage capacity impaired by sediment encroachment.

COLORADO RIVER BASIN PROJECT

LOWER COLORADO RIVER BASIN OPERATION STUDY
DEVELOPMENT CONDITIONS, 1975
[Period of record, 1906-65. Units, 1,000 acre-feet]

Year	Lake Mead operation					Distribution of scheduled release							
	Glen Canyon release	Net gain, Glen Canyon-Lake Mead	Total inflow, Lake Mead	Evaporation, Lake Mead	Scheduled release, Hoover Dam	Spill, Hoover Dam	End of year content, Lake Mead	Nevada-Mexico losses	California entitlement	Arizona entitlement	Available to CAP	Diversion limited to 1,200	Diversion limited to 2,500
1906	9,550	796	10,350	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
1907	9,550	796	10,350	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
1908	9,550	796	10,350	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
1909	14,143	796	14,940	770	9,650	0	18,150	2,140	4,555	2,955	1,935	1,200	1,935
1910	10,042	796	10,840	840	9,650	0	18,500	2,140	4,555	2,955	1,935	1,200	1,935
1911	11,768	796	12,560	880	9,650	0	20,530	2,140	4,555	2,955	1,935	1,200	1,935
1912	15,283	796	16,080	970	10,780	0	24,860	2,140	5,120	3,520	2,500	1,200	2,500
1913	10,203	796	11,000	1,020	10,780	0	24,060	2,140	5,120	3,520	2,500	1,200	2,500
1914	16,121	2,098	18,220	1,040	10,780	4,560	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1915	10,191	2,568	12,780	1,070	10,780	3,580	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1916	13,926	1,504	15,430	1,070	10,780	3,580	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1917	18,616	—	18,480	1,070	10,780	6,630	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1918	10,937	389	11,330	1,060	10,780	0	25,390	2,140	5,120	3,520	2,500	1,200	2,500
1919	9,550	709	10,260	1,030	10,780	0	23,840	2,140	5,120	3,520	2,500	1,200	2,500
1920	16,123	2,397	18,520	1,040	10,780	4,640	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1921	17,314	2,377	19,690	1,070	10,780	5,090	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1922	13,589	2,358	15,950	1,070	10,780	4,100	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1923	13,485	1,756	15,240	1,070	10,780	3,390	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1924	10,028	1,663	11,690	1,060	10,780	0	25,750	2,140	5,120	3,520	2,500	1,200	2,500
1925	9,550	629	10,180	1,040	10,780	0	24,110	2,140	5,120	3,520	2,500	1,200	2,500
1926	10,997	560	11,560	1,020	10,780	0	23,870	2,140	5,120	3,520	2,500	1,200	2,500
1927	13,502	778	14,280	1,040	10,780	430	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1928	12,713	367	13,080	1,070	10,780	1,230	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1929	16,406	67	16,470	1,070	10,780	4,620	25,900	2,140	5,120	3,520	2,500	1,200	2,500
1930	10,468	480	10,950	1,060	10,780	0	25,010	2,140	5,120	3,520	2,500	1,200	2,500
Subtotal, 1906-30	313,605	24,199	337,830	24,530	262,720	38,200	11,380	53,500	124,610	84,610	59,110	30,000	59,110
Average 1906-30	12,544	968	13,513	981	10,509	1,568	455	4,360	4,985	3,364	2,364	1,200	2,364
1961	9,560	538	10,090	1,020	10,780	0	23,300	2,140	6,120	3,640	2,600	1,200	2,600
1962	9,560	1,151	10,700	1,080	10,780	0	23,240	2,140	6,120	3,640	2,600	1,200	2,600

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COLORADO RIVER BASIN PROJECT

9,550	526	10,080	940	10,780	0	20,600	2,140	5,120	3,520	2,500	1,200	2,500
9,550	576	10,130	900	9,650	0	20,180	2,140	4,555	2,955	1,935	1,200	1,935
9,550	365	9,970	880	9,650	0	19,580	2,140	4,555	2,955	1,935	1,200	1,935
9,550	758	10,310	880	9,650	0	19,340	2,140	4,555	2,955	1,935	1,200	1,935
9,550	1,207	10,760	880	9,650	0	19,570	2,140	4,555	2,955	1,935	1,200	1,935
9,550	1,152	10,760	880	9,650	0	19,740	2,140	4,555	2,955	1,935	1,200	1,935
9,550	1,708	10,760	880	9,650	0	19,470	2,140	4,555	2,955	1,935	1,200	1,935
9,550	784	10,390	880	9,650	0	19,270	2,140	4,555	2,955	1,935	1,200	1,935
9,550	2,172	11,720	880	9,650	0	20,450	2,140	4,555	2,955	1,935	1,200	1,935
9,550	919	10,150	900	9,650	0	20,450	2,140	4,555	2,955	1,935	1,200	1,935
9,550	614	10,160	900	9,650	0	20,050	2,140	4,555	2,955	1,935	1,200	1,935
9,550	790	10,340	880	9,650	0	19,950	2,140	4,555	2,955	1,935	1,200	1,935
9,550	788	10,350	880	9,650	0	19,650	2,140	4,555	2,955	1,935	1,200	1,935
9,550	873	10,350	880	9,650	0	19,650	2,140	4,555	2,955	1,935	1,200	1,935
9,550	845	10,400	880	9,650	0	19,640	2,140	4,555	2,955	1,935	1,200	1,935
9,550	834	10,340	880	9,650	0	19,370	2,140	4,555	2,955	1,935	1,200	1,935
9,550	864	10,110	840	9,650	0	18,590	2,140	4,555	2,955	1,935	1,200	1,935
9,550	202	9,750	820	9,650	0	17,990	2,140	4,555	2,955	1,935	1,200	1,935
9,550	96	9,710	800	9,650	0	17,130	2,140	4,555	2,955	1,935	1,200	1,935
9,550	989	11,850	810	9,650	0	17,320	2,140	4,555	2,955	1,935	1,200	1,935
9,550	67	9,650	820	9,650	0	17,000	2,140	4,555	2,955	1,935	1,200	1,935
9,550	745	10,300	780	9,650	0	16,180	2,140	4,555	2,955	1,935	1,200	1,935
9,550	1,453	10,030	770	9,650	0	16,050	2,140	4,555	2,955	1,935	1,200	1,935
9,550	1,271	10,820	770	9,650	0	16,660	2,140	4,555	2,955	1,935	1,200	1,935
9,550	994	10,540	780	9,650	0	16,170	2,140	4,555	2,955	1,935	1,200	1,935
9,550	771	9,720	770	9,650	0	16,470	2,140	4,555	2,955	1,935	1,200	1,935
9,550	764	10,330	760	9,650	0	15,570	2,140	4,555	2,955	1,935	1,200	1,935
9,550	510	10,060	750	9,650	0	15,050	2,140	4,555	2,955	1,935	1,200	1,935
9,550	724	10,270	740	9,650	0	14,930	2,140	4,555	2,955	1,935	1,200	1,935
9,550	108	9,660	730	9,650	0	14,210	2,140	4,555	2,955	1,935	1,200	1,935
9,550	-29	9,320	710	9,650	0	13,370	2,140	4,555	2,955	1,935	1,200	1,935
9,550	1,058	10,610	700	9,650	0	13,630	2,140	4,555	2,955	1,935	1,200	1,935
Subtotal, 1931-65	23,552	359,110	29,350	341,140	0	-11,380	74,900	161,120	105,120	69,420	42,000	69,420
Average, 1931-65	9,587	673	838	9,747	0	-325	2,140	4,604	3,003	1,938	1,200	1,933
Grand total, 1906-65	649,160	47,751	696,940	53,880	39,200	0	128,400	285,730	189,730	128,530	72,000	128,530
Average, 1906-65	10,819	796	11,615	898	653	0	2,140	4,762	3,162	2,142	1,200	2,142

Note. Scheduled release: Minimum 9,650, maximum 10,780; to maximize yield from Lake Mead for a 2,500 diversion to central Arizona project. Distribution: Losses, 540; Mexico, 1,500; Nevada, 100; California, 4,400 plus 1/4 surplus; Arizona, 2,800 plus 1/4 surplus; and CAP, Arizona less 1,020 mainstream uses.

LOWER COLORADO RIVER BASIN OPERATION STUDY
DEVELOPMENT CONDITIONS, 1990
[Period of record, 1906-65. Units: 1,000 acre-feet]

Year	Lake Mead operation				Distribution of scheduled release								
	Glen Canyon release	Net gain, Glen Canyon-Lake Mead	Total inflow, Lake Mead	Evaporation, Lake Mead	Scheduled release, Hoover Dam	Spill, Hoover Dam	End of year content, Lake Mead	Nevada-Mexico losses	California entitlement	Arizona entitlement	Available to CAP	Diversion limited to 1,500	Diversion limited to 2,500
1906	8,750	776	9,530	700	8,800	0	13,300	2,190	4,400	2,210	1,050	1,050	1,050
1907	8,750	-----	9,530	700	8,800	0	13,300	2,190	4,400	2,210	1,050	1,050	1,050
1908	8,750	-----	9,530	700	8,800	0	13,300	2,190	4,400	2,210	1,050	1,050	1,050
1909	12,570	-----	13,350	760	8,800	0	17,180	2,190	4,400	2,210	1,050	1,050	1,050
1910	9,233	-----	10,010	820	8,800	0	17,570	2,190	4,400	2,210	1,050	1,050	1,050
1911	10,930	-----	11,710	860	8,800	0	19,520	2,190	4,400	2,210	1,050	1,050	1,050
1912	14,162	-----	14,940	930	11,110	0	22,520	2,190	5,260	3,660	2,500	1,200	2,500
1913	9,295	776	10,070	940	11,110	0	20,540	2,190	5,260	3,660	2,500	1,200	2,500
1914	15,063	2,078	17,140	990	11,110	0	25,580	2,190	5,260	3,660	2,500	1,200	2,500
1915	9,404	2,568	11,970	1,060	11,110	1,640	25,380	2,190	5,260	3,660	2,500	1,200	2,500
1916	12,848	1,484	14,330	1,060	11,110	5,140	25,900	2,190	5,260	3,660	2,500	1,200	2,500
1917	17,470	1,155	17,320	1,070	11,110	0	25,900	2,190	5,260	3,660	2,500	1,200	2,500
1918	10,044	-----	10,410	1,040	11,110	0	24,160	2,190	5,260	3,660	2,500	1,200	2,500
1919	8,750	689	9,440	980	11,110	0	21,510	2,190	5,260	3,660	2,500	1,200	2,500
1920	15,180	2,377	17,560	1,000	11,110	1,060	25,900	2,190	5,260	3,660	2,500	1,200	2,500
1921	16,054	2,397	15,680	1,070	11,110	3,480	25,900	2,190	5,260	3,660	2,500	1,200	2,500
1922	12,605	2,338	14,940	1,070	11,110	2,760	25,900	2,190	5,260	3,660	2,500	1,200	2,500
1923	12,501	1,736	14,240	1,070	11,110	2,060	25,900	2,190	5,260	3,660	2,500	1,200	2,500
1924	9,249	1,643	10,890	1,050	11,110	0	24,630	2,190	5,260	3,660	2,500	1,200	2,500
1925	8,750	609	9,360	990	11,110	0	21,890	2,190	5,260	3,660	2,500	1,200	2,500
1926	10,206	540	10,750	930	11,110	0	20,600	2,190	5,260	3,660	2,500	1,200	2,500
1927	12,516	758	13,270	930	11,110	0	21,830	2,190	5,260	3,660	2,500	1,200	2,500
1928	11,558	347	11,900	940	11,110	0	21,680	2,190	5,260	3,660	2,500	1,200	2,500
1929	15,319	47	15,370	990	11,110	0	24,950	2,190	5,260	3,660	2,500	1,200	2,500
1930	9,597	460	10,060	1,010	11,110	0	22,890	2,190	5,260	3,660	2,500	1,200	2,500
Subtotal, 1906-30	289,554	23,699	313,280	23,560	263,890	16,140	9,590	54,750	126,340	82,800	53,800	29,100	53,800
Average, 1906-30	11,582	848	12,531	946	10,556	646	383	2,180	5,054	3,312	2,152	1,164	2,152
1931	8,780	518	9,270	940	11,110	0	20,110	2,180	5,260	3,660	2,500	1,200	2,500
1932	8,780	1,131	9,890	890	9,100	0	20,000	2,180	4,400	2,510	1,360	1,200	1,360

1933.....	8,750	506	9,260	880	8,800	0	19,370	2,190	4,400	2,210	1,050	1,050	1,050
1934.....	8,750	556	9,310	880	8,800	0	19,700	2,210	4,400	2,210	1,050	1,050	1,050
1935.....	8,750	345	9,100	860	8,800	0	18,940	2,210	4,400	2,210	1,050	1,050	1,050
1936.....	8,750	739	9,480	850	8,800	0	18,480	2,210	4,400	2,210	1,050	1,050	1,050
1937.....	8,750	1,187	9,940	800	8,800	0	17,980	2,190	4,400	2,210	1,050	1,050	1,050
1938.....	8,750	1,132	9,880	860	8,800	0	18,760	2,190	4,400	2,210	1,050	1,050	1,050
1939.....	8,750	1,686	9,440	860	8,800	0	18,610	2,190	4,400	2,210	1,050	1,050	1,050
1940.....	8,750	764	9,510	860	8,800	0	18,830	2,190	4,400	2,210	1,050	1,050	1,050
1941.....	8,750	2,152	10,080	860	8,800	0	19,370	2,190	4,400	2,210	1,050	1,050	1,050
1942.....	8,750	573	9,730	880	8,800	0	19,520	2,190	4,400	2,210	1,050	1,050	1,050
1943.....	8,750	770	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1944.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1945.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1946.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1947.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1948.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1949.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1950.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1951.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1952.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1953.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1954.....	8,750	708	9,520	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
1955.....	8,750	1,038	9,750	880	8,800	0	19,300	2,190	4,400	2,210	1,050	1,050	1,050
Subtotal, 1931-55.....	396,798	27,852	529,680	28,640	310,610	0	-9,590	76,650	154,860	79,100	38,500	37,050	38,500
Average, 1931-55.....	8,766	653	9,419	818	8,875	0	-274	2,190	4,425	2,260	1,100	1,059	1,100
Grand total, 1906-55.....	596,252	46,551	642,948	52,300	574,500	16,140	0	131,400	281,200	161,900	92,300	66,150	92,300
Average 1906-55.....	9,948	776	10,716	872	9,575	269	0	2,190	4,687	2,698	1,538	1,102	1,538

Note: Scheduled releases: Minimum 8,800, maximum 11,110, to maximize yield from Lake Mead for a 2,500 diversion to central Arizona project. Distribution: Losses, 540; Mexico, 1,500; Nevada, 150; California, 4,400 plus 1/4 surplus; Arizona, 2,800 plus 1/4 surplus (assumes total deficiency of 2,800 not available); CAP, Arizona less 1,160 mainstream uses.

LOWER COLORADO RIVER BASIN OPERATION STUDY
DEVELOPMENT CONDITIONS, 2000
[Period of record, 1906-65. Units, 1,000 acre-feet]

Year	Lake Mead operation				Distribution of scheduled release								
	Glen Canyon release	Net gain, Glen Canyon-Lake Mead	Total inflow Lake Mead	Evaporation Lake Mead	Scheduled release, Hoover Dam	Soil, Hoover Dam	End of year context, Lake Mead	Nevada-Mexico losses	California entitlement	Arizona entitlement	Available to CAP	Diversion limited to 1,500	Diversion limited to 2,500
1906	8,580	756	9,340	660	8,650	0	12,130	2,240	4,400	2,010	780	780	780
1907	8,580	756	9,340	660	8,650	0	12,160	2,240	4,400	2,010	780	780	780
1908	8,580	756	9,340	660	8,650	0	12,190	2,240	4,400	2,010	780	780	780
1909	8,580	756	9,340	660	8,650	0	12,220	2,240	4,400	2,010	780	780	780
1910	8,580	756	9,340	660	8,650	0	12,250	2,240	4,400	2,010	780	780	780
1911	10,489	756	11,240	690	8,650	0	14,150	2,240	4,400	2,010	780	780	780
1912	13,763	756	14,520	870	8,650	0	19,190	2,240	4,400	2,010	780	780	780
1913	8,736	756	9,490	870	8,650	0	19,190	2,240	4,400	2,010	780	780	780
1914	14,628	2,058	16,680	940	11,300	0	23,640	2,240	5,300	3,730	2,500	1,200	2,500
1915	9,058	2,548	11,620	980	11,300	0	22,970	2,240	5,300	3,730	2,500	1,200	2,500
1916	12,446	1,464	13,910	1,000	11,300	0	24,580	2,240	5,300	3,730	2,500	1,200	2,500
1917	16,968	-1,175	16,790	1,050	11,300	3,120	25,900	2,240	5,300	3,730	2,500	1,200	2,500
1918	9,673	348	10,020	1,020	11,300	0	23,580	2,240	5,300	3,730	2,500	1,200	2,500
1919	8,580	669	9,250	960	11,300	0	20,580	2,240	5,300	3,730	2,500	1,200	2,500
1920	14,617	2,357	16,970	980	11,300	0	25,270	2,240	5,300	3,730	2,500	1,200	2,500
1921	15,599	-417	15,180	1,060	11,300	2,190	25,900	2,240	5,300	3,730	2,500	1,200	2,500
1922	12,158	2,318	14,480	1,070	11,300	2,110	25,900	2,240	5,300	3,730	2,500	1,200	2,500
1923	12,097	1,716	13,810	1,070	11,300	1,440	25,900	2,240	5,300	3,730	2,500	1,200	2,500
1924	8,916	1,623	10,540	1,040	11,300	0	24,100	2,240	5,300	3,730	2,500	1,200	2,500
1925	8,580	589	9,170	970	11,300	0	21,000	2,240	5,300	3,730	2,500	1,200	2,500
1926	8,702	528	9,230	910	10,310	0	20,000	2,240	4,835	3,235	2,005	1,200	2,005
1927	12,098	738	12,836	900	11,300	0	20,620	2,240	5,300	3,730	2,500	1,200	2,500
1928	11,107	327	11,434	908	11,150	0	20,000	2,240	5,255	3,655	2,425	1,200	2,425
1929	14,980	27	14,980	908	11,300	0	22,750	2,240	5,300	3,730	2,500	1,200	2,500
1930	9,183	440	9,623	940	11,300	0	20,130	2,240	5,300	3,730	2,500	1,200	2,500
1931	275,264	23,189	298,450	22,400	260,188	8,860	8,000	56,000	125,240	78,920	48,170	26,640	48,170
1932	19,068	1,923	11,978	2,000	10,408	355	321	2,240	5,000	3,157	1,867	1,080	1,867
1933	8,283	1,111	9,000	880	8,680	0	18,870	2,240	4,400	2,010	780	780	780

1933	8,580	486	9,070	880	8,650	0	19,370	2,240	4,400	2,010	780	780
1934	8,580	536	9,120	870	8,650	0	18,970	2,240	4,400	2,010	780	780
1935	8,580	325	8,900	850	8,650	0	18,370	2,240	4,400	2,010	780	780
1936	8,580	719	9,300	840	8,650	0	18,180	2,240	4,400	2,010	780	780
1937	8,580	1,167	9,750	840	8,650	0	18,440	2,240	4,400	2,010	780	780
1938	8,580	1,112	9,690	850	8,650	0	18,630	2,240	4,400	2,010	780	780
1939	8,580	668	9,250	850	8,650	0	18,630	2,240	4,400	2,010	780	780
1940	8,580	744	9,320	840	8,650	0	18,210	2,240	4,400	2,010	780	780
1941	8,580	2,132	10,710	860	8,650	0	19,410	2,240	4,400	2,010	780	780
1942	8,580	859	9,540	880	8,650	0	19,420	2,240	4,400	2,010	780	780
1943	8,580	574	9,150	870	8,650	0	19,050	2,240	4,400	2,010	780	780
1944	8,580	750	9,330	860	8,650	0	18,870	2,240	4,400	2,010	780	780
1945	8,580	748	9,330	850	8,650	0	18,700	2,240	4,400	2,010	780	780
1946	8,580	339	8,920	840	8,650	0	18,130	2,240	4,400	2,010	780	780
1947	8,580	805	9,380	840	8,650	0	18,020	2,240	4,400	2,010	780	780
1948	8,580	354	9,100	830	8,650	0	17,470	2,240	4,400	2,010	780	780
1949	8,580	524	9,100	810	8,650	0	17,110	2,240	4,400	2,010	780	780
1950	8,580	16	8,600	800	8,650	0	16,260	2,240	4,400	2,010	780	780
1951	8,580	162	8,740	770	8,650	0	15,580	2,240	4,400	2,010	780	780
1952	8,580	959	9,540	760	8,650	0	15,710	2,240	4,400	2,010	780	780
1953	8,580	58	8,640	750	8,650	0	14,950	2,240	4,400	2,010	780	780
1954	8,580	27	8,610	730	8,650	0	14,180	2,240	4,400	2,010	780	780
1955	8,580	765	9,020	720	8,650	0	14,090	2,240	4,400	2,010	780	780
1956	8,580	443	8,810	710	8,650	0	13,750	2,240	4,400	2,010	780	780
1957	8,580	1,231	9,810	720	8,650	0	14,200	2,240	4,400	2,010	780	780
1958	8,580	954	9,310	720	8,650	0	13,360	2,240	4,400	2,010	780	780
1959	8,580	131	9,320	710	8,650	0	13,660	2,240	4,400	2,010	780	780
1960	8,580	470	9,050	700	8,650	0	13,360	2,240	4,400	2,010	780	780
1961	8,580	684	9,260	690	8,650	0	13,280	2,240	4,400	2,010	780	780
1962	8,580	68	8,650	680	8,650	0	12,600	2,240	4,400	2,010	780	780
1963	8,580	-68	8,510	660	8,650	0	11,800	2,240	4,400	2,010	780	780
1964	8,580	1,018	9,600	650	8,650	0	12,100	2,240	4,400	2,010	780	780
1965	8,580											
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Subtotal, 1931-65...	300,300	22,152	322,430	27,710	302,750	0	-8,030	78,400	154,000	70,350	27,300	27,300
Average, 1931-65...	8,580	633	9,213	792	8,650	0	-229	2,240	4,400	2,010	780	780
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Grand total 1906-65...	576,554	45,351	621,880	50,110	562,910	8,060	0	134,400	279,240	149,270	53,940	75,470
Average, 1906-65...	9,609	736	10,365	835	9,362	148	0	2,240	4,654	2,468	899	1,258
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Note: Scheduled release: Minimum 8,650, maximum 11,300; to maximize yield from Lake Mead for a 2,500 diversion to central Arizona project. Distribution: Losses, 540; Mexico, 1,500; Nevada, 200; California, 4,400 plus ¼ surplus; Arizona, 2,800 plus ¼ surplus (assumes total deficiency if 2,800 not available); CAP, Arizona less 1,250 mainstream uses.

COLORADO RIVER BASIN PROJECT

LOWER COLORADO RIVER BASIN OPERATION STUDY
DEVELOPMENT CONDITIONS, 2030
[Period of record, 1905-65. Units, 1,000 acre-feet]

Year	Lake Mead operation					Distribution of scheduled release							
	Glen Canyon release	Net gain, GlenCanyon-Lake Mead	Total inflow, Lake Mead	Evaporation, Lake Mead	Scheduled release, Hoover Dam	Spill, Hoover Dam	End of year content, Lake Mead	Nevada-Mexico losses	California entitlement	Arizona entitlement	Available to CAP	Diversion limited to 1,200	Diversion limited to 2,500
1905	8,230	726	8,960	630	8,350	0	11,320	2,340	4,400	1,610	380	380	380
1907	8,230	726	8,960	630	8,350	0	11,300	2,340	4,400	1,610	380	380	380
1908	8,230	726	8,960	630	8,350	0	11,280	2,340	4,400	1,610	380	380	380
1909	8,230	726	8,960	630	8,350	0	11,260	2,340	4,400	1,610	380	380	380
1910	8,345	726	9,070	640	8,350	0	11,320	2,340	4,400	1,610	380	380	380
1911	10,181	726	10,910	67	8,350	0	13,210	2,340	4,400	1,610	380	380	380
1912	13,312	726	14,040	770	8,350	0	18,130	2,340	4,400	1,610	380	380	380
1913	8,358	726	9,080	840	8,350	0	23,000	2,340	4,400	1,610	380	380	380
1914	14,171	2,028	16,200	910	10,310	0	23,000	2,340	4,785	3,185	1,955	1,200	1,955
1915	8,696	2,518	11,210	960	10,230	0	23,000	2,340	4,745	3,145	1,915	1,200	1,915
1916	12,011	1,434	13,440	1,000	11,400	0	24,040	2,340	5,330	3,730	2,500	1,200	2,500
1917	16,474	2,205	16,270	1,040	11,400	2,970	24,900	2,340	5,330	3,730	2,500	1,200	2,500
1918	9,285	319	9,600	1,040	10,460	0	23,000	2,340	4,860	3,260	2,030	1,200	2,030
1919	8,230	639	8,870	880	8,350	0	22,540	2,340	4,400	1,610	380	380	380
1920	14,167	2,827	16,500	1,040	11,400	1,700	24,900	2,340	5,330	3,730	2,500	1,200	2,500
1921	15,119	447	14,670	1,070	11,400	2,200	24,900	2,340	5,330	3,730	2,500	1,200	2,500
1922	11,734	2,238	14,020	1,070	11,400	1,550	24,900	2,340	5,330	3,730	2,500	1,200	2,500
1923	11,672	1,686	13,360	1,070	11,400	1,690	24,900	2,340	5,330	3,730	2,500	1,200	2,500
1924	8,544	1,593	10,140	1,050	10,990	0	23,000	2,340	5,125	3,525	2,295	1,200	2,295
1925	8,230	1,559	8,790	960	8,350	0	22,460	2,340	4,400	1,610	380	380	380
1926	9,325	490	9,810	960	8,350	0	22,940	2,340	4,400	1,610	380	380	380
1927	11,658	708	12,370	990	11,330	0	23,000	2,340	5,295	3,695	2,465	1,200	2,465
1928	10,697	297	10,990	990	10,010	0	23,000	2,340	4,635	3,035	1,805	1,200	1,805
1929	14,495	-3	14,490	1,020	11,400	170	24,900	2,340	5,330	3,730	2,500	1,200	2,500
1930	8,803	410	9,210	1,010	10,100	0	23,000	2,340	4,680	3,080	1,850	1,200	1,850
Subtotal, 1905-30	266,427	22,449	288,890	22,640	245,080	9,480	11,680	58,500	119,835	66,745	35,995	20,980	35,995
Average, 1905-30	10,667	898	11,555	898	9,803	379	467	2,500	4,793	2,670	1,440	839	1,440
1931	8,230	468	8,770	970	8,350	0	22,380	2,340	4,400	1,610	380	380	380
1932	8,230	1,061	9,210	960	8,350	0	22,380	2,340	4,400	1,610	380	380	380

1933-----	8,230	456	8,690	940	8,350	0	21,780	2,340	4,400	1,610	380	380	380
1934-----	8,230	506	8,740	940	8,350	0	21,230	2,340	4,400	1,610	380	380	380
1935-----	8,230	295	8,520	920	8,350	0	20,480	2,340	4,400	1,610	380	380	380
1936-----	8,230	689	8,920	900	8,350	0	20,150	2,340	4,400	1,610	380	380	380
1937-----	8,230	1,137	9,370	900	8,350	0	20,270	2,340	4,400	1,610	380	380	380
1938-----	8,230	1,062	9,310	900	8,350	0	20,330	2,340	4,400	1,610	380	380	380
1939-----	8,230	1,638	8,870	890	8,350	0	19,660	2,340	4,400	1,610	380	380	380
1940-----	8,230	714	8,940	890	8,350	0	19,660	2,340	4,400	1,610	380	380	380
1941-----	8,230	2,102	10,330	900	8,350	0	20,740	2,340	4,400	1,610	380	380	380
1942-----	8,230	929	9,160	920	8,350	0	20,630	2,340	4,400	1,610	380	380	380
1943-----	8,230	544	8,770	900	8,350	0	20,150	2,340	4,400	1,610	380	380	380
1944-----	8,230	750	8,950	890	8,350	0	19,860	2,340	4,400	1,610	380	380	380
1945-----	8,230	718	8,950	880	8,350	0	19,590	2,340	4,400	1,610	380	380	380
1946-----	8,230	369	8,540	870	8,350	0	18,900	2,340	4,400	1,610	380	380	380
1947-----	8,230	775	9,000	860	8,350	0	18,690	2,340	4,400	1,610	380	380	380
1948-----	8,230	324	8,550	840	8,350	0	18,050	2,340	4,400	1,610	380	380	380
1949-----	8,230	494	8,720	830	8,350	0	17,590	2,340	4,400	1,610	380	380	380
1950-----	8,230	-14	8,220	810	8,350	0	16,650	2,340	4,400	1,610	380	380	380
1951-----	8,230	132	8,360	790	8,350	0	15,970	2,340	4,400	1,610	380	380	380
1952-----	8,230	929	9,160	770	8,350	0	15,910	2,340	4,400	1,610	380	380	380
1953-----	8,230	28	8,260	760	8,350	0	15,060	2,340	4,400	1,610	380	380	380
1954-----	8,230	-3	8,230	740	8,350	0	14,200	2,340	4,400	1,610	380	380	380
1955-----	8,230	675	8,900	720	8,350	0	14,030	2,340	4,400	1,610	380	380	380
1956-----	8,230	413	8,640	710	8,350	0	13,610	2,340	4,400	1,610	380	380	380
1957-----	8,230	1,201	9,430	710	8,350	0	13,980	2,340	4,400	1,610	380	380	380
1958-----	8,230	1,924	9,150	720	8,350	0	14,060	2,340	4,400	1,610	380	380	380
1959-----	8,230	101	8,330	710	8,350	0	13,320	2,240	4,400	1,610	380	380	380
1960-----	8,230	714	8,940	700	8,350	0	13,220	2,340	4,400	1,610	380	380	380
1961-----	8,230	440	8,670	690	8,350	0	12,850	2,340	4,400	1,600	380	380	380
1962-----	8,230	654	8,880	680	8,350	0	12,700	2,340	4,400	1,610	380	380	380
1963-----	8,230	38	8,270	670	8,350	0	11,950	2,340	4,400	0,600	380	380	380
1964-----	8,230	-99	8,130	640	8,350	0	11,090	2,340	4,400	1,610	380	380	380
1965-----	8,230	988	9,220	640	8,350	0	11,320	2,340	4,400	1,610	380	380	380
Subtotal, 1931-65-----	288,050	21,102	308,130	28,580	282,250	0	-11,680	81,900	154,000	56,350	13,300	13,300	13,300
Average, 1931-65-----	8,230	603	8,833	816	8,350	0	-333	2,340	4,400	1,610	380	380	380
Grand total, 1906-65-----	554,477	43,551	598,010	51,200	537,330	9,480	0	140,400	273,835	123,095	49,295	34,280	49,296
Average, 1906-65-----	9,241	726	9,967	853	8,968	158	0	2,340	4,564	2,052	4,822	4,571	4,822

Note: Scheduled release: Minimum, 8,350; maximum, 11,400; to maximum yield from Lake Mead for a 2,500 diversion to central Arizona project. Distribution: Losses, 540; Mexico, 1,500; Nevada, 300; California, 4,400 plus ½ surplus; Arizona, 2,800 plus ½ surplus (assumes total deficiency if 2,900 not available); CAP, Arizona less 1,230 mainstream uses.

Mr. ASPINALL. I wish to state that some members of the committee disagree with the Secretary on the flow of the Colorado River. With respect to the chart shown a few minutes ago, it is the only one that has shown a continuous downward trend. The other rivers show an up-and-down flow record. The Colorado has never been able to come back to any extent. But that is neither here nor there.

I want to thank you for having Mr. Riter give that information. I want the members of the committee to understand that these spills are due almost entirely to the assumed inclusion of the 1906-1922 runoff period. In order that the members understand the relationship between the inclusion of the 1906-1922 period and the water supply for the central Arizona project, let me point out that the Bureau shows that the average spill equals 35 percent of the total central Arizona project water supply, and that, under 2030 conditions, the average spills exceeds the total amount of water supplied to central Arizona project from the Colorado River.

I would like to have someone from the Secretary's staff explain this peculiar situation.

Secretary UDALL. Mr. Chairman, I wonder if we could include that answer also. It is related to the questions you asked earlier.

Mr. ASPINALL. I think it is very important.
Mr. JOHNSON. Mr. Secretary, you will furnish that?
Secretary UDALL. Yes, indeed.

Mr. ASPINALL. In other words, it would appear that most of the water from the central Arizona project is supplied from reservoir spills which would not be available if we adopt a period of runoff beginning in 1922, when we entered into the Colorado River Compact. (The material referred to follows:)

Basically, the Colorado River water supply for the Central Arizona Project will come from two sources: (1) regulated releases from Glen Canyon Dam and (2) spills from Glen Canyon Dam into the Lower Basin. Referring to the water supply analysis for the Central Arizona Project summarized in the table on page 96 of the March 1967 record of hearings on H.R. 3300 and similar bills, the breakdown of the estimated CAP water supply between these two sources is as follows:

[In thousands of acre-feet]				
Source	1975	1990	2000	2030
Regulated release.....	1,650	1,020	730	284
Upper basin spills.....	0	235	296	392
Total ¹	1,650	1,255	1,026	676

¹ With aqueduct capacity of 2,500 cubic feet per second.
Spills from the Upper Basin would serve other uses than CAP water supply. An approximate accounting of the Upper Basin spills shown on the referenced table is as follows:

[In thousands of acre-feet]				
Use	1975	1990	2000	2030
CAP water supply.....	0	235	296	392
California water supply.....	247	287	254	164
Unused Arizona entitlement ¹	247	283	232	146
Increased evaporation from Lake Mead.....	126	119	103	153
Spill to Mexico.....	653	269	148	158
Total.....	1,273	1,193	1,033	1,013

¹ Available to Arizona with a larger aqueduct than 2,500 cubic feet per second. If aqueduct is limited to 2,500 cubic feet per second, essentially all of this water would be additional spills to Mexico.

The estimated spills shown above are, of course, averages over the period 1906-1965. During such a cycle actual spills would be limited to a few years. If the runoff period 1922-1965 were used as the basis for analysis, our studies indicate that there would be no spills, either from Glen Canyon or from Hoover, and thus the entire water supply for CAP would come from regulated releases at Glen Canyon.

Mr. ASPINALL. In addition, it is hard for me to see how these spills are made usable to the extent indicated even if the period 1906 to 1967 is used. Where are you going to use this water under the proposals you have in the central Arizona project as such? How are you going to have it used?

You are not going to have it in Lake Mead. You are not going to have it in the rivers below. Are you going to carry it through the aqueduct and store it in central Arizona?

Where are you going to use the water?

Mr. RITER. The numbers I gave you are spills from Lake Mead, These would not be usable, sir.

Maybe you are referring to spills from Lake Powell.

Mr. ASPINALL. I am referring to the spills you suggested are going to be available to take care of the project.

Mr. RITER. The numbers I read to you from the record, the spills from Lake Mead, are nonusable.

Mr. ASPINALL. You don't mean that, because they will surely be picked up by the Yuma project or the California users. Do you mean to say they are going to go into the Gulf of California?

Mr. RITER. Yes, sir; at least into Mexico.

Secretary UDALL. Mr. Chairman, I think it is very clear that we have a big job on our hands to answer clearly, as clearly as we can, the question that you have posed here. We will certainly do so.

Mr. ASPINALL. Primarily, Mr. Secretary, Mr. Dominy, Mr. Riter, what I am trying to find out is what you are going to do with these spills between upper basin, which is Glen Canyon, and the Lake Mead supply. What are you going to do with those waters?

Are they going to be wasted?

Mr. RITER. Congressman Aspinall, the spills from Lake Powell we anticipated will be largely conserved in Lake Mead and used in lower basin projects.

Mr. ASPINALL. Well, if I have your figures correctly as they have been set forth, for the year 1975, you say the upper basin spill will be 1,273,000.

Mr. RITER. That is what our tables show.

Mr. ASPINALL. And the Lake Mead spill will be 653,000?

Mr. RITER. That is right.

Mr. ASPINALL. You have a recovered spill of 620,000. What are you going to do with that water?

Mr. RITER. That will be used in the lower basin, either in central Arizona or some of the lower basin projects.

Mr. ASPINALL. You have a spill in the year 2030 of 1,013,000. You have a Lake Mead spill of 158,000. That leaves a recoverable spill of 855,000. That is 85 percent. What are you going to do with that water?

Mr. RITER. Part of that will be diverted by the central Arizona project. Part of it will be diverted by other projects in the lower basin, sir.

Mr. ASPINALL. Mr. Secretary, before leaving this matter of virgin flow, I want to say I have no confidence in the stream flow records prior to 1922, as you might assume. I believe that my views are shared by most of the experts in this field who have studied this matter, other than the Bureau of Reclamation. In 1953, the State of Colorado hired the firm of Leeds, Hill & Jewett, to report on the availability of water for use in the upper basin and, in 1965, the Upper Colorado River Commission had an exhaustive series of studies made by the internationally recognized engineering firm of Tipton & Kalmbach. It is too bad Mr. Tipton has departed this world. Neither of these firms has agreed with the Bureau of Reclamation in this matter.

It has been 10 years since the progressive 10-year-average virgin flow assumed by the Bureau of Reclamation, and during this 35-year period the trend has been consistently down, as shown by your chart. You will not find this situation in any other river basin in the United States. It seems completely unreasonable to me to attribute this decline in water use entirely to the occurrence of a drought cycle.

Mr. Secretary, do you agree with me that over this period, there have been other scientific reasons for the declining water supply, such things as change in watershed conditions or anything else? What is the opinion of your experts?

Secretary UDALL. I don't think, Mr. Chairman, that we attribute the decline to any major changes in the watershed; watershed conditions that would affect runoff. I think it is our judgment that this is one of the most severe drought cycles in the long history of the Colorado, as indicated by tree-ring records.

Mr. ASPINALL. Mr. Secretary, the second assumption involved in the water supply involves upper basin depletions. In your statement, you point out the differences between the Bureau's estimate and the upper basin estimate of such depletions.

I want the members of the committee to understand how the difference in these estimates could make a big difference in the water availability in the lower basin.

In your statement, by the way, Mr. Secretary, you have taken it upon the Office of the Secretary to determine how these depletions will take place in the upper basin when the use of these waters under the compact are decisions for the upper basin States to make and they have their depletion studies also.

Your statement indicates that, by the year 1990, the Bureau estimates upper basin depletions at only 5,100,000 acre-feet, while the upper basin estimate—this is by the Upper Colorado River Compact Commission—shows 6,342,000 acre-feet. Members of the committee should note that the difference between these two figures is about the same amount as the average annual water supply for the central Arizona project.

I think you would agree to the determination that that is the difference.

Secretary UDALL. I cannot argue with your mathematics, Mr. Chairman; we do have a difference on certain assumptions that are made.

Mr. ASPINALL. Mr. Secretary, who do you think is in the best position to estimate the upper basin development—the Bureau of Reclamation or the States themselves who have a right to this water?

Secretary UDALL. I think we are both in the picture. I cannot argue with you that the States involved have a right to determine the schedule on which they want to make depletions, but because the Bureau of Reclamation will build the projects, because the Federal Government, Federal financing and a schedule of Federal action are involved, I think we are really both in the picture. Obviously we disagree on certain assumptions.

Mr. ASPINALL. We agreed, I think, in this assumption, that we want the river developed and that we want the river developed coordinately for the benefit of all sections of the river. On the other hand, I have heard some statements coming from Arizona to the effect that if they didn't get this project as a Federal project they would go ahead and build it themselves.

If Colorado should assume this same position, the Bureau of Reclamation wouldn't have very much to say about the depletion of the upper basin, would it—or if the State of Wyoming or the State of Utah should take that position? You wouldn't have very much to say about it as far as the representative of Federal Government, would you?

Secretary UDALL. That is an argument that cuts both ways. There are many problems attendant to the State building projects on their own, as I think some of the Arizona people have found out.

But, in a sense, one could make the argument the chairman is making, just as others have made the argument in a similar way.

Mr. ASPINALL. I am not asking for your agreement. What I am trying to say is that it isn't necessarily beholden on the Department of Interior or the Federal Government to determine what the development in the upper basin is going to be.

That is a matter for the States concerned and for the Congress of the United States. Is that not correct?

Secretary UDALL. I think I would have to agree with you in part that we do not have complete control.

Mr. DOMINY. Mr. Chairman, in appearing here in support of the central Arizona project authorization, I think it is proper for us to point out some weaknesses in the projection the upper basin has used. I do not agree with it. I think ours are much more realistic.

For example, Mr. Tipton showed an increase in upper basin depletion of nearly 3 million acre-feet between his study of a couple of years ago and 1985. Now, considering that, over the past 100 years, uses have developed to deplete the upper basin by only 2,800,000 acre-feet, we don't believe it is realistic to show uses developing in the next 17 years that will require depletion in excess of that amount.

Mr. Tipton shows full depletion by 1985, both on the Navajo Indian irrigation project and the Bonneville-central Utah project. I just don't think that this is possible of achievement by a long way. It would involve full development of 110,000 acres and full water depletion of 250,000 acre-feet by 1985 on the Navajo Indian irrigation project and 166,000 acre-feet of depletion by 1985 on the Bonneville unit of the central Utah project. I don't think it can be done.

Mr. Tipton shows full depletion of all five upper basin projects by 1985. Even if they were built concurrently with the central Arizona project, all the lands would not be in production nor would all the

water be depleted by 1985, by even an optimistic estimate. It isn't possible.

Mr. Tipton shows 40,000 acre-feet being used in the four counties area of northeast Colorado by 1975. That use has been in controversy, is still in controversy. If it were resolved today, the projected water use could not be accomplished by 1975. The Seedskaadee project, Mr. Tipton shows full depletion by 1980 on that project. That is not possible of achievement.

I defend the project projections the Bureau made. We have been in the business for a long time and we have no special axes to grind.

Mr. ASPINALL. I just want to say Mr. Dominy has defended the projections that the Bureau has made. This is his proposal as far as that is concerned. If it conflicts with the other information, he is certainly of a right to make that statement.

Mr. BURTON of Utah. Before you leave that point, I would like to draw it out a little better on the record.

When Congress seemed unsure of the central Arizona project, there were people in Arizona who said they would go it alone. Nobody in the Federal Government said Arizona did not have the right to go it alone. Is that correct?

Secretary UDALL. I think they have the right to go it alone. I think they can undoubtedly put a project of some kind together. There is no doubt that the water cost would be substantially higher. I think the State has the resources, I think it has the determination that, if once it were made clear there were to be no Federal legislation, you would see quite a movement in the State. That is my own judgment.

Mr. BURTON of Utah. If the gentleman from Colorado would yield further, that is the point, simply to ascertain that the compact rights of the seven States involved are inviolate, as far as I see it, from the Federal standpoint or Department of Interior standpoint.

If I may add this one point, Mr. Chairman, some people have fears in my State that if this project is built the ultimate fate of central Utah may never come to pass.

Because, as you indicated in your statement, Mr. Secretary, I think on page 9, it is unlikely that any Federal developments will be authorized when the river is virtually dry. However, there have been some people in Colorado and in Wyoming and in Utah who have said that, if we are not able to use our entitlement through the benefit of Federal projects, some of the States involved might use this water in the development of oil shale should this resource be developed in the future. I cannot see any reason why Utah or Colorado or Wyoming could not go it alone on certain reclamation projects if they choose or why they could not use the water in oil shale development in future years if they choose, without interference from the Department of the Interior.

Would you agree with that?

Secretary UDALL. I think whatever option Arizona has to go it alone the other States have a similar option. The only other ingredient is their own determination or their own desperation, as it might exist.

I want to add one other comment, though, because we develop quite a pessimistic, gloomy mood when we discuss it this way. I have been an optimist all along about the future of this region. This is one of the fastest growing regions in the country. This country is strong

enough and has the technological capability, I think, in one way or another to augment this river. Rather than talking about us running out of water, I think, if we get this legislation behind us, creative talk can then begin in the whole region about the various means of augmentation. That is the reason that I do not like to think we are heading down the road where a river runs dry. I do not like that kind of speculation.

Mr. BURTON of Utah. I share your optimism, Mr. Secretary, I wish I could get Mr. Wyatt here to join with me.

I thank you gentlemen for yielding.

Mr. UDALL. Would the gentleman yield?

I thoroughly agree with what has been said. Augmentation, as your statement said, makes all these questions academic. But talking about the determination of States to go it alone; there is determination in Arizona and I don't think there is any doubt about it that we are going to go the Federal route.

Mr. ASPINALL. I think my friend from Arizona, he is not speaking about water from the upper basin. The upper basin has control of its own water in the compact.

Mr. JOHNSON. Would the gentleman yield on that point?

Mr. ASPINALL. Yes.

Mr. JOHNSON. I want to say that that is California's real interest in this matter, that we have taken it upon our own and moved over to the river. We want to stay there and receive our share. That is our real interest.

Mr. ASPINALL. Let me get back, Mr. Chairman, to my question.

Let me point out, Mr. Secretary, that if we take the present depletion in the upper basin, and add projects already authorized, the total upper basin depletion will amount to four and a half million acre-feet of water. Do you believe, Mr. Secretary, that between now and 1990 there will be additional development, both Federal and non-Federal, which will result in the depletion of only an additional 600,000 acre-feet of water?

Secretary UDALL. Mr. Chairman, I would really rather provide a written reply, if I may, to that question.

Mr. JOHNSON. All right. I will ask permission to insert it.

The five upper basin projects authorized in this legislation alone involve the depletion of about 400,000 acre-feet of water. The question then is what is the answer on both of these questions.

You will furnish the information and put it in the record at this point.

Secretary UDALL. Yes.

Mr. ASPINALL. I ask unanimous consent.

Mr. JOHNSON. Do I hear objection to the request of the gentleman from Colorado?

Hearing none, it is so ordered.

(The material referred to follows:)

Studies made in 1965 show the "present" depletions in the Upper Colorado River Basin at Lee Ferry to be 2,878,000 acre-feet. The following table lists the estimated ultimate additional depletions from expansions of existing and authorized Federal and non-Federal projects and by the five Upper Basin Federal projects included for authorization in H.R. 3300. The table shows also

the Bureau of Reclamation estimate of the amount of the ultimate additional depletion that would be attained by the year 1990.

[In thousands of acre-feet]			
State	Project	Additional depletion	
		Ultimate	By 1990
All.....	Evaporation, Colorado River storage project.....	570	570
Arizona.....	Industrial use.....	39	39
Colorado.....	Silt.....	6	6
Do.....	Fryingpan-Arkansas.....	70	70
Do.....	Independence Pass expansion.....	14	14
Do.....	Bostwick Park.....	3	3
Do.....	Fruitland Mesa.....	28	28
Colorado-Wyoming.....	Savery-Pot Hook.....	38	38
Colorado.....	Denver expansion.....	215	135
Do.....	Colorado Springs expansion.....	6	6
Do.....	Homestake.....	74	58
Do.....	Englewood.....	10	10
Do.....	Pueblo expansion.....	3	3
Do.....	M. & I. from Green Mountain Reservoir.....	12	12
Do.....	Expansion, Hayden steamplant.....	12	8
Colorado-New Mexico.....	Animas-La Plata.....	146	79
Colorado.....	Dolores.....	87	69
Do.....	Dallas Creek.....	37	29
Do.....	West Divide.....	76	30
Do.....	San Miguel.....	85	40
New Mexico.....	Farmington M. & I.....	5	0
Do.....	Additional use, Hammond.....	5	5
Do.....	San Juan-Chama.....	110	110
Do.....	Navajo Indian.....	250	170
Do.....	Expansion, Hogback.....	10	10
Do.....	Additional use, Utah construction.....	25	25
Do.....	M. & I. from Navajo Reservoir.....	10	100
Utah.....	Additional use, Vernal unit.....	2	2
Do.....	Bonneville unit.....	166	150
Do.....	Upalco unit.....	20	20
Do.....	Jensen unit.....	10	10
Do.....	Emery County.....	17	17
Do.....	Industrial Resources, Inc.....	102	102
Wyoming.....	Seedskaadee.....	165	145
Do.....	Lyman.....	10	10
Do.....	Additional use, Westvaco, etc.....	36	36
Do.....	Cheyenne M. & I.....	31	26
Total at sites of use.....		2,495	2,185

¹ Proposed contracts would expire in year 2005.

Without making allowance for future salvage of channel losses between the sites of use and Lee Ferry, these numbers, added to estimated "present" depletions, indicate a total depletion of 4,972,000 acre-feet by the year 1990, or 128,000 acre-feet less than the 1990 depletion projected by the Bureau of Reclamation. Taking into account the salvage potential of 60,000 acre-feet, this would allow for 188,000 acre-feet of additional uses not identified in the above table.

Mr. ASPINALL. On the matter of water loss, I have no real disagreement with the Secretary except to point out that the Bureau's estimate of water losses is based upon having the salvage program and salvage works in operation. They are not computed at the present time and until they are, of course, water losses will naturally be higher.

I would like to have permission, Mr. Chairman, to put in the record at this point the detailed statement that puts in the record my views on the virgin flows and the upper basin depletion of the Colorado River Basin.

Mr. JOHNSON. Is there objection to the chairman's request?

(No response.)

Mr. JOHNSON. Hearing none, is it so ordered.

(The material referred to follows:)

COMMENTS ON WATER SUPPLY BY MR. ASPINALL

Throughout history the Upper Division States (Colorado, New Mexico, Utah and Wyoming) have relied upon the Colorado River Compact of 1922 and the Upper Colorado River Basin Compact of 1948 for their protection. These documents are supposed to protect (1) the right of the Upper Colorado River Basin to develop water apportioned to it as a whole, and (2) the right of each of the Upper Division States to conserve and utilize its share of the Upper Basin water. Their reliance on these documents is still predicated upon confidence in the approval by the Congress of these two keystone documents.

Due to the relatively slower rate of growth of the States of the Upper Basin as compared with the population and economic expansion of the Lower Basin, and political influences beyond their control, the four Upper Division States have had to wait until the Supreme Court resolved differences between Arizona and California before the Upper Basin could move ahead with its water resources program. For instance it was not until the last lawsuit *Arizona v. California* was well under way that a real Federal program of water development could be initiated in the Upper Basin.

In contrast to the legal entanglements among the Lower Division States the Upper States made their own decisions pertaining to the apportioning of water among themselves by means of the Upper Colorado Basin Compact. By approving this compact for the Upper Basin States the Congress for the second time strongly expressed its intent to preserve and protect the development of the water resources of the Upper Basin until social and economic conditions proved their conservation and utilization to be necessary in the best interests of the region and the Nation.

The Congress approved the Colorado River Storage Project Act in 1956. This Act is a comprehensive basin-wide integrated program of water and related natural resources development for the States of Colorado, New Mexico, Utah and Wyoming. In this Act the Congress for the third time expressed its intent to utilize the waters of the Colorado River system in the Upper Basin for the development of that region.

For the past 20 years this Committee has been subjected to a barrage of conflicting testimony pertaining to the amount of available water in the Colorado River system. Almost every occasion when legislation involving the Colorado River has been considered we have heard testimony indicating wide differences of opinion with regard to the dependability of the water supply actually remaining available for consumptive use. For this reason when H.R. 4671 of the 89th Congress, a predecessor bill to the pending legislation, was before the Committee I requested all of the States of the Colorado River Basin to compile up-to-date water supply analyses and to state their positions in the light of the results. During the course of the hearings on H.R. 4671 the Committee received testimony concerning three detailed analyses of water supply. These analyses were prepared by engineers at the Bureau of Reclamation, by engineers of the States of Arizona, California and Nevada, and by the engineering firm of Tipton and Kalmbach, Inc. (under the auspices of the Upper Colorado River Commission). The three sets of studies were based upon different assumptions as to net channel and evaporation losses, rates of increase of Upper Basin stream depletions and in some instances the periods of stream flow records. The studies of the Upper Colorado River Commission embraced many combinations of these factors.

The most important result of these three analyses is the surprising degree of agreement with respect to the water supply remaining available for development in the Basin. The differences in the final results of the three studies relate only to the expected time when utilization of the entire water resources of the Basin will be accomplished.

The Upper Basin's Colorado River Storage Project is based upon the principle of long-term holdover water storage—the holding of water in reservoirs from good water years to be used in the lean years. In fact, this is the fundamental concept and Congressionally expressed intent of the law under which the Upper Basin's water development program was authorized. Departmental witnesses in 1954 and 1955 told this Committee that it was only under such a long-term, hold-over storage principle that the Upper Division States could put to use their

compact-apportioned water supplies without curtailing their uses in lean water years. The Department in its report that it transmitted to the Congress in support of the Colorado River Storage Project stated:

"A capacity of 23 million acre-feet would be reserved in project reservoirs for long-time regulatory storage. The water stored would be released as needed in drought periods to meet the compact obligation at Lee Ferry. The reservoirs would be refilled during years of favorable water supply. In a dry decade such as that of 1931-40, release of the entire 23 million acre-feet would be necessary to meet the Lee Ferry obligation. A storage release in that amount would be necessary even if water uses in the upper basin were naturally curtailed by the drought, resulting in a depletion at Lee Ferry somewhat less than the compact-permitted 7,500,000 acre-feet annually.

"Present flows in the upper basin are adequate to meet the 10-year Lee Ferry obligation. Within 20 or 25 years, however, the depletions are expected to increase to the extent that curtailment of consumptive uses will be necessary in protracted dry periods unless some storage water is available for delivery to the lower basin. If the required storage works are to be available when needed, steps toward construction should be taken immediately. An extended construction period will be required and the reservoirs should be filled initially while unused apportioned water is available."

It is this limited supply of "unused apportioned water" that is the subject of controversy in this legislative effort.

I am sure that the Department still holds the view that its statement of 1954 is correct with respect to this point. I want to remind this Committee that at the time (1954) that the Department reported on the Colorado River Storage Project its witnesses were telling us that there was no doubt that there was a water supply available for Upper Basin development under the Colorado River Storage Project. This assertion was true because, at that time the Upper Basin States were using only 2 to 2½ million acre-feet of their compact apportionment of 7½ million acre-feet of consumptive use. I also wish to remind the Committee that in 1954, as mentioned by the Department, a minimum 10-year average of 11.8 million acre-feet of virgin flow at Lee Ferry was behind us. But, also at the same time the river was entering another 10-year period (1954-63) of minimum average virgin flow at Lee Ferry of only 11.8 million acre-feet. This record is now available. It was not in 1954. These two 10-year periods of minimum flows are far below that required to provide full compact-apportionments of 7½ million acre-feet of consumptive use per year to each of the two basins. As a matter of fact, the Department has pointed out that the average virgin flow for the period since the signing of the Colorado River Compact, 1922-1967, has been only 13.7 million acre-feet, and for the 1906-1967 period only 14.9 million acre-feet. Both figures are also below compact apportionments to the Upper and Lower Basins. The Department favors the use of the 1906-1967 period of record only because under that record can the Department find a water supply for the Central Arizona Project by using fairly large amounts of water presently unused by the Upper Basin, but the use of which has been apportioned to the Upper Basin. And let me remind you that this water will be put to use in the Upper Basin States at rates much more rapidly than those assumed by the Department in its studies.

Furthermore, the Department in order to find a water supply for a Central Arizona Project is forced to utilize so-called "spills" from the Upper Basin on an average annual basis. The use of those spills in water supply analysis on an annual basis is certainly open to question for the simple reason that they do not occur in that manner over a 62-year period. In other words, this type of analysis ignores the fact that all of the spills were interspersed in 24 years prior to 1929 and that in the following 36 years only regulated releases would be available for a Central Arizona Project water supply. In view of the present small amounts of water in Lake Powell and Lake Mead, only regulated releases can be anticipated for several more years. The question therefore arises as to the use of spills by the Department in its water supply analysis since past records and present conditions could preclude spills for 40 or more consecutive years. This places the water supply for a Central Arizona Project in a very precarious situation.

On the basis of the 1906-1963 period used by the Department's table in the Senate report on S. 1004, the spills are shown as averaging under 1975 conditions 1,273,000 acre-feet per year for the 60-year period; 653,000 acre-feet as shown as being lost as spill from Lake Mead. The recovered amount—620,000 acre-feet—is a substantial part (35%) of the supply contemplated for a Central Arizona

Project in 1975. It is interesting to note that the proportion of the Central Arizona Project water supply that is expected to be salvaged from Upper Basin reservoir spills is anticipated to increase in subsequent years as follows :

60-YEAR ANNUAL AVERAGE CAP WATER SUPPLY FROM UPPER BASIN SPILLS					
[In acre-feet]					
Year	Upper basin spill	Less Lake Mead spill	Recovered spill	Total water supplied CAP from Colorado River	Percent of total supplied from recovered spill
1975-----	1,273,000	653,000	620,000	1,759,000	35
1990-----	1,193,000	269,000	924,000	1,231,000	75
2000-----	1,033,000	148,000	885,000	1,011,000	88
2030-----	1,013,000	158,000	855,000	1 673,000	100

¹ The danger of depending upon the recovery of such hypothetical spills is partially recognized in the footnote of the table, which states: "Although the average yield under the year 2030 condition would be 723,000 acre-feet, the assured yield would be less than 1/2 of this figure * * *."

The Secretary in his statement mentioned that the Bureau of Reclamation in response to my request had estimated the average annual virgin runoff at Lee Ferry on the basis of the 1906-67 records and had found it to be 14,963,000 acre-feet instead of 15,068,000 acre-feet for the period 1906-1965, a reduction of 0.7 percent. The 0.7 percent, although algebraically correct, is misleading unless other factors are taken into consideration. When considered as an effect upon the annual average, it cannot be spread as 6.2 million acre-feet over the entire 62-year period, but only over the 15 years since 1952 because the Upper Basin reservoirs could logically be expected to refill in 1952, if they were ever to fill again. The critical difference would then be 400,000 acre-feet over 15 years instead of 100,000 acre-feet over 60 or 62 years. The important point, however, is that either the 400,000 or the 100,000 acre-feet would, in reality, constitute a serious item in the Central Arizona Project water supply.

I mentioned a moment ago that water remaining to be developed in the Upper Basin will be put to use at rates much more rapidly than those assumed by the Department in its studies. Certainly I believe that I have a sound foundation for assuming that the Department has a major inconsistency in its assumptions pertaining to future stream depletions in the Upper Colorado River Basin. In the Senate Committee report on S. 1004 the Department shows Upper Basin depletions as follows:

Year:	Depletion (acre-feet)
1975-----	4,220,000
1990-----	5,100,000
2000-----	5,430,000
2030-----	5,800,000

According to records submitted to the Senate Committee and to which the four Upper Division States and Upper Colorado River Commission agreed, present and imminent stream depletions in the Upper Basin States amount to 4,392 acre-feet distributed as follows:

[In thousands of acre-feet]			
State	Present depletion	Authorized Federal projects	State total
Arizona-----	11		11
Colorado-----	1,786	516	2,302
New Mexico-----	145	444	589
Utah-----	579	365	944
Wyoming-----	267	279	546
Total-----			4,392

To the above total must be added 100,000 acre-feet for municipal and industrial water contracts from Navajo Reservoir in New Mexico, (three contracts to use 51,550 acre-feet of this 100,000 acre-feet are now before this Committee) 20,000 acre-feet for the Unitah Unit of the Central Utah Project and 102,000

acre-feet for the Kaiparowits power development in Utah because these water uses are now in definite planning stages. These additions would bring the total to 4,614,000 acre-feet. If the thermal electric generating plant contemplated in pending legislation is to be constructed, Arizona's additional Upper Basin depletion would raise the total to 4,643,000 acre-feet or 433,000 acre-feet more than the Department allowed for Upper Basin depletions for year 1975. Adding five Upper Basin projects to be authorized in the bills before you would cause the Department's estimate to be short by 824,000 acre-feet annually as of 1975, or between 1975 and 1980, depending upon the time of completion of those projects. In addition, non-Federal projects under active consideration could run this deficit even higher which, if taken into account in the Department's analysis would eliminate a large segment of the water supply contemplated for the Central Arizona Project in years 1975 or 1980, again depending upon the date of completion of the Central Arizona Project and the other projects. You should be reminded that the Department contemplates delivery of water to the Central Arizona Project by not later than the year 1979.

These probable water deficits that I have mentioned are based upon the Department's application of a long-term high-flow water supply assumption to which I also cannot agree. Therefore, it appears quite clearly that the Department's study demonstrates that a water supply can be made available for a Central Arizona Project only by throttling future Upper Basin water uses, unless a Colorado River water supply augmentation is put into effect almost simultaneously with the Central Arizona Project. Apparently the Secretary seems to agree with me because in his statement I notice that he agrees that land and other resources in the Upper Basin could be physically developed to deplete water at the rate the Upper Basin estimates it could be depleted. He then adds that it does not appear likely that projects which would completely dedicate the Upper Basin's total remaining unused Colorado River water supply to specific areas or uses would be developed at rates commensurate with Upper Basin projections. Could it be the intention of the Department to put a brake on the Upper Basin development through enactment of this legislation? Certainly I would have to agree that if water that is apportioned to the Upper Basin is put to use in the Lower Basin the chances of the Upper Basin's ever getting it returned are extremely doubtful. This is especially true, also, without an in fact resolution of the magnitude of the Upper Basin's obligation to deliver water to fulfill the burdens of the Mexican Treaty.

Mr. Chairman, at this point I wish to insert into the record tables showing the present stream depletions, authorized Federal projects, probable future depletions, etc.:

TABLE I.—Upper Colorado River Basin stream depletions

COLORADO		Units: 1,000 acre-feet accumulated
1. Present depletions:		
Yampa and Green Rivers.....		65
Hayden Steam project.....		4
White River.....		34
Gunnison River.....		407
Smith Fork project.....		6
Paonia project.....		10
Colorado River—Main stream.....		481
Collbran project.....		7
Pueblo—Eagle River division.....		8
Colorado—Big Thompson project.....		260
Small ditches.....		1
Colorado Springs—Blue River.....		45
Denver—Blue River.....		15
Denver—Moffat Tunnel.....		67
Denver—Williams Fork.....		10
Busk—Ivanhoe Tunnel.....		5
Independence Pass Tunnel.....		38
Grand River ditch.....		30
San Juan and Dolores Rivers.....		289
Florida project.....		16
Total.....		1,788

TABLE I.—Upper Colorado River Basin stream depletion—Continued

	Units: 1,000 acre-feet accumulated
2. Authorized Federal projects:	
Savery—Pot Hook	26
Bostwick Park	4
Fruitland Mesa	28
Fryingpan—Arkansas	70
Ruedi Reservoir, municipal and industrial	6
Silt	6
Mainstream evaporation	342
Total	482
3. Probable future depletions:	
Hayden steam plant	12
Homestake Creek diversion	74
Pueblo—Eagle River	3
Denver—Blue River	215
Denver—Moffat Tunnel	
Denver—William Fork	
Denver—Eagle and Piney Rivers	
Englewood—Moffat Tunnel	10
Independence Pass Tunnel	14
Colorado Springs—Blue River	6
Municipal and industrial from Green Mountain Reservoir	12
Total	346
4. Proposed authorization—H.R. 3300:	
Animas-La Plata	106
Dolores	74
Dallas Creek	87
West Divide	76
San Miguel	85
Total	378
Grand total	2,992
NEW MEXICO	
1. Present depletions:	
Utah construction	15
Navajo Reservoir evaporation	20
Hammond	10
Other existing uses	100
Total	145
2. Authorized Federal projects:	
San Juan-Chama	110
Navajo Indian irrigation	250
Mainstream evaporation	74
Navajo Reservoir evaporation	10
Total	444
3. Probable future depletions:	
Town of Farmington	5
Utah construction	25
Navajo Reservoir contracts	100
Navajo Indian Hogback	10
Total	140

TABLE I.—Upper Colorado River Basin stream depletion—Continued

	Units: 1,000 acre-feet accumulated
4. Proposed authorization—H.R. 3300:	
Animas-La Plata-----	34
Total-----	34
Grand Total-----	763
UTAH	
1. Present depletions:	
Depletions as of 1952-----	407
Subsequent Utah Water and Power Board projects-----	25
Municipal and industrial uses not included elsewhere-----	4
Private developments-----	3
Miscellaneous exports-----	108
Central Utah project Vernal unit-----	10
Miscellaneous evaporation-----	22
Total-----	579
2. Authorized Federal projects:	
Central Utah project:	
Bonneville unit-----	166
Upalco unit-----	20
Jensen unit-----	10
Emery County project-----	17
Main stream evaporation-----	152
Total-----	365
3. Probable future depletions:	
Uintah Unit central Utah project-----	20
Kaiparowits power development-----	102
Total-----	122
4. Proposed authorisations—H.R. 3300-----	0
Grand total-----	1,066
WYOMING	
1. Present depletions-----	267
Total-----	267
2. Authorized Federal projects:	
Seedskafee-----	165
Lyman-----	10
Savery-Pot Hook-----	12
Main stream evaporation-----	92
Total-----	279
3. Probable future depletions:	
Westvaco Industrial-----	41
Cheyenne and Laramie Division-----	30
Total-----	71
4. Proposed authorizations—H.R. 300-----	0
Grand total-----	617

TABLE II.—SUMMARY OF UPPER COLORADO RIVER BASIN DEPLETIONS
[In thousands of acre-feet]

	Arizona	Colorado	New Mexico	Utah	Wyoming	Total
1. Present.....	11	1,786	145	579	267	2,788
2. Authorized Federal projects.....	482	444	365	279		1,604
3. Probable future.....	39	346	140	122	71	758
4. Proposed authorizations, H.R. 3300.....		378	34			425
Total.....	50	2,992	763	1,066	617	5,575

TABLE III.—COMPUTED COMPACT ALLOTMENTS BASED ON VARIOUS ASSUMED WATER SUPPLIES
[In thousands of acre-feet]

	Arizona	Colorado	New Mexico	Utah	Wyoming	Total
7,500,000 acre-feet available.....	50	3,855	838	1,714	1,043	17,500
6,300,000 acre-feet available.....	50	3,234	703	1,438	875	16,300
5,600,000 acre-feet available.....	50	2,872	624	1,277	777	15,600
5,800,000 acre-feet available.....	50	2,976	647	1,322	805	15,800

1 Based on full compact amount being available.
2 Amount from Tipton report limited by historic flow and 7,500,000 acre-foot Lee Ferry delivery.
3 Amount from Tipton report limited by historic flow and 8,250,000 acre-foot Lee Ferry delivery.
4 Amount available as estimated by U.S. Bureau of Reclamation.

The Secretary, as part of his testimony, included a table purporting to show basic differences in projection of Upper Basin stream depletions using a table of comparison of the Tipton depletions with those assumed by his Department. I wish to point out that the table is not complete. The Tipton report also included studies of the Bureau of Reclamation's assumptions of Upper Basin stream depletions in about half of its operation analyses. The Tipton report used projection of depletions as estimated in 1965. Delays in assumed date of construction of the Central Arizona Project and other reclamation projects would necessarily change these rates of assumed depletions if they were to be made today or as of 1970, for example. The same changing conditions would also affect assumptions of the Department. The Bureau of Reclamation's depletions do not include uses of water by all five Upper Basin projects included for authorization in this legislation.

The three million acre-foot difference between the Bureau's and States' stream depletion estimates includes some 650,000 to 700,000 acre-feet already committed to use in mainstream developments and about 400,000 acre-feet for the five Colorado projects. The rates assumed for depletions by the Central Utah and Navajo Indian Irrigation projects were questioned even though those projects are currently under construction. The fact that they may be completed by 1975-1980 or 1985 is not the real issue. If their rate of construction is slower than earlier anticipated, so will be the rate of construction of other reclamation projects. The Secretary has already extended the time of delivery of Central Arizona Project water several years to 1979. The time element, then becomes only relative. The assumptions with regard to physical factors still remain valid even if modified by a change in time of their application.

We have reached the stage in the Colorado River Basin where we are rapidly developing the last increments of the available water supply. Under these conditions, the risks of over development of the water, or of over estimating the supply and causing serious injury to existing and potential economies become compounded. Certainly anyone would have to agree that during the early 1950s, approximately 15 years ago, when the Colorado River Storage Project was being considering by the Congress, the risks of over estimating the available water supply were minor compared with the adverse effects that could result today. This is true because in the 1950s the Upper Basin States were consuming only 2 to 2½ million acre-feet of water per year contrasted with 4.6 million acre-feet that are and will be consumed by presently constructed and authorized projects. In other words, the amount of water remaining to be developed was much greater in the 1950s than it is today. It is more important today than ever before to avoid the risks associated with possible inaccuracies or over estimation from stream

flow records prior to 1922. The Department itself has pointed out that on the basis of the 1922 to 1967 period for which actual measured records at Lee Ferry are available, the virgin flow is estimated to be 13.7 million acre-feet as contrasted to 14.9 million acre-feet for its so-called long term period of 1906 to 1967.

I do not share the confidence that the Secretary seems to have in the stream flow records prior to 1922 for several reasons. First, the Department itself in its 1954 report in H. Doc. 364 on the Colorado River Storage Project mentioned that inaccuracies are risked with the extension of records prior to 1914. In order to avoid part of these risks the Department in its report on the Colorado River Storage Project extensively used the 1914 to 1947 period of water supply records. Of course, at that time (1954) as I have mentioned above, there was plenty of water available for the Colorado River Storage Project under almost any period of records that might be used.

Second, the Secretary has mentioned that continuous water records since 1906 are available at points upstream from Lee Ferry which measure about 70% of the runoff, and continuous records are available downstream from Lee Ferry since 1906 which can be used by statistical correlation methods to produce estimates of flow at Lee Ferry prior to 1922. Considering the risks involved in a possible over estimation of the water supply, I cannot ignore the advice of eminent hydrologists of the U.S. Geological Survey that data for accurate definition of extremes of stream flows are generally deficient. It should be remembered that the estimates of stream flows prior to 1922 involve a majority of the extremely high flows of the Colorado River. According to the Geological Survey experts:

"... tests of the performance of the existing streamflow network in furnishing information from which to estimate flow at ungaged points are being carried out by the Geological Survey using multiple regression methods. A sampling of the network—in the Potomac River Basin, the Central Valley of California, Kansas and Louisiana—suggests that it performs well as a base from which to estimate flows in the median range (error of estimate $\pm 20\%$), but that it is deficient as a base from which to estimate extremes of flow."

In 1968, considering the availability of our present day sophisticated hydrological methods, not much imagination is necessary to raise doubts about the estimates of extremes of the Colorado River flows between 1906 and 1922, or 45 to 61 years ago, when relatively primitive methods of measurement were used at the gaging stations that are now employed to estimate by correlation the synthesized flows at Lee Ferry.

It should be understood by the Committee, after hearing Secretary Udall and Commissioner Dominy and myself on this question of adequacy of a dependable water supply, that my objection, in a critical water supply situation, to the use of estimates (not actual measurements) of certain stream flow records prior to 1922 is based not on their questioned accuracy alone. I also question seriously the actual ability to utilize effectively the extensive spills that result on paper from the inclusion of these early estimates. No matter where the records start, an hydrologist must account for the low flow years following 1930. All of the computed annual reservoir spills cannot be carried over and fully utilized in the dry years following 1930 because of the limitations on reservoir space and the inability of man to forecast anticipated water yields from weather sufficiently far in the future with the required degree of accuracy.

Once the spills from Lake Powell have been stored in Lake Mead, it also fills. This filling is a rapid occurrence under the application of the stream flows in the years following 1906. How can you expect to store more Lake Powell spill water when both reservoirs are full?

Third, I cannot ignore the fact that in the early 1950s the late Silmon Smith, a renowned water attorney from western Colorado, found after extensive study that the ultimate stream depletion available for the Upper Colorado River Basin would be not more than 6.1 million acre-feet annually. This means that the average virgin flow at Lee Ferry would be close to 13.7 million acre-feet. Furthermore, in 1953 the State of Colorado hired the firm of Leeds, Hill and Jewett to report on availability of water for use in the Upper Basin. This report placed the limit on stream depletion by the Upper Basin at 6.2 million acre-feet per year. Again, in 1965 the Upper Colorado River Commission had an exhaustive series of studies made by the worldwide engineering firm of Tipton and Kaimbach, Inc. These studies revealed that with presently existing water storage

¹ Bulletin prepared for Advisory Committee on Water Data for Public Use by Office of Water Data Coordination, U.S. Geological Survey, November, 1967.

capacities and assuming curtailment of delivery water to the Lower Basin to an average of 7.5 million acre-feet per year, the stream depletions above Lee Ferry would be limited by nature to 6.3 million acre-feet per year. The net depletion excluding reservoir losses would be 5.6 million acre-feet annually. Thus, due to the vagaries of nature, the Upper Basin States are already suffering curtailment in their total water resource development to an amount 20% under that apportioned to them by the Colorado River Compact. The risks involved in further curtailment of the Upper Basin's social and economic development as the result of further curtailment of their water uses are real, not imaginary.

Fourth, on the basis of the Department's long-term streamflow records at Lee Ferry, not once since 1933—34 consecutive years—has the progressive 10-year average virgin flow exceeded the average virgin flow. During this 34-year period the trend has been consistently downward. It seems unreasonable to attribute this decline in water yield entirely to the occurrence of a "drought" cycle as contrasted to a "wet" cycle. Scientific reasons for this declining water availability do not seem to be fully known or clearly demonstrated. Maybe watershed conditions have changed materially during the past 35 years so that the same runoff does not result from comparable amounts of precipitation as occurred in earlier years. I recently received a memorandum from my esteemed colleague, Honorable Morris K. Udall of Arizona, that may better illustrate this point. This memorandum states:

"The records of this area (13,000 square-mile watershed of Salt River Project in Arizona) indicate that notwithstanding continuation of approximately the same average annual rainfall which existed more than fifty years ago, the runoff from the watershed has decreased by approximately 50 percent—principally by virtue of uneconomic water-wasting growth on the watershed area. What is true of this area must also be true of watersheds throughout the entire Colorado River Basin—and this undoubtedly has played a great part in the dwindling water supply of the Colorado River since adoption of the Colorado River Compact."²

Whatever the reason may be for this decline in water yield it is apparently obvious to others besides myself that the long-term reliable runoff of the Colorado River has decreased considerable below the estimates for years prior to 1922.

Fifth, the Secretary mentioned that "time will tell regarding your assumptions" that are used in making stream flow analyses. I agree. Yet it seems glaringly apparent from the testimony and discussion that the Department in its studies used the most optimistic water supply, the most pessimistic Upper Basin projected rates of stream depletions, and the most optimistic recovery of river losses of the several agencies whose estimates were compared by the Committee staff. Inherent risks are built into this type of project water supply justification.

In conclusion, Mr. Chairman, I have presented these facts and views on water supply to the Committee in this manner for three important reasons: First, on any river, whether it be the Colorado River or another, that is subject to both severe hydrologic limitations and restrictive legal requirements it is important that the use of water be kept within the capability of the river supply. Second, during my entire Congressional career, almost one-fifth of a Century, it has been the consistent policy of this Committee to report to the Congress only water resources bills about which there is no question concerning availability of water. I believe that this position has been sound, reasonable and in the Nation's interest. Third, I believe that this Committee and the Congress should have before it as complete a set of facts and figures as possible relating to the water supply of the Colorado River system. With all of the facets of the picture in mind and only on this basis with the serious social and economic implications of the probabilities of overestimating the water supply before it, should the Congress decide the issues of this legislation.

Mr. ASPINALL. Mr. Secretary, I am pleased with your discussion of the water quality standards in relation to the Colorado River Basin. I am particularly pleased with your statement that "salinity standards will not be established until we have sufficient information to

² Memorandum dated August 30, 1967, from Hon. Morris K. Udall of Arizona to Hon. Wayne N. Aspinall, Chairman of the Committee on Interior and Insular Affairs, House of Representatives.

assure that such standards will be equitable, workable, and enforceable." The practicable approach set out in your statement will be welcomed by all those throughout the Basin who have been concerned about this problem over the last 2 or 3 years. As you know, many throughout the Basin have been quite upset by statements and positions taken by some of your subordinates.

Now, Mr. Secretary, my only comment on your discussion of the Indian water rights, other than emphasizing to the members of the committee the sizable amounts of water involved and the priority given these rights, has to do with the question of the difference between the diversion amounts and the estimated consumptive use. My concern goes beyond the use of water on the Indian reservations; it goes to the determination of return flow throughout the entire Basin. Your staff has already been alerted as to my request for information on this matter. I hope that someone is in a position to give the committee a brief discussion on how the Bureau makes these determinations.

Are you prepared to do that?

Secretary UDALL. Commissioner Dominy would like to address himself to that.

Mr. DOMINY. Return flows from irrigation developments consist of surface water returns which, when collected in drainage facilities, can be measured. They consist of underground returns which mingle with natural underground flows and can't be positively identified. Thus, it is seldom, if ever, possible to get a complete measurement of all return flows. However, procedures have been developed which, by processes of deduction, give highly reliable estimates of return flows.

The quantity of water diverted for irrigation can be accurately measured and is being accurately measured. The effective rainfall over the growing season can be measured and is being accurately measured, which, together with the diverted water, comprises the water available to grow crops.

A great deal of research, primarily by the Department of Agriculture, has gone into the determination of the consumptive use requirements of various crops under varying soil and climatic conditions. In this research, large tanks are filled with soil. Crops are grown in these tanks under conditions which permit the most precise determination of water application and water use requirements—consumptive requirements of the plant.

Reliable consumptive use figures, not only for crops but for non-crop vegetation, are thus derived for varying climatic conditions and from such research, the widely used Blaney-Criddle method of estimated consumptive use has been developed.

When all estimated consumptive uses are subtracted from the total water available, the remainder must constitute return flow. Some of this return flow which percolates through the ground may take extensive periods to reach the main stream. The theoretical estimates are checked periodically by the Bureau of Reclamation and the most recent studies involved operations on the Rio Grande project in New Mexico and Texas and on the North Platte project in Wyoming and Nebraska, which are two of our oldest projects. The actual measurements of surface return flow at these two projects over several years,

plus considerations of unaccounted subsurface return and peripheral nonbeneficial consumptive uses gave us an excellent check on our estimates of consumptive use and return flow.

So I think, Mr. Chairman, we have established a supportable method for making realistic estimates of consumptive use and return flow.

Mr. ASPINALL. You think you are accurate within one percentage point?

Mr. DOMINY. I would say it is as accurate as man can propound and therefore, it is usable.

Mr. ASPINALL. Of course, Mr. Dominy, we have never had this matter completely determined by any scientific study as such. We have our assumptions. Are you accurate within a 10 percent degree or are you within a 20 percent degree?

Mr. DOMINY. We think we are accurate well within 10 percent, Mr. Chairman.

Mr. ASPINALL. Mr. Chairman, I would ask unanimous consent to place in the record at this place the detailed statement that I have before me of some figures here as to lower basin Indian water users. It is taken from the Secretary's figures.

Mr. JOHNSON. You have heard the request of the gentleman from Colorado.

Is there objection?

Mr. HOSMER. Reserving the right to object, does that conflict with the testimony that has been given?

Mr. ASPINALL. No, it does not. It is just additive to it so you can figure from it.

Mr. HOSMER. As I understand, these have been shown by the Secretary as present perfected rights but he did not estimate what other rights might be of a contingent nature. Is that correct?

Mr. ASPINALL. That is correct.

Mr. HOSMER. Does this paper of yours include contingencies?

Mr. ASPINALL. No.

Mr. HOSMER. I wonder if it would be possible for the chairman to add to his request an estimate from the Bureau of what the range of contingent demands from the Indian tribes might be.

Mr. UDALL. The Supreme Court decision affirmed rights of the Indians to water for the acreages of irrigable land specified in the Court's decree. There were no contingencies provided for. Therefore, the quantity of water involved, is the consumptive use required for the lands.

Mr. HOSMER. I understand there are some 900,000 acre-feet that the Secretary lists. There is some other figure.

Mr. ASPINALL. May the chairman of the full committee state that this information I have here showing that there is an annual consumptive use in 1966 by Indian tribes of approximately 223,566 acre-feet of water on the right they have, and 332,978 acre-feet remaining.

Mr. HOSMER. I thank the gentleman.

I withdraw my reservation.

Mr. JOHNSON. Further objection?

Hearing none, the matter will be placed in the record at this point.

(The material referred to follows:)

LOWER BASIN INDIAN WATER USERS—ARIZONA VERSUS CALIFORNIA

State (Indian reservation)	Acres	Ultimate annual consumptive use at 4 acre-feet per acre	Consumptive use in 1966 (last data available)	Amount remain- ing (acre-feet annually)
Arizona:				
Fort Mohave.....	14,916	59,664	0	59,664
Cocopah.....	431	1,724	1,600	124
Colorado River.....	99,375	397,500	201,966	195,534
Total, Arizona.....	114,722	458,888	203,566	255,322
California:				
Yuma.....	7,743	30,972	20,000	10,972
Fort Mohave.....	2,119	8,476	0	8,476
Chemehuevi.....	1,900	7,600	0	7,600
Colorado River.....	8,213	32,852	0	32,852
Total, California.....	19,975	79,900	20,000	59,900
Nevada: Fort Mohave.....	1,939	7,756	0	7,756
Total, lower basin.....	136,636	546,544	223,566	322,978

Mr. ASPINALL. Mr. Secretary, my only question with respect to pumped hydroelectric plans is whether or not the Department is continuing its studies on this possibility as a means of financing augmentation; if so, what is the present status of those studies?

Mr. DOMINY. We have no concrete proposal on this, Mr. Chairman. We have made some reconnaissance studies of potentials.

The potentials at Lake Mojave appear to be the most promising as a major source of peaking capacity.

Mr. ASPINALL. Mr. Secretary, one reason I wanted a statement from you on the operation of this river under section 602 of the legislation is to determine how important you consider the requirement of consultation and cooperation with the States in establishing the operating criteria and implementing them. It is, after all, the States of the upper basin who have entered into a compact to release certain amounts of water to the lower basin States. The Secretary's responsibility is to operate the works on the river in accordance with this compact and the other compacts, contracts, and so forth, which make up the law of the river.

I feel very strongly that there must be very close consultation with the States and the Upper Colorado River Commission which represents the upper basin States with respect to how the compact provisions and the provisions of section 602 are to be administered.

It is my assumption that the criteria established pursuant to section 602 will go into effect not later than July 1, 1970, the date set out in the bill, and at that time, the filling criteria which are now in effect will be terminated.

Do you agree with this assumption?

Secretary UDALL. Let me say, Mr. Chairman, we are going to need increasingly close consultation on all these matters. We are operating a river which is a life line of the region and which will be governed by criteria and provisions that Congress may write in regard to how we make management decisions. I think we are going to have to have a pattern operation that will involve increasingly close cooperation.

Mr. ASPINALL. Let me say, Mr. Secretary, so that the record will be clear, does the Secretary consider that this is the final determination

of the Secretary as to whether or not—not as to, but whether or not section 602 is part of the legislation?

Secretary UDALL. If section 602 is part of the legislation, we have to implement it and carry it out.

Mr. ASPINALL. You will do your best to carry it out within the time period that I suggested?

Secretary UDALL. That is my statement.

Mr. ASPINALL. Mr. Secretary, I am interested in your estimates of water that can be salvaged through conservation programs.

Does the Department presently have authority to carry out all the measures listed in your statement?

Secretary UDALL. We think that additional, specific authority would be helpful. We would need additional authorization, if, in addition to the items I listed, we are going to line the Imperial Canal. I think we have to be water-saving conscious. I think we can save substantial amounts of water, but there will be major investments and I think we all are going to find that we have an interest in conservation, particularly in the lower basin, where the present losses are high.

Mr. ASPINALL. I think that I would be in agreement with what you state, but of course, we have in H.R. 3300 a provision which would authorize the expenditure of \$42 million for this purpose.

That is still your figure; is it not?

Mr. DOMINY. That is substantially right; yes, sir.

Mr. ASPINALL. Do you not think it would be more to the—better for the operation of the Department if we placed this in this bill and came right out in the open and said what we have in mind rather than trying to hide a part of the cost of this project?

Secretary UDALL. I am all for writing a straightforward bill. I am also for water conversation. I do not see any objection to doing what you propose.

Mr. ASPINALL. Mr. Secretary, I have an opportunity to go briefly through the reconnaissance report on augmentation of the Colorado River—by desalting of sea water. And I want to tell you frankly that I have very little confidence in the cost estimate that the Department comes up with in the report. The estimate of 9.8 cents per thousand gallons for desalting, even though the report says that this is based upon 1995 technology, is in my opinion completely unrealistic and without foundation. As far as I know, there is no existing information on desalting technology which will justify this optimistic estimate.

Mr. Chairman, inasmuch as this report has been forwarded to us and it comes about under authority given to the Secretary, I ask that this report be made a part of the record at this place.

Mr. JOHNSON. You have heard the request of the gentleman from Colorado.

Is there objection?

Mr. SAYLOR. Reserving the right to object, Mr. Chairman, I will not object with the understanding that we will be permitted to question the Secretary of the Interior with regard to this report.

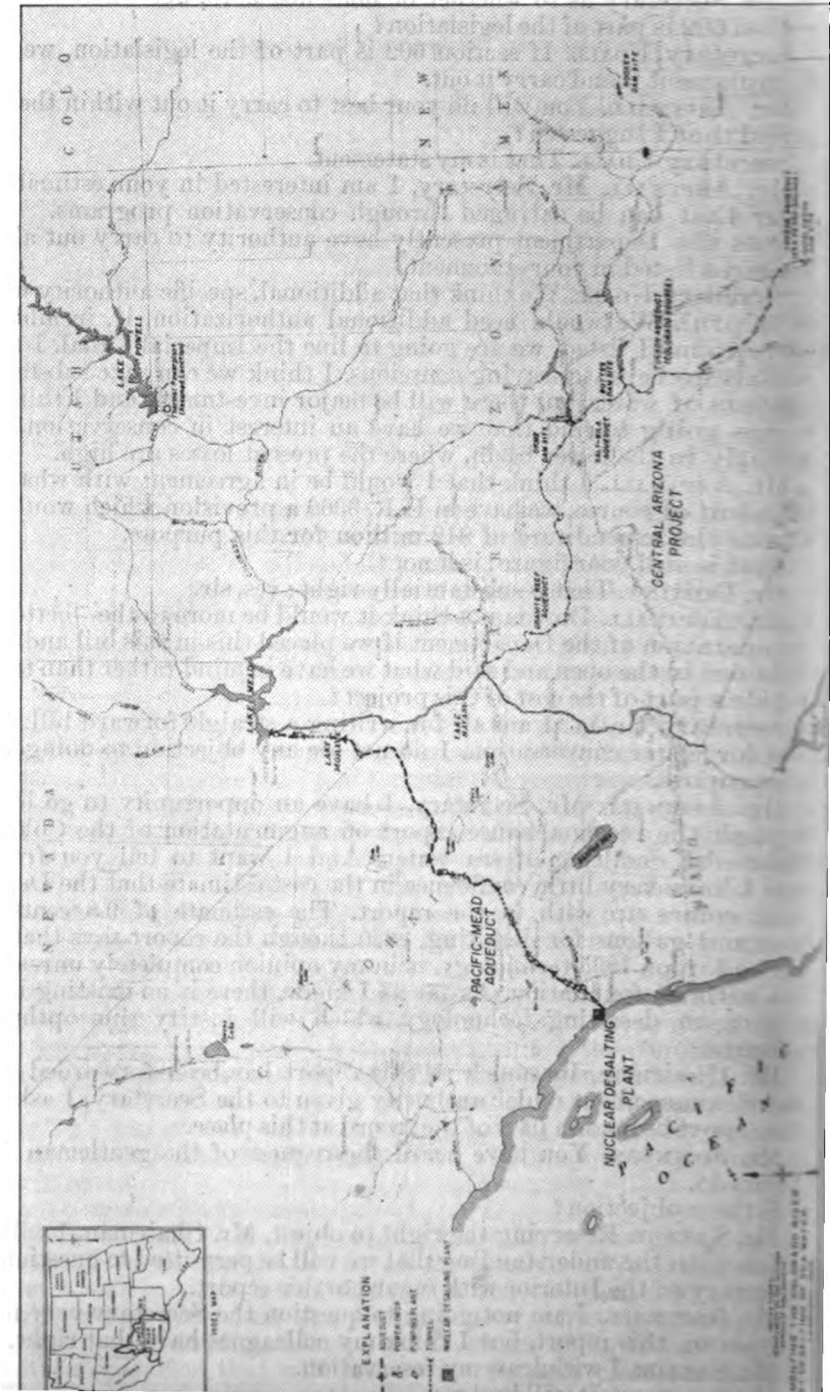
Mr. ASPINALL. I am not going to question the Secretary very much further on this report, but I think my colleagues have that right.

Mr. SAYLOR. I withdraw my reservation.

Mr. JOHNSON. It will be done.

(The material referred to follows:)

U. S. DEPARTMENT OF THE INTERIOR RECONNAISSANCE REPORT: AUGMENTATION OF THE COLORADO RIVER BY DESALTING OF SEA WATER, JANUARY 1968



Summary sheets

COSTS

	Million dollars
Project costs :	
Desalted water.....	809
Nuclear pumping power.....	112
Conveyance system.....	1, 863
Total	2, 784
Annual operation, maintenance, and replacement costs :	
Desalted water.....	39. 48
Nuclear pumping power.....	4. 11
Conveyance system.....	5. 32
Total	¹ 48. 91

¹ Includes sinking fund of \$19.6 million for replacing nuclear desalting facilities after 30-year life.

Benefit-cost analysis (100 years at 3¼ percent)

	Annual equivalent benefit, million dollars
Benefits :	
Mexican Water Treaty.....	120. 8
U.S. water supply.....	11. 8
Power	3. 0
Total annual benefit.....	135. 6

Costs :	
Total project costs.....	2, 784
Interest during construction.....	253
Federal investment.....	3, 037
Annual equivalent of investment costs.....	91. 7
Annual equivalent O.M. & R. costs.....	¹ 39. 4
Total annual costs.....	131. 1

Benefit-cost ratio : 100 years at 3¼ percent 1.03 to 1.00

¹ Includes component for plant replacement based on a 30-year sinking fund.

COST ALLOCATION
(In millions of dollars)

Purpose	Construction cost	Interest during construction	Total Federal investment	Annual O.M. & R.
Mexican Water Treaty.....	2, 505	228	2, 733	44. 02
U.S. water supply:				
Irrigation.....	237	21	258	4. 15
Municipal and industrial.....	42	4	46	. 74
Total.....	2, 784	253	3, 037	¹ 48. 91

¹ Includes sinking fund of \$19,600,000 for replacing nuclear desalting facilities after 30-year life.

REPAYMENT ANALYSIS
[In millions of dollars]

	Construction cost	Interest during construction	Total for repayment
Reimbursable costs:			
U.S. water supply:			
Irrigation.....	237	-----	237
Municipal and industrial.....	42	4	46
Subtotal.....	279	4	283
Nonreimbursable costs: Mexican Water Treaty.....	2,505	-----	-----
Total.....	2,784	4	283

DEVELOPMENT FUND
[In millions of dollars]

	Year 2029	Year 2059
Contributions (cumulative):		
Hoover.....	486	857
Parker-Davis.....	101	222
Intertie.....	42	130
Central Arizona project.....	-----	918
Total.....	629	2,127
Development fund: Balance after repayment of augmentation costs.....	192	1,551

INTRODUCTION

There is universal agreement that the water supply of the Colorado River is inadequate to meet developing demands. There is further widespread agreement that augmentation of the natural flows of the river will be necessary, not only as a solution to the rising water demands, but as a solution also to the controversies involving the disposition and full use of Colorado River runoff.

Of the four principal potentials for augmenting Colorado River water supply—desalting of sea water, surface water imports from basins of surplus water supply, weather modification, and water salvage measures—only the first two offer potentials of the magnitude necessary for adequate long-range solutions. Weather modification and water salvage measures may well provide the cheapest means of producing additional water supplies. As such, these potentials should be fully explored and exploited before more costly augmentation works are undertaken. There are limitations, however, on the amounts of new water available from these sources. Sooner or later, recourse must be made either to the unlimited seas or to surface water imports if the foreseeable water needs of the Colorado River Basin are to be met.

While the physical aspects of surface water imports should pose no exceptional problems, the institutional problems at this time, both national and international, are formidable. There are no bars, however, to the study of augmenting the Colorado River by desalting of sea water. The “Public Works and Atomic Energy Commission Appropriation Act, 1968” provided funds for the Central Arizona Project investigation specifically to include a reconnaissance study of Colorado River augmentation by desalting. This reconnaissance report is prepared pursuant to that provision.

Presented herein is a plan for augmenting the Colorado River water supply by desalting in amounts sufficient to assure the availability of 7.5 million acre-feet of Colorado River water for consumptive use by the Lower Basin States without calling upon the Upper Basin States to assume any portion of the obligation to deliver 1.5 million acre-feet of water annually to Mexico. The time available did not permit studies in sufficient detail to determine that the plan presented is the most economic plan available. To the contrary, there are indications that a better plan from an economic viewpoint would originate on the Gulf of California rather than the Pacific Ocean. Such a plan would require international agreements beyond the purview of a brief reconnaissance appraisal but should be explored thoroughly in any detailed studies of augmenting by desalting. A joint United States-Mexico study group is now making a preliminary assessment of the practicability of dual-purpose nuclear power and desalting plant to serve the general area of southern California, Arizona, Baja California and Sonora.

This reconnaissance report does show that within presently projected techniques for combined nuclear power-desalting plants, and within certain policy guidelines contained in pending legislation, there is sound reason to expect that detailed studies would establish the feasibility of a plan for augmenting the Colorado River to the extent necessary to assure the Lower Basin States 7.5 million acre-feet of Colorado River water annually for consumptive use.

UNDERLYING POLICIES, GUIDELINES, AND ASSUMPTIONS

Augmentation of the Colorado River through desalting of sea water, by increasing the basic water supply of the river, would alter the river's hydrology. The water supply for the Lower Basin, including the Central Arizona Project, would be increased. The controversy over any responsibility for the Upper Basin States to meet a portion of Mexican water deliveries would be settled. Capital and annual costs would be involved, and under Reclamation tradition, provision for return of the reimbursable costs, with interest where appropriate, must be made. As the initial desalting plants will not be required until about 1990, projections of techniques for producing nuclear power and desalting of sea water are required. These aspects give rise to the requirement, for study and report purposes, to establish guidelines, policies, and assumptions. The basic and important ones adopted are discussed in following paragraphs under the three broad headings of "Central Arizona Project," "Hydrology," and "Financial."

Central Arizona Project

The Central Arizona Project (CAP) would be a separate entity, financially self-contained, essentially as described in the Bureau of Reclamation's "Summary Report—Central Arizona Project with Federal Prepayment Power Arrangements" dated February 1967. It is assumed that after payout of project costs, surplus revenues from the CAP would accrue to the Lower Colorado River Basin Development Fund and be available to assist in returning the reimbursable costs of any Colorado River augmentation works. The only effect of CAP on the plan presented herein is thus in the magnitude of Development Fund revenues that would accrue from CAP. With an augmented river, there would be a great deal more water for sale from CAP, both for irrigation and municipal and industrial purposes, and the water marketing presented in the Summary Report would be substantially altered.

With an augmented Colorado River a constant diversion of about 1.6 million acre-feet annually would be assured. In the Summary Report, which reflected natural river conditions, it was projected that prior to 1990 the average water supply available to the CAP would begin to decrease progressively as Upper Basin uses increased, dropping from 1.6 million acre-feet (m.a.f.) to an average diversion of 676,000 acre-feet by the year 2030. Of this average diversion, only a little more than 300,000 acre-feet represented assured project deliveries. Thus, in the Summary Report, sales of water for municipal and industrial (M&I) purposes were limited to assured deliveries of 312,000 acre-feet which accommodated increased M&I demands up to the year 2000. After the year 2000 M&I water deliveries were held constant. With an assured diversion of 1.6 m.a.f. from an augmented Colorado River, increases in M&I demands after the year 2000 would be met from CAP water supplies. By the year 2030 it is projected that 672,000 acre-feet of M&I water demand would be served from CAP water. As part of the increased M&I water supply would be needed to serve Tucson, additional capacity in the Tucson Aqueduct would be required in the future. The CAP revenues to the Development Fund shown in this report take into account the need for repayment of the cost of such additional capacity.

Under the augmented water supply conditions, the CAP would repay all of its costs from project revenues. Assumed water rates at canal side are \$10 per acre-foot for irrigation and \$56 per acre-foot for M&I water. All capital cost repayment requirements would be met by the year 2033, and thereafter the CAP would contribute about \$34,000,000 annually to the Development Fund.

The capacity of the Granite Reef Aqueduct has been assumed as 2,500 cubic feet per second (c.f.s.). However, because CAP is treated as a self-contained financial entity during payout, assumption of a 3,000-c.f.s. aqueduct would have little effect on the augmentation study. Previously, 1975 has been assumed as the initial date of Colorado River diversion for the CAP. This date no longer appears realistic and in this report initial diversion is assumed in 1979.

Since an augmented river would provide California with a minimum of 4.4 m.a.f. for consumptive use at all times, the question of a 4.4-m.a.f. priority for California would automatically be resolved.

Hydrology

In this study the same basic hydrologic and river operation criteria have been retained as used in earlier Bureau of Reclamation studies, modified only to accommodate extension of the runoff record through the year 1967 and the addition of 2.0 to 2.5 m.a.f. of desalted water in Lake Mead annually. Such an addition, however, would have appreciable effects. It would increase the water supply for the Lower Basin and, by eliminating the question of Upper Basin responsibility for a portion of the Mexican Treaty delivery, assure the Upper Basin of a greater water supply. Water quality in the Colorado River below Hoover Dam would be measurably improved.

Lower basin water supply.—Without augmentation and with a regulated delivery of 8,250,000 acre-feet annually at Lee Ferry, it is estimated that the average water supply available for consumptive use in the Lower Basin at Lee Ferry would decrease by the year 2030 to 6,830,000 acre-feet and the assured water supply to 6,310,000 acre-feet. With augmentation and with a regulated delivery at Lee Ferry of 7,500,000 acre-feet annually, comparable figures would be 7,730,000 acre-feet average supply and 7,500,000 acre-feet assured supply.

From these figures, it can be seen that the amount of augmentation needed to assure the Lower Basin of 7.5 m.a.f. of consumptive use in the year 2030 would be 1,940,000 acre-feet annually $[(7,500,000-6,310,000) + (8,250,000-7,500,000)]$. For the basic study of this report, we have rounded this figure to 2,000,000 acre-feet. It, of course, would not all be needed initially but could be staged. Analysis shows the following staging to be appropriate: year 1990, 1.0 m.a.f.; 2000, 0.5 m.a.f.; and 2010, 0.5 m.a.f.

The derivation of 2,000,000 acre-feet as the required magnitude of augmentation to assure 7.5 m.a.f. to the Lower Basin is based on Bureau of Reclamation estimates of future main-stem losses after realization of salvage potentials along the lower Colorado River. There is not full agreement among other Colorado River experts as to the effectiveness of future water salvage measures, and estimates of the amounts of augmentation water required to assure 7.5 m.a.f. consumptive use in the Lower Basin range up to 2.5 m.a.f. While the Bureau of Reclamation believes that its estimate of 2.0 m.a.f. is adequate, this report also presents an alternative study based on the requirement of 2.5 m.a.f. as the necessary amount of augmentation to assure 7.5 m.a.f. of Colorado River water for the Lower Basin States. Under this alternative the following staging of desalting plants would be appropriate: Year 1985, 0.75 m.a.f.; 1990, 0.5 m.a.f.; 1995, 0.75 m.a.f.; 2010, 0.5 m.a.f.

Upper basin water supply.—Based upon past records of Colorado River runoff and operation of the reservoirs of the Colorado River Storage Project, studies show that with delivery of 75.0 m.a.f. of water at Lee Ferry every 10 consecutive years, there would remain but 6.55 m.a.f. for consumptive use annually in the Upper Basin. If the Upper Basin were required to contribute in addition one-half of the water deliveries to Mexico, or 750,000 acre-feet annually, the amount available for consumptive use annually in the Upper Basin would be 5.8 m.a.f.

In connection with the Colorado River Basin Project, the Bureau of Reclamation has previously projected that consumptive use of Colorado River Basin water by the Upper Basin States would reach 5.8 m.a.f. in the year 2030. The Bureau recognized that the potential for use of water by the Upper Basin States is much greater and could occur at a much earlier date. The projections made were judgment values based on a limited water supply. With augmentation of the Colorado River and consequent assurance that the Upper Basin would not be required to contribute to Mexican water deliveries, it could be expected that expansion of Upper Basin depletions would be faster and to a higher ceiling. To reflect this, new projections were made of Upper Basin depletions for this report which are compared with the projections of the 1967 Summary Report in the following tabulation:

[In millions of acre-feet]

Year	Annual upper basin depletions	
	1967 summary report	This report
1975.....	4, 220	4, 220
1990.....	5, 100	5, 475
2000.....	5, 430	6, 180
2030.....	5, 800	6, 550

Should Upper Basin depletions occur at a faster rate than projected, it would be necessary to bring the initial units of the augmenting desalting works into operation at an earlier date. Otherwise there would be no significant effect on the augmentation study.

Water quality.—The introduction of from 2.0 to 2.5 m.a.f. of pure water annually into the lower Colorado River would have a significantly beneficial effect on water quality. The greatest benefits would be obtained by thorough mixing of this pure water with natural river flows above the points of use. In fact, to avoid wide fluctuations in water quality, which could be highly undesirable, it might well be necessary to discharge desalted water into the river upstream from the point of all major Lower Basin uses. For this reason Lake Mead was selected as the point in this study to receive desalted water.

There are other possibilities for obtaining a satisfactory mix of desalted and natural waters. One such scheme would involve construction of a large reservoir on the Bill Williams River which would act as a regulating depository for desalted water to be fed into Lake Havasu at rates necessary to obtain desired mixes. If such a scheme proved feasible, it would reduce the costs of the desalted water conveyance system appreciably, particularly if a route from the Gulf of California proved feasible.

Mexican Treaty delivery obligation.—Legislation is pending which provides that the costs of measures to satisfy the obligations of the Mexican Water Treaty from the Colorado River plus losses of water associated with delivery of water under that treaty would be treated as a national obligation and be non-reimbursable. The water delivery obligation under the Treaty is 1.5 m.a.f. per year. The losses associated with that delivery are functions of the magnitude of the water losses on the lower river. Based on Bureau of Reclamation estimates, the total net losses on the Colorado River below Lee Ferry after all water salvage measures are in effect will average about 1,550,000 acre-feet per year. The pro rata share of losses associated with the Mexican water delivery, weighted as to point of delivery, is 300,000 acre-feet. Thus, of the 2.0 m.a.f. which the Bureau of Reclamation estimates to be necessary to augment the Colorado River to assure 7.5 m.a.f. for the Lower Basin, 1.8 m.a.f. would be associated with delivery of water to Mexico.

Should the losses prove to be greater and 2.5 m.a.f. augmentation be necessary, the pro rata share associated with the Mexican water delivery would also be greater. In this event, it is estimated the associated losses would be 430,000 acre-feet, for a total of 1.93 m.a.f., identified with the Mexican water delivery.

Financial

The financial feasibility of the augmentation plan presented herein looks, in large measure, to the enactment of provisions in pending Colorado River Basin Project legislation.

Mexican Treaty obligation.—Pending legislation, as embodied in H.R. 3300 and similar bills, declares that the satisfaction of the requirements of the Mexican Water Treaty constitutes a national obligation. Accordingly, such legislation provides that costs of construction, operation, and maintenance allocated to the replenishment of depleted Colorado River flows occasioned by compliance with the Mexican Water Treaty shall be nonreimbursable. The replenishment would include losses in transit, evaporation from regulatory reservoirs, and regulatory losses at the Mexican boundary incurred in the transportation, storage, and delivery of water in discharge of the obligations of that treaty.

As discussed previously, the amount of augmentation necessary to satisfy the Mexican Water Treaty will vary with the magnitude of water losses on the lower Colorado River. For the plan requiring 2.0 m.a.f. augmentation, 1.8 m.a.f. is identified with Mexican water deliveries. For the plan requiring 2.5 m.a.f. augmentation, 1.93 m.a.f. is identified with Mexican water deliveries. The costs of the augmentation works are split between reimbursable and nonreimbursable, essentially on a pro rata basis.

Lower Colorado River Basin Development Fund.—Pending legislation (S. 1004, H.R. 3000, and similar bills) provides also for establishment of a Lower Colorado River Basin Development Fund which would be a source of financial assistance to return the reimbursable costs of augmentation works. For the purposes of this report, it is assumed that the following revenues accruing to the Development Fund would be available to apply toward the reimbursable costs of the augmentation plan: (1) the surplus revenues from the operation of the Boulder Canyon and Parker-Davis projects after payout of these projects and after ad-

justments for the in-lieu-of-tax payments to the States of Arizona and Nevada as provided for in section 2(c) of the Boulder Canyon Project Adjustment Act: (2) the surplus Federal revenues from the portion of the Pacific Northwest-Pacific Southwest intertie located in the States of Nevada and Arizona; and (3) excess revenues (gross revenues less annual operation, maintenance, and replacement costs) of the CAP after the project's reimbursable capital costs have been repaid.

Price guarantec.—H.R. 3300 and similar legislation provide that to the extent the main stream of the Colorado River is augmented to satisfy annual consumptive uses of 2.8 m.a.f. in Arizona, 4.4 m.a.f. in California, and 0.3 m.a.f. in Nevada, the Secretary of the Interior shall make such augmented water available to users of main-stream water in those States at the same costs and on the same terms as would be applicable if main-stream water were otherwise available to supply such consumptive use. This provision was adopted for this report and thus there are no revenues deriving directly from the augmentation works. Some funds would accrue to the Development Fund, however, from increased power generation at Hoover and Parker-Davis and from increased water revenues from the Central Arizona Project after payout.

Dual-purpose nuclear desalting power arrangements.—It is assumed that the Federal Government would obtain only desalted water and project pumping power from the dual-purpose nuclear desalting plants and that non-Federal entities would participate to the extent of financing and marketing the commercial power component. It is anticipated that an arrangement would be made whereby the non-Federal entities would construct and own the electric turbine-generator plant. The United States, through prepayment of an appropriate share of the capital costs, would obtain the rights to the electrical capacity and energy necessary for project purposes. Through such an arrangement, the United States would retain the benefits of Federal financing for the prepaid portion of the electrical plant. The commercial power aspects, however, would be divorced from the Federal plan and handled by non-Federal interests.

It is also assumed that there would be cooperative development of the nuclear reactors which will serve as a joint heat source for the desalting and electric power generation facilities. The portion of the reactor costs associated with commercial power generation would be borne by non-Federal interests.

PROJECT DESCRIPTION

Purpose

This potential project would provide 2 million acre-feet of additional water annually for use in the Colorado River Basin. The principal project plan described below was selected to demonstrate the various factors involved in this concept of augmentation by sea water desalting and for preliminary analysis of its feasibility. The physical works include nuclear reactors, thermal electric power generating facilities, desalting plants, power transmission facilities, and conveyance works to transport desalted sea water from the coast of southern California to Lake Mead on the Colorado River.

Dual-purpose nuclear desalting plant

Location.—The nuclear power generation and desalting facilities would be located on the Pacific coast of southern California. For the purposes of estimating costs, this report assumes the site to be within the boundaries of the Camp Joseph C. Pendleton Naval Reservation about seven miles northwest of Oceanside, California. This site is in Federal ownership, would appear to satisfy current reactor siting criteria, and has excellent access from U.S. Highway 101 and the Santa Fe Railroad.

In detailed studies, consideration would also be given to other potential sites along the coast. Studies indicate that there will be one or more suitable land-based sites along the southern California coast which could be used for large-scale nuclear desalting plants after 1980. This conclusion is based upon geologic information, consideration of waste brine disposal problems, projected population distributions, reactor siting criteria, and the assumption that credit can be taken for engineered safeguards.

Particular attention would be directed to the possibility of siting on an offshore, man-made island. Consideration of offshore siting would increase significantly the number of potential sites.

Nuclear Reactors and Turbine-Generators.—The estimates of costs for the nuclear reactors are based upon information provided by the Atomic Energy Commission. The reactor concept used is based upon a projected level of tech-

nology for breeder type reactors for about 1995. The assumed timing of the reactor installations is keyed to the staging of augmentation water deliveries in years 1990, 2000, and 2010. Replacement plants will also be required at the end of the 30-year service life for each dual-purpose plant.

While it is recognized that the full benefits of 1995 technology will not be available for the first-stage installation, the same reactor costs have been used throughout the study period to simplify the analysis. Since two of the three installation stages and all the replacement reactors will be built after 1965 and will have the advantage of further technological improvements, it was considered that the 1995 assumptions adequately represent average conditions over the period. Also, in view of the long-time period and the attending uncertainties involved, further refinements reflecting different levels of technology for various specific installations would not be expected to enhance the accuracy of the projections at this time.

The nuclear reactors are assumed to be of the fast breeder type. This reactor concept is an advanced type and will require further development, testing, and demonstration. The Atomic Energy Commission, American industry, and foreign countries have extensive programs for the development of fast breeder power reactors using various designs. Emphasis is being directed toward development of this type of reactor because it is predicted that its use will be essential to permit the nuclear industry to achieve the expansion projected by the end of this century.

Development of high-grain breeder reactors will increase the efficiency of fuel utilization. This will have the effect of permitting the economic use of lower grade uranium ores, and will thereby extend the available resources. The breeding feature results in very low fuel cycle costs, and hence these reactors have a potential for producing low cost heat and power.

The design used for cost estimates in this report is based upon those developed by the Argonne National Laboratory in 1966 for a sodium-cooled, fast breeder reactor. The Atomic Energy Commission provided base estimates for two 5,000-megawatt thermal (mwt) reactors at a single station. Because of the time period involved, the individual sizes may be smaller or larger. The use of a station with multiple reactors would provide added flexibility of operation. Multiple reactors, also would reduce the hazard to electric systems which rely on the plant for firm power and would have to carry spinning reserves to protect against the possibility of an emergency reactor shutdown. From the base figures, costs were derived for reactor capacities to meet the heat requirements for each stage of desalting plant installation.

In addition to the heat energy required for desalting, the reactors will provide heat for the production of electric power. The power production will exceed the requirements for the pumping of project water in each stage, and, as explained previously, the financing and marketing of power in excess of project needs would be the responsibility of non-Federal entities and are divorced from the financial analysis in this report. Because the reactor concept used in the present study has been developed primarily for commercial power production, large amounts of electric power will be produced. According to recent estimates prepared by the Federal Power Commission, however, approximately 4,500 megawatts (mw) of new generating capacity will be required each year by about 1990 to meet anticipated commercial load growth in southern California, Arizona, and southern Nevada. About one-half of the 4,500-mw load growth, or 2,200 mw, represents the requirement for commercial baseload generating capacity. Furthermore, future technology may yield concepts which could decrease the amounts of electric power produced.

The output of the reactors and turbine generators and uses associated with each stage are as follows :

Stage (year)	Total reactor capacity (megawatt-tons)	Powerplant installed capacity (megawatts)	Auxiliary power in plant (megawatts)	Project pumping (megawatts)	Available for commercial sales (megawatts)
1990.....	13,050	3,615	452	567	2,596
2000.....	6,525	1,807	225	283	1,299
2010.....	6,525	1,807	225	283	1,299
Total.....	26,100	7,229	902	1,133	5,194

Desalting plant.—The cost estimates in this report for the desalting plant are based upon estimates provided by the Office of Saline Water. The reference plant concept represents 1990–1995 projections and is a combination multi-effect, vertical tube and multistage flash evaporator. Both the vertical tube and horizontal condenser surfaces are shaped to promote high heat transfer rates. The maximum brine temperature is limited to 250 degrees F., with acid pretreatment of feed to reduce scale formation problems in the evaporator.

The reference plant has a capacity of 1 billion gallons per day (bgd) divided into four trains of 250 million gallons per day (mgd) each. The concept includes improvements in plant technology which are currently undergoing laboratory tests.

For purposes of this analysis, plants were sized for each stage to provide the quantity of desalted water desired for delivery at Lake Mead plus the anticipated 5 percent conveyance losses. The capacities of the stages are as follows:

Stage (year)	Plant output (million gallons per day)	Delivery to Lake Mead	
		Million gallons per day	Acre-feet per year
1990.....	1,044	992	1,000,000
2000.....	522	496	500,000
2010.....	522	496	500,000
Total.....	2,088	1,984	2,000,000

Economic advantages are derived from the dual-purpose design of the nuclear electric power and desalting complex. Both purposes share in the economy of scale of a large reactor and the common site. The turbines operate efficiently with high-temperature, high-pressure steam produced by the reactor while the evaporator makes use of the turbine exhaust steam at lower temperature and pressures and acts as a condenser for the turbines. Possible future modifications of evaporator design to utilize the vapor compression process or increased brine temperatures might result in the production of water with less electric power output.

Conveyance System

Location and general description.—The aqueduct system which would convey the desalted water from the Pacific Coast to Lake Mead will be 313 miles in length. It would consist of 85 miles of pipeline, 77 miles of tunnel, 135 miles of lined canal, and 16 miles of pumping plant discharge and penstock lines. Ten pumping plants would be required to lift product water 4,277 feet, and three power drops would be utilized to recover the energy in 1,682 feet of head. The route is shown on the frontispiece map.

From the desalting complex, product water would be conveyed for regulation and storage to the proposed De Luz site on the Santa Margarita River downstream from De Luz Creek which is at Mile 10 of the aqueduct. The aqueduct would then cross Murrieta Creek in the Temecula Valley about 1 mile southeast of Murrieta, and continue with the aid of a number of pump lifts through pipelines and tunnels to the summit of the San Geronio Pass about 1 mile south of Banning. A series of tunnels and pipelines would convey water to the foot of the Little San Bernardino Mountains. At this point a pumping plant would lift water to a gravity tunnel 17.8 miles in length for conveyance under the Little San Bernardino Mountains. From the tunnel outlet portal, about 2 miles east of Joshua Tree, the aqueduct would turn to the north and by means of pipelines, tunnels, and canal would proceed to the east side of El Dorado Valley and through a pass about 2.5 miles east of Boulder City, Nevada, to its terminus in Lake Mead at a point east of Hemenway Wash and about 2 miles west of Hoover Dam in Boulder Basin.

Storage reservoir.—For purposes of this study, the De Luz Dam site was used for regulation. In detailed studies a number of alternative storage sites near the desalting plant would be considered. The dam would be located on the Santa Margarita River immediately downstream from De Luz Creek and about 10

miles northeast of the desalting plant. The dam would be an earthfill structure rising 219 feet above streambed with a crest length of 4,100 feet at elevation 344. The reservoir would provide 40,000 acre-feet of regulatory storage for the conveyance system from a total capacity of 175,000 acre-feet.

Tunnels.—Eighteen gravity flow, horseshoe-section, concrete-lined tunnels would be required. All tunnels would be single-stage construction, would be 17.5 feet in diameter, and would have a capacity of 3,240 c.f.s.

Pipelines.—Pipelines would be required for about 85 miles of the aqueduct system. All pipelines would be double-barreled, precast concrete, gravity-flow sections. Each barrel would be 15 feet in diameter and have a capacity of 1,620 c.f.s. The pipelines would be constructed in two equal stages.

Pumping plants.—Ten pumping plants, constructed in three stages, would be required, ranging in total dynamic head from about 173 to 723 feet. The total capacity of each plant after third-stage construction would be 3,240 c.f.s. and would consist of nine units, including one standby. The total installed electric capacity of the pumping plants would be 1,430 megawatts.

Power drops.—Three power drops would be constructed in three stages to a total hydraulic capacity of 3,240 c.f.s. with eight units. The total installed capacity of the inline powerplants would be 372 megawatts.

Canals.—All open canals would be concrete lined and would be constructed in one stage. The canals would have a capacity of 3,240 c.f.s., a base width of 24 feet, and a water depth of 17.0 feet.

Transmission facilities.—Energy for pumping desalted sea water to Lake Mead would be supplied by the dual-purpose nuclear powerplant on the California coast and by inline hydroelectric powerplants installed at power drops along the conveyance system. The Federal Government would construct the transmission system necessary to serve the pumping plants.

Transmission lines would roughly parallel the conveyance system throughout its length so that power could be furnished to each pumping plant and energy could be recovered from the power drops. Transmission system losses for capacity and energy were assumed to be 5 percent.

The transmission system would be constructed in three stages.

Project costs

Dual-purpose nuclear desalting plant.—The construction and annual operating costs of the nuclear reactor are prorated between the purposes of desalting and electric power generation on the basis of the proportion of the useful heat applied to each process. All of the desalting cost are Federal costs. The electric power costs were prorated between that portion of capacity required for project pumping and the portion of capacity surplus to project needs. The latter portion of the costs would be non-Federal costs and are excluded from this analysis.

Estimates provided by the Atomic Energy Commission and the Office of Saline Water are based upon 1966 price levels and market conditions.

DUAL-PURPOSE NUCLEAR DESALTING PLANT CONSTRUCTION COSTS

(In millions of dollars)

Feature	Stage			Total
	1990	2000	2010	
Nuclear reactor.....	241	121	121	483
Powerplant.....	142	71	71	284
Desalting plant.....	312	179	179	670
Total.....	695	371	371	1,437
Less non-Federal power costs.....	258	129	129	516
Federal costs.....	437	242	242	921
Desalted water.....	(381)	(214)	(214)	(809)
Nuclear pumping power.....	(56)	(28)	(28)	(112)

The annual operation, maintenance, and interim replacement costs for the dual-purpose plant at the completion of each stage of installation are as follows :

DUAL-PURPOSE NUCLEAR DESALTING PLANT, ANNUAL O.M. & R. COSTS¹
[In millions of dollars]

Feature	Stage (cumulative)		
	1990	2000	2010
Nuclear reactor.....	4.24	6.37	8.50
Thermal powerplant.....	1.83	2.74	3.65
Waterplant.....	9.21	14.50	19.79
Total (operation, maintenance, and "interim replacement").....	15.28	23.61	31.94
Non-Federal power costs.....	3.97	5.96	7.95
Federal costs:			
Desalted water.....	10.45	16.36	22.27
Nuclear pumping power.....	.86	1.29	1.72
Subtotal.....	11.31	17.65	23.99
Sinking fund for rebuilding plants.....	9.32	14.46	19.60
Total.....	20.63	32.11	43.59

¹ Includes fuel, interim replacements, and for Federal costs an amount for rebuilding the plant at the end of the 30-year service life.

A small amount is included (0.35 percent of capital costs) to provide for interim replacement of minor components within the assumed 30-year life span of the plants. To account for the longer period of analyses for benefit-cost and the pay-out studies, an annual sinking fund as shown above is included in the Federal operating costs to cover reconstruction of the nuclear desalting complex at the end of the 30-year service life.

The nature of breeder reactors is that they produce more fuel than they consume. The excess fuel produced is sold for use in other reactors. Plutonium credits partly offset the costs of fabrication, processing, and interest charges on investments in fuel inventory. These savings, together with the advantages of Federal financing of the fuel inventory, result in a low fuel cycle cost for the advanced breeder concept.

Conveyance system.—The total estimated construction cost for the conveyance system to Lake Mead based on reconnaissance estimates and unit prices as of October 1967 is \$1,863,000,000. The estimates include electrical transmission system; right-of-way acquisition; and engineering, supervision of construction, and other indirect costs. Pumping plants, power drops, and transmission lines would be constructed in three stages for completion in 1990, 2000, and 2010 and pipelines in two stages for completion in 1990 and 2000. Canals, tunnels, and other facilities would be constructed to their ultimate capacity during the first stage.

The construction costs are as follows :

CONVEYANCE SYSTEM CONSTRUCTION COSTS
[In millions of dollars]

Feature	Stage			
	1990	2000	2010	Total
Dam (De Luz site).....	24			24
Tunnels.....	509			509
Canals.....	137			137
Pipelines.....	290	236		526
Pumping plants.....	369	60	60	489
Power drops.....	65	18	17	100
Transmission system.....	47	25	3	75
Access roads.....	3			3
Total.....	1,444	339	80	1,863

The estimated annual operation, maintenance, and replacement costs after the completion of the three stages of construction are as follows:

CONVEYANCE SYSTEM, ANNUAL O.M. & R. COSTS
[In millions of dollars]

Feature	Stage		
	1990	2000	2010
Aqueduct facilities.....	3.02	3.46	4.11
Transmission system.....	.73	1.17	1.21
Total.....	3.75	4.63	5.32

Summary of Federal project costs.—A summary of the total Federal project costs for augmentation of the Colorado River by 2.0 m.a.f. delivered to Lake Mead follows:

SUMMARY OF TOTAL FEDERAL PROJECT COSTS
[In millions of dollars]

Feature	Stage			Total
	1990	2000	2010	
Construction costs:				
Desalted water.....	381	214	214	809
Nuclear pumping power.....	56	28	28	112
Conveyance system.....	1,444	339	80	1,863
Total.....	1,881	581	332	2,784
Annual O.M. & R.: ¹				
Desalted water.....	10.45	16.36	22.27	.....
Nuclear pumping power.....	.86	1.29	1.72	.....
Sinking fund for rebuilding plants.....	9.32	14.46	19.60	.....
Conveyance system.....	3.75	4.63	5.32	.....
Total.....	24.38	36.74	48.91	.....

Annual O.M. & R. costs are cumulative after completion of each stage.

Cost of pumping power.—The cost of pumping power includes an allocated portion of the capital and OM&R costs of the nuclear powerplant plus costs of the transmission system associated with conveyance works. The amount of pumping power capacity required from the nuclear powerplant was determined by deducting the power available at power drops from the total requirement and adjusting for transmission losses. The cost of thermal pumping power at the dual-purpose plant is 0.9 mills per kilowatt-hour. The average transmission cost is 0.4 mills per kilowatt-hour. These two components plus an adjustment for transmission losses and for plant replacement at the end of 30-year life will result in an average cost for thermal pumping power of about 1.5 mills per kilowatt-hour at the pumps.

ECONOMIC AND FINANCIAL ANALYSIS

The analysis of the economic justification of the augmentation plan does not readily lend itself to the application of typical benefit-cost procedures of conventional Reclamation projects. The primary emphasis of this economic analysis is to define the magnitude of the investment and operating costs involved so that a judgment can be made on the reasonableness of using nuclear desalting of ocean water as a source of augmentation, and to determine whether sufficient revenues are available in the Development Fund to cover reimbursable costs within the general framework of Reclamation financing criteria. Since adequate procedures have not been developed for measuring the benefits associated with meeting the Mexican obligation, somewhat arbitrary benefit estimates were used for this reconnaissance effort.

Economic costs

The derivation of costs can logically be divided between the cost of producing desalted water and pumping power at the dual-purpose desalting complex and the cost of conveying product water to the river.

Dual-purpose nuclear desalting plant.—The financial criteria, the method of allocating joint heat costs of the nuclear reactors between water and electricity, and the plant-loading characteristics play crucial roles in determining the cost of production. The ability to stage the plants to meet future needs as they develop also has an important bearing on overall costs by minimizing the economic costs of unused capacity.

The determination of capital cost for use in the economic studies includes construction cost and interest during construction computed at 3¼ percent. A 30-year service life is assumed for the reactor, thermal powerplant, and water plant. Consistent with Reclamation financing criteria, components for taxes and insurance were not included.

The method adopted for allocating joint nuclear reactor costs follows the use-of-facility concept with use measured in terms of available heat energy consumed in each of the water and power production processes. This approach permits both purposes to share in the advantages of dual-purpose production. Other joint costs resulting from the use of a common site were proportionally distributed on the basis of use. Inasmuch as the reactors, turbine-generators, and the water plant require internal auxiliary electric power, suballocations of electric power costs were made to each plant account in accordance with the capacities required.

It is expected that the dual-purpose installation would operate at full capacity as each stage is placed in service. It is assumed that the plants would operate at an average annual plant capacity factor of 90 percent.

A final division of costs was made between power needed for project pumping and the residual available for commercial sale by non-Federal entities participating in the cooperative venture. Costs were prorated between commercial and pumping power after adjusting for hydroelectric power produced by power drops in the aqueduct system.

The average product costs for the three stages at the plant boundary, before conveyance and transmission losses, are estimated to be 9.8 cents per 1,000 gallons, or \$32 per acre-foot, and 0.9 mill per kilowatt-hour for project pumping power. One of the most important factors influencing these costs is the low cost of heat provided by the fast breeder reactors. Prime steam is estimated at 5.1 cents per million BTU and exhaust steam from the turbines for use in the water plant at 1.6 cents per million BTU.

Conveyance costs.—Conventional procedures were followed in deriving the economic costs of the aqueduct system. These facilities are assumed to have a 100-year service life, and a 3¼ percent interest rate is used for purpose of amortization.

Total project costs

Total investment costs for the augmentation plan consist of the estimated construction costs discussed earlier plus interest during the period of construction and are summarized as follows:

FEDERAL INVESTMENT COST			
[In millions of dollars]			
Feature	Construction cost	Interest during construction	Total
Nuclear desalting facilities (including project pumping power)....	921	53	974
Conveyance system.....	1,863	200	2,063
Total.....	2,784	253	3,037

Total annual operating costs include operation, maintenance, interim replacements, nuclear fuel, and a sinking fund component to permit rebuilding the

nuclear desalting and project pumping facilities every 30 years through the 100-year period of analysis. These costs are summarized as follows :

FEDERAL ANNUAL O.M. & R. COSTS

[In millions of dollars]

Feature	O.M. & R.	Sinking fund for plant replacement	Total
Nuclear desalting facilities (including project pumping power).....	23.99	19.60	43.49
Conveyance system.....	5.32	-----	5.32
Total.....	29.31	19.60	48.91

Annual equivalent costs were determined over a 100-year period of analysis beginning with the completion of the first stage in 1990, using a 3¼ percent interest rate. Investment costs and operating costs associated with staged development were appropriately discounted. Total annual economic equivalent costs of investment averages \$91.7 million; annual OM&R discounted for time of occurrence averages \$39.4 million, making the total annual economic costs \$131.1 million. Based on the ultimate annual delivery of 2.0 m.a.f. as scheduled in this study, the economic cost of desalted water conveyed to the Colorado River at Lake Mead averages \$81 per acre-foot (25 cents per thousand gallons).

Project benefits

This project will provide a number of tangible and intangible benefits. As a result of the project, the flows of the Colorado River will be augmented by 2.0 m.a.f. annually. Because the treaty with Mexico insures the delivery of water to Mexico whether or not augmentation occurs, the augmented supplies will be utilized within the United States.

The replacement, as a Federal obligation, of the portion of water assigned to Mexico will eliminate much of the long controversy which has impeded orderly development in the Lower Colorado River Basin States and threatens future orderly development in both the Upper and Lower Basins.

Augmentation by desalting will provide opportunities to improve the quality of the water supply provided from the river. The addition of almost pure distilled water will enhance the overall quality of the river downstream from the point of delivery, with attendant benefits to users.

The delivery of additional supplies at Lake Mead will also produce power benefits from increased generation at Hoover and Davis powerplants.

Mexican Water Treaty.—National benefits are associated with discharging the Federal obligation of the Mexican Water Treaty. Because of the difficulties of measuring the intangible values involved, it has been assumed that the benefits of meeting the terms of this international agreement, as a minimum, are equal to the costs of an augmentation plan sized to deliver 1.8 m.a.f. annually to the river. Therefore, an average annual equivalent benefit of \$120.8 million has been claimed for this function.

Additional water use in the United States.—The augmentation plan will make available an additional 200,000 acre-feet of water for use in the Lower Basin within the United States over the amount required to provide water to Mexico.

The average annual benefit value, of about \$74 per acre-foot, discounted for staged deliveries results in total annual equivalent benefits of about \$11.8 million.

Water quality.—The benefits associated with water quality improvements have not been evaluated in this preliminary study but should prove to be significant.

Increased hydroelectric power generation.—Increased generation at Hoover and Davis powerplants will result in increased power sales averaging some \$3 million annually in increased revenues.

Total annual benefits.—Total annual benefits evaluated above amount to \$13.6 million.

Benefit-cost ratio

Utilizing the benefits which were evaluated above, and excluding any benefit from improved water quality, the project has a ratio of benefits to costs of 1.06 to 1.00 over a 100-year period of analysis at a 3¼ percent interest rate.

The benefit-cost ratio derived from the incremental costs and benefits associated with providing 200,000 acre-feet of water in excess of that required for the replacement of the Mexican Treaty requirements is 1.17 to 1.00.

Cost allocation

Costs of the augmentation plan were first allocated to (1) replacing the requirements of the Mexican Water Treaty and (2) providing additional water for use in the United States. These costs were distributed in proportion to the ultimate supply in each category; i.e., 90 percent to the Mexican Treaty obligation and 10 percent to use in the Lower Basin. The latter assignment was suballocated between purposes now being served in the Lower Basin based on historical use (85 percent irrigation and 15 percent municipal and industrial water). A summary of the cost allocation follows:

SUMMARY OF COST ALLOCATION
[In millions of dollars]

Purpose	Construction cost	Interest during construction	Total Federal investment	Annual O. M. & M.
Mexican Water Treaty.....	2,505	228	2,733	44.02
U.S. water supply:				
Irrigation.....	237	21	258	4.15
Municipal and industrial.....	42	4	46	.74
Total.....	2,784	253	3,037	48.91

¹ Includes sinking fund of \$19,600,000 for replacing nuclear desalting facilities after 30-year life.

Repayment Analysis

For the purposes of this study, all costs allocated to the Mexican Treaty obligation are considered nonreimbursable; the remainder are treated as reimbursable costs to be returned by the Development Fund. In accordance with Reclamation repayment policy, investment costs allocated to M&I are to be repaid with interest at the current rate of 3.253 percent; construction costs allocated to irrigation are repaid without interest. Repayment of facility costs is to be accomplished within the service life of the facility or 50 years, whichever is shorter, after the completion of each facility. Reimbursable and nonreimbursable costs are shown in the following tabulation.

SUMMARY OF REIMBURSABLE AND NONREIMBURSABLE COSTS
[In millions of dollars]

	Construction cost	Interest during construction (3.253 percent)	Total for repayment
Reimbursable:			
U.S. water supply:			
Irrigation.....	237	-----	237
Municipal and industrial.....	42	4	46
Subtotal.....	279	4	283
Nonreimbursable: Mexican Water Treaty.....	2,505	-----	-----
Total.....	2,784	4	283

Of the total annual operating costs of \$48.91 million, \$4.89 million is assigned as reimbursable. Included is the sinking fund component required to completely replace the desalting and thermal pumping power facilities throughout the payout period at 30-year intervals. Hydrologic studies of the Colorado River with augmentation show that, on a probability basis, there will be years in which reservoirs will be full and no augmentation water can be beneficially used. Because of the dual-purpose nature of the nuclear complex and the need for continued production of commercial power, discontinuation of operations for extended periods is not economic. The variable operating costs for the desalting plant and the thermal pumping power, excluding all replacement and other fixed charges, represents a small percentage of the total production costs. Consequently, it was assumed that, at a minimum, the operating costs could be returned by interim sales of product water near the site or along the aqueduct. To simplify the repayment analysis, these sales are reflected as a small reduction in the desalting and thermal pumping power portions of the operating costs.

As presented in the detailed payout schedule (Table I), the repayment analysis demonstrates that all reimbursable costs can be returned well within the allowable periods from Development Fund revenues. As indicated earlier, those revenues include surplus power revenues from the Boulder Canyon and Parker-Davis Projects, the portion of Pacific Northwest-Pacific Southwest Intertie located in the States of Nevada and Arizona, and the Central Arizona Project, all after completion of project payout. Revenues accumulated from these sources and the balances remaining in the Development Fund after repayment of augmentation costs are shown below for year 2029, representing 50 years after first year of full operation of the Central Arizona Project, and year 2059, reflecting 50 years after completion of augmentation works.

[In millions of dollars]		
	Year 2029	Year 2059
Contributions (cumulative):		
Hoover.....	486	857
Parker-Davis.....	101	222
Intertie.....	42	130
Central Arizona project.....		918
Total.....	629	2,127
Development fund balance after repayment of augmentation costs.....	192	1,551

TABLE I.—AUGMENTATION OF THE COLORADO RIVER BY DESALTING OF SEA WATER
REPAYMENT ANALYSIS—REIMBURSABLE COSTS (2,000,000-ACRE-FOOT PLAN)

[In thousands of dollars]

Year	Development fund revenues				O.M. & R. ¹	Development fund—less reimbursable O.M. & R.	Repayment				Development fund balance	
	Hoover	Parker-Davis	Intertie	CAP			Total	Interest bearing		Interest free		
								Unpaid balance	Plant in service	Unpaid balance		Plant in service
1986					2,320	-2,320	1,008	31,000	160,000	160,000		
1990	12,691				2,320	10,371	1,052	32,356	161,972	160,000		
1991	12,691				2,320	10,371	1,749	23,037	161,972	160,000		
1992	12,691				2,320	10,371	436	13,415	161,972	160,000		
1993	12,691				2,320	10,371	113	3,480	155,194	160,000		
1994	12,691				2,320	10,371	0	0	144,823	160,000		
1995	12,691				2,320	10,371	0	0	134,452	160,000		
1996	12,691				2,320	10,371	0	0	124,081	160,000		
1997	12,691				2,320	10,371	0	0	113,710	160,000		
1998	12,691				2,320	10,371	0	0	162,339	210,000		
1999	12,691				3,490	9,201	0	0	153,138	210,000		
2000	12,438				3,490	8,948	0	0	144,190	210,000		
2001	12,438				3,490	8,948	0	0	135,242	210,000		
2002	12,438				3,490	8,948	0	0	126,294	210,000		
2003	12,438				3,490	8,948	0	0	117,346	210,000		
2004	12,438	4,046			3,490	12,594	0	0	104,352	210,000		
2005	12,438	4,046			3,490	12,594	0	0	91,358	210,000		
2006	12,438	4,046			3,490	12,594	0	0	78,364	210,000		
2007	12,438	4,046			3,490	12,594	0	0	65,370	210,000		
2008	12,438	4,046			4,640	12,994	0	0	85,376	238,000		
2009	12,398	4,046			4,640	11,844	0	0	73,532	238,000		
2010	12,398	4,046			4,600	11,804	0	0	61,728	238,000		
2011	12,398	4,046			4,640	11,804	0	0	49,924	238,000		
2012	12,398	4,046			4,640	11,804	0	0	38,120	238,000		
2013	12,398	4,046			4,640	11,804	0	0	26,316	238,000		
2014	12,398	4,042			4,640	11,800	0	0	14,516	238,000		
2015	12,398	4,042			4,640	11,800	0	0	2,716	238,000		
2016	12,398	4,042			4,640	11,800	0	0	0	238,000		
2017	12,398	4,042			4,640	11,800	0	0	0	238,000		
2018	12,398	4,042			4,640	11,800	0	0	0	238,000		
2019	12,398	4,042			4,640	11,800	0	0	0	238,000		
2020	12,398	4,042			4,640	11,760	0	0	0	238,000		
2021	12,398	4,042			4,640	11,760	0	0	0	238,000		
2022	12,398	4,042			4,640	11,760	0	0	0	238,000		
2023	12,398	4,042			4,640	11,760	0	0	0	238,000		
2024	12,398	4,042			4,640	11,760	0	0	0	238,000		
2025	12,398	4,042			4,640	11,760	0	0	0	238,000		
2026	12,398	4,042			4,640	11,760	0	0	0	238,000		
2027	12,398	4,042			4,640	11,760	0	0	0	238,000		
2028	12,398	4,042			4,640	11,760	0	0	0	238,000		
2029	12,398	4,042			4,640	11,760	0	0	0	238,000		
2030	12,398	4,042			4,640	11,760	0	0	0	238,000		
2031	12,398	4,042			4,640	11,760	0	0	0	238,000		
2032	12,398	4,042			4,640	11,760	0	0	0	238,000		
2033	12,398	4,042			4,640	11,760	0	0	0	238,000		
2034	12,398	4,042			4,640	11,760	0	0	0	238,000		
2035	12,398	4,042			4,640	11,760	0	0	0	238,000		
2036	12,398	4,042			4,640	11,760	0	0	0	238,000		
2037	12,398	4,042			4,640	11,760	0	0	0	238,000		
2038	12,398	4,042			4,640	11,760	0	0	0	238,000		
2039	12,398	4,042			4,640	11,760	0	0	0	238,000		
2040	12,398	4,042			4,640	11,760	0	0	0	238,000		
2041	12,398	4,042			4,640	11,760	0	0	0	238,000		
2042	12,398	4,042			4,640	11,760	0	0	0	238,000		
2043	12,398	4,042			4,640	11,760	0	0	0	238,000		
2044	12,398	4,042			4,640	11,760	0	0	0	238,000		
2045	12,398	4,042			4,640	11,760	0	0	0	238,000		
2046	12,398	4,042			4,640	11,760	0	0	0	238,000		
2047	12,398	4,042			4,640	11,760	0	0	0	238,000		
2048	12,398	4,042			4,640	11,760	0	0	0	238,000		
2049	12,398	4,042			4,640	11,760	0	0	0	238,000		
2050	12,398	4,042			4,640	11,760	0	0	0	238,000		
2051	12,398	4,042			4,640	11,760	0	0	0	238,000		
2052	12,398	4,042			4,640	11,760	0	0	0	238,000		
2053	12,398	4,042			4,640	11,760	0	0	0	238,000		
2054	12,398	4,042			4,640	11,760	0	0	0	238,000		
2055	12,398	4,042			4,640	11,760	0	0	0	238,000		
2056	12,398	4,042			4,640	11,760	0	0	0	238,000		
2057	12,398	4,042			4,640	11,760	0	0	0	238,000		
2058	12,398	4,042			4,640	11,760	0	0	0	238,000		
2059	12,398	4,042			4,640	11,760	0	0	0	238,000		
2060	12,398	4,042			4,640	11,760	0	0	0	238,000		
2061	12,398	4,042			4,640	11,760	0	0	0	238,000		
2062	12,398	4,042			4,640	11,760	0	0	0	238,000		
2063	12,398	4,042			4,640	11,760	0	0	0	238,000		
2064	12,398	4,042			4,640	11,760	0	0	0	238,000		
2065	12,398	4,042			4,640	11,760	0	0	0	238,000		
2066	12,398	4,042			4,640	11,760	0	0	0	238,000		
2067	12,398	4,042			4,640	11,760	0	0	0	238,000		
2068	12,398	4,042			4,640	11,760	0	0	0	238,000		
2069	12,398	4,042			4,640	11,760	0	0	0	238,000		
2070	12,398	4,042			4,640	11,760	0	0	0	238,000		
2071	12,398	4,042			4,640	11,760	0	0	0	238,000		
2072	12,398	4,042			4,640	11,760	0	0	0	238,000		
2073	12,398	4,042			4,640	11,760	0	0	0	238,000		
2074	12,398	4,042			4,640	11,760	0	0	0	238,000		
2075	12,398	4,042			4,640	11,760	0	0	0	238,000		
2076	12,398	4,042			4,640	11,760	0	0	0	238,000		
2077	12,398	4,042			4,640	11,760	0	0	0	238,000		
2078	12,398	4,042			4,640	11,760	0	0	0	238,000		
2079	12,398	4,042			4,640	11,760	0	0	0	238,000		
2080	12,398	4,042			4,640	11,760	0	0	0	238,000		
2081	12,398	4,042			4,640	11,760	0	0	0	238,000		
2082	12,398	4,042			4,640	11,760	0	0	0	238,000		
2083	12,398	4,042			4,640	11,760	0	0	0	238,000		
2084	12,398	4,042			4,640	11,760	0	0	0	238,000		
2085	12,398	4,042			4,640	11,760	0	0	0	238,000		
2086	12,398	4,042			4,640	11,760	0	0	0	238,000		
2087	12,398	4,042			4,640	11,760	0	0	0	238,000		
2088	12,398	4,042			4,640	11,760	0	0	0	238,000		
2089	12,398	4,042			4,640	11,760	0	0	0	238,000		
2090	12,398	4,042			4,640	11,760	0	0	0	238,000		
2091	12,398	4,042			4,640	11,760	0	0	0	238,000		
2092	12,398	4,042			4,640	11,760	0	0	0	238,000		
2093	12,398	4,042			4,640	11,760	0	0	0	238,000		
2094	12,398	4,042			4,640	11,760	0	0	0	238,000		
2095	12,398	4,042			4,640	11,760	0	0	0	238,000		
2096	12,398	4,042			4,640	11,760	0	0	0	238,000		
2097	12,398	4,042			4,640	11,760	0	0	0	238,000		
2098	12,398	4,042			4,640	11,760	0	0	0	238,000		
2099	12,398	4,042			4,640	11,760	0	0	0	238,000		
2100	12,398	4,042			4,640	11,760	0	0	0	238,000		

2024.....	12,358	4,042	5,200	.....	21,600	4,640	16,960	0	0	45,000	0	238,000	107,124
2025.....	12,358	4,039	5,200	.....	21,597	4,640	16,957	0	0	45,000	0	238,000	124,081
2026.....	12,358	4,039	5,200	.....	21,597	4,640	16,957	0	0	45,000	0	238,000	141,038
2027.....	12,358	4,039	5,200	.....	21,597	4,640	16,957	0	0	45,000	0	238,000	157,995
2028.....	12,358	4,039	5,200	.....	21,597	4,540	16,957	0	0	45,000	0	238,000	174,952
2029.....	12,358	4,039	5,200	.....	21,597	4,640	16,957	0	0	45,000	0	238,000	191,909
Subtotal.....	486,492	101,075	41,600	.....	629,167	150,900	478,267	3,358	0	45,000	0	238,000	191,909
2030.....	12,358	4,039	5,200	5,992	27,589	4,640	22,949	0	0	45,000	0	238,000	214,858
2031.....	12,340	4,039	5,200	6,048	27,627	4,640	22,987	0	0	45,000	0	238,000	237,845
2032.....	12,340	4,039	5,200	15,702	37,686	4,640	23,046	0	0	45,000	0	238,000	260,891
2033.....	12,340	4,039	5,200	6,107	37,281	4,640	32,641	0	0	45,000	0	238,000	293,532
2034.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	344,483
2035.....	12,340	4,039	5,200	34,013	55,592	4,640	50,952	0	0	45,000	0	238,000	395,435
2036.....	12,340	4,039	5,200	34,013	55,592	4,640	50,952	0	0	45,000	0	238,000	446,387
2037.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	497,339
2038.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	548,290
2039.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	599,241
2040.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	650,192
2041.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	701,143
2042.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	752,094
2043.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	803,045
2044.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	853,996
2045.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	904,947
2046.....	12,340	4,039	5,200	34,012	55,591	4,640	50,951	0	0	45,000	0	238,000	955,898
2047.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,001,649
2048.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,047,400
2049.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,093,151
2050.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,138,902
Subtotal.....	745,650	185,894	130,000	612,056	1,673,600	248,340	1,425,260	3,358	0	45,000	0	238,000	1,138,902
2051.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,184,653
2052.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,230,404
2053.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,276,155
2054.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,321,906
2055.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,367,657
2056.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,413,408
2057.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,459,159
2058.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,504,910
2059.....	12,340	4,039	0	34,012	50,391	4,640	45,751	0	0	45,000	0	238,000	1,550,661
Total.....	856,710	222,245	130,000	918,164	2,127,119	290,100	1,837,019	3,358	0	45,000	0	238,000	1,550,661

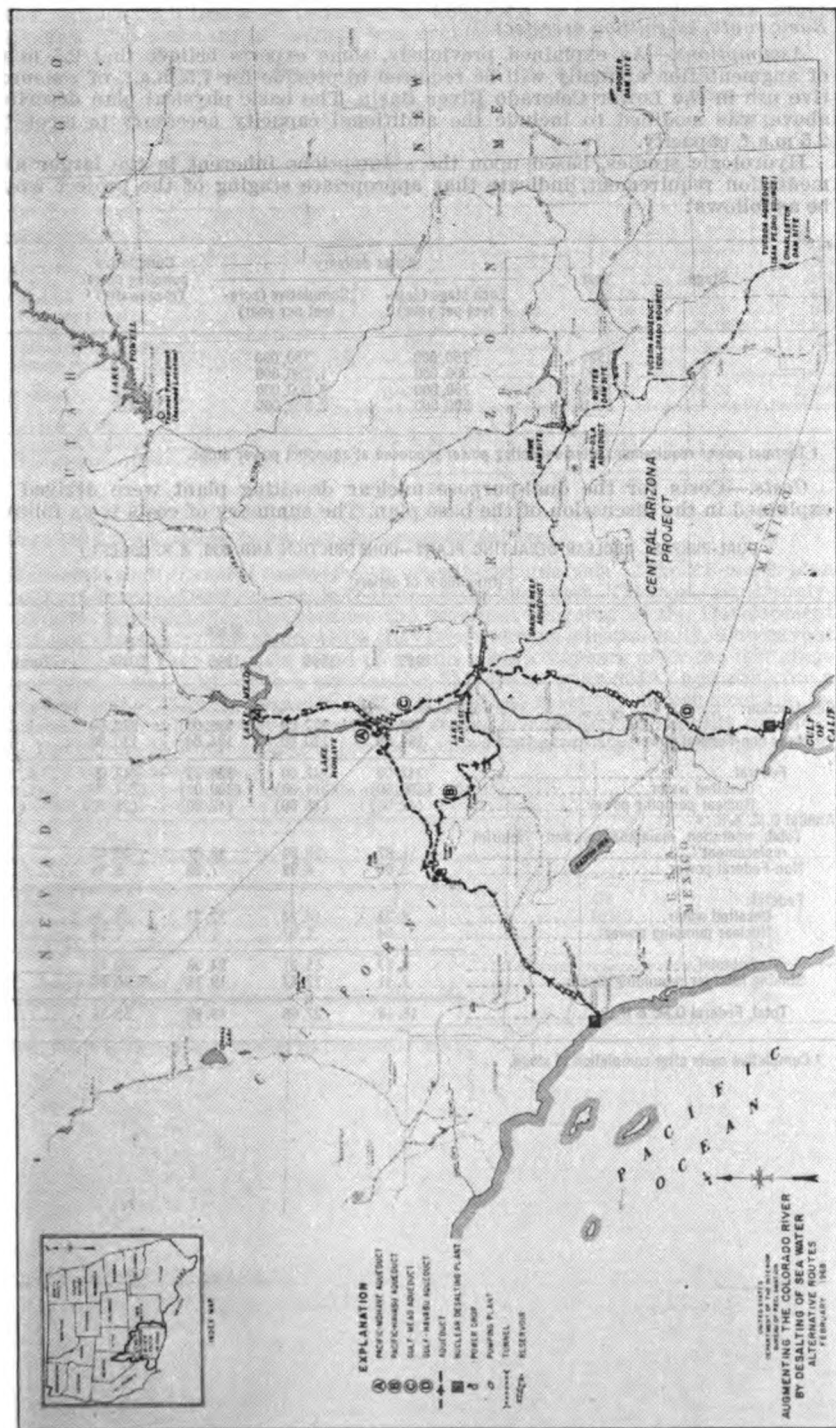
‡ Includes sinking fund component for replacement of reimbursable portion of nuclear complex.

ALTERNATIVE PLANS

Preliminary analyses of several alternative plans of development were made in the course of this investigation. The base plan described previously was evaluated at an enlarged size to permit the delivery of 2.5 million acre-feet of water annually to the Colorado River. In addition, preliminary cost estimates were developed for four alternative conveyance routes at both 2 and 2.5 million acre-feet capacities. Two of these alternative routes are associated with desalting facilities on the Gulf of California, rather than on the coast of southern California. (See map.)

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Basic route, 2.5 million acre-feet

Assumptions.—As explained previously, some experts believe that 2.5 m.a.f. of augmentation annually will be required to provide for 7.5 m.a.f. of consumptive use in the Lower Colorado River Basin. The basic physical plan described above was modified to include the additional capacity necessary to meet the 2.5 m.a.f. capacity.

Hydrologic studies, based upon the assumptions inherent in the larger augmentation requirement, indicate that appropriate staging of the project would be as follows:

Stage	Year	Water delivery		Cumulative pumping power (megawatts) ¹
		Each stage (acre-feet per year)	Cumulative (acre-feet per year)	
1	1985	750,000	750,000	425
2	1990	500,000	1,250,000	708
3	1995	750,000	2,000,000	1,133
4	2010	500,000	2,500,000	1,416

¹ Thermal power requirement after deducting power produced at aqueduct power drops.

Costs.—Costs for the dual-purpose nuclear desalting plant were derived as explained in the discussion of the base plan. The summary of costs is as follow:

DUAL-PURPOSE NUCLEAR DESALTING PLANT—CONSTRUCTION AND O.M. & R. COSTS ¹
[In millions of dollars]

	Stage				Total
	1985	1990	1995	2010	
Construction:					
Total.....	536.00	372.00	536.00	372.00	1,816
Less non-Federal power.....	194.00	130.00	194.00	130.00	648
Federal.....	342.00	242.00	342.00	242.00	1,168
Desalted water.....	(300.00)	(214.00)	(300.00)	(214.00)	(1,028)
Nuclear pumping power.....	(42.00)	(28.00)	(42.00)	(28.00)	(140)
Annual O.M. & R.: ¹					
Total, operation maintenance, and "interim replacement".....	11.87	20.20	32.07	40.40	
Non-Federal power.....	3.00	4.99	7.99	9.98	
Federal:					
Desalted water.....	8.23	14.14	22.37	28.28	
Nuclear pumping power.....	.64	1.07	1.71	2.14	
Subtotal.....	8.87	15.21	24.08	30.42	
Sinking fund for rebuilding plants.....	7.31	12.47	19.78	24.94	
Total, Federal O.M. & R.....	16.18	27.68	43.86	55.36	

¹ Cumulative costs after completion of stage.

Conveyance facilities were increased to 4,050 c.f.s. to accommodate the larger deliveries. The summary of costs of conveyance works is as follows :

CONVEYANCE SYSTEM—CONSTRUCTION AND O.M. & R. COSTS ¹
[In millions of dollars]

Feature	Stage (year)				Total
	1985	1990	1995	2010	
Construction costs:					
Dam (De Luz site).....	24.00				24
Tunnels.....	583.00				583
Canal.....	153.00				153
Pipeline.....	333.00		270.00		603
Pumping plants.....	395.00	56.00	83.00	55.00	589
Power drops.....	53.00	16.00	24.00	15.00	108
Transmission system.....	53.00		32.00		85
Access roads.....	3.00				3
Total.....	1,607.00	72.00	409.00	70.00	2,158
Annual O.M. & R.:					
Aqueduct facilities.....	2.98	3.44	4.28	4.80	
Transmission system.....	1.01	1.01	1.68	1.68	
Total.....	3.99	4.45	5.96	6.48	

¹ The annual O.M. & R. costs are the total costs after completion of each stage.

Economic and financial analysis.—A benefit-cost analysis of the 2.5-m.a.f. plan would produce results comparable to those of the base plan. The repayment analysis would vary significantly because the revenues accruing to the Development Fund are essentially the same while the costs increase substantially. The payout study indicated that all costs could be repaid within 50 years after the last stage is completed and still leave a substantial balance at year 2059; however, for a period of some 12 years between 2033 and 2046 the revenues do not meet the repayment requirement for each individual stage. A summary of surplus revenues and Development Fund balances for the 2-m.a.f. plan similar to those presented for the base plan follows :

[In millions of dollars]

	Year 2029	Year 2059
Contribution (cumulative):		
Hoover.....	514	908
Parker-Davis.....	109	140
Interlie.....	42	130
Central Arizona project.....		918
Total contributions.....	665	2,196
Development fund balances after repayment of augmentation works.....	0	436

Note: Details of the repayment schedule are presented in table II.

COLORADO RIVER BASIN PROJECT

TABLE 11.—AUGMENTATION OF THE COLORADO RIVER BY DESALTING OF SEA WATER
REPAYMENT ANALYSIS—REIMBURSABLE COSTS (2,500,000-ACRE-FOOT PLAN)

[in thousands of dollars]

Year	Development fund revenues				O. M. & R. ¹	Development fund less reimbursable O. M. & R.	Interest bearing		Repayment		Interest free		Development fund balance
	Hoover	Parker-Davis	Intertie	CAP			Total	Unpaid balance	Plant in service	Unpaid balance	Plant in service	Unpaid balance		Plant in service
1984					4,400	-4,400	74,000	74,000	378,000	378,000	378,000	378,000	378,000
1985					4,400	-4,400	2,507	80,234	80,234	381,740	378,000	381,740	381,740
1986					4,400	-4,400	2,507	83,504	83,504	385,480	378,000	385,480	385,480
1987					4,400	-4,400	2,610	86,880	86,880	389,220	378,000	389,220	389,220
1988					4,400	-4,400	2,716	90,366	90,366	392,960	378,000	392,960	392,960
1989					4,400	-4,400	2,826	93,912	93,912	396,700	399,000	396,700	396,700
1990					6,990	-6,990	3,330	106,744	106,744	403,642	439,000	403,642	403,642
1991	13,294				6,990	6,304	3,472	103,912	103,912	407,420	439,000	407,420	407,420
1992	13,294				6,990	6,304	3,380	100,988	100,988	411,198	439,000	411,198	411,198
1993	13,294				6,990	6,304	3,285	97,969	97,969	414,976	439,000	414,976	414,976
1994	13,294				6,990	6,304	3,187	94,950	94,950	418,754	439,000	418,754	418,754
1995	13,294				10,820	10,820	3,956	124,374	124,374	422,532	484,000	422,532	422,532
1996	13,294				10,820	10,820	2,474	125,946	125,946	426,310	484,000	426,310	426,310
1997	13,294				10,820	10,820	2,474	127,569	127,569	430,088	484,000	430,088	430,088
1998	13,294				10,820	10,820	2,474	129,245	129,245	433,866	484,000	433,866	433,866
1999	13,294				10,820	10,820	2,474	130,975	130,975	437,644	484,000	437,644	437,644
2000	13,294				10,820	10,820	2,474	132,762	132,762	441,422	484,000	441,422	441,422
2001	13,166				10,820	10,820	2,346	134,735	134,735	445,200	484,000	445,200	445,200
2002	13,166				10,820	10,820	2,346	136,772	136,772	448,978	484,000	448,978	448,978
2003	13,166				10,820	10,820	2,346	138,875	138,875	452,756	484,000	452,756	452,756
2004	13,166				10,820	10,820	2,346	141,047	141,047	456,534	484,000	456,534	456,534
2005	13,166	4,437			10,820	10,820	4,518	143,286	143,286	460,312	484,000	460,312	460,312
2006	13,166	4,437			10,820	10,820	4,588	145,596	145,596	464,090	484,000	464,090	464,090
2007	13,166	4,437			10,820	10,820	4,517	147,975	147,975	467,868	484,000	467,868	467,868
2008	13,166	4,437			10,820	10,820	4,443	150,428	150,428	471,646	484,000	471,646	471,646
2009	13,166	4,437			10,820	10,820	4,367	152,951	152,951	475,424	484,000	475,424	475,424
2010	13,166	4,437			13,420	13,420	4,288	161,335	126,000	509,642	545,000	509,642	509,642
2011	13,133	4,437			13,420	13,420	4,111	162,191	126,000	513,420	545,000	513,420	513,420
2012	13,133	4,437			13,420	13,420	4,825	163,115	126,000	517,198	545,000	517,198	517,198
2013	13,133	4,437			13,420	13,420	4,840	164,105	126,000	520,976	545,000	520,976	520,976
2014	13,133	4,437			13,420	13,420	4,911	165,159	126,000	524,754	545,000	524,754	524,754
2015	13,133	4,437			13,420	13,420	4,981	166,278	126,000	528,532	545,000	528,532	528,532
2016	13,133	4,437			13,420	13,420	4,911	167,461	126,000	532,310	545,000	532,310	532,310
2017	13,133	4,437			13,420	13,420	4,911	168,708	126,000	536,088	545,000	536,088	536,088
2018	13,133	4,437			13,420	13,420	4,911	170,020	126,000	539,866	545,000	539,866	539,866
2019	13,133	4,437			13,420	13,420	4,911	171,396	126,000	543,644	545,000	543,644	543,644
2020	13,133	4,437			13,420	13,420	4,911	172,837	126,000	547,422	545,000	547,422	547,422

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2020	13, 153	4, 342	17, 495	13, 420	4, 075	4, 775	147, 484	126, 000	569, 642	343, 000	569, 642
2021	13, 159	4, 342	17, 481	13, 420	4, 051	4, 798	148, 221	126, 000	569, 642	345, 000	569, 642
2022	13, 159	4, 342	22, 681	13, 420	4, 231	4, 822	143, 782	126, 000	569, 642	345, 000	569, 642
2023	13, 159	4, 342	22, 681	13, 420	4, 231	4, 877	135, 198	126, 000	569, 642	345, 000	569, 642
2024	13, 159	4, 342	22, 681	13, 420	4, 231	4, 328	134, 465	126, 000	569, 642	345, 000	569, 642
2025	13, 159	4, 339	22, 678	13, 420	4, 238	4, 374	129, 581	126, 000	569, 642	345, 000	569, 642
2026	13, 159	4, 339	22, 678	13, 420	4, 238	4, 215	124, 538	126, 000	569, 642	345, 000	569, 642
2027	13, 159	4, 339	22, 678	13, 420	4, 238	4, 051	119, 331	126, 000	569, 642	345, 000	569, 642
2028	13, 159	4, 339	22, 678	13, 420	4, 238	3, 882	113, 955	126, 000	569, 642	345, 000	569, 642
2029	13, 159	4, 339	22, 678	13, 420	4, 238	3, 707	108, 404	126, 000	569, 642	345, 000	569, 642
Subtotal..	514, 381	109, 485	665, 466	487, 650	177, 816	184, 862	108, 404	126, 000	569, 642	545, 000	569, 642
2030	13, 159	4, 339	28, 670	13, 420	15, 250	3, 528	96, 680	126, 000	569, 642	545, 000	569, 642
2031	13, 132	4, 335	28, 715	13, 420	15, 235	3, 145	94, 330	126, 000	569, 642	545, 000	569, 642
2032	13, 132	4, 335	28, 715	13, 420	15, 235	2, 750	91, 879	126, 000	569, 642	545, 000	569, 642
2033	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2034	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2035	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2036	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2037	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2038	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2039	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2040	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2041	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2042	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2043	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2044	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2045	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2046	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2047	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2048	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2049	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
2050	13, 132	4, 335	28, 659	13, 420	14, 359	2, 504	89, 317	126, 000	569, 642	545, 000	569, 642
Subtotal..	790, 160	200, 524	1, 732, 740	769, 470	963, 270	198, 476	0	126, 000	0	545, 000	93, 794
2051	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	131, 853
2052	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	169, 912
2053	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	207, 971
2054	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	246, 030
2055	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	284, 089
2056	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	322, 148
2057	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	360, 207
2058	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	398, 266
2059	13, 132	4, 335	51, 479	13, 420	38, 059	0	0	126, 000	0	545, 000	436, 325
Total.....	908, 348	239, 539	2, 196, 051	890, 250	1, 305, 801	198, 476	0	126, 000	0	545, 000	436, 325

! Includes sinking fund component for replacement of reimbursable portion of nuclear complex.

Alternative routes

Four alternative routes for conveyance of desalted sea water to the Colorado River were examined for purposes of comparison to the base plan. For each alternative route, costs were estimated for the provision of 2 m.a.f. and 2.5 m.a.f. of augmentation supplies. (See map of alternative routes.)

Those alternative plans which involve the delivery of desalted water into the Colorado River downstream of Hoover Dam (plans A, B, and D) would not have the use of storage capacity of Lake Mead for regulation. As a result, preliminary studies indicate that these plans would require additional regulatory storage as a feature of the augmentation plan.

Such storage near the terminal point of the conveyance works would also provide an opportunity to mix the very high quality desalted water with the natural river water. It appears that provisions for adequate mixing will be essential to optimize the benefit from use of the desalted water to reduce the river's salinity, as well as to avoid the problems associated with delivering water of widely varying quality to users.

Cost estimates for plans A, B, and D include the costs of a regulatory reservoir on the Bill Williams River arm of Lake Havasu located approximately 2 miles upstream from Parker Dam. The Bill Williams Reservoir would have a storage capacity of about 800,000 acre-feet, and the estimates include provisions for pumping from Lake Havasu into the reservoir. It would provide sufficient storage capacity to accommodate hydraulic mixing as well as regulatory storage to maintain efficient operation of the river.

The estimates for plans C and D incorporate dual-purpose nuclear desalting complexes situated at El Golfo de Santa Clara on the Gulf of California. As discussed later, siting of the plants in Mexico would involve international agreements. A joint study group formed by the Governments of the United States of America and Mexico and the International Atomic Energy Agency is currently conducting an assessment which will serve to define these considerations.

Summary tabulations of the costs and physical features of the alternative routes follow:

ALTERNATIVE IMPORT ROUTES (2,000,000 ACRE-FEET)

	Pacific-Mohave	Pacific-Havasu	Gulf-Mead	Gulf-Havasu
	(A)	(B)	(C)	(D)
Construction cost (million dollars):				
Nuclear desalting facilities ¹	904	899	931	854
Conveyance system.....	1,837	1,868	2,357	1,198
Total.....	2,741	2,767	3,288	2,052
Annual costs, O.M. & R. ² (million dollars):				
Nuclear desalting facilities.....	42.8	42.5	43.8	41.2
Conveyance system.....	4.6	4.2	8.3	4.2
Total.....	47.4	46.7	52.1	45.4
Physical features (miles):				
Tunnels.....	66	94	38	57
Pipeline.....	87	77	130	37
Canal.....	101	122	184	138
Penstocks and discharge lines.....	13	10	17	11
Total.....	267	303	369	283
Pumping plants:				
Number of plants.....	9	8	19	11
Total dynamic head (feet).....	4,105	3,381	5,045	5,154
Installed capacity (mw.).....	1,357	1,117	1,667	1,638
Power drops:				
Number of drops.....	4	3	6	2
Design head (feet).....	2,114	1,418	2,315	451
Installed capacity (mw.).....	481	323	527	94

¹ Includes allocated power costs for project pumping.
² Includes fuel costs, interim replacements, and sinking fund to rebuild at the end of 30-year service life.

ALTERNATIVE IMPORT ROUTES (2,500,000 ACRE-FEET)

	Pacific-Mohave (A)	Pacific-Havasu (B)	Gulf-Meed (C)	Gulf-Havasu (D)
Construction cost (in millions of dollars):				
Nuclear desalting facilities ¹	1, 140	1, 134	1, 174	1, 085
Conveyance system.....	2, 113	2, 149	2, 672	1, 360
Total.....	3, 253	3, 283	3, 846	2, 445
Annual costs—O.M. & R. ² (in millions of dollars):				
Nuclear desalting facilities.....	54. 4	54. 0	54. 7	52. 0
Conveyance system.....	5. 5	5. 1	9. 6	4. 7
Total.....	59. 9	59. 1	64. 3	56. 7
Physical features (miles):				
Tunnels.....	66	94	83	27
Pipeline.....	87	77	130	27
Canal.....	101	122	184	138
Penstocks and/discharge lines.....	13	10	17	11
Total.....	267	303	369	203
Pumping plants:				
Number of plants.....	9	8	19	10
Total dynamic head (feet).....	4, 105	3, 381	5, 045	1, 650
Installed capacity (megawatts).....	1, 696	1, 397	1, 992	651
Power drops:				
Number of drops.....	4	3	6	2
Design head (feet).....	2, 114	1, 418	2, 315	415
Installed capacity (megawatts).....	601	403	629	113

¹ Includes allocated power costs for project pumping.
² Includes fuel costs, interim replacements, and sinking fund to rebuild at the end of 30-year service life.

CONSIDERATIONS FOR FEASIBILITY STUDIES

The objective of this study was to explore, based upon reconnaissance level data, the possibilities of augmenting the water supply of the Colorado River by desalting of sea water. The plan presented herein has been selected in order to demonstrate the various factors involved in the concept of augmentation by desalting of sea water without introducing unnecessary complications. In the course of study, a number of potential alternative or modified courses of action were taken into consideration. Because of limitations on the time and scope of the study, it was not possible to explore in detail all of the potential opportunities to improve the plan. A number of these possibilities appear to be of significant potential advantage, however, and should be considered in detail when feasibility studies are undertaken. The following discussion concerns the most important of these possibilities.

Coordination with Mexico-United States of America desalting proposal studies

A joint study group has been formed by the Government of Mexico, the Government of the United States of America, and the International Atomic Energy Agency to make a preliminary assessment of the technical and economic practicability of a dual-purpose nuclear power and desalting plant which would serve the general areas of California, Arizona, Baja California, and Sonora. The work on this assessment is presently under way.

It is certain that long-range provisions for additional augmentation of the Colorado River will be necessary to support the continued economic and sociological development of the Pacific Southwest. The assessment being made by the joint study group is giving consideration to providing for such long-range needs.

If agreement is reached among the parties and plans to proceed with this joint venture materialize, an opportunity might exist to obtain the augmentation water from this source at a significant saving, particularly in conveyance costs. Consolidation of these two proposals would impart the advantages of financing

associated with the augmentation to a portion of the joint venture, and important advantages might be provided the augmentation effort by plant siting in Mexico.

Because of the obvious uncertainties of international agreements and timing associated with siting of the plant in Mexico, this reconnaissance report has been based upon a plan which is located entirely within the United States. If feasibility studies are undertaken, however, further attention should be given to the progress of the study group's efforts and economic analyses made of the alternative of utilizing the joint venture as a source of augmentation water.

National Water Commission

Congressional action is well advanced on pending legislation to establish a National Water Commission. If established, it is anticipated that the commission will address itself to the problems of water supply in the Pacific Southwest at an early date. Among the factors which should be considered by the commission is the practicability of augmenting the Colorado River by desalting of sea water. To meet the objectives outlined in this report, it will not be necessary to initiate construction of desalting facilities until after 1980. The National Water Commission's recommendations will be available well in advance of the need to make a final decision to proceed with construction.

Need for additional augmentation

This reconnaissance study has been directed toward the provision of sufficient water to prevent shortages in the 7.5 m.a.f. of annual consumptive use apportioned among the State of the Lower Colorado River Basin. The provision of this quantity of water would, of course, not supply adequately the potential uses of the Pacific Southwest. California uses from the river presently exceed 5.0 m.a.f. annually and would, with this augmentation in effect, be reduced to an assured 4.4 m.a.f. Estimates of Arizona's present ground-water overdraft made for earlier reports are 2.2 m.a.f. annually as compared to about 1.5 m.a.f. which would be supplied from the Central Arizona Project. Nevada's allocation has been estimated to be adequate to provide for municipal and industrial growth of the Las Vegas metropolitan area until 2020, but population growth is exceeding the projections annually in this area. One potential source for provision of water would be by desalting, as is being studied by the joint committee discussed above. The ability to provide staged construction of desalting facilities has the advantages of flexibility in timing capacity to meet needs, spreading the time of construction investment, and maximizing the use of advancing technology. Future studies of desalting facilities should include consideration of additional capacity for long-range needs. If such capacity can be shown to be desirable, plans should include provisions which would facilitate future stages.

The Upper Basin has committed the major portion of its available water supply. Large population centers within and adjacent to the Upper Basin will remain dependent on the Colorado River for the development of increased supplies of municipal water. Mineral resources of phosphates, oil and gas, coal, trona, uranium, and oil shale exist extensively in the Upper Basin and would depend on a supply of additional water for development. Agricultural opportunities also exist which could use additional water.

Potential pumped storage

In the course of the reanalysis of the Central Arizona Project, which was performed in late 1966, and other reconnaissance-grade investigations, the Bureau of Reclamation has made preliminary examinations of a number of potential pumped storage, hydroelectric plants in Arizona. The plan which appeared most favorable, based upon available data, was the Mohave pumped storage plan which is located in Arizona adjacent to Lake Mohave about 21 river miles downstream from Hoover Dam.

The existing Lake Mohave, the reservoir formed by Davis Dam, would serve as the lower reservoir for the installation. Low cost thermal electric power from plants of power systems in the Southwest would be used at times of low power demand to pump water, using reversible pump-generators, to an upper reservoir. The 49,000-acre-foot upper reservoir would be formed by excavation and damming of a natural depression on Malpais Mesa almost 1,400 feet above Lake Mohave.

During periods of peak power demand or at times of sudden loads on the integrated power systems, water would be released from the upper reservoir back into Lake Mohave, providing a source of quickly available, high value peaking power.

The plant could be built to a capacity of 5,100 megawatts or larger, and could be integrated with baseload steamplants of the electric utility systems in the area to provide sources of low cost pumping energy. The nuclear powerplants associated with the dual-purpose desalting facilities would be another potential source of off-peak energy. Although the Mohave pumped storage would produce no net energy, the facility would make substantial contributions to a development fund through the sale of peaking capacity if an appropriate source of pumping energy were available.

Other favorable pump storage sites in Arizona identified by the Bureau include the Buckskin Mesa site on the Bill Williams arm of Lake Havasu, the White Tanks Mountain site adjacent to the Granite Reef aqueduct in central Arizona, the Montezuma site southwest of Phoenix, Arizona, and the Horse Mesa pump storage site adjacent to the Salt River Canyon some 40 miles east of Phoenix.

As additional large, efficient thermal electric powerplants are added to the power systems of the Pacific Southwest, the need for additional efficient, quick-starting peaking capacity to meet hourly and daily peak loads will become critical. Pumped storage plants such as the Mohave plan would provide an attractive source of peaking power. If such installations were integrated with the Lower Colorado River Basin Development Fund, the surplus revenues from power sales would improve the financial feasibility of augmentation proposals.

Impact of weather modification

Recent scientific and technical advances in the field of weather modification have shown that practical applications of this knowledge to increase streamflows in a significant scale may be imminent. The Department of the Interior's current atmospheric water resources program includes projects aimed at developing the capability to increase the yield of water from the atmosphere in specific localities and regions.

Operational capability to increase streamflow will first be achieved in areas where significant amounts of data and experience have been accumulated from experiments now in progress. Initial effects of the program may become evident in the Colorado Basin by the early 1970's.

If weather modification proves to be successful in increasing precipitation in the basin, the effect will be to postpone, but not replace, the need for augmentation measures. Before any construction need be initiated on desalting works, it is expected that the results of weather modification will be apparent. To the extent that construction of desalting units is delayed, technological advances in desalting techniques may be expected to improve the financial feasibility of the plan.

Impact of water salvage measures

The plan proposed for the Central Arizona Project includes water salvage measures along the lower Colorado River consisting of ground-water recovery in the Yuma area and phreatophyte clearing along the lower reaches of the River. It is anticipated that these undertakings will yield 320,000 acre-feet of water annually for use. The benefit of this salvage is incorporated in the hydrologic assumptions underlying the studies in this report.

Accomplishment of the above measures, along with the recently completed Senator Wash reservoir and channel alignment work presently under way, will substantially exhaust the opportunities for increasing the yield of the river by salvage along the main stem. There might remain some possibility of decreasing the evaporation losses in the major reservoirs, and the Bureau is conducting studies of evaporation suppression at the present time. However, no practical method of suppressing evaporation on large reservoirs has yet been developed.

In the course of detailed augmentation studies, the results of water salvage activities will, of course, be taken into account. The timing of initiation of augmentation can be adjusted as necessary to accommodate the actual future conditions; but it does not appear that water salvage activities will have appreciable influence on the feasibility of the desalting project.

CONCLUSIONS

Based on the analysis presented herein it is concluded that there is reasonable expectation that detailed studies will establish the feasibility of augmenting the Colorado River by the amount of 2 to 2.5 million acre-feet annually by desalting of sea water. The validity of this conclusion rests principally on three future developments; (1) the realization, at least in part, of projected tech-

niques for combined nuclear-desalting and thermal-electric plants, (2) the enactment of those provisions of pending legislation which would declare that discharge of the Mexican Water Treaty obligation is a national responsibility, and (3) the establishment of a Lower Colorado River Basin Development Fund to provide financial assistance in repaying the reimbursable costs of augmentation works.

As pointed out throughout this report, a number of conservative assumptions and choices of alternatives have been incorporated in the analysis of the basic plan. This approach has been taken with the objective of minimizing, to the extent possible, the potentially adverse impact which indeterminate future conditions could have upon the validity of study. The accomplishments of the base plan, as presented in the analysis, therefore, are reasonably capable of being achieved.

Furthermore, a number of opportunities exist to improve upon the base plan and achieve major financial advantages if detailed studies and future conditions prove favorable. Examples of the most significant of these potential improvements are siting of the desalting plant on the Gulf of California along with delivery of augmentation water downstream of Boulder Dam, postponement of the construction of facilities through weather modification or advantageous natural runoff in the Colorado River Basin, and coordination of the augmentation plan with pumped storage hydroelectric installations.

Augmentation of the natural runoff of the Colorado River in the amounts projected herein would, among other things, achieve the following:

1. Guarantee the Lower Basin States a minimum annual water supply from the Colorado River of 7.5 million acre-feet for beneficial consumptive use.
2. Resolve the question of responsibility for delivery of water to Mexico and thereby assure the right of the Upper Basin to deplete the flow of the river for beneficial consumptive use unhampered by any controversy over obligations for delivery of Mexican Treaty water.
3. Eliminate, or make completely academic, the question of a 4.4 million acre-foot priority for California.
4. Enhance, significantly, the quality of Lower Colorado River water.

Mr. ASPINALL. Mr. Secretary, do you not think it a little foolish to propose the conveyance of Pacific Ocean water into Lake Mead, lifting it more than 4,000 feet in the process?

Mr. DOMINY. I felt that way about it when we first started these studies, Mr. Chairman. But as we developed the facts of life and if we are going to fully use augmentation of the lower river to take care of the problems of the lower river which include water quality, I became convinced that we had to introduce the desalted water into the river at a point where it would do some good. It has to come in as far upstream as Lake Mojave in order to get the mixing that would be required.

Mr. ASPINALL. Why wasn't your report prepared on the basis of the closest and most economical source of water?

Mr. DOMINY. As you well recognize, this is merely a reconnaissance report. There is a joint study being made with the Republic of Mexico as to the possibility of locating a plant on the Gulf of California. We decided to fashion this study as to what the costs would be involved, for a development entirely within the continental United States and not complicate it with international considerations, knowing that these other aspects would be fully considered if we go into a feasibility grade study.

Mr. ASPINALL. Assuming the water has to be obtained from the Pacific Ocean, surely it is not necessary to bring the water all the way to Lake Mead, is it?

Mr. DOMINY. As I have said, you have to bring it as far as Lake Mojave in order to get the essential mixing. If it is to be brought that far north, there is reason to pump it into Lake Mead and use it for peaking power purposes.

Mr. ASPINALL. Mr. Secretary, the report concludes that detailed studies will establish the feasibility of augmenting the river by desalting. Don't you believe that before we conduct feasibility studies of augmentation by desalting, we must at least have reconnaissance studies of all other possible means for augmentation?

Secretary UDALL. I would agree with that. I think the proper thing to do, Mr. Chairman, is to look at the economics of various alternatives. After all, this is a projection, it is an extrapolation. Let's see how the big Bolsa Island-southern California plant works. Let's see what the next generation of desalting plant looks like. We will know more 10 years from now than we do today.

Mr. ASPINALL. In this connection, I am bothered by the language in the reconnaissance report leaving the impression that we must await some word from a National Water Commission before there can be a study of the possibility of importing water from outside of the basin.

There is no National Water Commission and no assurance that there will be at this time, is there, Mr. Secretary?

Secretary UDALL. There is no assurance. I am optimistic that I can get the two bodies of Congress together sometime during this session on this issue.

Mr. ASPINALL. The chairman of the full committee was criticized because around the first of last June, we had not proceeded. Now we have passed the bill and they have had it over in the other body ever since last August. It seems there is no intent over there to pass it.

As you know, I have never been enthusiastic about the National Water Commission or the values that might accrue from its establishment, but I didn't oppose it. I have gone along with the legislation in hope that it might be useful in solving this Nation's water problems. But I tell you that it is not a National Water Commission that is going to make the policy decisions as to whether importations from other basins are appropriate augmentation sources for study purposes. This is the implication left by the language in the report. The Congress of the United States is going to make this determination and we are not going to take water from other basins simply because the National Water Commission says we should and we are not going to keep from taking water from other basins simply because the Water Commission, the proposed National Water Commission, says that we shouldn't. This is a question that will be worked out by agreement among the States as to what the studies will show will be feasible.

Would you agree with that statement?

Secretary UDALL. Mr. Chairman, I have no quarrel with your basic point, which is that the Congress is going to make the final decisions. I must say I think the improvements that the House committee put in the bill to establish a National Water Commission are very important improvements. I think the House bill is the better vehicle. I believe a National Water Commission could give guidance to the Nation for the kind of national action that may be needed in the future and could help make the case for the right kind of programs, whatever they are. That has been my real hope for a National Water Commission.

But the Congress and the Executive, in their usual way, are going to make the decisions; yes.

Mr. ASPINALL. I am surprised you defend the executive department. I am interested in your discussion of weather modification as the means of increasing the water supplies of the river. I am in full agreement with the research that the department is conducting in this field, but, at the present time, you and I both know that this is not a dependable source of new water.

Do you agree with me on that at the present time?

Secretary UDALL. We have the scientists of the Bureau of Reclamation in Denver working on this. I have the highest regard for their scientific competence, their scientific approach. I know they want to move slowly and be sure of what they are doing. We are about 10 years off, in their judgment, if we give them the right kind of research support, from knowing what we really can do and how and what results are possible.

Mr. ASPINALL. At some time in the future, if the water supply from the Colorado River can be increased by this means, the additional supplies surely will be welcomed by all the States in the basin and quickly put to beneficial use. But this is surely not a source on which to base the planning and justification of the central Arizona project, or any other project in the basin, at least at the present time.

Secretary UDALL. I have to answer in two parts:

The central Arizona project, as the Bureau has planned it, does not rely on this kind of augmentation. It stands on its own merits.

On the other hand, however, when I look at the long-term future of the basin, I am rather optimistic about weather modification. But for the shorter term, I don't think we should base the plans for the central Arizona project on weather modification.

Mr. ASPINALL. One last question:

Under your present investigation and in accordance with your present thinking, when would you propose that the construction of the projects authorized in the legislation now before this committee be commenced?

Secretary UDALL. Fiscal year 1970 is the date we have in mind, Mr. Chairman.

Mr. ASPINALL. You say this when you know full well that the administration, the Bureau of the Budget, has looked at our \$2.5 billion-plus backlog of authorizations and they are only giving us this coming year new construction money of approximately \$203 million.

Mr. Chairman, I reserve the balance of my time with the understanding that the other members will have their time and if there are any other matters that come up during our proceedings, that I be allowed to come back again.

May I say to our committee members that we will adjourn but we will come back this afternoon. The Secretary will be with us. The Secretary will not be with us tomorrow, but he has said he will be with us Thursday if it is necessary for him to be here.

Mr. JOHNSON. We are in recess until 2 p.m.

(Whereupon, at 12 o'clock noon, the subcommittee was recessed, to reconvene at 2 p.m., this same day.)

AFTERNOON SESSION

Mr. JOHNSON. The Subcommittee on Irrigation and Reclamation will resume its hearing.

I now recognize the gentleman from Pennsylvania, Mr. Saylor.

Mr. SAYLOR. Thank you, Mr. Chairman.

As I left the committee room this morning, people in the audience said that they had observed that there was a smile on my face when the chairman of the full committee was interrogating the Secretary and the Commissioner of Reclamation, and they wondered why. I would just like to tell the chairman that I was torn, as it were, between two songs, as to whether to open my statement this morning with "Oh, what a beautiful morning, Oh, what a beautiful day, I've got a beautiful feeling, Everything's going my way" or "All the world is waiting for the sunrise, Every rose is heavy with dew."

You might wonder why two songs that are as opposite to one another have me torn. I want to say publicly that there is no Member of this Congress now or in the 20 years it has been my privilege to serve, who has been a greater advocate of reclamation than the Honorable Wayne A. Aspinall, the chairman of the full committee. And when he asked the question that he did this morning, he was following the same pattern of questions that a man from Pennsylvania named Saylor has been asking of the Bureau of Reclamation since 1949. And when I asked those questions—trying to get truthful answers—I was accused of being an enemy of reclamation. If the Bureau of Reclamation had given to me the same kind of forthright answers that the Secretary of the Interior has given to the chairman this morning, we might have had an entirely different picture in a great deal of the so-called semiarid West over the past number of years.

First, Mr. Secretary, let me say to you that I want to commend you for the answers you gave in response to the letter which the chairman forwarded to you. I think that you have conscientiously tried within the limits of the Bureau of Reclamation's ability to come as close as any Secretary has ever done in giving some of the best testimony that has been presented before this committee.

Now, I have a few questions to ask. Back when the Upper Colorado River project was authorized, in the hearings before this committee during the 84th and 85th Congress, the Bureau of Reclamation testified as to the flow of the river and when I at that time questioned the reliability of the Bureau's figures, I was told that there was absolutely no doubt about it. That the figures of the Bureau were correct and that there were not only 15 million acre-feet of water in the river, but that there was also enough water to do what people who met in Santa Fe in 1922 anticipated, that there would be water to divide over and above that figure between both the upper and lower basins.

Now, Mr. Secretary, I gather from the figures given us today that the only really dependable figures on which you have any absolute guarantee as to their reliability on the flow of the Colorado River are from 1929 until 1968. Is this correct?

**STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE
INTERIOR—Resumed**

Secretary UDALL. Mr. Congressman, I want to be understood on this. The words I used this morning with regard to the 1906-1922 or 1906-1929 period were that in the view of our experts these data are sufficiently accurate to be highly reliable. I do not want to confuse the record here on that point. It is our view that although the flows were not measured at Lee Ferry, as they were later, the data are accurate and reliable.

Mr. SAYLOR. In other words, you have evaded the question, sir, whether intentionally or otherwise? You have exact figures from 1922 until today?

Secretary UDALL. Yes; that is correct.

Mr. SAYLOR. These measurements that you are taking out there now, which the Bureau is collecting, are—

Secretary UDALL. No guesswork at all.

Mr. SAYLOR. It is exact. There is absolutely no guesswork on any of those figures? The figures from 1922 to 1929, in that 7-year period are more reliable because they were taken with a great deal more accuracy than the measurements before that time; is that not correct?

Mr. DOMINY. Well, Mr. Saylor, it is not that the figures available were not taken with accuracy. We had more gaging stations. We did not have some of them in the prior years. We did not establish the one at Lee Ferry, for example, until 1922. But we did have accurate figures of the flow at Yuma from 1903 and we did have other stations above Lee Ferry prior to 1922 with accuracy of measurement.

Mr. SAYLOR. Yes; but you will notice that the Secretary limited his figures to 1906. Now, there have been gaging stations on that river since the 1800's.

Mr. DOMINY. That is correct.

Mr. SAYLOR. 1886, I think, is the first time a gaging station was placed on the Colorado. So that the figures on the Colorado fall into three classifications—four classifications. Those before 1906, from 1906 until 1922, from 1922 to 1929, and from 1929 to 1968. Is that a fair statement?

Mr. DOMINY. I think that is a fair statement.

Mr. SAYLOR. And that the Secretary's testimony here has been based upon the figures from 1906 until 1968, which he says, from the experts in your Department, are reliable.

Now, if they are reliable, what has happened to the studies that were made when we had the Colorado River Storage project and indicated that we would have a full Lake Mead and a full Glen Canyon, and the date that they said they would be filled?

Mr. DOMINY. Let the record show that we had a full Lake Mead not long ago.

Mr. SAYLOR. When did you have a full Lake Mead?

Mr. DOMINY. In 1962 we had a full Lake Mead.

Mr. SAYLOR. When did you close the gates at Glen Canyon?

Mr. DOMINY. In 1963. Unfortunately, since that time, we have had only one above-average year and the rest have been below average.

Mr. SAYLOR. So that in order to take care of the requirements of the Hoover Dam and the payouts by the contract which the Department has entered into with the power users, you have had to release quantities of water out of Glen Canyon?

Mr. DOMINY. No, sir, we have never released one drop of water out of Glen Canyon just to make power. We have released it to meet the lower basin use requirements. Obviously, we have made power with it both at Glen Canyon and at Hoover in so doing. But we have never reduced the level at Lake Powell by 1 inch just to make power.

Mr. SAYLOR. Well, for whatever reason you may want to justify your releases—

Mr. DOMINY. The law is what I rely upon, Mr. Saylor.

Mr. SAYLOR. It is true that you did release the water out of Lake Powell?

Mr. DOMINY. That is right, to take care of the downstream uses—depletions.

Mr. SAYLOR. Now, what downstream depletions?

Mr. DOMINY. We have all of the California contracts, the Arizona contracts and the Indian uses downstream, as well as the Mexican Treaty obligation.

Now, it is true that we did not want Lake Mead to drop below minimum head, but we did not release any water out of Lake Mead just to make power. We did adjust the levels of the two reservoirs so that we did not build a higher head at Lake Powell at the expense of dropping below a minimum head at Lake Mead, for example. This would not have made sense. And we do try to make sense with our operation.

Mr. SAYLOR. Confidentially, many of the things you have done in that Bureau over the years have not made sense to some of us. So this one more would not be exception.

Mr. ASPINALL. Would the gentleman yield?

Mr. SAYLOR. Yes.

Mr. ASPINALL. Following up what you have said, Mr. Dominy, in order to take care of 75 million acre-feet of water for the consecutive 10-year period, counting the period which you are in now, we are going to have to release greater amounts than we have the last 3 or 4 years.

Mr. DOMINY. That is correct.

We were well ahead of the 75 million acre-feet 10-year moving average until we closed Glen Canyon Dam. Now, we have dropped consistently below that. So to meet the 10-year average release requirement, there will have to be some additional releases.

Mr. SAYLOR. Mr. Secretary, am I correct in understanding that the basic law of the Colorado River is contained within the so-called Colorado River Compact entered into in 1922 among the seven basin States?

Secretary UDALL. Well, this is one of the basic documents, probably the most basic, but there are others, such as the Upper Colorado Compact and so on.

Mr. SAYLOR. Just a minute. They do not affect—I asked for the Colorado River. Now, there are some agreements in the upper basin and in the lower basin. But outside of the Colorado River Compact and the Supreme Court decision, which only affects the lower basin, is not the Colorado River Compact and the Mexican Water Treaty the supreme law of the land?

Secretary UDALL. There are three basic documents, my lawyer tells me—the Mexican Treaty, the Compact between the States, and the Boulder Canyon Project Act of 1929.

Mr. SAYLOR. This was the one which authorized the construction of the Hoover Dam?

Secretary UDALL. The Hoover Dam; that is right.

Mr. SAYLOR. Now, under the terms of the Colorado River Compact, the Upper Basin States are obliged to deliver to the lower basin 75 million acre-feet every 10 years at Lee Ferry.

Mr. WEINBERG. The upper basin is obligated not to deplete the flow of the river at Lee Ferry below 75 million feet every 10 years.

Mr. SAYLOR. Now, will you explain the difference between the question as I put it and the answer you have given?

Mr. WEINBERG. Yes. An obligation to deliver would connote an obligation to take an affirmative action. An obligation not to deplete the river is an obligation only to hold up diversions so that there will be sufficient natural flow in the river to make up the 75 million acre-feet. The upper basin has no hard-and-fast obligation to make a delivery of water that Nature does not put in the river.

Mr. SAYLOR. Well, let us assume that there is only 7.5 million acre-feet of water in any year or 10 consecutive years in the Colorado. Where must it go?

Mr. WEINBERG. On that assumption, it must be released at Lee Ferry. It can't be withheld upstream.

Mr. ASPINALL. He is only partly right.

Your answer is keeping in mind the decreed rights that were in existence in the upper basin as of 1922.

Mr. WEINBERG. Yes.

Mr. ASPINALL. All right.

Mr. SAYLOR. Now, since the Colorado River Compact was entered into, the Federal Government has entered into a Mexican Treaty with the Republic of Mexico. Is that correct?

Secretary UDALL. That is correct.

Mr. SAYLOR. And this calls upon the delivery of a million and a half acre-feet to the Republic of Mexico at the border. Is this correct?

Secretary UDALL. That is correct.

Mr. SAYLOR. This over and above the 7.5 million acre-feet delivered at Lee Ferry?

Mr. WEINBERG. The compact provides that the Mexican treaty burden shall be made up first out of water that is surplus over and above the III(a) and III(b) quantities, and then if there still remains a deficiency, each basin is required to meet one-half of the deficiency.

Mr. SAYLOR. Well, if the Secretary's story is correct as verified by the Commissioner of Reclamation, the past number of years, there has not been any surplus and the average flow, according to the figures which have just been submitted, indicate that the total flow is only—is less than 15 million acre-feet. Is that not correct?

Mr. DOMINY. That is the projection for the future based on the longest period of record, that is correct.

Mr. SAYLOR. Now, Mr. Secretary, in your statement, you state that the lower basin has an obligation to deliver half of the Mexican treaty water, but you state that there is no such obligation—or that is the impression which I get from your statement—there is no such obligation on the upper basin. Now, is this correct?

Secretary UDALL. Well, your implication is not correct.

Mr. ASPINALL. If my colleague will yield, neither is the answer of Mr. Weinberg correct, because this is an unresolved situation as of the present time.

Mr. WEINBERG. That is a point, Mr. Chairman, that I was about to make. This issue is an unresolved issue and the Secretary's statement points out that it is an unresolved issue.

Mr. SAYLOR. Well, if your statement, then, Mr. Weinberg, is that each basin is required to make up half of the shortage, what is unresolved?

Mr. WEINBERG. I didn't quite say that, Mr. Saylor. I said the compact provides that the Mexican treaty burden shall first be made up out of water that is surplus in each basin. Now, the unresolved issue is whether or not there is surplus in the lower basin that would be available before the upper basin is called upon to meet a deficiency in the Mexican water treaty deliveries.

Mr. SAYLOR. All right.

Now, I would like to turn, Mr. Secretary, to your proposition with regard to the power which you intend to use. I would like to say for the record, Mr. Secretary, you must be contemplating leaving your office, because never before has a Secretary of the Interior been so open and frank and forthrightly honest as you have been in the second paragraph of your statement on page 7 with regard to power. If this does not cause the REA to tear their hair out and wonder what has happened to their great friends in the Department of the Interior, I do not know what it will take. Because for the first time, we have a Secretary of the Interior who admits that the yardstick method has two measurements, that they are not the same. And you have come forward and stated the reasons for the higher cost for utilities to furnish power in the commercial market.

This, Mr. Secretary, if you will be remembered for nothing else, will be a landmark day in American history. And I will quote it for the next thousand years.

Now, Mr. Secretary, you state that you estimate that it will be necessary to have power costing 6.5 mills at the Page site. Is this correct?

Secretary UDALL. If we had to buy it commercially, it would be 6½ mills.

Mr. SAYLOR. If you had to buy it commercially, it would be 6½ mills?

Secretary UDALL. That is right.

Mr. SAYLOR. Now, Mr. Secretary, when you came before this committee, or when your predecessors came before this committee and suggested that we authorize the Upper Colorado River storage project, they said that they were going to produce power at Glen Canyon and they were going to sell power up there and it was going to be available at 6 mills? Now, why do you not use some of this power up there? You have enough powerlines up there to run it down. Why should you get in the business of underwriting a steam generating plant?

Mr. DOMINY. The Upper Basin States, for which the Upper Basin Colorado River storage project is being built, want that power to be marketed in their area and the project criteria so provides. It is to be marketed in the lower basin until the upper basin has the need for it. We could not rely on upper basin power for the central Arizona project because it would soon be withdrawn for upper basin uses.

Mr. SAYLOR. Well, how soon? You have been producing power up there and it is cheaper than you say you can buy it from other companies on a commercial basis.

Mr. DOMINY. The uncertainty of its availability in the lower basin would preclude relying on it for the central Arizona pumping power needs. Furthermore, the upper basin power is being produced at a much lower load factor than is the requirement for energy to pump the central Arizona water supply. The power needs of the central Arizona project do not fit the generation pattern, Mr. Saylor. It could not be done economically.

Mr. SAYLOR. Now, Mr. Secretary, in this WEST group you mention the planning group, you have mentioned several groups in the State of Arizona. There is the Salt River group and the Arizona public power group. Why could not they, being semipublic agencies, build this plant and you buy the power from them?

The reason I ask this, they have all the advantages—at least Salt River has the advantage of not being required to make a profit and they have the advantage of a pretty good interest rate—two of the three factors that you say cause this high cost of commercial power are already available to one of the partners in WEST. Why can't you go to that group and ask them to build this plant and you take the power from them?

Secretary UDALL. Congressman, you are very close to precisely what we are proposing here. The reason the WEST organization works is that the modern way to produce electric power is to go to very large units. We get the largest units we can in order to get the economies of scale and to get cheap power for everyone. And any participant, public or private, that wants a piece of the action can own a piece of the plant—12 percent, 15, 27, or whatever it happens to be. In this instance, we will not own part of the plant, we will simply be entitled to the product of the plant in a certain quotient, depending upon what we have contributed.

The plant will be financed in part by public agencies and in part by private agencies. We will contribute our part.

This is the way it works. One of the things that permits the Arizona project to stand on its own feet without subsidy and pay its way under the traditional approach is the fact that it will have 3.5-mill power instead of 6.5-mill power. This will help a great deal in the economics.

Mr. SAYLOR. Mr. Secretary, if my information is correct WEST proposes to build its plant somewhere in the area of Page, Ariz. Is this correct?

Secretary UDALL. This is a general vicinity description.

Mr. SAYLOR. I mean within miles?

Secretary UDALL. Yes, that is right.

Mr. SAYLOR. This is the so-called area for which it would be built. Does not the Federal Government own practically all the land in that area?

Secretary UDALL. No, the Navajo Indians do.

Mr. SAYLOR. Well, it belongs to the Navajo Indian Reservation. Who is the trustee for the Navajo Indians?

Secretary UDALL. I wear that little mantle, I am afraid.

Mr. SAYLOR. Now, you have that hat on, you have the hat of the Secretary of the Interior, and the hat for the Indians.

Now, in order to build a thermal generating plant, you have to have water, is that not correct?

Secretary UDALL. That is correct.

Mr. SAYLOR. You have to build cooling towers. And the only water in that area is in the Colorado River?

Secretary UDALL. In Lake Powell at the place where we will be operating.

Mr. SAYLOR. And who has charge of granting permits for the taking of water out of the lake?

Secretary UDALL. The Secretary of the Interior. We sign a contract the way we do in other parts of the river.

Mr. SAYLOR. That is the third hat you have on now.

Now, the minerals that we are going to use to produce steam from the water. We have to have some minerals. I understand that you are going to use coal?

Secretary UDALL. We felt this would be a point in our favor with the Congressman.

Mr. SAYLOR. Mr. Secretary, that is not wax in my ear, that is coal dirt.

Now, is the mineral deposit, coal, also on the Indian reservation?

Secretary UDALL. Yes.

Mr. SAYLOR. So that WEST will have to come with hat in hand to ask the Secretary of the Interior whether or not they can enter into a contract with the Navajo Indians to buy the coal? Is that not correct?

Secretary UDALL. Well, I want to make this plain, as I think the Committee knows. The Navajos have very tough, able executives that they hire. They have tough, mean lawyers. I do not tell them what to do these days. And if this project were not in their interest, it would never get to my desk.

We have a very happy situation here, because we might have an argument otherwise between the Indians and some of the Arizona people over this Arizona water that is in Lake Powell, this 50,000 acre-feet which is Arizona's entitlement. But here we would use it very happily to develop Indian coal to provide water for an Arizona water project. It is really a very excellent solution to the problem.

Mr. SAYLOR. Well, Mr. Secretary, as long as you are there, I think you will deal fairly. But I just want to point out for the record that whomsoever is involved in the WEST planning group is actually operating under a tremendous handicap, because even though they enter into a fine arrangement with the Indians, the power of veto or approval still rests with the Secretary of the Interior. Is that not correct?

Now, this is true whether or not you put any money in it or whether you buy power from just a block of power.

Secretary UDALL. We have considerable control, it is true. But I think you should understand that the WEST organization has been highly successful at this point. We put other plants together. We are planning for the whole region. This includes southern California with the fastest growing electric power load in the country. Although the Department of the Interior is not part of the WEST organization officially, we are keenly interested in its success and we are, therefore, helping all that we can to put these various projects together.

Mr. SAYLOR. Mr. Secretary, you may talk about the mean and competent lawyers that the Navajo Indians have. The Bureau of Reclamation and the Department of the Interior lawyers have never been known for their mealy-mouthed attitude in any manner. And when they get mean, they can be meaner than anybody else I know and they can have more standards to justify more things than any other group of lawyers I have ever known in my life, including the seven that sit on the Supreme Court.

Mr. BURTON of Utah. Will the gentleman yield?

Mr. SAYLOR. I yield to my colleague.

Mr. BURTON of Utah. I would like to say, Mr. Secretary, that your own lawyers are not surpassed by anyone I know in terms of being men, rough, and tough, vis-a-vis Great Salt Lake.

Mr. SAYLOR. Somebody up here asked did I not know that there are nine members on the Supreme Court, and I said sure I do, but there are only seven on it that I know are lawyers.

Mr. HOSMER. Will the gentleman yield?

Mr. SAYLOR. The chairman of the subcommittee has asked me to yield to him.

Mr. ASPINALL. Thank you.

I just wanted to ask one question at this point in regard to the coal. I presume that the large coal companies are dealing with the Indians on the coal matter and they in turn will offer the coal to the group that would build and construct the powerplant?

Secretary UDALL. Precisely. We have already put one WEST plant together using the same coal by the Peabody Coal Co. They will have a coal slurry pipeline 300 miles to Nevada. The coal companies must get together with the WEST power group. We are sort of looking over their shoulder, but there is a lot of negotiating that goes on to which we are not direct parties.

Mr. JOHNSON. That is the way I understand it. The coal companies have moved in there and have now under lease working arrangements for the coal that will fire this plant. Am I right?

Secretary UDALL. That is correct.

Mr. STEIGER. Will the gentleman yield at that point?

Mr. JOHNSON. Wait just a minute.

They have already secured their leases from the Navajo Indians, so the coal matter has been settled as far as this plant is concerned and can move forward.

Secretary UDALL. That is correct, as far as the coal leasing arrangement is concerned, this has already been consummated.

Mr. SAYLOR. Now, second to that, have they been given, the group that is going to build, the insurance that they will have the water that is supposedly Arizona water?

Secretary UDALL. We have openly indicated that if the Page plant goes forward, we see no obstacle to granting a water contract.

This has several advantages.

Mr. SAYLOR. I realize that.

Secretary UDALL. You should realize, too, that they have to pay a price for the water. The revenues go into the Upper Basin fund in this instance and it helps all the way along the line.

Mr. HOSMER. I would like to pay tribute to the Interior Department's lawyers, too, and give credit where credit is due. If it had not

seen for them coming into the breach and standing up like Horatio at the bridge, we would have been invaded by a tax-paying, royalty-paying geothermal steam industry today and these lawyers saved us from being plagued with those extra revenues in the U.S. Treasury.

Mr. SAYLOR. Let us get this back on the hearing for which the Secretary came up here.

Secretary UDALL. I am overwhelmed with bouquets.

Mr. SAYLOR. Mr. Secretary, you would deal with the Lower Colorado River Basin development fund. Why do you not look to the revenues from Hoover and Parker-Davis for first payment into this fund. And, second, why do you not use the power from these sources for the development of pumping water for the project?

Secretary UDALL. In relation to the use of this power for Central Arizona pumping, there are several reasons why it can't be used. The power at Hoover Dam is under contract for the entire payout period and in effect has been sold at least for the first 50 years. These contractors have rights to renewal of contracts. So this is part of the answer.

Another reason is that the load factor is not suitable for meeting pumping requirements.

As far as the lower basin development fund is concerned, as I have indicated today, we have no objection to this. I simply make the point that the Arizona project does not need this help. It stands on its own feet the way we have the plan laid out now.

Mr. BURTON of Utah. Mr. Chairman, will the gentleman yield to me?

Mr. SAYLOR. I would like to go ahead here.

Mr. BURTON of Utah. Go ahead, then.

Mr. SAYLOR. Next I am coming to water supply, which is the next item which the Secretary has covered.

Mr. BURTON of Utah. I will renew my request that the gentleman yield, because I have a point on that particular issue.

Mr. SAYLOR. All right.

Mr. BURTON of Utah. Mr. Secretary, is it not true that if the revenues from Parker, Hoover and Davis are not applied in the Basin account, when the payoff period is complete, these revenues can be used to give, in effect, southern California a power windfall that is not available to any of the sister States, and these revenues will not be used to create any participating projects other than in that area?

This is one of the reasons why some of us wonder if your proposal to exempt those revenues from participation in central Arizona and other projects in the basin, including the Dixie, is not an unfair advantage to some interests in California.

Secretary UDALL. I am not proposing that they be exempted at all. All I am saying is that as far as this present legislation is concerned, it is not absolutely necessary. The Congress has the option to consider the policy question of what should be done when Hoover payout occurs. For the project, unlike most of the later power projects, there is no subsidy out of Hoover for irrigation at the present time. If the Congress wishes to create a development fund after payout, this is certainly a subject in which we can take a very keen interest. We are raising no objections to that.

Mr. BURTON of Utah. On that point, Mr. Secretary, previously when you testified before the committee—and I say this with all re-

spect—you have recommended the creation of a lower basin account which would include Arizona, which would include the Dixie project in Utah, and which would include the projects in California. I think that you have not directly answered the question, Is it not possible that these revenues, after the payout period, can be used to produce a power windfall for the people in southern California that the people—that the other States in the basin contributing their water and contributing their interest would not benefit by?

Secretary UDALL. One can give it that interpretation. I know the problem with the Dixie project, which is a project that needs an irrigation subsidy. This is an argument for some kind of lower basin development fund. But I have tried to layout the question for the committee as I see it. If it is the committee's desire to create a fund both for Dixie and for augmentation purposes in the future to help with the Mexican treaty, or for whatever purposes, the entire subject is before the committee.

Mr. BURTON of Utah. I realize this is a matter of conjecture, but it is something that I think legitimately ought to be raised on the record.

I thank the gentleman for his indulgence.

Mr. SAYLOR. Now, Mr. Secretary, on page 10 of your statement you have the figures for the virgin runoff at Lee Ferry. The first set of figures you have which you call the critical period from 1931 to 1967. That is 12,990,000 acre-feet average annual flow. If this figure is correct, that is 1,970,000 acre-feet below the figure which you state is the longest reliable period of record on the Colorado River. Is that correct?

Secretary UDALL. That is correct.

Mr. SAYLOR. And if we take the figures from 1922 to 1967, which you say are the actual records at Lee Ferry, of 13,750,000 acre-feet, you are still 1,210,000 acre-feet below the average of 14,960,000. Is that correct?

Secretary UDALL. That is correct.

Mr. SAYLOR. Now, Mr. Secretary, when this project was before the other body, those Congressmen who serve on the north side of the Capitol, your organization, the Bureau of Reclamation, gave to them certain figures which appear on page 35 of the Senate report to accompany S. 1004, first session of the 90th Congress.

I find on that page that you have the following: Net gain Lee Ferry to Hoover, you estimate in the year 1975, 772,000 acre-feet; in the year 1990, 753,000 acre-feet; in the year 2000, 732,000 acre-feet; and in the year 2030, 704,000 acre-feet; is that correct?

Secretary UDALL. As I read the figures on that line, yes.

Mr. SAYLOR. I have not had a chance, Mr. Secretary, to look at a map of that area, but relying upon my memory and the visits I have made to that area, I believe that at least the main streams which make that contribution are Kanab Creek, the Virgin River, the Little Colorado, Havasu Creek, and Johnson Creek. Is that correct? Are there any others that—

Secretary UDALL. That sounds like the main ones from my knowledge of it.

Mr. DOMINY. Paria comes in right at Lee Ferry, and the gauging measurement is taken above Lee Ferry.

Mr. SAYLOR. My recollection is that it would be taken below——

Mr. DOMINY. Paria River flows are included in those at Lee Ferry.

Mr. SAYLOR. Now, this committee some years ago authorized the Dixie project; is that not correct? They have had a little difficulty with those lawyers you have downtown.

Secretary UDALL. Yes.

Mr. SAYLOR. If the Dixie project is authorized, it will use about one-third of the total of that Virgin River; is that not correct?

Mr. BURTON of Utah. Mr. Chairman, if the gentleman will yield——

Mr. SAYLOR. No. The reason I am asking this is that some of us are questioning the reliability of your figures; that is all.

Mr. DOMINY. The present depletion is 35,500 acre-feet. We would increase the depletion if the Dixie project is built. Some of that area is already being irrigated. We would increase the depletion by 48,200 acre-feet.

Mr. SAYLOR. Now, one of these streams that runs in here is the Little Colorado. Now, I have walked up that Little Colorado when it has been bone dry, maybe a little pool somewhere up the line that the heat had not gotten down and dried up yet, but basically it was dry. Now, if you have to rely on these unusual washes and these strange rains, are you going to count on the Bureau seeding clouds somewhere along the line and putting a little water in the Little Colorado?

Mr. DOMINY. The Little Colorado was not dry after that 7-foot snow hit the area down around Flagstaff. It is a river that runs feast or famine, to be sure, but we have measurements on it.

Mr. SAYLOR. Now, in checking a little bit, Mr. Secretary or Mr. Commissioner, do not go overboard on that 7-foot snow. You had drifts of 7 feet, but you did not have 7 feet of snow.

Mr. DOMINY. There were areas around Flagstaff that measured 7 feet on the level, Mr. Saylor.

Mr. SAYLOR. Some of the people who came through there said they had a lot of snow, but they did not have that much.

Now, you anticipate, Mr. Secretary, that even if you take your figures of 1922 to 1967 wherein you indicate that there is only 13,750,000 acre-feet in the Colorado River, there will be sufficient water in the river to build the central Arizona project.

Mr. DOMINY. Mr. Saylor, as we have made abundantly clear, we do not accept projections that rely on the more critical years of record. We do not think that is realistic, to throw out the years of higher flow and limit analysis of projects in the future to conditions of the bad years. If that chart that has four of the major rivers of the West could be put up again I think this is something that is worthy of the committee's attention.

This chart starts in 1906 for four rivers of the West. The 100-percent line, is the average yield line derived from actual records on these four principal rivers. The flowing line is the 10-year moving average. So the first point on each of the rivers is the 1916 point, the 10-year moving average starting with 1906.

You will note that each of these rivers started out back in the period 1906 to 1930 above average. Then all of them dipped during that 1930 drought period. We could plot all the other rivers in America, including the Potomac, the Rappahannock, and the Susquehanna, and they would all do the same thing.

The only difference between the Colorado River and the Columbia and the Missouri and the Sacramento is that the Colorado has not yet recovered. Certainly that does not give me any reason to think that the climate of the United States has changed. Three of major drainage areas of the West—two of them drain more country than the Colorado River above Lee Ferry—have all had recurrences of wet cycles similar to the earlier records on those rivers. I think that the hydrology of the Colorado River, as was testified by the gentleman who went clear back to 1250 and took tree rings into account illustrates that this is a river that has longer periods of ups and downs than the average. It is kind of like the differences between the hog market and the cattle market. The hog market varies a lot faster than the cattle market. It takes the cattle market a lot longer to recover a longer cycle from one high point to the next.

The Colorado River has long periods of drought, then it has long periods of wet spells. I certainly think we would be doing an injustice to everybody who relies on the Colorado River for its future water supply to decide that it is only the years since 1922 that we ought to take into account in projecting water supply.

Mr. SAYLOR. Mr. Secretary and Mr. Commissioner, what you are trying to tell us is you have shown us some nice charts. The chart shows that for three of the four river basins which you chose—not me, nor members of his committee—

Mr. DOMINY. Do you know of any other four principal rivers in the West?

Mr. SAYLOR. Just a minute. You picked them out. We did not pick them out.

It shows that they have had their ups and downs. The Colorado River is the only one that you have shown that has gone down and down and down, and the indications are that it is still going down. You would ask us to come along here and authorize a billion dollar project or more on the basis of the fact that, well, somebody cut down a tree that went back to 1200 and counted tree rings and you are going to tell us we should rely on the tree rings rather than the statistics that you have. This is just what you suggested to us.

If you are going to talk about the hog market and the difference between the hog market and the cattle market, at least you can get a hamburger or pork chops out of those whether the market is up or down. You cannot get much out of a dry stream for irrigating crops as your own figures indicate. I want a project, but I do not want to ask the people of this country to buy a project where there is not going to be enough water to take care of it.

Now then, Mr. Secretary, let us move on a little bit to some of the next things that you have talked about in your upper basin depletion.

On page 15 you stated,

It seems more likely that some reserves will be held for future municipal and industrial growth. Also influencing our judgment is the uncertainty as to whether the Upper Basin is obligated to meet part of any Mexican Water Treaty deficiencies. Until that issue is resolved, we doubt that projects dependent on the contested water supply, as a practical matter, would be authorized or undertaken.

My question to you, Mr. Secretary, is in view of that statement, is that the reason that I find absolutely no reference whatsoever to the five projects in Colorado in the upper basin. And is the im-

lication that we are not to authorize any projects in the upper basin until that matter is settled?

Secretary UDALL. Congressman Aspinall's letter did not request information on the five projects. Therefore, that is covered in the beginning of my statement, that our position on these projects is unchanged from our position of a year ago. We only responded in this statement to Chairman Aspinall's letter.

Mr. SAYLOR. Well, what other projects or what projects are in the upper basin which are dependent on a contested water supply which have been or would be authorized or undertaken?

Mr. DOMINY. All of those five projects, all of the others that were authorized as part of the Colorado River storage project, and those that were listed for advanced attention for continued planning have been taken into account, Congressman Saylor, in our own projections of upper basin depletions. The difference is that we project those depletions and full use of the upper basin water over a longer period of time than Mr. Tipton and others have suggested might be realized.

Mr. SAYLOR. The next item that you come to is the water losses along the Lower Colorado River. The last sentence of your statement, Mr. Secretary, states that we know that we can salvage water through ground water recovery. Now, ground water recovery in Arizona near the Wellton-Mohawk project was the cause of a tremendous international incident between the United States and the Republic of Mexico regarding the quality of water. If we are going to recover—salvage water through ground water recovery, what is its quality?

Secretary UDALL. Congressman, the Wellton-Mohawk project did provoke this serious problem. The ground water we are talking about here is in the Yuma area. In several of these projects—the Yuma Mesa area is a good example—we built up, by applying water on desert land, tremendous underground water reserves that had not existed. They call them underwater domes. We would pump out of those domes and salvage water in that fashion.

But the quality of water, in answer to your question, in this instance is very good as compared with that underlying Wellton-Mohawk.

I am not saying there is not a diminution in quality, but the quality is generally good.

Mr. SAYLOR. That is just it, the water is bound, Mr. Secretary, to have picked up certain minerals as it was leached through the ground and leached out certain minerals. There is no water purification plan that exists is there, that you know of?

Secretary UDALL. One thing you have to bear in mind is that as a project gets older, the solids are leached out and the quality of water gets better. This will happen with Wellton-Mohawk, we think.

Mr. SAYLOR. On page 17 you list the waters in the central Arizona project. You leave this committee in a position where they are going to have to act like Solomon because, assuming that this is the best possible presentation that the Bureau of Reclamation can make, you state that only time will tell which assumptions are more nearly correct. I notice you do not say which facts are more nearly correct. And you further state there is no way of guaranteeing or proving with certainty any given assumptions today.

Now, despite that fact, despite the fact that you have indicated that there is not going to be sufficient water to take care of a 2,500-second-

foot aqueduct or a 3,000-second-foot aqueduct, you still want us to authorize the building of the central Arizona project based on the assumptions and to guess that the assumptions, some of which have been made, as referred to by the chairman of the full committee by men eminently as qualified as people in the Bureau, indicate that you just do not begin to have enough water to build this first phase of the project.

Secretary UDALL. I would rather the Commissioner answer the question, although I want to say one thing as a preface to his answer because essentially, when you authorize a long term water project, it seems to me you must make certain assumptions, make certain predictions, as it were, with regard to the future.

There is a question of whether one wants to be optimistic or pessimistic. There is certain elbow room of that kind. But I think the main point, as I understand it, that the Bureau makes—and I have let them make all the calculations and the figures are theirs—is that they feel the soundest and most scientific way to approach this is in terms of the known data. I do not regard their figures as being necessarily on the liberal side. I think they sort of cut down the middle. They do not say, "Well, we are going to be conservative this time," or "We are going to be liberal in our estimate." They have to hue to the best scientific data they have available.

Mr. DOMINY. This problem is no different for the central Arizona project than on any major project the Bureau has built in the last 9 years, Congressman Saylor. We have to operate on assumptions made at the time of planning and construction.

Mr. SAYLOR. If you will, permit me to give the chairman and myself at least one little pat on the back. Until we got on this committee, you and your predecessors had never built a project within its estimated cost. So your past record until this committee began to take a real good look at you was not good. Now you have improved. I want to commend you for the improvement you have made.

Mr. DOMINY. Thank you, sir. I only want to take credit for the last 9 years. That is as long as I have been Commissioner.

But let us go back to Hoover. There were people who thought this never should be built. They said it would silt up in 15 or 20 years. Well, it did not silt up in 15 or 20 years. Even before Glen Canyon was built, it took all the silt of the Colorado River for 25 years and was completely unimpaired.

They said Grand Coulee should not be built, that you could not possibly market the power up there. During the war that is the place we really used it to good advantage. They said after the war you will not need that power at all. We could not even stop the turbines and generators long enough to rewind them. That is how much the demand for power was.

So I am not impressed with negative assumptions that these projects will not work and they will not pay out and they are a boondoggle and that sort of thing. That has not been the case in reclamation history. Nor will it be in this project.

We have made valid assumptions based on known facts, and we are prepared to defend them before any tribunal. We have admitted that without augmentation there will be a gradual diminution of the amount of water available to the central Arizona project, and, as a

result of it, there will be a gradual declining of the agricultural lands because the domestic and municipal uses are going to be moving in the other direction.

We have testified repeatedly and we testify now that all of our judgment and experience in evaluating projects is that this project will pay out on the basis that we have presented.

Mr. SAYLOR. All right. Now you have brought up the proposition of augmentation. I did not expect to get into that until a little later on, but I think we ought to get into it now since you have brought it up, because one of your experts back there testified about all the spill that is taking place.

I have asked our staff to furnish me with a computation of a simulated year-by-year operation of this whole business of the Colorado River from 1906 until 1967. These are basically the same figures which the chairman asked that you furnish us, with the assumptions which you in your Department have based your records on or your recommendations. And assuming that each one of the reservoirs—namely, at Glen Canyon and at Hoover Dam—had been built in 1906, the best figures that our staff has—and they get those figures from you—tell me that there would have been a spill at Lake Powell anywhere from three-tenths of a million acre-feet in 1908 to $10\frac{3}{10}$ million acre-feet in 1909, a total of 88 million acre-feet spilled at Lake Powell, and a considerably less spill than that at Lake Mead.

Mr. McFarland's study indicates there would not have been a spill at Lake Powell from 1930 to 1967 or at Lake Mead from 1928 until the present time.

Now, where are we going to get all of these spills that were referred to at page 35 of the Senate report which was testified to this morning? Where are we going to get those spills?

Mr. DOMINY. We have a reservoir operations plan for the river repeating the hydrology from 1906 to 1967. We would be interested in seeing the staff study. To answer you, we would have to see what assumptions the staff made.

For example, you said assuming Hoover and Glen Canyon were built in 1906. But were they empty in 1906 or were they already filled?

Mr. SAYLOR. We assume we started right off with them full. We took those real lush periods that you referred to, and you did not have very good measurements, and the river ran full. We had all the trouble down below in California and the Salton Sea was developed. We assumed that Congress in its wisdom had been smart enough that we built those dams and got the runoff and we had them full.

We do not have any spills until any time after 1930.

Mr. DOMINY. I would be very interested in having a look at the study and having Mr. Riter and our hydrologic experts examine it.

Mr. SAYLOR. I would say, Mr. Chairman, that I would hope that after the Department has a chance to look at the figures of our committee staff, and they have submitted their figures, that at least the members of the committee be permitted to either have the Commissioner or the Secretary back to answer questions with regard to this item, because I think it is very important to know the amount of water that is anticipated below the Hoover Dam.

Mr. JOHNSON. You have heard the request of the gentleman from Pennsylvania. Is there objection?

(No response.)

Mr. JOHNSON. If not, I wonder, Mr. Secretary, if you would have your people bring in your figures and studies and, at the same time, the staff's figures and study will be made available to you so that you can have a double study made and your figures go into the record?

Secretary UDALL. I think the committee is certainly entitled to have the clearest picture it can get. I want to say we have, all of us, the very highest regard for Mr. McFarland and his own competence and integrity. I think this is the way to get at the differences, whether they are differences of assumptions or differences of fact.

Mr. JOHNSON. It is understood that yours will be prepared and brought up to the committee so the committee can make a study of yours and at the same time you take his and make a study of the staff-study?

Secretary UDALL. Yes.

Mr. ASPINALL. As I understand it, the Department cannot have this staff study until they bring their studies up to us. Then we will compare the studies.

Mr. DOMINY. I might say, Mr. Chairman, between the years 1930 and 1967, using the flows that we are recommending be used for future projections, I do not think there is any disagreement. I am sure our studies also will show very little opportunity for spill during that particular period of years.

The important thing is the basis used to project the future—what period of time and what average flow should be used, and should we project a succession of wet years such as we had in the early part of the 1906-67 period.

Mr. HOSMER. The difficulty seems to be that you are on the wet cycle and Mr. Saylor is on a Honda.

Mr. JOHNSON. I want to clear this up just a little bit in my own mind. I understood this morning when the figures were given to us by Mr. Riter that it was in this period of time these spills would have occurred or have occurred.

Mr. DOMINY. We were talking about what would have happened during the payout period if the 1906-67 cycle of the Colorado River repeats itself.

Mr. JOHNSON. We will exchange the studies, then. Your studies will be made available to the staff, the staff will make their studies available to you, and we will get together and see if we can resolve any differences.

Mr. DOMINY. All right, sir.

Mr. JOHNSON. If that is agreeable to the committee that is the way this matter will stand.

Proceed, Mr. Saylor.

Mr. SAYLOR. Mr. Secretary, do you know Frank C. Di Luzio?

Secretary UDALL. Yes; I know him well.

Mr. SAYLOR. For the record, will you tell us who he is?

Secretary UDALL. Until January 1 or thereabouts he was my Assistant Secretary supervising water pollution control and the saline water program. Prior to that he was Director of the Office of Saline Water.

Mr. SAYLOR. Mr. Di Luzio appeared before this committee on January 27, 1967, with regard to the Metropolitan Water District desalting plant. At that time he stated that the estimated cost of desalted water at plant site, when all units are onstream, would be approximately 21.9 cents per thousand gallons, \$71 an acre-foot.

Mr. Secretary, at the same time we are conducting these hearings, word has come to me that there are certain people over in the Joint Committee on Atomic Energy conducting some hearings and making some public statements over there. Basically these are the figures that were given to me over the noon hour: The Atomic Energy Commission has said that between 1967 and 1968 there has been approximately a 40-percent rise in the cost of atomic energy and that the break-even point on a power plant, atomic powerplant in 1967, when Mr. Di Luzio gave us these figures, was 500,000 kilowatts, and, at the present time, it is 800,000 kilowatts. The cost has risen from 4 mills to 5 mills plus for a kilowatt of power.

Now, in view of that, Mr. Secretary, I was astounded and doubly so when I read last night the summary of the "Reconnaissance Report for the Augmentation of the Colorado River" by desalting seawater. I saw where your people were using costs which were below what Mr. Di Luzio gave this committee less than a year ago, and you indicated you might anticipate 9-cent water.

I am wondering how these two can be tied together or whether the information which the Atomic Energy Commission is now releasing to the public was never released to the people making your reconnaissance report.

Mr. DOMINY. First of all, Mr. Saylor, Secretary Di Luzio was talking about a plant that was going into construction on the basis of today's technology. The estimates which you read in our summary are based on the technology expected to be realized by the period 1990 to 1995. These were provided to us by the Atomic Energy Commission for the atomic reactors and by the Office of Saline Water for the desalting works. Now, these data reflect, as I said, the technology projected for a long time in the future. They depend upon a fast breeder nuclear reactor being available. They assumed improvements in the water plant, including a combination of vertical tube and multistage flash evaporators. And they assumed better heat transfer surfaces.

The results reflect an estimated production cost of 9.8 cents a thousand gallons at plant, provided there was combined a large atomic powerplant and a large desalting plant, to take full use of the advantages of size.

Mr. SAYLOR. Of course, I am sure that you assumed that there was no cost escalation between this and 1990, because I assume that you disregarded completely the admonition of Admiral Rickover when he, who was the one who saw the great potential in the fast breeder reactors, asked that it be withdrawn and all the other miracles that you have anticipated between this date and 1990. Because nothing less than a miracle is ever going to produce 9-cent water pumped 4,000 feet to run through the turbines at Lake Mead.

Mr. DOMINY. The 9.8-cent cost is at plant site on the seacoast. That is not the cost of delivered water. The larger portion of total cost is in the conveyance of the water to the Colorado River. This is what runs the costs up. The final costs are over \$80 an acre-foot.

Mr. SAYLOR. Well, that is only a small step up from the \$71 we were told we were going to have a year ago. That is only a \$9 increase. This indicates there is not going to be much increase in costs.

Mr. Secretary, as the chairman pointed out this morning, the other body apparently had very, very little interest in establishing a National Water Commission. It is my understanding that this was a recommendation of the administration. I am not privy to most of the things in the administration because I sit on the outside and only get the crumbs that fall from the table when people walk out and shake their napkins on the outside. I am never asked to feast, or come to the festive board and to know all of the plans of the Great Society.

But if my information is correct that the President is in favor of this National Water Commission, and since the chairman has even stated that he did not believe it was going to accomplish very much, those of us who said that even though it might not accomplish much, we were willing to give it a chance, were able to get it out of this committee, predominated by the members of your party, and I was able to convince most of the people on my right, in my party, to go along with it and spoke for it on the floor of the House and got the bill passed.

It seems to me with the 2-to-1 majority over the Congressmen who serve on the north side of the Capitol, if the President was interested in that National Water Commission to help solve the problems of the West, he would have had that bill out and signed. Although if the people he appoints on it do not have any more expertise than the ones he appointed to take vacancies that were created in the Indian Claims Commission, I will have to agree with the chairman, I might not expect very much from the National Water Commission.

Now, if you care to comment.

Secretary UDALL. First, on the festive board, Congressman, it is not as sumptuous as it sometimes appears from the outside.

I think the House did a very good day's work when it passed this committee's bill on the National Water Commission. I sincerely hope we can get a bill. I am going to do what I can to that end. I want to assure you of that. I think this could serve a very useful function, to help lay the groundwork for the long-term future of this country in terms of its water supply.

Mr. SAYLOR. Now, Mr. Secretary, the last questions I have concern the decision of the Supreme Court in the case of *Arizona v. California*, in which they perfected the rights for Indian reservations. In March of last year the Solicitor General filed with the Court a list of present perfected rights. You have included those in your statement, but they do not correlate with the figures which you indicated you were supposed to get of 4 acre-feet of water on every acre of land in Arizona. Is this still contemplated?

Secretary UDALL. Yes, we base our estimate of consumptive use on the 4 acre-foot figure.

Mr. ASPINALL. If the gentleman will yield.

Mr. SAYLOR. Yes.

Mr. ASPINALL. That is on diversions.

Secretary UDALL. Our figures are referenced to a consumptive use of 4 acre-feet per acre.

Mr. SAYLOR. Now, Mr. Secretary, are the rights in California which you have listed the only Indian rights of which either the Bureau of Indian Affairs or the Solicitor General has any knowledge?

Mr. WEINBERG. Under the decree in *Arizona v. California*; yes.

Mr. SAYLOR. If these are perfected rights, are they inferior to the rights of the All-American Canal, the Imperial Valley Irrigation District, the Coachella Valley Irrigation District, the Metropolitan Water District of San Diego, and the Metropolitan Water District of Los Angeles?

Mr. WEINBERG. Congressman Saylor, the Indian rights in California are present perfected rights. There are other present perfected rights in California also. The Imperial Irrigation District has, to a considerable degree, present perfected rights. The Metropolitan Water District does not.

Mr. SAYLOR. If the committee decides that the 4.4 allocation to California is the total allocation to which that State is entitled, will the rights of the Indians be required to come out of California's 4.4?

Mr. WEINBERG. Yes, Congressman Saylor, with one exception: In the event of an extremely severe shortage so that there is only water for present perfected rights, present perfected rights are then met in the order of their priority without regard to State allocations. But with this exception, yes, they will be charged to the California allocation.

Mr. SAYLOR. In view of the fact that you have stated that there is only one or two irrigation districts in California which have present perfected rights on the river, does anybody in the Bureau of Reclamation believe the flow of the river will ever be at such a stage that there will not be sufficient waters to take care of all of the present perfected rights, be they Indian or irrigation district?

Mr. DOMINY. No, sir.

Mr. SAYLOR. Does the same conclusion hold for the present perfected rights of the Indians in Arizona and the present perfected irrigation rights in Arizona?

Mr. DOMINY. Yes, sir.

Mr. SAYLOR. In view of the fact that there is an Indian tribe in Nevada with a present perfected right, what would its effect be on the project which this committee authorized last year authorizing the diversion of water from Lake Mead for the benefit of metropolitan Las Vegas?

Mr. DOMINY. The estimated consumptive use for that Indian reservation is only 7,756 acre-feet and would be insignificant in terms of overall water supply.

Mr. SAYLOR. In view of the surveys that are being made for pumped storage, is it your conclusion, Mr. Secretary, that there is only one site which you are still seriously considering for pumped storage?

Secretary UDALL. No, Congressman, the engineers tell me there are several promising sites. Naturally an ideal pump storage site is where there already exists a reservoir because you need a body of water to pump from. The other requirement is a nearby high bluff that has a natural cachement basin on it or one can be built there. These are the two essential ingredients for a pump storage project, so that you can lift the water and drop it great distances. There are several promising sites.

Commissioner Dominy singled out the one at Mohave, right near Lake Mohave, because from a quick survey, it appeared to be the best one.

Mr. SAYLOR. If pumped storage is installed at one or more places in the lower basin, to whom will the evaporation losses be charged?

Mr. DOMINY. There would be little evaporation loss as there would be but a small holding reservoir. There would be a net loss of a few additional acre-feet.

I am sure it would be very small in terms of the total flow of the river, Congressman Saylor.

Mr. SAYLOR. Mr. Dominy, maybe you and I have been in the wrong places, because I am sure that some of those high mesas where you might find an indentation where you might store water for any period of time, the temperature growing, peak or offpeak hours, gets above 100 and those sandstone—chinle rock is it, Mr. Secretary?

Secretary UDALL. Chinle shale.

Mr. SAYLOR. Chinle shale, for instance, they drink that water up quite a bit and they put it out both day and night.

Mr. Dominy, you made a little mistake in bank storing up there in Lake Mead. I am just trying to make sure we do not have any more mistakes on evaporation above Mohave.

Mr. DOMINY. Of course, we do evaporate a lot of water at Lake Mead and Lake Powell with upwards of 30 million feet of capacity in each reservoir. But the little holding reservoir for a pumped storage project would involve only a few thousand acre-feet with consequently little additional evaporation losses.

Mr. SAYLOR. Mr. Chairman, I want to reserve the balance of my time, and I want to thank you and the members of the committee for having been so patient.

There is just one problem, I might add.

Mr. Secretary, the last time you appeared before this committee, one of the projects which you said would be included in the lower basin—in the Arizona project—would be a dam called Hooker Dam. At that time I asked the people in the department whether or not they had any idea about the size of this dam and was told then that nobody had any idea how much water was there, how much water would be put in or how much water could be put in. Has the Bureau, in the year's time, been able to come up with any definite figures on the size of the Hooker Dam if it might be included in this central Arizona project?

Mr. DOMINY. I will start by saying no, sir. The size of Hooker Dam, if we are to conform with the requirements of the Senate bill, must be such as to make available 18,000 acre-feet a year of additional water for use in New Mexico without prejudice to the rights of downstream water users under the Gila River decree and of the U.S. Supreme Court decree.

To size the reservoir to comply with those provisions involves very complex water supply and reservoir operation studies which we have not yet had the time nor the funds to make. We cannot tell you at this time how large that reservoir would need to be in order to comply with these requirements.

Reconnaissance studies indicate that a reservoir capacity of something like 265,000 acre-feet might be required as compared to the

98,000 that was originally contemplated. That is estimated on a reconnaissance basis. We have not had the time nor the funds to make the full study that would be necessary before we can say how large a storage cachement would have to be in order to comply with the requirements.

Mr. SAYLOR. In other words, Mr. Secretary, you are telling me that you have to have a reservoir large enough to have 15 years' storage? That is basically what you said. Even if that is true, then your own figures on what you anticipate this river will do are completely invalid, because you say you expect a return to a wet cycle and there will not be a reservoir big enough to take care of 18 years' supply.

Mr. DOMINY. We cannot overlook the fact that Hooker Dam is to supply flood control, and we cannot supply the 18,000 acre-feet of water to New Mexico to the disadvantage of the downstream users. This is why we cannot give you the figure until we have analyzed the complete effect of supplying 18,000 acre-feet upstream.

Mr. SAYLOR. Since you cannot give us that kind of a figure, do you think it should be authorized? This is a situation where you are just asking this committee to have blind faith in the Bureau of Reclamation.

I might say to you, Mr. Commissioner, in view of some of the changes you have made in the Frying Pan-Arkansas project without coming up and asking this committee, I for one am not going to give you the authorization to go ahead and build anything you want without coming before this committee. Especially when you come out now and say you have to change the plans for the Frying Pan-Arkansas project to make it feasible. That is what our releases from your Department downtown said. I assume your public relations man must have put those out with your blessing. The Secretary must have approved it.

The only conclusion is that the project as originally authorized was not feasible.

Mr. DOMINY. There has been a considerable change in the way power is produced and marketed between the time the original studies on the Frying Pan-Arkansas project were made and now. We found that a number of small powerplants did not fit the current needs and we combined them into two larger ones. This is the major change on the Frying Pan-Arkansas project.

Mr. SAYLOR. Of course you never came up to this committee and asked to do this and that is one of the reasons this committee has questioned the Bureau. Maybe the conclusions you have come to now are not correct. But if they were good, you should have come up and asked this committee. Heaven knows, as loaded as it is in your favor, if the project was any good, you should not have had any trouble getting it out of here.

Mr. Secretary, I thank you for coming forward with the answers that you have. As I say, I think this is, if for nothing else—your statement on the differences in the yardstick make this a day long to be remembered. I will be reminding you and your successors of this statement because of your wisdom in at least recognizing why your predecessors have refused.

Secretary UDALL. Congressman, just be sure to spell my name right.

Mr. UDALL. Would the gentleman yield?

Mr. SAYLOR. Yes.

Mr. UDALL. Would the gentleman be willing to paraphrase Churchill and say that should the Interior Department endure for yet a thousand years, surely it will be said this was its finest hour?

Mr. SAYLOR. Oh, no, I would not go that far.

Mr. Chairman, I have one further request. I ask unanimous consent that at this place in the record a speech made by the Honorable Morris K. Udall before the Town Hall of California, Biltmore Hotel, Los Angeles, on Tuesday, December 19, 1967, be placed in the record.

Mr. UDALL. Reserving the right to object, Mr. Chairman, would the gentleman not agree and so state for the record that this is undoubtedly one of the great orations of our time?

Mr. SAYLOR. Well, all I can say to my colleague is that he probably did not get paid even his expenses for going over, if I know most of the people in that group.

The only real reason I am doing it is because I want to have on record the violation of the law which the gentleman from Arizona blatantly admits he started out with in his opening statement.

Mr. UDALL. I admit my guilt, concede I was paid nothing even for expenses, and withdraw my reservation.

Mr. ASPINALL. Mr. Chairman, I reserve the right to object. I wish to know if the gentleman from Arizona still stands 100 percent on everything he said in Los Angeles, adamant and cannot be moved.

Mr. UDALL. If the chairman would yield, I have adopted a position of flexible rigidity and am prepared to negotiate at any time. Arizona never negotiates out of fear, but we never fear to negotiate.

Mr. BURTON of Utah. Reserving the right to object, Mr. Chairman. I would like to suggest to the gentleman from Arizona that a better Churchillian phrase which might characterize this project would be "we will fight them on the beaches, we will fight them in the fields, we will fight them in the ditches, we will fight them in the streets," and you are doing all of that.

Mr. UDALL. Perhaps we could go even further and state in Churchillian terms never have so many labored so hard and so long to produce so little water for so many?

Mr. JOHNSON. You have heard the requests.

Is there any further objection?

Hearing nothing, it will be so ordered.

(The speech referred to follows:)

COUNTDOWN ON THE COLORADO

Remarks of Hon. Morris K. Udall, U.S. Representative, District 2 of Arizona, Before the Town Hall of California in the Biltmore Hotel, Los Angeles, Tuesday, December 19, 1967

Gentlemen, I'm very happy to be here today, waving the white flag of truce which brought me safely through the outer defenses of the Colorado River Board. I hope I will be as fortunate on my return to the Arizona lines.

I brought with me today a little sample of what it is that's been causing all this fighting between our two states. Here it is. Don't get me wrong; this isn't whiskey. It says on the bottle you're not supposed to refill it. I suppose I violated the law. But if all this contained was whiskey, I don't think we would have much of a problem. We'd just break it open, everyone would have a "snort", and we'd all be friends.

No, this bottle doesn't contain whiskey. It contains much stronger stuff. It's been known to addle men's brains. It arouses uncontrollable passions. It divides father from son and brother from brother and—what's even worse—Duke

crat from Democrat! This is the stuff that has had Arizonans and Californians shooting at each other, man and boy, for half a century. Along with a lot of salt and silt and maybe a few spent bullets this bottle, gentlemen, contains genuine, rare Colorado River water!

Take a good look at it because this is what I'm going to be talking about for the next half hour. But don't get any ideas about this possibly being a peace offering. It isn't. I intend to take this bottle with me when I leave. Judging by the way things have been going up until now this may be the last pint of Colorado River water I'll ever get my hands on!

As I began to draft this speech I thought of the old story about the fundamentalist minister who was delivering his Judgment Day fire-and-brimstone speech, and he was going on very heatedly some like this: "Ladies and gentlemen, on that great Judgment Day, there will be lightning and fire. On that Judgment Day, there will be earthquakes and storms, and the earth will shake. Brothers and sisters, on that great Judgment Day, there will be weeping and wailing, and you will all gnash your teeth." At this point, a lady in the front row said, "But Reverend, I ain't got no teeth." The minister pointed a stern finger at her and replied, "Madam, on that great Judgment Day, teeth will be provided."

I have entitled my address "Countdown on the Colorado" because a Judgment Day of sorts, a day of reckoning, is fast approaching not only for our two states, but for all the reclamation states of the West. When I say that this Day of Judgment will be "sooner than you think," I mean in just a few short weeks. And once that Judgment Day has come, nothing in the West will ever be the same again. Between now and then I believe it is vital that your state and my state and all the reclamation states consider most carefully the decisions they must make. The wrong decisions can have lasting and devastating consequences on the entire West.

I hope it will be said of me and my state that we acted with vision and reason and fair play, and without rancor or prejudice or parochialism. And I hope the same will be said of your participants in these decisions.

I have lived in the area of the Colorado River Basin all of my life. One of Arizona's original senators in 1912, the late Henry Fountain Ashurst, was accustomed to tell on himself the story of his maiden speech. After arriving in Washington, with some local reputation as an orator, he began his maiden speech saying something like this: "Oh, Mr. President, this great new baby state that I represent has every potential. Oh, Mr. President, this great baby state could become a veritable paradise. To become a paradise we need only two things, Mr. President. We need water, and we need lots of good people." At this point, according to Ashurst, a gruff old senator from New England interrupted to say, "If the distinguished gentleman will pardon me for saying so, that's all they need in hell."

Well, we've had the good people come into this great Pacific Southwest region by the millions—into your state and mine—but we in Arizona still have the same basic source of water we had when Senator Ashurst spoke in 1912—but in lesser and diminishing amounts each year.

My very earliest political recollections are of living in this little town in northern Arizona and as a boy of 9 or 10 observing, in the fall of an even-numbered year, various politicians coming through and telling the townspeople how they proposed to save the Colorado River from the greedy citizens of California. Well, Arizona followed that course of blind opposition for nearly two decades, and ended with nothing. I have seen my state pay a heavy price for its inflexibility, its rigidity and its unwillingness in those early years to cooperate with our neighboring states.

But, I must tell you in all frankness that I have seen something of the same sort in California—and I must remind you that your leaders, in those days, were not noted for *their* cooperation on Colorado River matters. And I believe the consequences of non-cooperation can be just as serious for California and the entire reclamation West as they were in that earlier era for Arizona.

I have come here today to speak with candor and to say the same things to you that I would say to audiences in Phoenix and Tucson. I want to give you my honest assessment of where our two states stand in relation to that coming Day of Judgment. There is no question that there are hard feelings between our states. Many of our people see each other as Machiavellian schemers and plotters. Some Arizonans view your water leaders as occidental Ho Chi Minhs: If we will but abandon our plans to take water from the Colorado River, they will agree to meet us at the conference table.

Shortly I'm going to review some of the things that have brought about these hard feelings—but let me say first that I sense a possible easing of tensions between us within the last few weeks. I have begun to hope that we may yet find the way to a new period of cooperation. And surely this is the only course that holds any promise for any of us.

I am speaking to you today as an Arizonan who feels his state has been misunderstood, and I would like you to hear the history of some of these events as we view them in Arizona. I'd like you to play a mental game with me. Pretend that you were born in Arizona, that you had lived there all your life and, perhaps, even that you are a farmer in one of our central valleys, and that some of your land has gone out of production for lack of water—as thousands of acres already have. As you sit in Arizona and look out across your state and over the river into California, you think back on some of the things that have happened.

You recall the compact of 1922, when the flow of the Colorado River was divided roughly on a 50-50 basis between the three Lower Basin states and the four Upper Basin states. You recall the short-sightedness of your own Arizona leaders in refusing to sign that compact until 1944.

You recall that during those years other Colorado River Basin states moved ahead with their water projects and their development. But, going its own way, Arizona could do nothing about its greatest need—finding a way to channel water from the Colorado to the places where it was needed most. And then in the 1940s your state came to life, ratified the Santa Fe Compact and entered into a contract with the United States for its 2.8 million acre feet of Colorado River water. In 1947 it introduced into the Congress a bill to authorize the Central Arizona Project.

You recall the great efforts of your Arizona senators which led to passage of that project in the Senate in 1950 and again in 1951. You recall the tense fight in the House when by a narrow margin the Interior Committee deferred action on the bill, and Arizona was told to settle its legal right to Colorado River water by a suit in the United States Supreme Court.

You remember the words of a great California governor, Earl Warren, who said:

"Whenever it is finally determined what waters belong to Arizona, it should be permitted to use that water in any manner or by any method considered best by Arizona."

And then you think about the 12 long years of litigation, the millions of dollars spent on it, the trial itself lasting from June 14, 1956, to August 28, 1958, the parade of 340 witnesses and 25,000 pages of testimony.

And you think of that great moment in 1963 when the Court handed down its decision, substantially upholding Arizona's claim to 2.8 million acre feet of river water, agreeing in the main that Arizona had just as much right to that share of the river as California had to its 4.4 million acre feet—and vice versa.

And you remember the elation and excitement of that moment as the people of Arizona looked to Congress to complete action on the water bill set aside in 1951.

You recall the words of another great California governor, Pat Brown, who said as the Court handed down its decision that California, having lost the Supreme Court case, "would not try to accomplish by obstruction what she had failed to accomplish by litigation."

And you recall with some bitterness your first realization that some of the same people who opposed you in 1951—and especially the people of Governor Warren's and Governor Brown's California—still opposed you and still insisted that their water rights and their needs were superior to yours, notwithstanding the decision of the Court.

You then recall the great efforts of Arizona's leaders to bring about regional cooperation, to put an end to this old feud, by drafting legislation that would not only build the Central Arizona Project but would solve most of the other problems of the region as well, legislation that provided for two dams in the vicinity of the Grand Canyon, for studies to implement water imports from the Northwest, and for a guarantee to California of priority for its 4.4 million acre feet over Arizona's 2.8 million—thus giving away much of Arizona's hard-fought legal victory in the Supreme Court.

You think about the enormous sums spent by Arizona interests to pass that legislation and about the big push of 1965-66 culminating in a favorable vote in the House Interior Committee.

And with real bitterness you reflect on the secret decision of California's water leaders who helped block that bill in the House Rules Committee, thus preventing it from ever coming to the House floor for a vote. In retrospect, you realize Arizona probably had insufficient time and momentum to get past the Senate in 1966 even if the House had acted, but the memory of California's role still rankles.

And as you think about that turn of events, much as you try to understand California's actions, you find a certain phrase going through your mind—the words of President Roosevelt in 1940: "The hand that held the dagger has struck it into the back of its neighbor."

You think about the shock wave that went through Arizona at that moment and about your state's efforts to scale down its legislation, to strip from it the controversial features that couldn't pass. And you recall its passage in the Senate this year over the heated opposition—you guessed it—from California.

And finally, you think about all the intemperate words thrown at your state in the past year, continuing almost to the present moment, accusing—not California—but Arizona of abandoning the cause of cooperation and breaking up the team effort toward a regional bill.

If you have followed me in this little recital, perhaps you can appreciate a little better why it is that you have on the east bank of the Colorado River some neighbors whose mood is one of anger and doubt and concern—and why it is that they tend to view with suspicion any suggestion, no matter how meritorious, coming from California.

And you may understand why it is that Arizona's leaders have told our congressional delegation: "Boys, this is it. Either you pass the bill in this Congress or Arizona builds its own project, whatever the cost."

As I look back at that great legislative effort of the last Congress—the one that California helped block in the home stretch—I recall the old fairy tales of my youth in which the brave but humble young man would seek to marry the king's daughter. The king would tell him, "Oh yes, you may have her hand in marriage if you will but slay the seven-headed dragon in yonder dark cave." The young man would go forth and slay the dragon, something the king thought impossible, and would return expectantly only to be told that he must then slay a three-eyed Cyclops across the water on a dangerous island. And when this was done, there would be still another obstacle. And so on.

Our legislative effort of 1965-66 was not unlike one of those fairy tales. First, we were told that a condition for passing the Central Arizona Project was an agreement, written in blood, that in times of shortage in river flow California's uses would have priority over Arizona's uses. It was hard to do, those of us in the congressional delegation were criticized at home for doing it, but we agreed.

Then we were told, "All right, now you must add to your bill provisions for trans-basin imports to augment the Colorado River. This will be very expensive, and it will lose you the support of powerful Northwest Congressmen who have other plans for that water, but you must do it." So we did.

Originally, we had planned to finance our project with power revenues from a dam 80 miles downstream from Grand Canyon. We expected some opposition from conservationists, who oppose such dams, but we were told this isn't enough. "You must put another dam in your bill," they said, "—this one 12½ miles upstream of the Grand Canyon and battle the conservationists all the more." And we did that.

About this time our friends in Colorado and the Upper Basin states said, "Now wait just a minute. Before you divert any water downstream from us you must guarantee that our future water needs are not endangered in any way." So we added protective language which they wanted, and we threw in five new reclamation projects in Colorado costing over \$350 million. Could we then have the daughter's hand? We could not. We next had to do something for New Mexico. So we added Hooker Dam and a reservoir to our bill.

Then Utah said, "We don't have enough money to build our Dixie Project. It won't pay out without a subsidy. How about letting us participate in your basin development fund?" So we did.

Was this enough dragon slaying? It was not. About this time Texas and Kansas heard what was going on, and they said, "Hey, how about letting us get some of that Columbia River water?" So we said, "Well, OK, maybe."

And then what do you suppose happened? Why the good king—in this case, California—said, "Sure, you've done all these things I demanded and a few

more besides. But I'm still not going to let you marry my daughter because I don't think you've got the strength left to take her to the altar."

If you view things in this light it is little wonder that many Arizonans question the good faith of Californians who tell us, "We want you to get your share of Colorado River water, but first there are these few little old conditions."

Now I know, and most Arizonans know, that compromise is the essence of the legislative process. And we can't expect to pass any legislation as big as this without some give and take. But we'd certainly like to see a little more take with the give, or less give with the take.

What we are really complaining about in Arizona is a curious double standard for water development projects—one standard for the west bank of the river and quite another for the east. In my nearly seven years in Congress I've seen the enactment of at least ten projects in the states that make up the Colorado River Basin—projects like the \$425 million Auburn-Folsom Project, which I voted for, and the \$100 million San Felipe Project, both here in California. When projects like these come up—and I certainly want to mention the \$72 million federal participation in your Bolsa Island desalting plant—the only questions raised are: Is it sound? Is it feasible? Will it repay its costs? If the answers are affirmative, the bill passes, and that's that. When Auburn-Folsom came up, no one suggested that hearings had to be postponed until your state had guaranteed Arizona's water requirements for the next fifty years; no one demanded that controversial dams be built, that the Mississippi River be diverted, or that Arizona's 2.8 million acre feet take precedence over your state's share of the Colorado River. When the \$81 million Southern Nevada Project came up, no one suggested that the vote had to be delayed until all problems in the Colorado River Basin had been solved. No one demanded these things when the \$43 million Dixie Project in Utah and the \$170 million Frypan-Arkansas Project in Colorado came along, even though the waters were to come from the same river we are now told is too short.

Authorizations for your Central Valley Project here in California now exceed over one-and-three-quarter billion dollars, and on no occasion have you people in California had to stand on your little fingers, perform backward cartwheels, or demonstrate unusual heroics or feats of legerdemain in order to enact this legislation.

But on the east bank of the Colorado, once it passes Lee Ferry, it is quite another story. In the state which has the most serious shortages of all, which has the second most rapid population growth in the country and the most rapidly falling water tables, which has been stymied for 40 years while the other states of the basin have raced ahead—almost always with Arizona's support—in this one state only a different standard applies. It isn't enough that we show feasibility, need, cost-repayment criteria, and all the rest. According to California, we can't even bring our bill to a vote in the House of Representatives until we have given guarantees, single-handedly run over the Northwest, built the most controversial dams in the nation's history, and with our three-man delegation foreclosed any possibility that our 432 colleagues might change a single word, or even a comma, before final passage.

So much for dwelling upon the past, which, after all, is only prologue for what happens in the future. As we approach 1968 I think it's vital for your state and mine to assess where we are, what is possible and what is not, what is fair and what is right.

Where are we? Well, from the standpoint of reclamation, we're at essentially the same point we were at when the 89th Congress began. Nothing of consequence has moved forward. This big issue is holding up a backlog of reclamation issues—a lot of them in California—waiting to be considered. As long as this issue remains unresolved, the whole reclamation cause is hung up on a reef, going nowhere.

What is possible and what is not? Let me begin with a couple of major "impossibles" and get them out on the table for all to see.

For one thing, it is no longer possible to pass the big package of proposals we were all united on in 1966. Your leaders made the decision to help block final action in the 89th Congress, and the critical moment passed. In spite of all the charges of the Sierra Club and other organizations that we were going to flood the Grand Canyon—which wasn't true—and in spite of opposition from the Northwest that we were going to rob them of their water—a really absurd idea—we had succeeded in convincing a majority of the members of that Congress that our cause was just and that this bill should be passed. After 18 months of hard work, meetings, speeches, mailing campaigns and lapel tugging we were at the psycho-

logical moment for a floor vote. But it never came. The moment passed, and it will never return.

I must tell you bluntly that no bill providing for a so-called "Grand Canyon dam" can pass the Congress today. I fought them—we fought them together—but the protectionists have won—at least for now.

I must also tell you that no bill providing for augmentation of the Colorado River by importing water from the Columbia River system—or even feasibility studies directed at the Columbia—can pass the Congress today Senator Jackson, chairman of the Senate Interior Committee, will see to that.

There isn't a California water leader or Member of Congress with any knowledge of the situation who can say with a straight face that either of those two things can happen today any more than he can say that the sun can be made to rise in the west. Yet the official position of the California water agencies as I stand here at this moment is that the Central Arizona Project must be opposed vigorously unless these two impossible conditions are included.

Let's start with a good, strong dose of candor right here. If this is California's position, you are simply out to obstruct any Arizona bill from ever passing. You don't fool us, and you shouldn't try to fool yourselves.

All right, these things are impossible. What is possible? Obviously, this is where we ought to concentrate our efforts if we sincerely want to see reclamation move ahead, if we want to enable Arizona to utilize its share of the Colorado River, if we truly want to end this feuding that has gone on so long. And I will tell you that I see many avenues that are open to us, many ways in which our two states can proceed side by side to solve our common problems.

One of the greatest satisfactions for me in public life is reaching that point where divisions are bridged, feuds settled, where people who have been fighting can lay down their guns and begin to build instead of fight. Lyndon Johnson often quotes his father as saying that any jackass can kick a barn down, but it takes a pretty skilled carpenter to build one. I look back with real satisfaction on several such occasions in my congressional career.

Last year I thought we had reached such a meeting of minds in the Colorado River Basin states. I am hopeful that we may yet, in the six weeks remaining in our countdown, recapture the essence of that 1966 agreement, for it contains a whole bundle of things that are possible and can be enacted. Stripped of a lot of detail and many items of considerable but secondary importance you could write the essentials of that agreement on the back of an envelope. There were four main points:

1—California and Arizona's other neighbors would, at long last, support Arizona in building its aqueduct from the river to Phoenix and beyond.

2—Recognizing that this new drain on the river would bring shortages for all of us in 25 to 30 years, we agreed to start right now on a big, solid, meaningful program of studies and actions to augment that river so that, when the pinch of the 1990s comes, we would have enough water to meet all our needs.

3—We knew that augmentation would require big, bold steps and that they would cost money—hundreds of millions of dollars. This was where the dams came in. With their revenues we hoped to open a "savings account" to pay for the things our studies and investigations indicated were necessary and feasible.

4—Finally, to relieve California's great fears, we came to an understanding about what would happen in the 1990s and thereafter if, in spite of the augmentation program, there were shortages. We agreed that the Arizona aqueduct would beat those shortages to the extent required to get you your 4.4 million acre feet until this river was augmented or until the Resurrection, whichever came first. In effect, we gave away much of our "paper" victory in the Court to get our aqueduct built.

We have been promised that early in 1968 there will be a vote in the House Interior Committee on this legislation. We intend to try to win it—either with your help or over your dead bodies. But before that vote occurs there is time to get back on that four-point program—not in its precise form of 1966 as your leaders demand—but in its essence.

I suspect I'm going overboard on metaphors today, to make a metaphor. But another one comes to mind. I see that 1966 bill as a kind of jerry-built airplane designed to get a lot of people off a desert island. Because there were so many people to accommodate and so much excess baggage we put on about seven engines and five wings and three-and-a-half fuselages and six-and-a-half landing gears. It was a real dandy; it just had one defect: it wouldn't fly. In fact, California's designers and test pilots even refused to get on board. Out of that

experience I hope we've learned a lesson. This time let's build a smaller, sounder and less complicated airplane—but one that will fly. And if it won't accommodate all of our would-be passengers on one single glorious flight, we'll just take those with the most urgent business the first time and make several other trips for those who have no need to go right now.

In the context of our four-point agreement of last year I see the possibility for a new meeting of minds and a new joint effort of our two states and the other basin states. This is clearly evident when you realize how little change is necessary to bring that agreement into line with the realities of 1968.

I

On the building of the Arizona aqueduct there obviously can be no compromise and no one has suggested one. This is the center of the controversy.

On the need for immediate, meaningful steps toward augmentation there certainly can be and ought to be complete agreement. Augmentation is more important than ever, for all of the basin states, and already we have lost over a year of irreplaceable time. It is not in the need for augmentation, but in the method of achieving it, that we have encountered difficulties. And I see no reason for these differences to continue.

When the Santa Fe Compact was signed in 1922, everyone assumed that the river would continue to flow at the same rate as it had in former years. But it hasn't, and we now know that there will be years when the river provides less water than the total of all our legally-constituted shares. This is the reason that your state has attempted to use its 38 votes in the House to exact from Arizona with its three votes the guarantee that I have discussed. Well, I happen to think it's a lot more important to augment the water supply than argue about dividing up shortages. And while the exact form of augmentation contained in our 1966 bill is no longer possible—at least not in the foreseeable future—there are three other methods of augmentation that are available to us. In other words, of the four, three are available to us. Let me list them.

First, there is desalting.

Second, there is weather modification. This is really exciting and may answer our problems all by itself.

And finally, there is salvage and conservation of existing water in the Lower Basin.

This leaves only so-called trans-basin transfers—in other words, importing water from the Columbia Basin—as unavailable to us at this time.

Let me tell you a little bit about this one method we're having to abandon for now. It would involve constructing a large, long, costly aqueduct, pumping system and other works—and doing it now in dimensions capable of meeting our needs 30, 40 and 50 years from now. To build a little aqueduct to meet our present demands would be an awful mistake, as it would simply have to be enlarged later. But to build a huge aqueduct now, many years in advance of actual need, would mean carrying an enormous investment that was yielding no return for up to half a century. At this moment no one, including those Californians most sanguine about this proposal, has any real idea what it would cost. However, the best engineering estimates based on today's technology price the water from that system at anywhere from \$80 to \$200 an acre foot.

Just to put that in perspective, we have a couple of friendly economists in Arizona who say that our farmers can't afford to pay \$10 an acre foot. Domestic users, of course, can pay much more, even \$200 an acre foot, but they certainly don't want to pay such prices if water is available more cheaply some other way.

Which brings me to the first of the possible means of augmentation available to us. This is desalting.

There are two very favorable factors working for us in this regard. The first is that today's technology will produce desalted water for us more cheaply than imported Columbia River water. The second is that desalting units can be built in stages as they are needed, rather than all at once, saving the "idle plant" cost inherent in importation.

I have said we must assume there will be shortages in the Colorado River. But they don't exist today because the four Upper Basin and three Lower Basin states aren't yet at that level of population and development to utilize all their allocations. Let's see what this means in relation to the construction of desalting plants to make up for these deficiencies.

I am told that the first of these staged desalting plants would not have to be put into service until the year 1992, the second in 2001, a third in the year 2018.

and a fourth in 2025. And you can be sure that advancing technology will reduce the unit cost of water produced by each successive plant in the series.

Thus, instead of carrying idle plants for decades, adding immeasurably to the cost of our water, we will invest money only when it is needed and on a descending scale of unit cost. I happen to think that is more than an adequate substitute for the abandoned alternative of importation.

Incidentally, I understand that your big new desalting plant off the coast will produce fresh water for about \$70 per acre foot. That's considerably less than the \$80 to \$200 price for Columbia River water.

The second method of augmentation I mentioned was weather modification. I find this so exciting that I think a few years from now we will wonder why we spent so much time arguing about whose share of the river had priority over other shares; there will be enough to meet all uses, including what we call the Mexican Treaty Burden. I won't weight you down with that matter except to say that we have to guarantee 1.5 million acre feet to Mexico, and in a water-short year we worry about which states are going to have to relinquish the most water. Well, weather modification—not here in Southern California or in Arizona either, for that matter, but rather in the headwaters of river basins such as the upper slopes of the Rocky Mountains in Colorado—may end those arguments. Through cloud seeding additional snowfall can be produced in these watersheds, increasing the spring thaw and ultimate river flow. This technology is progressing so rapidly that the Department of Interior suggests full-scale programs will be in operation in the next decade.

While any cost figure on such a program must be pretty rough right now, it has been estimated that additional streamflow can be generated at a cost of around \$1 to \$4 an acre foot. Compare that with the \$80 to \$200 for Columbia River water and the \$70 for desalted water.

You can see from these figures that it would be a mistake to tie ourselves here and now either to a vast system of import works or to a precise schedule of construction on desalting plants when a much cheaper option may become available in 10 years or less.

This brings me to the third alternative available to us, and that is the salvage and conservation of existing water in the Lower Basin. If someone said he knew of a secret underground river which would add, right now, 1.5 million acre feet of water annually to the Colorado River—enough, for example, to satisfy that Mexican Treaty burden—I'm sure you would say, "Let's go after it." Well, there is no underground river, but there is something almost as good. Every year the irrigation districts of the Imperial and Coachella valleys run off as drainage and waste, some of it never having touched an irrigable acre, over a million acre feet of usable water. While I realize this is a subject concerning my friends in the Imperial Valley are understandably sensitive, I think this waste needs to be looked at. It includes drainage water, tail water and so-called "regulatory waste."

There are other ways in which we could get more use out of the water already existing in the Lower Basin. Every year more than three-quarters of a million acre feet of reclaimable sewage effluent is wasted in Arizona and Southern California—water which could be reused for agriculture with the resulting savings of an equal amount of potable water for domestic and municipal use.

Then there are still large amounts of mainstream water lost each year between Hoover Dam and Mexico through its absorption by salt cedars and other water-loving plants which are still permitted to grow along and in the river bed.

These are some of the avenues that are available to us and which ought to be getting our attention. They offer us more than adequate means to "make whole", as they say, the Colorado River Basin, to augment its water supply to the point that all shares can be utilized and new increments added with the passing of years.

III

Now to review briefly. I have already covered the first two of those four essentials I said could be written on the back of an envelope. They were the Arizona aqueduct and augmentation. Now we come to the third, which was how we raise the money. Last year our plan was to build two big power dams to provide a basin fund. Since these dams are now out of the question, where can we get the money to do these things we have to do? Well, let's see.

The Central Arizona Project bill, as it passed the Senate, takes a big step in this direction. It sets up the same basin fund we proposed last year, but without the revenues from the Grand Canyon dams. Going into that fund will be all

surplus revenues from the Hoover and Parker-Davis projects when they are paid out, and from the Pacific Northwest-Pacific Southwest power intertie located in the state of Arizona and Nevada. The basin fund in last year's bill would have built up to around \$3 billion by the year 2050. This fund, without those two controversial dams, will still generate about \$1.3 billion. And I think we're going to develop other revenue-producing projects in the next few years to add to that.

There is something else we can do, I believe, that will more than make up for the loss of those dams. In our bill last year we had a little feature that went almost completely unnoticed, and there was little controversy about it. That feature provided that the federal government would assume the Mexican Treaty burden, picking up the tab for the first 2.5 million acre feet of augmentation of the river. That little item, all by itself, could mean perhaps about \$2.5 billion to the states of the Colorado River Basin, the equivalent of about two Hualapai Dams. I think such a transfer of that burden is still possible and ought to be getting our maximum attention and effort. I think what we can do for ourselves in this area is a lot more important than grousing about the loss of those two dams.

IV

Finally, we come to item four on the back of that envelope—what happens if the river is still short in the 1990s and thereafter—the 4.4 guarantee issue. Let's all stop a moment and take a good, hard, cold unemotional look at this. Of the four essential parts of the 1966 agreement this was really the least important. The other three dealt with water, with progress, with people's needs. But this one dealt only with words on a piece of paper—with emotions, with face, pride, fear and all the rest. On both sides of the river we found ourselves mesmerized with a paper controversy that actually didn't involve the life or death stakes Arizonans and Californians attributed to it. It had a lot of importance psychologically, or as a test of good faith, but in terms of bedrock problems it just didn't mean much.

The fundamental fact for all of us is that the Colorado River will be short in the 1990s—not now, but 25 years from now. If you manage to defeat and obstruct the Central Arizona Project, the river will still be short, and your long-term needs won't be met by the 4.4 you are entitled to—or even the 5.1 million acre feet you are using temporarily now.

If we beat you and pass the project without a guarantee, the river will still be short in the 1990s—short for you and for us as well. And if Arizona "goes it alone," the river will be short also.

Indeed, even if we capitulate and give you last year's guarantee, the river will still be short in the 1990s—in that case, short for you and even shorter for us.

The fact is, my friends, we will all be in trouble—guarantee or no guarantee—win, lose or draw—unless and until we take steps to make augmentation a reality. When that is done, there will be enough water in the river and the question of paper guarantees will be entirely academic—which, in the final analysis, is about what it now is.

For thirty long years now you have had your aqueducts. You've used your share of water and some of ours too. In the Senate bill passed this year Arizona consents to your continued priority over our uses for *another* 27 years. But your state says there can be no compromise; the guarantee must run until the river is fully augmented or Gabriel blows his horn. I see two things wrong with this California position:

1—The first of these is your leaders' insistence that, even if given a guarantee of 4.4, there can be no credit for water added to the basin through such programs as I have outlined unless that water is dumped physically into the Colorado River itself. Let me illustrate why this position makes no sense.

I have indicated that four large desalting plants, built in stages, could give our water-short region enough new water to make up for anticipated deficiencies in the basin. Suppose now that we give you a guarantee lasting until new water is found to relieve the basin of the Mexican Treaty burden of 1.5 million acre feet. And suppose that our engineers tell us the best place to build the first of these plants is the Los Angeles area along the seacoast.

All right. Now let's assume that Congress authorizes the project, and we pay for it with federal funds, perhaps out of the basin account. The plant is built and begins to pump brand new \$70 water into the basin, cutting down the regional shortage for all of us. A reasonable person might expect that this new water would

apply as a credit on Arizona's guarantee. However, that's not the way your water leaders see it. Unless the water is dumped physically into the mainstream of the river, they say, it just doesn't count.

But, they say, if we build the same plant under the same arrangements with the same federal financing, *and* if we build a tremendous new aqueduct to Las Vegas and pump this new water to Lake Mead and dump it there, it *does* count on the guarantee. By the time we pump it to Lake Mead and then pump it back to Los Angeles, to meet this ridiculous requirement, that \$70 water will cost perhaps \$200—but it will count on the guarantee.

Similarly, they say Arizona can get no credit for the kind of "new water" made available by expensive basin fund expenditures for salvage, canal lining, phreatophyte control and the like.

This logic is a little hard for us to follow and impossible to accept. When you propose this kind of guarantee, you are really saying that Columbia River water counts, and nothing else does. I believe I have shown that this road, justly or not, is not now open to us.

2—The second thing wrong with your state's position on the guarantee is that it saddles Arizona, and Arizona alone, with the main burden of augmenting the river. It gives us every incentive to augment and you every incentive to block augmentation. I think this is unrealistic and unfair. It's unrealistic because your state is going to need much more water than this, and it's unfair because the burden is just as much yours as ours.

After all, by the time that 27-year guarantee runs out, California will have had preferential use of the Colorado River for a total of 60 years. I think we'll all be better off if the incentive to augment it after that date falls equally on both our states.

Thus, of the four items on that envelope, we have three on which I think we could reach agreement without too much difficulty, and one which remains a subject of controversy. I don't think my state will go beyond the 27-year guarantee of the Senate bill, but theoretically we could give a perpetual guarantee. While I don't think this whole argument makes much sense or makes much real difference, I suppose we can continue to haggle about it. If we do, I hope our haggling doesn't divert too much of our attention away from the far more important things we have to discuss.

I entitled this speech "Countdown on the Colorado." That countdown, which began some time ago, will end in late January or early February when we've been promised a committee vote on our Central Arizona Project-Colorado River Basin bill. As that day approaches it seems to me all of us—but especially California—have two basic philosophies to choose from:

The first is a philosophy of pessimism, localism and defeatism—the philosophy Arizona observed in the 1920s and 1930s and which is now urged on you by some of your people. This philosophy says that not one single step can be made toward meeting Arizona's needs of the 1970s and 1980s until we know precisely—in the minutest detail—what will be done about California's needs in the 1990s. If your state follows this philosophy then whatever happens in Congress you will lose and we will probably lose with you—the river will remain short and no one will have enough. This is a fact that everyone has to face. If Arizona should go it alone and take its water out of the river under some kind of state plan, we will have to face the shortage of the 1990s, just as you will. This is the ultimate hard rock that everyone has to face. Furthermore, if Arizona is forced to build its own project, you can bet that we're going to oppose any and all federal projects sought by your state, perhaps your lawyers or ours will dream up some more lawsuits, and conceivably we'll even raise some questions about all that good water going to non-reclamation, non-municipal, non-economic use in the Salton Sea. I think your decision to follow this philosophy can be disastrous for our states and for the cause of reclamation.

The other choice is to continue the proven path of progress and cooperation, to adopt a philosophy of optimism and faith and hard work and a willingness to join together in solving—one step at a time—the problems as they arise. Except in water matters this has been the history of our two states. This philosophy acknowledges that we can't do everything we'd like to do right now. We can't fully and finally, in one bill, augment the river to meet the needs of all time. But we can make a substantial start on an augmentation program and we can create a basin fund to help pay for it. We can and we will meet Arizona's needs for an aqueduct now. And while it is being built we will spend money on investigations, feasibility studies, long-range plans. We will begin the great and im-

portant program to make sure that long before the 1990s we have the additional water our states need for their growing populations.

I'm sure you know which of these philosophies I believe is in the best interests of your state as well as mine.

Your state's position today seems to be based on the notion that, unless iron-clad arrangements are made now, the United States is going to let California and Arizona dry up and blow away. I have too much faith in the country, in the Congress, and in Arizona's and California's leaders to take this defeatist view.

The world was not built in a day; your Central Valley Project and your magnificent Imperial and Coachella Valley projects didn't spring full blown from the drawing boards to be rushed through in one gigantic omnibus bill. The fantastic Columbia River system wasn't authorized in one bill. All these successful efforts were authorized and built one sound step at a time.

This is the proven, progressive path by which all the Western states have been built. Today, Arizona is asking you to get back on that path with us. For your sake and for ours there is no time to lose.

Mr. JOHNSON. In response to the quorum call on the floor, the committee will adjourn for the day. Since the Secretary cannot be here tomorrow, we will resume with him on Thursday for questions by the members. The gentleman from Arizona will be recognized at that time.

(Whereupon, at 3:40 p.m., the committee recessed, to reconvene at 10 a.m., Thursday, February 1, 1968.)

COLORADO RIVER BASIN PROJECT

Part II

THURSDAY, FEBRUARY 1, 1968

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:55 a.m., in room 1324, Longworth House Office Building, the Honorable Harold T. Johnson (chairman of the subcommittee), presiding.

Mr. ASPINALL. The Subcommittee on Irrigation and Reclamation will now be in order for the consideration of such business as is regularly scheduled to come before it, which is the continuation of the hearing on H.R. 3300 and S. 1004.

It is nice to see you back, Mr. Secretary. I hope that you had a pleasant birthday.

STATEMENT OF HON. STEWART L. UDALL, SECRETARY, DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY KENNETH HOLM, ASSISTANT SECRETARY FOR WATER AND POWER; FLOYD E. DOMINY, COMMISSIONER, BUREAU OF RECLAMATION; AND EDWARD WEINBERG, DEPUTY SOLICITOR

Secretary UDALL. Thank you, Mr. Chairman.

Mr. ASPINALL. Now, I am going to throw you to the mercy of that very talented, young, and dedicated brother of yours. When he gets through, I want to know what your reaction is to his operations.

Mr. UDALL. Mr. Chairman, through a series of brilliant questions, I intend to rend these witnesses from limb to limb as the morning goes on.

Mr. SAYLOR. Will the gentleman yield to me for a unanimous request before proceeding with that task?

Mr. UDALL. The gentleman said the other day this was their finest hour. I hope this will still be the situation when we are finished today.

Mr. SAYLOR. Mr. Chairman, I ask unanimous consent that we be allowed to place in the record at this point a letter I addressed to Mr. Floyd E. Dominy, Commissioner of Reclamation, on October 18, 1967, together with the answers to that letter which I received from Mr. Dominy under date of October 24, 1967, and November 24, 1967.

Mr. HOSMER. Reserving the right to object, what does this blank check for the gentleman concern?

Mr. SAYLOR. This concerns only the Hooker Dam which, believe it or not, does not affect any water in California.

Mr. HOSMER. Does it have a Sierra Club twist to it?

Mr. SAYLOR. No, but I am going to ask that the report of the Sierra Club be placed in the file.

Mr. HOSMER. Does it discuss the water supply situation?

Mr. SAYLOR. It discusses only a proposed dam site.

Mr. HOSMER. No fallout that will move westward?

Mr. SAYLOR. There might be some if it finally got to the Gulf of Mexico, somewhere around where the Gila River runs into the mainstream of Colorado.

Mr. HOSMER. I withdraw my reservation.

Mr. ASPINALL. Is there any objection?

There being no objection, it is so ordered.

You have heard the request of the gentleman from Pennsylvania that the correspondence on the Hooker Dam be made a part of the record and that the report of the Sierra Club be made a part of the file. Is there any objection?

(No response.)

Mr. ASPINALL. Hearing none, it is so ordered.

(The material deferred to follows:)

(The report referred to will be found in the committee files.)

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., October 18, 1967.

Mr. FLOYD E. DOMINY,
Commissioner, Bureau of Reclamation,
Department of the Interior,
Washington, D.C.

DEAR MR. DOMINY: As you know, the House Interior and Insular Affairs Committee intends to take up in Executive Session early next year the Central Arizona Project. So that I may be properly informed before the bill is acted upon in Committee, I will from time to time submit questions concerning this project as it is considered.

I am listing below a series of questions in regard to the Hooker Dam and Reservoir, and wish you would provide answers at your earliest convenience. This project is one in which I have not arrived at any definite conclusion, therefore, my questions are quite detailed, and I sincerely hope that your answers are equally informative.

1. Present legislation expresses the size of the proposed Hooker Dam and Reservoir in indefinite terms. HR 3300 does prescribe an initial capacity for the Reservoir of 98,000 acre feet, but then, like S 1004 just passed by the Senate, sets the final size only in terms of the additional consumptive use to be provided for New Mexico, this being 18,000 acre feet per annum under both bills. What are the plans for the specifications of this project in the following terms:

- (a) The height of the dam? The maximum water surface elevation?
- (b) The capacity of the reservoir?
- (c) The area of the water surface of the reservoir at full capacity?
- (d) The length in river mileage of the reservoir at full capacity, together with the length of the encroachment on the Gila Wilderness and Primitive Areas?
- (e) The water for additional consumptive use to be provided New Mexico, excluding evaporative losses; and
- (f) The yearly evaporative losses?

Each of these characteristics of the project should receive multiple answers if the dam is to be built in stages.

2. (a) How extensive a study has been made of the project in order to establish its characteristics?

(b) Assuming that only a reconnaissance study has been made, as I understand to be the case, what degree of change can be expected in the characteristics as plans are made definitive upon authorization of the project?

3. Based on its reconnaissance studies, it is said that the Bureau of Reclamation has settled on the Hooker site as the best site for the project as conceived. What is the extent of these site studies?

4. What alternate sites along the Gila River were considered and studied by the Bureau? If any submit the studies.

5. (a) What is the benefit-cost ratio for Hooker Dam?

(b) What are the results of the studies by the Bureau with respect to each alternate site considered in comparison with the Hooker site, in terms of details, figures, prospective benefits, and benefit-cost ratio?

6. (a) How does the benefit-cost ratio of Hooker Dam compare with a potential project to supply New Mexico's water entitlement utilizing ground water storage and pumping? The ground water used in this manner would appear to be adequately recharged by periods of high flow in the Gila River. In view of its effect on surface flows in the Gila River above Coolidge Dam, such a project should include most presently irrigated land which might benefit from Hooker Dam. Potential benefits for such a project might include no evaporation losses from surface water storage and possible reduction in evapotranspiration by phreatophytes to lowering of the water table.

(b) Has there been consideration of any other alternate plans to the Hooker Project (n.b., project, not just dam)?

7. The primary objective of the Hooker project is to provide additional water for consumptive uses in New Mexico amounting to 18,000 acre feet per annum. How was this amount of water established. Is it?

8. What is the planned breakdown of this 18,000 acre feet to the various consumptive uses?

9. How was this breakdown arrived at?

10. Assuming that there was some delay in completing the Hooker project to its full capacity and that at a lesser capacity, presumably 98,000 acre feet, the project could provide some lesser amount of water for additional consumptive use, how much water would be provided and how would this quantity be broken down to consumptive uses?

11. (a) Is Hooker actually part of the Central Arizona Project in an engineering or an operating sense?

(b) If Hooker is actually essential to the Central Arizona Project, in what respect is this true?

12. What would be the type of construction of the Hooker Dam?

13. What would be the cost of the project as of October 1, 1967?

14. What would be the effect on type of construction and cost if the dam were constructed in stages?

15. Benefits to be derived from Hooker have been claimed for flood control, outdoor recreation, fish and wildlife, and for municipal, industrial, and agricultural uses through the provision of a firm water supply resulting from river regulation. Is this the extent of the claimed benefits?

16. These claimed benefits pertain only to New Mexico, do they not?

17. What are the full details in facts and figures which are the basis for the claimed benefits to agriculture, in terms of flood control, firm water supply, or additional consumptive use?

18. Does S. 1004 permit the irrigation of new lands in New Mexico with Gila River water? If so, how will the water be supplied to these lands?

19. How much land with appurtenant water rights was brought up in the Gila Valley on behalf of the Phelps-Dodge Corporation for use of the water rights in support of their Tyrone operation?

20. What will be the effect of the diversion of these water rights on the potential of the Gila Valley as an area for irrigated farming?

21. Would the Hooker project serve in any way to salvage the agricultural potential of the Valley in the foreseeable future?

22. What is the basis in detail for the benefits claimed for outdoor recreation?

23. Are the benefits claimed for outdoor recreation adequately discounted for the negative effect on outdoor recreation which would be caused by the intrusion of the reservoir on the Gila Wilderness and Primitive Areas?

24. How would a site for the project, downstream of the Hooker site, compare with Hooker site for conventional outdoor recreation?

25. What is the basis in detail for the benefits claimed for fish and wildlife?

26. Have the claims for benefits to fish and wildlife been checked by a qualified ecologist?

27. As planned, the Hooker Reservoir would encroach on the Gila Wilderness and Primitive Areas, and in doing so would be destructive of habitat for the native flora and fauna, thus altering the native ecology which it is the function of those Areas to preserve. Are the benefits claimed for "fish and wildlife" adequately discounted for this negative effect?

28. What is the meaning of "wildlife" as used in the claims for benefits from the Hooker project?

29. How could Hooker provide benefits for wildlife under any definition of the term?

30. What is the meaning of "fish" as used in the claims for benefits from the Hooker project?

31. Is the claim for benefits to "fish" based on prospective improvement of habitat for native water animals, or does it refer to improved facilities for stocking sport fish for "put and take" recreational fishing?

32. Would the New Mexico Game and Fish Department be allowed to contract for municipal and industrial water from the Hooker Reservoir to be used to compensate for evaporation at certain state-owned lakes?

33. What would be the effect of the Hooker project on the native flora?

34. How would a site for the project downstream of the Hooker site compare in terms of conventional fishing for recreation?

35. Has the prospective value of the Hooker Reservoir for conventional outdoor recreation and sport fishing been assessed by a qualified expert or experts on those subjects?

36. Has the Forest Service been consulted with respect to the problems of administering wilderness regulations on the Hooker Reservoir and in the vicinity, considering that it would lie astride the wilderness boundary?

37. Has the opinion of the Forest Service been sought concerning the Hooker project in general? What is its position? If in writing furnish copy of same.

38. What areas would be protected from floods that are not now protected or would be protected by authorized or pending projects?

39. How much water is allocated for use by Silver City? How would Silver City's share of the water be made available for use, what would be the cost of delivery, and at whose expense would this be?

40. It is understood that water allotments were established by interviews with appropriate industrial officials incident to the Bureau of Reclamation reconnaissance studies, thus allotments must be earmarked to specific users. Who are the prospective users for the 10,000 acre feet of water apportioned to mining and milling? How much would they be charged for this water?

41. (a) Is there any intention to transport mining and milling water east across the Continental Divide, or that is be so transported to users so located?

(b) If water is to be transported across the Continental Divide, for whom might it be destined and at whose expense would it be moved?

42. Will the income derived from water and power sales from Hooker Dam be sufficient to cover reimbursable project costs? If not, how much financial assistance is necessary from a basin fund?

In view of the fact that there is an unusual method of financing provided in the proposed legislation and which has already been approved by the Bureau. I also request an up-to-date breakdown of the amount of monies which will be advanced by the Federal Government for construction of a Thermal Electric Plant, which the Government will contract for, the length of time such power is available, your estimated cost to the taxpayers, and the cost per kilowatt under the most advantageous and adverse conditions.

The information that I am seeking is for my own personal edification and benefit. I would appreciate your forwarding these answers to *me personally* at your earliest convenience and without circulating them to any other Member of Congress as in the past.

With every good wish,
Sincerely,

JOHN P. SAYLOR,
Member of Congress.

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., October 24, 1967.

Hon. JOHN P. SAYLOR,
House of Representatives,
Washington, D.C.

DEAR MR. SAYLOR: This is in further reply to your letters of September 14 and October 18, 1967, enclosing a list of questions concerning the Central Arizona Project and proposed Hooker Dam in New Mexico. The following replies are numbered to correspond with your questions:

Answer No. 1.—The provisions in H.R. 3300 and S. 1004, 90th Congress, with regard to additional New Mexico consumptive use in the amount of 18,000 acre-feet per year are based upon negotiations between the States of Arizona and New Mexico. As we understand these provisions, if either bill is passed by the Congress, our Bureau would be authorized to proceed with definite plan studies to determine the reservoir capacity required to allow 18,000 additional acre-feet of consumptive use from the Gila River, its tributaries, and underground water sources in New Mexico without prejudicing the rights of downstream interests under the Colorado River and Gila Decrees. Our testimony to date before congressional committees has related to a reservoir with a capacity of 98,000 acre-feet, but we have not established the capacity which will be required to meet the provision of 18,000 acre-feet of additional consumptive use. The following data submitted in answer to subparagraphs (1) through (6) of Question No. 1 are, therefore, for a reservoir of that capacity.

(1) Height of dam.....	227 feet.
Maximum water surface elevation.....	4,880 feet.
(2) Capacity of reservoir (including surcharge storage).....	117,000 acre-feet.
(3) Surface area, maximum water surface.....	1,250 acres.
(4) Reservoir length, full capacity.....	9.2 miles.
Length of encroachment:	
Gila wilderness.....	3.5 miles.
Primitive area.....	0.7 miles.
(5) Consumptive use additional to New Mexico—less evaporation.....	(¹).
(6) Average annual evaporation loss over 100 years.....	3,700 acre-feet.

¹ Unknown; would vary with reservation for flood control and resolution of legal problems.

Detailed operation studies will be required to determine the reservoir capacity necessary to accomplish the exchange contemplated in the bills.

Answer No. 2.—(a) The design characteristics of Hooker Dam as presented in our 1947 report were adopted from studies made by the Corps of Engineers and presented in its December 1, 1945, "Interim Report on Survey, Flood Control, Gila River and Tributaries Above Salt River, Arizona and New Mexico." Cost estimates were updated to October 1963 price levels in our recent testimony before the committees. In total, these studies could be considered to be a little better than reconnaissance level.

(b) Our experience in the past is that feasibility-grade studies result in changes in cost and minor modifications in structure arising from additional foundation and hydrologic data which are not available from reconnaissance studies. In the case of Hooker Dam, if the requirement to provide 18,000 acre-feet of water for consumptive use is included in the authorizing legislation, we will need to perform detailed operation studies to size the reservoir. The resulting reservoir may be considerably in excess of the 98,000 acre-foot capacity used in the report.

Answer No. 3.—Various sites have been studied at a reconnaissance level by our Bureau and the Corps of Engineers over the past 35 years or so. Information on these studies is contained in our original Central Arizona Project report of 1947 and in the Corps of Engineers' 1945 interim report on the Gila River and tributaries above Salt River.

Answer No. 4.—Our reconnaissance investigations since about 1930 include the following:

- The Alum Dam site located upstream from the Hooker site.
- Hooker Dam and Reservoir.
- The Upper and Lower Cliff Dam sites located below the Cliff-Gila Valley.
- The Conner Dam site located below the Cliff-Gila Valley.

(e) The Fuller Ranch Dam site located downstream from the Red Rock Valley.

Answer No. 5.—(a) It is a feature of the Central Arizona Project dependent upon that project; hence, no determination of a separate benefit-cost ratio for Hooker Dam and Reservoir has been made.

(b) We have made reconnaissance investigations of numerous damsites on the Gila River in New Mexico since about 1930. These include the following, which are listed in downstream order:

The Alum Dam Site, being located upstream from the Hooker Dam site, could serve the same geographic areas and could provide similar benefits. The cost per acre-foot of net water yield at this site was shown by reconnaissance studies to be only slightly higher than at the Hooker site. The Alum Dam and Reservoir site, therefore, was considered to be a truly comparable alternative to the Hooker site but was dropped from further consideration because the site is located entirely within or surrounded by the Gila Wilderness Area at considerable distance from paved highways or habitations, making it less desirable than sites outside or on the edge of the wilderness area. Because the Alum site is located higher on the watershed, the quantity of water that could be developed and the degree of flood protection that could be provided to downstream areas also would be less than at the Hooker site.

Hooker Dam and Reservoir were proposed as features of the Central Arizona Project because of the strategic location and superior physical potentialities of the Hooker site relative to benefits within the State of New Mexico. Although the cost per acre-foot of net yield at the Hooker site was shown by reconnaissance studies to be less than at any other site studied, this finding was not the sole basis for selecting the Hooker site for more detailed investigation.

Hooker Dam site is located at the point where the Gila River emerges from the mountains and flows through the irrigated valleys of western New Mexico into eastern Arizona. A dam and reservoir at this strategic location would serve the three principal irrigated areas along the Gila River in New Mexico, the Cliff-Gila, Duck Creek, Red Rock, and Virden Valleys and also would provide the most practicable source of additional municipal and industrial water supply for the Silver City and Tyrone areas. It also would provide aquatic recreation and fishing and hunting opportunities readily accessible by paved highways to Silver City and other urban areas. The dam would be located outside the Gila Wilderness and Primitive Areas, and the reservoir would back water only a few miles inside these areas which, at this point, are comprised of typical, undistinguished, sparsely vegetated, desert hills located in close proximity to State highways, towns, and farmsteads.

The Cliff Dam Sites (upper and lower) were dropped from consideration because early reconnaissance investigations indicated that the physical potentialities of these sites were inferior to either the upstream Hooker site or the downstream Conner site. A dam at this site would inundate about 2,000 acres of presently irrigated farmland.

The Conner Dam Site, being located downstream from the Cliff-Gila Valley, would neither serve nor protect that valley, which contains nearly 50 percent of all farmlands irrigated from the Gila River in the State of New Mexico. This site, therefore, is not a comparable alternative to the Hooker Dam site insofar as it relates to benefits within the State and, for that reason, was not considered in the original Central Arizona Project report. New developments that have occurred during the 20 years since the original Central Arizona Project report was issued provide no basis for reconstruction of this site.

As previously noted, the 18,000-acre-foot increase in New Mexico's annual water use from the Gila River as provided for in the Arizona-New Mexico agreement includes the evaporation losses that would occur on any reservoir constructed to develop this water. Such losses would be far greater at the Conner site because of its lower location on the watershed and the resulting requirement for increased reservoir capacity due to its greater sediment inflow. It is estimated that the annual evaporation from the Hooker site will be about one-third that of the Conner site. Evaporation from a reservoir at the Conner site constructed with active storage capacity needed for water conservation purposes might easily consume most of the additional 18,000 acre-feet per year permitted by the interstate agreement. The Conner site is also less desirable from a recreation and fish and wildlife standpoint because

of its isolation and lack of access facilities. It also would require about 500 feet of additional pump lift to transport municipal and industrial water to the areas of potential use. A dam at this site would also inundate about 900 acres of presently irrigated farmland.

The Fuller Ranch Dam Site, being located downstream from both the Cliff-Gila and Red Rock Valleys and at great distance from potential municipal and industrial water users, was eliminated from consideration on the basis of its geographic disadvantages with respect to increased water use and other benefits in the State of New Mexico. A dam at this site would inundate about 1,400 acres of irrigated lands.

In general, the rate of evaporation would be greater in the locations of the downstream sites. Flood protection to the important developed lands of the Cliff-Gila can not be provided by reservoirs at the Cliff, Conner, or Fuller Ranch sites. Our studies of the alternative sites also are not to sufficient grade to ascertain that the foundations for the dams and reservoir areas are adequate.

We have not carried the studies of the alternative sites to the degree of refinement which would provide quantitative statements of current costs, benefits, and other factors.

Answer No. 6.—(a) No feasibility-grade hydrogeologic and ground-water studies of the Upper Gila River Basin have been made. It is our judgment, however, that, on the basis of reconnaissance studies, it would not be possible to sustain pumping an additional 18,000 acre-feet per year from the area. The two proposals, therefore, are not comparable.

It is doubtful that adequate well yields and adequate recharge in periods of high flow could be obtained in reasonable proximity to the potential water requirements. Also, operation of the suggested well fields in a manner that would not affect downstream rights would be extremely complex. For example, at low flow, it would be necessary to pump from the well systems into the river an amount equal to the computed effects of earlier pumping from the wells on river flows. Reliable computations of such effects, acceptable to downstream interests, might pose a difficult problem.

(b) We are now engaged in authorized feasibility investigations of the potential Upper Gila River Project, which embraces that part of the Gila River Basin in Arizona and New Mexico above Coolidge Dam. Consideration is being given in these studies to many alternative plans for increasing water use in both the Arizona and New Mexico portions of the Upper Gila River Basin involving additional storage works, phreatophyte eradication, canal and lateral lining, and exchange arrangements with downstream water users to be supplied directly from the Central Arizona Project aqueduct system. Reconnaissance plan formulation studies evaluating alternatives which have so far been completed have included storage combinations without the proposed Hooker Dam and Reservoir, but all have demonstrated less favorable results than alternatives which include Hooker Dam and Reservoir.

Answer No. 7.—This amount was established by mutual agreement between the States of Arizona and New Mexico after a long period of negotiations. Our Bureau was not a part of these negotiations but, upon request, furnished both States such data as were available.

Answers Nos. 8 and 9.—Our reconnaissance studies indicate a potential demand for about 10,800 acre-feet of additional municipal and industrial water, leaving a balance of 7,200 acre-feet for reservoir evaporation, irrigation, fish and wildlife, recreation, or other uses. The amount of reservoir evaporation would depend upon the reservoir capacity and operating criteria. These figures were made available to both Arizona and New Mexico during the aforementioned negotiations. The figures or breakdown result from a determination of the potential need for M&I supplies.

Answer No. 10.—It would be our intention to give the first consideration to M&I uses in providing a water supply of any quantity. To the extent that water is available in excess of current M&I needs, it would be used in an interim irrigation supply.

Answer No. 11.—(a and b) Hooker Dam would not be a viable development insofar as its contemplated accomplishments are concerned without the Central Arizona Project. Hooker Dam, on the contrary, is not necessary to the engineering and operating viability of the other portions of the Central Arizona Project. Hooker Dam, as embodied in H.R. 3300 and S. 1004, however, is necessary to accommodate an exchange of water for the benefit of New Mexico. The physical

accomplishment of that exchange would require storage facilities in New Mexico.

Answer No. 12.—Hooker was originally planned as a concrete structure but, due to technological advancement since that time, we believe that definite plan studies may indicate that an earthfill structure would be more economical.

Answer No. 13.—The cost of constructing a 98,000-acre-foot reservoir with a concrete Hooker Dam is estimated at \$28,797,000.

Answer No. 14.—If stage construction should be adopted, an earthfill design would probably be adopted. Costs for the first stage would be increased somewhat by the inclusion of structural features required for enlargement. Such costs might or might not be offset by savings in deferment of a portion of the total cost for a number of years.

Answer No. 15.—Benefits were claimed for flood control, outdoor recreation, and fish and wildlife. The benefits for municipal and industrial and irrigation water supply for the Central Arizona Project are associated with the quantities of water delivered by the main aqueduct (and also those developed at Buttes and Charleston Dams) without regard to the specific area of use. This amount of water, and hence these benefits, would be the same whether or not an exchange of water to New Mexico is accomplished. We do not, therefore, claim any additional irrigation or M&I water supply benefits for the Hooker Dam.

However, the benefits of the Central Arizona Project must be redistributed by means of the Hooker Unit to give New Mexico its equitable share in Lower Basin development as determined by the May 1966 agreement between the States.

Answer No. 16.—In addition to the benefits in New Mexico, there would be flood control benefits in the Duncan Valley in Arizona; and the project recreation and fish and wildlife benefits would accrue particularly to citizens of Texas, New Mexico, and Arizona, and to some extent to all of the citizens of the United States.

Answer No. 17.—As indicated above, no benefits to agriculture were claimed in terms of additional consumptive use. Flood control benefits of \$70,000 annually were evaluated by the Corps of Engineers on a reconnaissance basis using average future conditions and 1961 price levels. This reflects the value of damage prevented as is usual in Federal water resource projects, and is predicated upon the operation of the reservoir basically for flood control and would be reduced if the operation were varied to meet other considerations.

Answer No. 18.—Section 2(c) of S. 1004 as passed by the Senate provides: "Unless and until otherwise provided by Congress, water from the Central Arizona Project shall not be made available directly or indirectly for the irrigation of lands not having a recent irrigation history as determined by the Secretary, except in the case of Indian lands, national wildlife refuges, and, with the approval of the Secretary, State-administered wildlife management areas."

Answer No. 19.—Our land status studies have not been recently updated, but we have been advised informally that the Pacific Western Land Company is reported to have acquired approximately 3,500 acres of land in the Gila Valley having surface and ground-water rights. We are not informed whether or not this company is affiliated with mining interests.

Answer No. 20.—If water rights appurtenant to farmlands are transferred to other uses, the lands would have to be retired from production until such time as an additional water supply is available.

Answer No. 21.—Yes. Under the Arizona-New Mexico agreement, water from Hooker Reservoir could be used to prevent the retirement of agricultural lands.

Answer No. 22.—Information on outdoor recreation is presented in summary in the report prepared by the Bureau of Outdoor Recreation, which is included in the appendix of the Secretary's report of January 1964 on the Pacific Southwest Water Plan. We are requesting the Bureau of Outdoor Recreation to reply further to you concerning Questions No. 22, 23, 24, and 35.

Answer No. 23.—See Answer No. 22.

Answer No. 24.—See Answer No. 22.

Answer No. 25.—The fish and wildlife benefits are reported in summary in the substantiating report of the Fish and Wildlife Service included in the appendix to the Secretary's January 1964 report on the Pacific Southwest Water Plan. We are requesting the Bureau of Sport Fisheries and Wildlife to reply further to you concerning Questions No. 26, 27, 28, 29, 30, 31, and 35.

Answer No. 26.—See Answer No. 25.

Answer No. 27.—See Answer No. 25.

Answer No. 28.—See Answer No. 25.

Answer No. 29.—See Answer No. 25.

Answer No. 30.—See Answer No. 25.

Answer No. 31.—See Answer No. 25.

Answer No. 32.—No provision of law would prevent such an allocation. This would be a matter for later determination in consultation with the State of New Mexico.

Answer No. 33.—We do not have available an analysis of the impact of Hooker Dam upon the native flora. We have made data available to the Forest Service for further evaluations of the impact of Hooker Dam on Forest lands, which are under way.

Answer No. 34.—No evaluation of fish and wildlife benefits has been made of the downstream sites.

Answer No. 35.—See Answers No. 22 and 25.

Answer No. 36.—Yes.

Answer No. 37.—Yes. The Department of Agriculture comments on the Pacific Southwest Water Plan are included in the Secretary's report dated January 1964. In summary, that Department recommended that close collaboration between it and the Department of the Interior be maintained to minimize any adverse impact which the developments included in the plan may have on programs associated with the National Forest System. We are providing data to the Forest Service for further impact studies.

Answer No. 38.—The areas protected would include Gila Valley lands in New Mexico below the Hooker site and Duncan Valley lands in Arizona.

Answer No. 39.—We have made no specific water allocations subsequent to the Arizona-New Mexico agreement as proposed in H.R. 3300 and S. 1004. Water could be made available at the reservoir site at the appropriate allocated cost, which has yet to be determined.

Answer No. 40.—The Arizona-New Mexico agreement provides for increased consumptive use in New Mexico in the amount of 18,000 acre-feet per year, but no specific allotments have been made. Ultimate users would be determined by the Secretary of the Interior in consultation with the State of New Mexico, and water would be marketed through contracts negotiated with the Secretary of the Interior, in accordance with the terms of the proposed authorizing legislation.

Answer No. 41.—(a and b) Our plans do not include provisions for transportation of water across the Continental Divide. We contemplate that water sales would be at the reservoir. (Water contractors would be determined by the Secretary of the Interior in consultation with the State of New Mexico.)

Answer No. 42.—The development of hydroelectric power is not contemplated at Hooker Dam. The repayment of the costs of this facility would be integrated into the overall repayment plan for the Central Arizona Project just as any other reservoir or major feature of the project plan. Under the Administration's proposal, the entire Central Arizona Project would repay its reimbursable costs without development fund assistance. The amount of assistance for the Central Arizona Project required under any other plan would be determined by the provisions of the legislation.

You also inquired concerning the prepayment power arrangements which have been recommended in the Administration's proposed plan for the Central Arizona Project.

The Administration's proposal included a main aqueduct with a capacity of 2,500 c.f.s. for the Central Arizona Project. This size aqueduct would require 400 megawatts of pumping capacity. S. 1004 as passed by the Senate includes a 3,000-c.f.s. aqueduct, which would require 470 megawatts of capacity.

In each case, the project cost would include the capital cost for prepayment for the required generation facilities and costs of prepayment for a part of the transmission facilities and of Government construction of part of the transmission facilities. These costs are as follows:

	Administration proposal	S. 1004
Prepayment for thermal electric generating capacity.....	\$42,000,000	\$49,000,000
Transmission facilities.....	49,950,000	54,000,000

The prepayment would be reimbursed from project revenues and is expected to provide for power from a thermal-electric powerplant which, with normal maintenance and minor replacement, would have a useful life of 35 years. The repayment analysis for the project further provides for payments into a reserve for replacement which would accumulate sufficient capital to provide for a new prepayment arrangement when major plant replacement becomes necessary.

Thus the repayment analysis provides for power throughout the life of the project.

The project would be charged 3 mills per kilowatt-hour for irrigation pumping and 5 mills per kilowatt-hour for M&I pumping. Power acquired under the prepayment plan but not needed for project pumping (because of fluctuations in water supply) would be sold commercially at 5 mills. The total of these revenues would repay the capital costs and operation and maintenance costs of the generation and transmission facilities and would provide the reserve for replacement.

Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., November 24, 1967.

HON. JOHN P. SAYLOR,
House of Representatives, Washington, D.C.

DEAR MR. SAYLOR: Please refer to our letter of October 24, 1967, in response to your inquiries concerning the proposed Hooker Dam in New Mexico.

As we explained, we requested the Bureau of Sport Fisheries and Wildlife and the Bureau of Outdoor Recreation to respond further to certain of your questions. We now have their comments. Your questions are repeated for convenient reference along with the replies of each of the agencies.

BUREAU OF SPORT FISHERIES AND WILDLIFE

25. What is the basis in detail for the benefits claimed for fish and wildlife?

Various plans for the Hooker Reservoir site have been studied intermittently since 1947, including preliminary studies conducted in 1962 for the Pacific Southwest Water Plan. The Bureau of Sport Fisheries and Wildlife participated in a reconnaissance study begun in 1963 and terminated upon completion of a report entitled, "Upper Gila River Project, Arizona and New Mexico—Bureau of Sport Fisheries and Wildlife Report," dated February 19, 1964. The Upper Gila River Project report presents a refinement of fish and wildlife data presented in the Pacific Southwest Water Plan. Enclosed is a copy of the Upper Gila River report.

Specifically, the February 1964 report provides two plans of development for Hooker Reservoir: Plan 1 with an active pool with a capacity of 150,000 acre-feet and a surface area of 1,780 acres, and Plan 2 with an active pool of 200,000 acre-feet and a surface area of 1,850 acres. In both plans, the sediment pool would be 65,000 acre-feet, with a surface area of 845 acres. Hooker Reservoir's value to fish and wildlife would be essentially the same under both plans.

The reservoir site is located in a narrow canyon in desert grassland-pinyon-juniper transition zone. About 13 miles of the Gila River would be in the Hooker Reservoir site and 13 miles below the dam would be affected. Channel catfish, smallmouth bass, and trout fishing projected over the life of the project would amount to about 9,400 man-days annually without the project. None of the sport fishes in the project area are indigenous.

With-the-project analysis is based upon the 845-acre minimum pool which would extend about 3 miles within the Gila Wilderness Area of the Gila National Forest. Preliminary studies by the New Mexico Department of Game and Fish indicate that the reservoir would be suitable for trout and would be stocked and managed as a trout fishery by the State. There would be an estimated 79,500 man-days of fishing annually distributed as follows: reservoir, 46,500 man-days; tailwater, 20,000 man-days; and the 13-mile-downstream reach, 13,000 man-days. Fishery benefits would total \$222,000 annually. The above estimates are for fishing without specific facilities.

Fishing could be improved by the addition of the following specific facilities: construction of two launching ramps would increase fishing by 20,000 man-days with benefits of \$60,000; access for 1,000 feet below the dam, including a berm or other platform, would provide 5,000 man-days with benefits of \$15,000; and reservoir zoning would permit an additional 25,000 man-days with benefits of \$75,000. The three additional measures to the project would increase fishing by 50,000 man-days with annual benefits of \$150,000.

Upland-game species on the 8,000 acres of habitat under Plan I and 10,600 acres under Plan II include Gambel's quail, scaled quail, mourning dove, cottontail, and jackrabbit. A few Mearns's quail, wild turkeys, band-tailed pigeons, and chukars are on the site. The mule deer is the principal big-game animal with

reservoir site. The rather sparse population of fur animals include raccoons, foxes, badgers, muskrats, and beavers. A few rails and waterfowl are found in the river bottoms during fall and spring migrations. Low densities of game species and lack of access limit hunting, and losses therefore would be low.

The above analysis is based upon the investigations and experience of Bureau of Sport Fisheries and Wildlife biologists who have been active in project planning for more than 20 years. It also is supported by the experience of New Mexico Department of Game and Fish biologists who are intimately familiar with the project area.

If this project enters detailed studies, the Bureau of Sport Fisheries and Wildlife, in cooperation with the New Mexico Department of Game and Fish, will intensively investigate the project and will make more detailed recommendations on means of preventing losses and enhancing benefits to fish and wildlife.

26. Have the claims for benefits to fish and wildlife been checked by a qualified ecologist?

The people who prepared the fish and wildlife analysis for Hooker Reservoir are qualified fish and wildlife biologists. One of them is a Ph. D. in wildlife management. Others who contributed to the study at both State and Federal levels have graduate training in fish and wildlife ecology.

27. As planned, the Hooker Reservoir would encroach on the Gila Wilderness and Primitive Areas, and in doing so would be destructive of habitat for the native flora and fauna, thus altering the native ecology which it is the function of these areas to preserve. Are the benefits claimed for "fish and wildlife" adequately discounted for this negative effect?

As indicated in the answer to question No. 25, there were no benefits to wildlife. Benefits to fishing were derived after consideration of losses. None of the sport fishes in the project area are native species. In addition, the aquatic habitat appears to have changed over the years as a result of changes in precipitation and the impact of past land use. There also have been changes in wildlife species and their abundance which cannot be specifically identified. It generally appears that the project site does not maintain an undisturbed native flora and fauna.

28. What is the meaning of "wildlife" as used in the claims for benefits from the Hooker project?

"Wildlife" as used in the Bureau of Sport Fisheries and Wildlife's report referred to the big game, upland game, fur animals, and wildlife referred to in question No. 25. Wildlife includes all vertebrate animal life other than fishes, but the wildlife other than those listed above usually are not susceptible to economic evaluation; however, it recognizes them and their importance in its investigations.

29. How could Hooker provide benefits for wildlife under any definition of the term?

Other than for waterfowl, Hooker Reservoir does not provide benefits to wildlife; rather there are minor losses as stated in the answer to question No. 25.

30. What is the meaning of "fish" as used in the claims for benefits from the Hooker Project?

Fish include all finned vertebrates. Although only those brought to creel are mentioned, the non-game species were considered in the analysis. There was no important loss anticipated for non-game species.

31. Is the claim for benefits to "fish" based on prospective improvement of a habitat for native water animals, or does it refer to improve facilities for stocking sport fish for "put and take" recreational fishing?

Benefits for fishing are based upon both improvement of habitat and stocking of fish. Incidentally, there have been so many introductions of fishes in this area that it would be difficult to define native water animals. There would be an initial stocking of warmwater species in the reservoir. These fishes would be expected to be self-perpetuating. The New Mexico Department of Game and Fish also has calculated annual fish requirements of 46,555 pounds of trout comprising 512,000 6-inch fish in the reservoir, stilling basin, and downstream; 900,000 3-inch fish in the reservoir and downstream; and 1,800,000 1-inch fish in the reservoir.

35. Has the prospective value of the Hooker Reservoir for conventional outdoor recreation and sport fishing been assessed by a qualified expert or experts on these subjects?

Qualified fish and wildlife biologists of the New Mexico Department of Game and Fish and the Bureau of Sport Fisheries and Wildlife participated in the field studies, and their work in turn was reviewed and found adequate by other highly trained biologists. Some of the biologists have had as much as 20 years experience in fish and wildlife management problems on water development projects.

BUREAU OF OUTDOOR RECREATION

22. What is the basis in detail for the benefits claimed for outdoor recreation?
Benefits in the February 1967 report on the Central Arizona Project for outdoor recreation at Hooker Reservoir are those reported in the Pacific Southwest Water Plan of 1964, as follows:

Activities	Visitor-days	Value (per day)	Total
General use.....	30,000	\$0.52	\$15,600
Boating and skiing.....	10,000	.55	5,500
Camping.....	15,000	.50	7,500
Total.....			28,600

The Bureau of Outdoor Recreation is currently making a detailed study of use, costs, and benefits for the Hooker Project. New benefit figures are being developed. Indications are that they will be higher than the above.

23. Are the benefits claimed for outdoor recreation adequately discounted for the negative effect on outdoor recreation which would be caused by the intrusion of the reservoir on the Gila Wilderness and Primitive Areas?

The outdoor recreation benefits displayed above have not been discounted for negative effect. Possible negative effects of Hooker Reservoir resulting from minor intrusion on the existing wilderness are being evaluated by the Bureau of Outdoor Recreation.

24. How would a site for the project, downstream of the Hooker site, compare with Hooker site for conventional outdoor recreation?

Storage downstream from the Hooker site has been considered by the Bureau of Reclamation to be undesirable for other purposes, and no recreation study has been made.

35. Has the prospective value of the Hooker Reservoir for conventional outdoor recreation and sport fishing been assessed by a qualified expert or experts on those subjects?

Recreation resources specialists of the Bureau of Outdoor Recreation are currently making a detailed recreation study of the Hooker Project. This study is being coordinated with the Bureau of Sport Fisheries and Wildlife.

If we can be of further service in this matter, please call on us.

Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

Mr. ASPINALL. I thank the gentleman from Arizona for yielding. He is now recognized.

Mr. SAYLOR. I ask that he yield.

Mr. UDALL. I yield for one further reasonable request.

Mr. SAYLOR. I ask unanimous consent that the Secretary of the Interior be directed to furnish to the committee a copy of a report which was made in 1967 from the chief design engineer, Ralph Charles, with regard to the Conner damsite.

[NOTE.—The Bureau of Reclamation is not aware of any such report as requested. Mr. Ralph Charles also stated that he had not prepared any such report.]

Mr. HOSMER. Reserving the right to object, is that one that—

Mr. SAYLOR. This is again the same river, has nothing to do with the Colorado. It is simply a proposed damsite in the State of New Mexico.

Mr. UDALL. It is a proposed alternate for Hooker Dam, as I understand it.

Mr. SAYLOR. That is correct.

Mr. HOSMER. I withdraw my reservation.

Mr. ASPINALL. Is there objection?

(No response.)

Mr. ASPINALL. Hearing none, it is so ordered.

The gentleman from Arizona.

Mr. UDALL. Mr. Chairman, I do not have too many questions this morning.

I want to say, after consultation with my Arizona colleagues in the House, that we generally approve what you are trying to do in connection with the Fort McDowell Indian Reservation. I hope that you can work this out and submit some language to us which will take care of the rights and needs of that Indian tribe in connection with the construction of Orme Dam. I assume since you were talking the other day in terms of taking 15,000 acres of their territory for this damsite, that the Department is presently contemplating some flood-control component in the Orme Dam which would help to protect the metropolitan area of Phoenix from the kind of disastrous floods they have had in the past.

Secretary UDALL. If we can work out the type of amendment that I am thinking about, the flood control component does not present a serious problem. If we are going to wipe out an Indian reservation without doing what this committee has done so generously with Indian tribes previously, I think you present me then with some very serious choices. We all ought to work on this.

I will be frank to say I am having some difficulty with the Forest Service. I hope that Secretary Freeman will cooperate with me, and I think he will, and that we can work something out. To me, there is a rather simple solution and we have some people spending full time on it. I hope that by the time the subcommittee gets to the conclusion of its markup, we can have an amendment and come and tell you that everyone has agreed upon it. But I may need some help from the Arizona delegation on this.

Mr. UDALL. You will get it. If we can't do it, we will enlist the aid of the gentleman from Florida.

Mr. HALEY. Will the gentleman yield at that point?

Mr. UDALL. I will yield.

Mr. HALEY. Mr. Secretary, you say that is not a wipeout of an Indian reservation in this project?

Secretary UDALL. It is not as bad as the Seneca Indian problem, where the reservation was eliminated entirely. If we use the idea of an easement taking, taking an easement rather than taking the land in fee for the flood-control aspect, and if we can give these Indians a little of the river bottom and upstream, I think we can preserve basically the integrity of the reservation and come in with a solution that would be better in a sense, Congressman, much better than we had with the Seneca Indians.

Mr. HALEY. Well, the Secretary does not propose to allow the Bureau of Reclamation to take the devious methods that were being taken by the Corps of Army Engineers in the Seneca situation, do you?

Secretary UDALL. Congressman, I do not propose that by any means. We can use a newer method and new approach.

The other thing that I propose to do, and I do not think there is any disagreement with the Arizona people on this, is to make the small but fine little reservoir we are creating here into an Indian recreational development. Let us give them the control of the development and make this a benefit to them rather than just taking it away from them, as we did in some of these other instances, by turning the recrea-

tion development over to some other agency. I think this could be a tremendous economic benefit to the Indians and I propose we do it the way.

Mr. UDALL. It would be within 30 miles of a million people where water recreation is in great demand and short supply. I think we could work out something that would really do justice to them and give them tremendous benefits.

Mr. HALEY. I just hope the Secretary will present the program to the Indian Affairs Subcommittee of the House and not let the Bureau go over to this fine hall of justice we have, who, knowing they can't take Indian land, will let them take a flowage easement over the Indian land. Of course, they said that was not taking land, but of course the land is under 100 feet of water and I do not know how you are going to do much farming and that sort of thing. I hope the Secretary will come to the Indian Affairs Subcommittee and let us take a look at the project before it is started.

Secretary UDALL. It is because the chairman of the Indian Affairs Subcommittee has been such a staunch champion of Indian rights and of justice for them that I want him to be particularly satisfied. I have had him in mind in working out this amendment. I want him to know that.

Mr. UDALL. He comes out like a mother bear when one of her cubs is threatened and we can count on him for that.

Mr. HALEY. I thank the apostle from Arizona.

Mr. UDALL. Mr. Dominy, I know you and the Secretary had considered various alternatives suggested for the Page plant, including buying the power commercially from public or private utilities. The Secretary said the costs would be 30 percent higher if purchased from a public utility and about 60 percent higher if purchased from a private utility. I think you contemplated getting power from the Page plant at about 3.5 mills?

Mr. DOMINY. That is about right on the average. It would be about 3 mills for irrigation and 5 mills for municipal and industrial water. It would average out to about 3.5 mills per kilowatt-hour.

Mr. UDALL. For the record, I would like to have you translate this into dollars if you have a figure. I was given a rule-of-thumb figure that, for every increase of one mill you had to pay for that power, you would deprive the development fund or the repayment revenues of about \$2.5 million a year.

Mr. DOMINY. We can do that for the record, Congressman. I don't have it in mind.

Mr. UDALL. I ask unanimous consent that that figure be placed in the record at this point.

Mr. JOHNSON (presiding). You have heard the request of the gentleman from Arizona.

Are there objections?

(No response.)

Mr. JOHNSON. If not, it is so ordered.

(The material referred to is as follows:)

With the average cost of energy of 3.5 mills per kwhr. as now contemplated for the Federal share of Page powerplant under the prepayment scheme, an added cost of 1 mill per kwhr. would increase the cost of project power by \$2.5 million per year. Over a 50-year period this amounts to \$125 million.

Mr. UDALL. On the hydrology question, both you, Mr. Secretary, and Mr. Dominy indicated that the hydrology figures you are using in planning and evaluating the central Arizona project see reasonably accurate and highly reliable even back to 1906.

Is this correct, Mr. Dominy?

Mr. DOMINY. Yes.

Mr. UDALL. To put it in focus, I should say that we are really talking in terms of degrees of reliability here in considering these different periods and the different factors that we have to estimate the water supply. I suppose there has been some refinement in hydrology techniques in the last 50 years; but, has there been any basic change in the method of determining the flow of the river?

Mr. DOMINY. No, sir; the refinement basically is just more years of record and more gaging stations at more different places on the system.

Mr. UDALL. To use a homely analogy: if I wanted to measure speed, I could, (a) use my old Ford speedometer, which is accurate to within 5 or 6 percent, I suppose, or, (b) get a brand new speedometer carefully calibrated, or, (c) get Massachusetts Institute of Technology, with laser beams and what not within a thousandth of 1 percent, perhaps. But, as I understand it, you are saying that, while the 1906-1922 figures are less reliable, perhaps, than the very latest ones because of these factors you mentioned, they are nevertheless as reliable as my old speedometer.

Mr. DOMINY. I think you have a very good analogy. I think this is right.

Mr. UDALL. If those 1906 to 1922 figures are off, isn't it just as likely that they are off on the low side as the high side?

Mr. DOMINY. This is correct.

Mr. UDALL. There may have been even more water during those years?

Mr. DOMINY. A marginal error, plus or minus.

Mr. UDALL. Once in a while, I see the implication that you are somehow using a brandnew kind of hydrology to justify the central Arizona project. I want to ask you this question: Have you used the same technique and the same figures, as they were available for the central Arizona project, as you used for the Colorado River storage project for San Juan-Chama, for all of the Upper Basin projects, all of the Utah projects, Dixie and the other reclamation projects in the Colorado River Basin?

Mr. DOMINY. That is absolutely correct, and we are plowing in the longest period of record, which includes a long period of dry years.

Mr. UDALL. Is it not true that any engineer in a water project does exactly what you did, that is, use the longest period formula?

Mr. ASPINALL. I think, if my colleague will yield, that is a misleading question, because two or perhaps three other prominent engineering firms have used some other formula. I think you should confine that question to the Bureau of Reclamation.

Mr. UDALL. I am trying to get, Mr. Chairman, at a very narrow point. I remember a rainfall in my area of 5 inches in 24 hours. This was 30 or 40 years ago. It has never happened since.

But would not any engineer, if he had an accurate record of such an event that took place, assume that it is going to happen again sometime?

Mr. DOMINY. He would have to plow it into his projections for future protection against floods.

Mr. UDALL. This is why we use flood flow frequency analyses whereby we extend the records to encompass the 50-year flood, the 100-year flood, and so forth, in all standard engineering projections?

Mr. DOMINY. This is right.

Mr. UDALL. Now, we have had a lot of talk here in these hearings about spills from Lake Mead and spills from Lake Powell. There is no suggestion that all of the Arizona water is going to come from spills, is there?

Mr. DOMINY. No; indeed not.

Mr. UDALL. The primary factor in regulating Mead is to meet your contract commitments for irrigation down below?

For example, am I correct in assuming that you do not hold water back to provide power needs?

Mr. DOMINY. No, sir. Since Glen Canyon has been completed we have adequate storage capacity to control the river. We release no water at either Glen Canyon or Hoover Dams strictly for power purposes. It is all released on the basis of requirements for diversion.

Mr. UDALL. We will just talk about spill.

I think I made the point when you testified previously on this legislation that the talk about spills emphasizes the importance of adequate sizing of the Arizona aqueduct. The bigger aqueduct Arizona has, within reasonable limits, the better able we would be to take more water and to utilize these spills and to prevent waste?

Mr. DOMINY. That is correct.

Mr. UDALL. And the bigger aqueduct we get, within reasonable limits, the more feasible and more beneficial the project is?

Mr. DOMINY. Yes. The big advantage of the central Arizona project over the average project is that it has a ground water reservoir which will continue in use. You can take water whenever it is available and put it on the surface and thus preserve the underground water for use in the years when there is not much surface water available.

Mr. UDALL. Has it ever been contemplated, in your planning, that the central Arizona aqueduct would have a full supply at all times and that it would always be running full?

Mr. DOMINY. No, sir. All of our projections have indicated that there would be an overall diminution of water supply with time. However, there would be years when water is adequate and there would be years when water is scarce.

Mr. UDALL. Taking all this into account, is it your professional judgment and the judgment of the Bureau that the central Arizona project is an engineeringly feasible project, a financially feasible project and a project that has a very favorable cost-benefit ratio?

Mr. DOMINY. Yes, sir; without qualification.

Mr. UDALL. None of the things that have been brought up in these hearings have shaken your faith in these conclusions?

Mr. DOMINY. No, sir.

Mr. UDALL. I will leave this water supply issue if I may cover one more point.

A person can actually make somewhat less favorable water supply assumptions than you have made and still come out with a feasible central Arizona project, can he not?

Mr. DOMINY. That is correct. We would still have a favorable benefit-cost ratio and a project that would pay out if we took more adverse conditions that have been mentioned.

We might have to make the municipal and industrial water rate somewhat higher under more unfavorable circumstances.

Mr. UDALL. Just to clarify this, let us assume, for a moment, a 4.4 guarantee—and it pains my soul to even assume this for purposes of arguments—but let's assume that California gets this pristine pure, total perpetuity guarantee that has been talked about.

Let's assume that we fully respect the Upper Basin's compact rights as the Upper Basin States develop and agree to give back whatever water we, in the Lower Basin, have been temporarily using. Let's assume there is no augmentation in the river—not a drop. I think this is a very violent assumption, because I am as sure as anything in this life that there will be augmentation.

Let's assume the Upper Basin depletion figures that you have used in your calculations are correct and assume a repetition of the 1922-1967 water cycle. Surely, we would have something less than a full aqueduct in those circumstances. We would have a lot less water than we would like to have in those circumstances. But let me ask whether that project would be financially feasible and have favorable benefit-cost ratio in those circumstances?

Mr. DOMINY. With one other assumption, assuming that the Upper Basin met half of the Mexican obligation, yes. This would be a key. Under those adverse assumptions, if they didn't deliver half of the Mexican Treaty, then you would be in trouble. Otherwise, you could have a viable project.

Mr. ASPINALL. Will my colleague yield?

Mr. UDALL. Yes.

Mr. ASPINALL. Will my colleague put into the record at this time the other assumption—the assumption that the Upper Basin will use its water in accordance with its understanding of what its availabilities may be?

Then what would you say, Mr. Dominy?

Mr. DOMINY. I would say you would still have a viable project providing the Upper Basin delivers one-half of the Mexican Treaty obligations.

Mr. ASPINALL. This, I think, is most important because this is the only way, as I see it, that the Upper Basin can support this project. Because the Upper Basin takes umbrage, as I suggested the other day, to the difference between its understanding of its water availability and the Bureau's understanding this last assumption is very important. With this last assumption, I think that we have the complete picture. Unless the Upper Basin has water, we just do not have the whole picture.

I yield back.

Mr. UDALL. I yield to Mr. Saylor.

Mr. SAYLOR. Will you ask the Commissioner whether or not he will also include what the President said in his budget message, that hereafter, all agencies of Government will be required to figure the interest rate not on the 15-year average, but on the interest rate which the Government is required to pay for money at the time of authorization?

Mr. DOMINY. That, Mr. Saylor, is directed not toward the repayment provisions of reclamation law, but to benefit-cost ratio calculations. I am sure that it would reduce the project benefit-cost ratio significantly, but I am confident it would still remain better than 1 to 1, because this project has a high benefit-cost ratio now.

Mr. UDALL. It is 2.6, now, isn't it?

Mr. DOMINY. 2.5 to 1 and I am certain it would still remain well above unity, but it would decrease substantially.

Mr. SAYLOR. The reason I ask that, it will work in this project, but there are many that you have down there that it is going to put at less than 1 to 1.

Mr. DOMINY. I agree with you.

Mr. HOSMER. Will the gentleman yield?

Mr. UDALL. Mr. Tunney had asked me to yield previously.

Mr. TUNNEY. Thank you, Mr. Udall.

I would like also to ask you how much more would California be getting, assuming that the central Arizona project goes through?

Mr. DOMINY. He assumed a 4.4 million acre-feet priority for California.

Mr. TUNNEY. And you assumed that California would get—

Mr. DOMINY. Yes; in my answer I was assuming 4.4.

Mr. HOSMER. Will the gentleman yield?

Mr. UDALL. I yield to the gentleman from California.

Mr. HOSMER. I was assuming that in the 4.4 there would be certain Lower Basin projects that would have inadequate water to supply their capacity in later years.

Mr. DOMINY. In the low water years, certainly. In high water years, California has been using more than 4.4.

Mr. HOSMER. I understand that. But what I am trying to get at is it seems to me there is a cost detriment back there when you consider forgoing use of existing installations that cost many millions of dollars. I wonder if this cost detriment factor has been put into your answer that the cost-benefit ratio would be still above unity?

Mr. DOMINY. Well, no, because under the Supreme Court decision there are certain entitlements to the water on the river.

Mr. HOSMER. But this is in fact a loss, but it is a loss that is not factored into the answer that you have given relative to the cost-benefit ratio?

Mr. DOMINY. It has not been considered, that is right, sir.

Mr. HOSMER. The point, Mr. Dominy, that I am making is you can make any assumptions you want to, but you do not have to take the best assumptions of all to make the CAP feasible? You can take some assumptions that are less favorable and still have a highly feasible project?

Mr. DOMINY. That is right.

Mr. HOSMER. If you do not assume a 4.4 formula or something less than the actual pristine perpetuity guarantee, CAP is even more favorable.

Mr. DOMINY. That is correct, you would have a considerably better water supply over the life of the project if there were a sharing of shortages, for example, under the Riffkind formula or some such pattern.

Mr. HOSMER. I yield back to the gentleman.

Mr. UDALL. Let me ask the Secretary, the Department's testimony and Department's calculations have all been made on the assumption that California will have a 4.4 guarantee. I assume that this does not mean to imply that the Department advocates that or takes the position that California is entitled to it or anything like it?

Secretary UDALL. Our position on that is the same as it was a year ago when we presented our testimony. We assumed this because at one point, at least, there was the appearance that Arizona and California, or at least some of the States, were operating on this as an assumption. We regarded this as something that was primarily a matter, an argument between the two States, to be adjusted and determined by the committee. If it is the view of the Congress that the 4.4 is the right thing to do, we have no objection. If there is some modified position determined upon, we have no objection to that.

Mr. UDALL. Obviously, if the river is augmented, all this argument about the guarantee or about the water supply for the central Arizona project goes out the window; these things become academic, as you say in your statement.

Secretary UDALL. It disappears; that is right.

Mr. UDALL. Mr. Chairman, I have a unanimous consent request.

I have finished with my questions, except to yield to Mr. Haley.

Let me make my request, first.

We are making a record here for the future and some of my Arizona hydrologists and experts are concerned about the modest differences we have in hydrology or in conclusions from hydrology with the Department, or with statements of members here. They fear that my silence here might be mistaken by historians as acquiescence. I would like to ask unanimous consent to file a brief memorandum setting forth some further comments on hydrology and other matters concerning water supply and related matters, particularly dealing with Indian water rights on their lands.

Mr. HOSMER. Reserving my right to object.

Mr. JOHNSON. The gentleman from California.

Mr. HOSMER. Would the gentleman include permission for me to do the same?

Mr. UDALL. Of course, and Mr. Hosmer should have the same right.

Mr. SAYLOR. Reserving the right to object, I oppose the request.

Are these to be statements by the respective members or are these to be statements from other hydrologists and engineers?

Mr. UDALL. I had not reached that point. I was assuming that I would file a memorandum on behalf of Arizona setting forth any modest differences we have in conclusions to be drawn from various water studies, and the figures which our experts tell us are slightly different from those of the Department and those submitted by other members of the committee.

Mr. SAYLOR. Does the gentleman from California have the same thought in mind?

Mr. HOSMER. My thought in mind would be to produce such a statement with or without accompanying authoritative materials as the situation demanded.

Mr. SAYLOR. I withdraw my reservation. I just wanted to know the ground rules on which we might expect these two statements.

Mr. ASPINALL. Mr. Chairman.

Mr. JOHNSON. The gentleman from Colorado.

Mr. ASPINALL. As I understand it, all the gentlemen are asking for is that these be made a part of their own statements.

Mr. UDALL. That is right.

Mr. ASPINALL. I withdraw my reservation.

Mr. JOHNSON. Any further objection?

(No response.)

Mr. JOHNSON. Hearing none, the statements will be allowed to be placed in the record.

(The letter containing the information from Mr. Udall and dated February 7, 1968, follows:)

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., February 7, 1968.

HON. WAYNE N. ASPINALL,
Chairman, Committee on Interior and Insular Affairs, House of Representatives,
Washington, D.C.

MY DEAR MR. CHAIRMAN: On Thursday, February 1, 1968, I requested and received permission to submit for the record comments as to certain matters which I felt were not fully explained in the record. The following comments deal primarily with the suggestion of hydrology and the availability of water for a Central Arizona Project.

Arizona does not subscribe to California's claims of highly efficient utilization of Colorado River Water in the area tributary to the Salton Sea.

In general, Arizona subscribes to the hydrologic analysis presented by the Bureau of Reclamation. However, we believe they tend to be conservative in that the amounts of water hereafter available for use by the Central Arizona Project will be more rather than less than that forecasted by the Bureau of Reclamation.

My only additional comment is to present the latest position of the American Public Power Association with respect to the thermal plant. The following resolution was adopted by the "Legislative and Resolutions Committee" of the APPA at its meeting on January 30, 1968:

"Whereas this Association, at its 24th Annual Conference in Denver, Colorado, adopted Resolution No. 21 endorsing, among other things, the maximum development of hydroelectric facilities at Hualapai damsite on the Colorado River and opposing the substitution of steam generating stations for such hydroelectric generating facilities; and,

"Whereas on August 7, 1967, the Senate of the United States passed and sent to the House of Representatives for its consideration S. 1004, (1) reserving Hualapai damsite for further and future consideration by the Congress; (2) authorizing construction of the Central Arizona Project and various other reclamation projects in Colorado, Utah and New Mexico; and (3) authorizing the Secretary of the Interior to participate in a larger thermal generating unit to provide electric power for pumping water for the Central Arizona Project; and

"Whereas the Committee on Interior and Insular Affairs currently has under consideration various proposals, including S. 1004, H.R. 14834, introduced January 25, 1968, by Congressman Johnson of California for himself and a majority of the California delegation, and various amendments to H.R. 3300, introduced by Chairman Aspinall in the 1st session of the 90th Congress, all of which legislation would defer authorization and construction of Hualapai Dam and would further authorize the Secretary of the Interior to participate in a large thermal generating plant in order to acquire electric power and energy to pump water in connection with the Central Arizona Project; and

"Whereas such legislation, in all probability, will be promptly considered by the House Committee on Interior and Insular Affairs and acted on by the Congress prior to the next annual conference of this Association—necessitating current advice and instruction to the staff and management of this Association as to the Association's present policy in connection with S. 1004, H.R. 14834, other similar legislation and amendments to H.R. 3300 now being considered by the Committee and the Congress: Now, therefore, be it

Resolved, That the present policy of the Association be and is as follows:

"1. The Association continues to approve and endorse the maximum development of the nation's hydroelectric sites as sources for electric power—including sites on the Colorado River—to satisfy the needs of public agencies.

"2. Recognizing that under existing circumstances the authorization and construction of Hualapai Dam as a part of the pending Colorado River legislation is improbable and unlikely in this 2nd session of the 90th Congress, this Association endorses and approves the removal of Hualapai damsite from the jurisdiction of the Federal Power Commission as provided in S. 1004 and other similar current proposed legislation, and approves deferral of authorization of Hualapai Dam and related hydroelectric generating facilities for future consideration by the Congress.

"3. Recognizing the need for large amounts of electric power for pumping in connection with the Central Arizona Project, this Association endorses and approves the participation of the United States in a large thermal generating station pursuant to the general concept and plan provided in S. 1004, H.R. 14834 and other similar proposals now under consideration by the Congress.

Sincerely,

MORRIS K. UDALL.

Mr. UDALL. I yield to the Great White Father of all the Indians, the gentleman from Florida.

Mr. HALEY. That is just what the Great White Father wants to do, protect the Indian people up there. You people in the upper and lower basin are well able to take care of yourselves. As long as we have the assistance of the Secretary, and as I suggest, the junior Senator from New York, I think we may get help for the Indians.

Mr. Secretary, on page 10 of your statement, something disturbs me a little bit. As I understand the history of this compact, what you propose actually in order to take care of all the entitlement of the upper and the lower basin and the Mexican treaty will require approximately 16.5 million acre-feet of water. Is that correct?

Secretary UDALL. Over the long haul, that is roughly correct.

Mr. HALEY. Mr. Secretary, none of your figures, and you go back to 1906—and frankly, I think the only reliable figures that you have here are the figures from 1931 to 1967—but in no place do you or anybody claim that there is even 15 million acre-feet in this river. Is not that what your figures say?

Mr. DOMINY. Yes; we are willing to take that as a factual situation based on the hydrology as we know the river today. We think that the reasonable assumption is 14,960,000 acre-feet average over the next 62-year period. That is why we recognize that unless nature changes and we get better than that on an average in the future, we do need an augmentation program to keep the States that use the Colorado from losing their economic base.

Mr. UDALL. The difference, Mr. Dominy, between the 14.9, which is almost 15, and the 16.5 figure that my friend used, is almost precisely the amount of water that the 48 States gave to Mexico during World War II as part of the Mexican treaty, is it not?

Mr. DOMINY. This is correct. It actually takes about 1,890,000 acre-feet a year to supply the million and a half to Mexico, considering the losses associated with delivering it.

Mr. HALEY. I understand all of that. However, we do have a treaty with Mexico that guarantees the delivery of a certain amount of water. Isn't that the law of the river, that you have priorities in it?

Mr. DOMINY. Yes, sir; this is perfectly normal to have compacts and international agreements.

Mr. HALEY. Wouldn't the treaty between the U.S. Government and the Government of Mexico override any State laws?

Mr. DOMINY. Yes, sir; it has the first right.

Mr. HALEY. Well, that is fine. So actually, what you are going to have to do, and you might as well face up to it, you have to go somewhere else to steal enough water to meet the commitments down there. There is only one place you can get it, as I see it. And that is the Columbia River. Let's not kid ourselves that when you start this project you are going to have to eventually go over someplace and steal the water from someplace else—maybe not at the moment.

Mr. Secretary, I just want to ask one more question, and I realize this is probably a little frivolous. But on the Indian reservations, the various Indian reservations, they have a right for diversion of 905,496 acre-feet of water. That is spread over California, Arizona, Nevada—those are the only States affected.

Mr. Secretary, do you consider these rights superior to any other rights, with the exception possibly of the rights of the Government of Mexico.

Secretary UDALL. They are superior to every right that is dated after their right. They are among the oldest, of course, on the river. I am not so sure that the Indian rights as such—that is a legal question—would not take precedence over the Mexican treaty commitment, unless the Congress itself may have directed otherwise.

Let me nail this down. I will ask Mr. Weinberg: did not the Supreme Court say, as the basis of its decision on this point, that there was a presumption when Congress created each one of these Indian reservations that the Congress then and there gave them the right to enough water as of that date, to cover every irrigable acre on the reservation?

Mr. WEINBERG. Yes; that is the basis of the right. That is why their priority dates back to the establishment of the reservation and that priority exists even though they are not using the water at the present time.

Mr. HALEY. There would be no obligation on the part of these Indian tribes entitled to these rights, there would be no obligation on their part to return anything to the river, is that right? I mean if they want to use the water. In here somewhere—I don't see it right now—it is stated that so many acre-feet presumably would be returned to the river. But they don't have to do that.

Secretary UDALL. I want to assure the Congressmen that these Indian tribes that have this water right—the Colorado River Indians near Parker are a good example—have some of the most valuable farming land in the United States. We have had a very aggressive program over the last 3 years in putting thousands and thousands of new acres into production. We are moving right ahead on this. But any wisely managed irrigation practice means that there are return flows. You have to drain water off or your land gets waterlogged. Therefore, I think that in any formal assumptions concerning agricultural operations there has to be a return flow.

Mr. HALEY. I am well aware of the fact, Mr. Secretary, that water rights in the Western States, in my knowledge of that, water rights are more valuable, sometimes, than land, because if you happened to have some land and did not have water rights, you probably could not do anything with it. So it is the view of the Department, Mr. Secretary, and if you want to have your legal counsel submit a brief or statement for the record so there will be no doubt that these rights of the Indians on that river are superior to any rights or if they are not, say who has the prior right.

Secretary UDALL. I cannot think of any parties having a prior right because most of these Indian reservations date back to the 1860's or 1870's. The earliest non-Indian irrigation, the Palo Verde project, in my recollection was in the 1890's. There may be a few exceptions, but most of the Indian rights are prior water rights in terms of the river.

Mr. HALEY. They go back to 1856 and then move up to 1873, 1874, 1890, 1894, 1907, 1917.

Secretary UDALL. I think we ought to be precise on this. I know the Congressman wants to make a clear record. I would like to submit something on this myself so that it will be in the record at this point that would answer the question precisely.

Mr. HALEY. Mr. Chairman, I ask that that be made a part of the record at this point when received.

Mr. JOHNSON. You have heard the request of the gentleman from Florida, Mr. Haley; is there objection?

Mr. SAYLOR. Reserving the right to object, Mr. Chairman. I will not object.

Mr. Secretary, could you enlarge that information to include not just the Indian reservations in the Lower Basin, but also the Indian reservations and their rights in the Upper Basin?

Secretary UDALL. Yes.

Mr. SAYLOR. Because while they were not affected in the case between Arizona and California, I think your lawyer would tell you the same law would apply if the case got back to the Supreme Court again.

Secretary UDALL. I think that is true.

Mr. JOHNSON. Is there any other objection?

Mr. SAYLOR. I withdraw my reservation.

Mr. JOHNSON. It is so ordered.

(The material referred to follows:)

As presented in our prepared statement, in March of 1967 the Solicitor General of the United States filed the following list of claimed Indian "present perfected rights" for the Lower Basin pursuant to Article VI of the Supreme Court Decree in *Arizona v. California*:

PRESENT PERFECTED RIGHTS FOR INDIAN RESERVATIONS IN WATERS OF THE MAIN STREAM OF THE COLORADO RIVER¹

Indian reservation	State	Diversion acre-feet	Net acres	Priority date
Yuma.....	California.....	51,616	7,743	Jan. 9, 1884
Fort Mojave.....	Arizona.....	27,969	4,327	Sept. 18, 1890
	do.....	68,447	10,589	Feb. 2, 1911
	California.....	13,698	2,119	Sept. 18, 1890
	Nevada.....	12,534	1,939	Do.
Chemehuevi.....	California.....	11,340	1,900	Feb. 2, 1907
Cocopah.....	Arizona.....	2,744	431	Sept. 27, 1917
Colorado River.....	do.....	358,400	53,768	Mar. 3, 1865
	do.....	252,016	37,808	Nov. 22, 1873
	do.....	51,886	7,799	Nov. 16, 1874
	California.....	10,745	1,612	Nov. 22, 1873
	do.....	40,241	6,037	Nov. 16, 1874
	do.....	3,760	564	May 15, 1876
Total.....		905,496	136,636	

¹ According to the terms of the decree, the quantity of water in each instance is measured by (i) diversions or (ii) consumptive use required for irrigation of the respective acreage, and for satisfaction of related uses, whichever of (i) or (ii) is less.

There are no comparable judicial determinations of quantitative water rights or irrigable lands for Indian Reservations in the Upper Basin. Article XIX of the Upper Colorado River Basin Compact of 1948 states "Nothing in this Compact shall be construed as: (a) Affecting the obligations of the United States of America to Indian tribes; * * *" The Indian Reservations in the Upper Basin are as follows:

Indian reservation:	State	Indian reservation:	State
Navajo -----	Arizona.	Southern Ute -----	Colorado.
Do -----	New Mexico.	Ute Mountain -----	Do.
Jicarilla -----	Do.	Uintah -----	Utah.
		Uncompahgre -----	Do.

Mr. HALEY. I yield back to my colleague.

I think if he has any further questions, he had better go ahead and take his time.

Mr. UDALL. Mr. Chairman, in the words of my great Indian colleague from Florida, I have spoken.

Mr. JOHNSON. Mr. Secretary, I want to say I did take in the Prayer Breakfast this morning. The Prayer Breakfast and all its activities were over in time, but there was a slight traffic congestion and I thought we would never get out of there once we got started. I do thank the chairman for taking over and utilizing the time of all you people here. They prayed and I prayed, too. I had in mind the meeting that was taking place in this room when I prayed.

Mr. HALEY. I hope the chairman prayed for the water users in Arizona, too.

Mr. JOHNSON. I wanted to hear what the gentleman from Arizona would say. I did get here in time to hear him say that even with California getting their 4.4, he thought there was only one thing standing in the way of that and that was augmentation. I think we might put this in the bill that while we are waiting for augmentation in California, we will be taken care of.

Mr. UDALL. My silence should not be deemed as acquiescence.

Mr. JOHNSON. The gentleman from California, Mr. Hosmer.

Mr. HOSMER. Mr. Secretary, the State of Arizona went out and got itself a study on the feasibility of going it alone, a do-it-yourself State project for the central Arizona project. That report indicated that such a project was financially feasible. The State as a matter of fact, proceeding upon it, has made application for certain power dam sites along some of the rivers, has held discussions with financial people in Wall Street relative to getting the money; the State legislature has in fact acted, authorized certain of the agencies within the State to go ahead with the project.

Do you have any objection to Arizona going ahead with a do-it-yourself project on a State basis?

Secretary UDALL. There has been a lot of discussion in the State in the last 2 years on this. The legislature has taken action. It is very obvious to me, as I said yesterday, that there is a determination, a rather fierce determination in Arizona, that one way or the other, they are going to have a water project. I am convinced if the State is willing to pay the price, that it could achieve that if the Congress finally and conclusively indicated that there was no possibility of Arizona having what all the other States on the river have, a Federal project to put its water to use.

I would quickly add there are many obstacles. Some of them that they have to jump over are higher than I think the Arizona people realize.

I think their assumption, for instance, that they could key such a project to Marble Canyon Dam or Hualapai Dam has some quicksand in it. And I think because of the added costs——

Mr. HOSMER. They are going to find out if, under the circumstances you have mentioned, whether or not you would be one of those roadblocks to such a project.

Secretary UDALL. I would think, Congressman, we are getting into a very "iffy" situation. I think this Congress is going to act.

Mr. HOSMER. I think so, too, but I am trying to get an evaluation of the proposal from your standpoint whether you would stand in its way or not.

Secretary UDALL. For me to say what I would do or for me to even assume that I would be Secretary at that time that came up gets into an "iffy" situation. Generally speaking, I think if the Congress in its wisdom said no project and Arizona was determined to go, in order for the Federal Government to be fair and to do justice, it ought not to unnecessarily obstruct such a project if the State were willing to pay the price and do the things that were necessary.

Mr. SAYLOR. Mr. Chairman, point of order.

Mr. JOHNSON. The gentleman from Pennsylvania.

Mr. SAYLOR. Mr. Chairman, on behalf of the committee, I would hope my colleague from California would remove from the record the implication that the present Secretary of the Interior is a roadblock. He and I have had our differences, violent differences. But I have never considered him a roadblock.

Mr. HOSMER. Well, I have not considered him a roadblock in all senses myself. I was asking him specifically about a hypothetical situation, as to whether he would under those certain assumptions constitute himself a roadblock to what appears to be somewhat of a fervent desire in Arizona for a do-it-yourself project.

Mr. SAYLOR. I would hope, Mr. Chairman, that the gentleman from California would use a more descriptive adjective for the Secretary than a roadblock.

Mr. HOSMER. I think I also used the term "barrier."

Mr. BURTON of Utah. Would the gentleman yield?

Mr. HOSMER. I yield.

Mr. BURTON of Utah. Wouldn't you think a more appropriate term would be "detour?" After having gone through Marble Canyon and Hualapai and now to steam generators.

Mr. HOSMER. After the rough going of the past 2 days, I don't know whether "detour" would be better than "barrier" or not.

Mr. JOHNSON. I am wondering if the gentleman from California would use the wording there, would you be in opposition to Arizona?

Mr. HOSMER. Cumulatively, I would be delighted to.

Mr. JOHNSON. Would you have any objection, Mr. Secretary, to that?

I do think you are on record as opposed to the dams in the river.

Secretary UDALL. I would think, myself, if Arizona were forced to another alternative, it would have to key to a steamplant solution something like the Page plant. This is very clear to me as a practical matter if it wants action, rather than have a 10-year argument before the Federal Power Commission, for example, and lose it.

But on the other hand, I think that there are ways that this could be accomplished. I think the State would probably have to have, realizing that the whole State and its economic system would benefit from water, a statewide ad valorem tax or a tax of some kind imposed on at least the counties that would benefit from a water district. They could accomplish this and they could have a project. The water would be much more costly. It would put Arizona in the position of having to go to a much more costly solution than any other State on the river. I don't think that is right, I don't think it is fair.

But if they were put to it, I think Arizona would do this. That is what I would advocate if I were an Arizonan that had a vote on it.

Mr. HOSMER. As long as we are quibbling about semantics, I would like to direct your attention to page 10 of your statement in connection with the 4.4. You use the term "California priority." The gentleman from Arizona, Mr. Udall, has spoken in terms of a guarantee.

Isn't this rather a shortage formula? Does it not put the burden first of any shortages because of CAP diversions on California and then at a point shift a share of the shortages to Arizona?

Secretary UDALL. Well, Congressman, there are two strong arguments. California has one, Arizona has the other. The committee is simply going to have to evaluate them. I am glad we can sort of toss it back to you and step aside on this one, because California on the one hand can say that it has put works in place and that it is entitled to have its uses that are keyed to these works protected.

On the other hand, Arizona very strongly feels in terms of equity and justice that for the Congress at California's behest to take away water that was given to Arizona by the U.S. Supreme Court is not right and fair. There you have the argument and I do not propose to get in the middle of it.

Mr. HOSMER. Could it not be, and is it not truly, a shortage formula?

Mr. UDALL. Would the gentleman yield?

Mr. HOSMER. I ask Mr. Dominy.

Secretary UDALL. My people say yes. I suppose it is in a sense a way of dealing with a shortage.

Mr. DOMINY. Certainly, if there is enough water for everybody, there is no objection to their taking it.

Mr. UDALL. Will the gentleman yield?

Mr. HOSMER. Yes.

Mr. UDALL. I also believe the term "priority" is more accurate than "guarantee." We have lapsed into using that term. It is a shortage-sharing formula, if you want to call it that.

Mr. HOSMER. Carrying forward this question about the Indians and recalling that you, I think, initiated withdrawal of the Hualapai Dam, how is the morale of the Hualapai Indians these days?

Secretary UDALL. Well, quite naturally they are not happy. They would like to see their resources developed. But we just have to find some other ways of helping this tribe at the present time.

Mr. ASPINALL. Will my colleague yield?

Mr. HOSMER. Yes.

Mr. ASPINALL. My colleague is not suggesting that there is any question about Federal relations with the Indians, is that right?

Mr. HOSMER. That is the way it appeared to me. The Indians came out second.

There are certain provisions in this bill with respect to transmission lines, power. It occurred to me that almost every time we have had one of these bills, there has been some hassling about transmission line problems and I suppose in this case, the same bears true, does it not?

Secretary UDALL. I do not see any serious transmission line problems. Our only problem presented by this bill is that we are going to have to get a substantial quantity of power from the Page plant to the place where we have to use it for pumping.

Now, we already have a transmission net. It is beginning to be merged together more and more, which it should be. I think we will just let the engineers decide this. This is the way we are making the decisions on powerlines, what the best way to do this is.

Mr. HOSMER. And I suppose that the Secretary would have no objection if approximately the same principle and procedures that were included in other priority authorizations of this type with respect to transmission lines would be included—

Secretary UDALL. With regard to the Upper Colorado project as an example, I would not think so. We work so well together now that we have the WEST organization, I think I can say to you I do not see any problems. If you want to put the Upper Colorado formula in, I think that is fine.

Mr. HOSMER. Back to the Indians, you submitted a figure of 905,496 acre-feet of present perfected rights of the Indians in the lower basin. Mr. Aspinall subsequently obtained unanimous consent to put in an estimation that had it only about half as big—546,544 acre-feet.

I wonder if your figure includes the diversion—

Mr. DOMINY. I think so. The first figure is the diversion and the later is the consumptive use.

Mr. HOSMER. Thank you.

Now, those diversions were calculated in your formula using the Blaney-Criddle method of converting those, were they not?

Mr. DOMINY. That is correct.

Mr. HOSMER. I wonder if it would be possible for the Bureau to furnish their tabulations for diversion and return flow, measured and unmeasured, and consumptive use for each of the projects in the Lower Colorado River Basin for the past 10 years?

Mr. DOMINY. Yes, if the committee wishes that information, I am sure we can work it up.

Mr. HOSMER. Mr. Chairman, I ask unanimous consent that the Bureau be permitted to furnish that.

Mr. JOHNSON. You have heard the request of the gentleman from California.

Is there objection?

Hearing none, it is so ordered.

(The material referred to follows:)

The information requested is available in full only for the Colorado Indian Reservation in Arizona. Information on measured diversions only is available for the Cocopah and Yuma Indian Reservations. As no lands are irrigated on the Ft. Mohave or Ohemehuevi Indian Reservation nor on the Colorado River Indian Reservation in California, the requested information is not pertinent.

For the Colorado River Indian Reservation in Arizona, the following are records of diversion, measured return flows, irrigated area, estimated consumptive use and estimated unmeasured return flows. It will be observed that in this 10 year period the average annual diversion per acre is nearly twice that granted by the Supreme Court in *Arizona v. California*. This over diversion of water results in a very large measured return flow.

COLORADO RIVER BASIN PROJECT
COLORADO RIVER INDIAN RESERVATION, ARIZ.

Year	Acreage irrigated	Measured diversions	1,000 acre-feet		
			Measured return flows	Estimated consumptive use ¹	Water unaccounted for ²
1957.....	31,041	320.9	159.1	124.2	37.6
1958.....	31,381	367.5	208.8	125.5	33.2
1959.....	30,471	378.0	212.5	121.9	43.6
1960.....	30,616	412.8	227.4	122.5	62.9
1961.....	30,755	438.6	267.7	123.0	47.9
1962.....	31,710	466.8	288.6	126.8	51.4
1963.....	31,008	484.5	298.5	124.0	62.6
1964.....	31,998	455.7	275.7	128.0	52.0
1965.....	31,940	414.6	253.1	127.8	33.7
1966.....	36,919	461.7	259.8	147.7	54.2

¹ Using value of 4 acre-feet for acre irrigated.
² Unmeasured return flow plus phreatophyte losses.

For the Cocopah Indian Reservation in Arizona and the Yuma Indian Reservation in California the diversions and return flows are encompassed in the records for the Yuma Project which include both Indian and non-Indian lands. For the past three years the diversions by these reservations have been determined to be as follows:

[In thousands of acre-feet]

Year	Diversions	
	Cocopah, Ariz.	Yuma, Calif.
1964.....	2.9	43.5
1965.....	2.7	39.9
1966.....	3.7	47.3

Mr. HOSMER. Mr. Secretary, late in your statement, around page 24, you alleged that with the existing system of large storage reservoirs there is no utilizable water from the Colorado River escaping to the sea. Early in the paper, around page 5, you said even during the earlier years, there will be dry periods when low river flow will decrease pumping requirements with the CAP.

I am wondering in the context of all the storage you have on the river, why the variation in the water supply could not be handled on the basis of storage regulations so you pump the same amount of water in CAP each year?

Mr. DOMINY. May we have that chart that shows the annual fluctuations of the Colorado River? If we could operate in terms of average over a 62-year period of hydrology and assume we would have that average at any given time, then we could assume a constant even flow in the aqueduct. Unfortunately, you can see the wide disparity on an annual basis of the flows of this river. We talk about the droughts since the thirties on the Colorado River, but, as you can see, even there we have years that are well above the median.

The high years are not grouped in consecutive periods. That is what is needed to fill the big reservoirs to provide carryover storage.

Mr. HOSMER. In short, the annual variations may be so great as to—

Mr. DOMINY. That is right, the reservoirs have to be designed for long cyclical periods of drought.

Mr. HOSMER. I understand in connection with the sizing of the CAP at 2,500 cubic feet per second, there was a considered need in some

years to pump more water than in others to average out at 1.2 million acre-feet per year.

Mr. DOMINY. That is correct. You have a project with ground water capable of variable use. When you get good years, you would curtail pumping. In dry years, you would increase pumping.

Mr. HOSMER. If you did not have that problem, you could size it at 1,800 cubic feet per second with a steady flow every year?

Mr. DOMINY. Yes; if we had certain water assured at all times we could design a smaller canal and still get the same amount of water.

Mr. HOSMER. But you size it at 2,500 so it takes into account fully all annual variations in your chart and projections.

Mr. DOMINY. I cannot say fully, because we could even justify an aqueduct larger than 2,500 cubic feet per second under certain assumptions. But 2,500 cubic feet per second does a lot better in capturing water for the project than would an 1,800-cubic feet per second aqueduct.

Mr. HOSMER. That size is calculated to provide an average of 1.2 million acre-feet—

Mr. DOMINY. This is essentially so.

Mr. HOSMER. To the CAP project, which is the CAP's project requirement.

Mr. DOMINY. This is correct.

Mr. HOSMER. So that is a correct figure for the CAP?

Mr. DOMINY. I think it is an adequate figure; yes, sir.

Mr. HOSMER. Now, on the matter that you mentioned 2 days ago, Mr. Secretary, relative to the basin fund on page 10 again of your testimony—pages 8 and 9—there is a figure of a total of \$38 million annual contribution. Would you explain just what that figure is?

Mr. DOMINY. Yes, that is the Hoover-Parker-Davis power revenues after payout, \$14.5 million, and revenues from the Arizona-Nevada portion of the Pacific Northwest-Southwest intertie after payout, which would be \$5,200,000. The central Arizona project revenues after payout, assuming a municipal-industrial water rate of \$56 an acre-foot would put \$18,300,000 into the account, for a total of \$38 million.

Mr. HOSMER. That is the amount that you calculate as sufficient to insure the financial stability of the project?

Mr. DOMINY. Well, as the Secretary testified—

Mr. HOSMER. I mean—not to Arizona, the \$18.3 million.

Mr. DOMINY. As the Secretary testified, the central Arizona project with a \$56 municipal-industrial rate does not need assistance from the basin account in and of itself.

Mr. HOSMER. And that would leave the basin account revenues then applicable to augmentation if this or subsequent legislation so provides?

Mr. DOMINY. Yes, it could be so.

Mr. HOSMER. These revenues without these special provisions in these laws, they would just go straight to the U.S. Treasury without earmarking?

Mr. DOMINY. Except for the Hoover revenues. We would have to have legislation to handle those after payout.

Mr. HOSMER. By legislation now, where do the Hoover revenues go?

Mr. WEINBERG. They go into a special fund to be available for water development throughout the Colorado River Basin. They do not go into the general fund, though.

Mr. HOSMER. Except for the provision of law they would go into the Federal Treasury?

Mr. WEINBERG. Yes.

Mr. DOMINY. It would also be true that there could be reduced rates for the central Arizona project after project payout. If you had no provision in law for a basin account for revenue purposes for additional projects, then there would be no justification for continuing the municipal-industrial rate at \$56 after payout. The users certainly would want to reduce it down to their operation and maintenance requirements.

Mr. ASPINALL. Will the gentleman yield?

Mr. HOSMER. Yes.

Mr. ASPINALL. As I understand it, this figure of \$500 million came from the annual Hoover-Parker-Davis report which is based upon an increase in the cost of power from the present rate of 2.46 to approximately 4. Is that not correct?

Mr. DOMINY. This is based on raising Hoover production to a 4 mill rate and continuing Parker-Davis at the present level of about 4.7 mills.

Mr. HOSMER. Now, the pumped storage projects and the other science fiction features of your testimony, were they dangled before us as just possible things that we might look at, kind of a shopping list of cash registers for river augmentation?

Secretary UDALL. Well, I would put them in two categories, Congressman. I personally am willing to be a little bit of a prophet and predict that we might very well find that the Mexican treaty obligation ultimately will be fulfilled by a combination of weather modification and desalting. I do not think that is too much in the fictional category.

As far as pumped storage projects of the kind I am talking about, these are very vital and necessary features of highly integrated modern electric power systems. I would think they would serve two purposes: one, they would be peaking facilities for the entire electric power grid, and number two, they might very well be an attractive source of funds for an augmentation project.

Mr. HOSMER. But they are not a part of the legislation before us.

Secretary UDALL. No, sir. We simply discussed them in our testimony because the chairman in his letter, very wisely I think, asked us to. I think that the pumped storage technology is not something that engineers are dreaming about. It is in existence. It is proven.

Mr. HOSMER. But insofar as augmentation is concerned, they would be a cash register feature rather than a—

Secretary UDALL. That could be considered, yes, sir.

Mr. SAYLOR. Will the gentleman yield?

Mr. HOSMER. Yes.

Mr. SAYLOR. It seems to me when you refer to some of his science fiction features, it comes with rather poor grace from the ranking Republican member of the Joint Committee on Atomic Energy, who has developed more science fiction than any other Government agent in all history.

Mr. HOSMER. And also more science fact.

Mr. SAYLOR. That is a matter of opinion, only of the Joint Committee on Atomic Energy.

Mr. HOSMER. Let's develop this theme.

Mr. Secretary, in your statement 2 days ago, as I understand it, you stated that the desalting features that you describe were based on 1995 desalting technology and on 1995 atomic electricity technology. Would you explain what desalting technology you are contemplating in this period?

Secretary UDALL. Congressman, this does involve a great deal of guesswork. I am sure the idea was to put this in as a basis for assumption. There is much more speculation with regard to that than there is as to the feasibility of a pumped storage project of the kind we describe. I know there is some skepticism on this committee, which may be well founded—

Mr. HOSMER. I am not exactly skeptical. I am just wondering what you are doing. So far, we have been brute forcing and in order to get an additional amount of desalted water, you have to put in an additional unit. I was wondering if you had some breakthrough in mind that would overcome that?

Secretary UDALL. Quite frankly, the big breakthrough in desalting is going to be your Bolsa Island project. When we get that completed and in operation, I think we are going to be fairly well grounded in projecting whether we can then move to larger sizes of nuclear reactors in desalting and get further reductions in cost.

All the engineers think this will be the case. But let's get Bolsa Island in operation and then we will know. That is the reason I may be a little more conservative than the Bureau of Reclamation engineers who prepared this reconnaissance study, because I feel I would be a little more sure about projections, and I am sure they would, if we had a large plant in operation. There is no such plant in the world. This is going to be the first one. Let's get it in operation and then we will know.

Mr. HOSMER. Leaving the desalting technology for a moment, insofar as the nuclear technology is concerned, did you say you were assuming that it would be such in 1995 that you would be getting two mill power?

Secretary UDALL. Well, the Congressman is a member of the Joint Committee on Atomic Energy. I would really defer to your judgment on this as to what kind of reactors we are going to have in 1990 and whether the fast-breeder technology will be perfected. I do not want to pretend to be an authority on this.

Mr. HOSMER. No, but you have made this nice feasibility study or reconnaissance study based upon some assumptions and I am trying to find out if there is a two mill power assumption. I may think you can go down to a half mill, maybe.

Mr. DOMINY. This is based on the atomic energy people's assumptions that we would have fast breed nuclear reactors in the period 1990-95. It was also based on the salt water research people's judgment that we would have improved in the water plant, including the multi-stage flash evaporators and converters and we would have better heat transmission facilities in the next 25 years.

Mr. HOSMER. Of course, there is an alternative, as you understand. What you do is instead of desalting sea water, is to break it down into its components of hydrogen and oxygen at the sea. Then you, through a pipe, send the hydrogen to Arizona, say, and make sale of the oxygen. Then in Arizona, you burn the hydrogen and the smoke is water and use the heat for Arizona's factories and the water for its farms. Dis-

cussing that with the Atomic Energy Commission, I understand it would require about one mill power.

Secretary UDALL. Congressman, I have the feeling the oxygen might be needed for breathing in southern California.

Mr. HOSMER. I think you just got yourself a triple purpose project which also solves the smog problem.

At any rate, I understand that one mill power will do this and that the saving on pumping costs between liquid and gas over these long distances might make the idea economically feasible.

Another thing along this line, at the present time, at the University of Arizona at Tucson, Dr. Norman Hillberry and some of his associates are speaking seriously of the application of underground engineering to the Arizona water problem. By underground engineering, we mean the use of nuclear explosives beneath the ground for a number of purposes. In Arizona, the first purpose would be to create large underground catch basins, where a more efficient recovery of rainfall could be obtained. The second purpose would be for fracturing conduits so that the collected underground water could get into the aquifers. The third purpose would be, like up where you have that secret water bank in the Chino Valley or wherever it is, to fracture that underground volcano cavity so that the millions of acre-feet of water could get out into your aquifers and the underground reservoir level would be reduced at the same time and thereby provide capacity to receive fresh rain waters.

You did not discuss those in your submission, but would they be possibilities?

Secretary UDALL. Congressman, this is very advanced thinking. I have asked my scientific people, within the last 2 or 3 weeks, in relation to the water pollution control program, if it would be feasible to use the plowshare program. For example, where very saline water gets into water systems, would it be possible to force it underground or desalt it.

Well, the geologists are giving a lot of thought to what you might do with the plowshare program.

None of us really know. I have not talked to any geologists in my Department that really know. I think the most interesting thing is that with the peaceful uses of atomic energy, maybe we can come up with some solutions. We are just beginning to consider them. Project Gas Buggy is the first one.

We hope to put together an oil shale project, Project Bronco, to see what the application may be made there.

I would not venture to say where plowshare will lead us, what we will be doing 30 years from now. It may be a very exciting future. It may be that there are problems that make it not as promising. But I would not want to discuss it in any other than that context here.

Mr. HOSMER. I understand that, Mr. Secretary. But I am optimistic that these techniques will, in fact, make a substantial increase in available water supply.

Secretary UDALL. They might; I hope they do.

Mr. HOSMER. I am wondering whether or not we should anticipate it in this legislation, at least by deciding what happens.

Suppose Arizona picks up 3 to 5 million acre-feet of water in this manner. Should that be credited to all the Colorado River or shouldn't it?

Secretary UDALL. This is a broad problem. This committee may be discussing it 25 years from now. I would rather not be drawn into it at this time, because it presents policy questions that none of us has had a chance to seriously analyze. I do not think I could be helpful.

Mr. HOSMER. Well, I was thinking of the possibility that we could see Arizona with a tremendous supply of water within her boundaries, yet the possibility of her six sisters on the river still suffering from a lack of augmentation and so forth I am wondering if this should really be a basin asset.

Secretary UDALL. Congressman, it seems to me that if the plowshare program involving peaceful uses of nuclear energy proves able to augment the underground sources, improve the aquifers, this would probably be true in all States or most States. It would depend on geological conditions. Another problem in the Colorado River Basin would involve use of a development fund to support various projects. Also involved would be the manner of crediting the augmented supply. This is a very broad subject and it will be discussed in the future if the system works.

Mr. HOSMER. Very well. One final question.

On this M & I water, about the biggest customer there would be is Phoenix. Is there any problem about Phoenix actually buying it?

Secretary UDALL. Phoenix and Tucson would purchase M & I water. Tucson has a far more crucial problem than Phoenix. Both, of course, are very much interested in having this augmentation supply for future growth.

Mr. HOSMER. Tucson is?

Secretary UDALL. Tucson has a much more critical problem. Phoenix is in the Salt River watershed.

Mr. HOSMER. But Phoenix uses much more water and if we are going to sell a lot of this at M & I prices, we must at least be questioning whether Phoenix is going to want to pay that.

Secretary UDALL. The Commissioner tells me we already have applications for the supplies that we will be able to provide.

Mr. HOSMER. For whom?

Mr. DOMINY. Phoenix and Tucson both have indicated firm applications for even more water than we think we will be able to supply.

Mr. HOSMER. Would these be under long-term contracts?

And what prices are we talking about?

Mr. DOMINY. We have not, of course, finalized any contractors. This depends on the kind of legislation finally enacted. We have been talking of a \$50 plus per acre foot rate for M & I water.

Mr. HOSMER. I reserve the balance of my time.

Mr. JOHNSON. The gentleman from California, Mr. Tunney.

Mr. TUNNEY. Thank you, Mr. Chairman.

Mr. Secretary, assuming that there is no augmentation water on the Colorado River, and assuming also that the central Arizona project is constructed with 2,500-cubic-feet-per-second capacity, at what year would California go below the 5.2 million acre-feet she is now using?

Mr. DOMINY. We estimate, Congressman Tunney, that as soon as CAP was actually functioning, it would probably get to that point very quickly.

Mr. TUNNEY. It would go below 5 million two?

Mr. DOMINY. Yes, very quickly.

Mr. TUNNEY. I notice somewhere in the record of last year—it disappeared and I have not been able to dig it out—assuming that there is no 4.4 protection to California, when would you anticipate that California would have to share shortages in the lower basin below 4.4?

Mr. DOMINY. Below 4.4, we do not anticipate—

Mr. TUNNEY. Even if the upper basin completes its project?

Mr. DOMINY. You could run into deficiency on the 4.4 along about 1990, or possibly a little earlier.

Mr. TUNNEY. Assuming that you were going to have extensive works construction to, say, import water from some other source, or assuming that you were going to have to build a huge desalinization plant that could make up the Mexican Treaty obligation, how long a lead-time do you think would be needed to either construct the canals or build the desalinization plant?

Mr. DOMINY. From 5 to 10 years leadtime, depending on how far you went to the augmenting source.

Mr. TUNNEY. Five or 10 years?

Mr. DOMINY. Yes.

Mr. TUNNEY. So then if the Congress approved, we will say, the program by 1980, we could then have those works in operation that would supply the additional water by 1990?

Mr. DOMINY. I think this is a reasonable assumption.

Mr. TUNNEY. One of the great problems for water users in the Southwest, especially in Coachella and Imperial Valley is the fact that the salinity of the water is getting worse and worse. Has the Department gone into a study of what the salinity factor will be, assuming that you have development of the upper basin projects and runoff back into the Colorado River?

Mr. DOMINY. Yes, the Geological Survey and Bureau of Reclamation have been monitoring the Colorado River for water quality purposes for a long while. We have made periodic reports as requested by the Congress on this subject. Our judgment at the moment, collective judgment of the Geological Survey and the water pollution people and the Bureau of Reclamation in the Department, would be that with full Upper Basin development the water quality at Imperial Dam would gradually worsen to probably something like 1,400 parts per million of dissolved minerals.

Mr. TUNNEY. Has there been any discussion with the Department of Agriculture or with water users in the area to determine what effect or impact this would have upon crops?

Mr. DOMINY. Yes, indeed. We are considering this all the time and there is research underway on how to prevent adverse effects from happening, and what measures can be taken to prevent the quality from worsening. And, of course, augmentation would have tremendous influence on this, too, if that were to occur.

Secretary UDALL. Congressman, I want to add here just so the record shows this, I know your interest in your problem, because some of your people are, like the Mexicans, the last man on the ditch, so to speak. In our statement 2 days ago, we in effect officially announced that we have decided to set aside and hold in abeyance the determination under the Water Pollution Control Act of salinity standards for the river. The reason we did this is that we do not know all the an-

swers yet. The States, I think quite rightly, raised this as a basic question. I think the whole region has to be much more conscious of the needs for a regimen of water quality management from now on. We have to find ways, if we can through scientific research, of minimizing the deterioration of quality and of maintaining the river.

This is another reason why we feel strongly that ultimately, a desalination project in the estuary of the Colorado River, with the introduction of pure water for blending purposes, may very well be a must and may very well be a fine solution to the problem.

Mr. TUNNEY. Located above what point?

Secretary UDALL. Well, it would be located in Mexico. This is the one we have been studying for a year and a half with the Mexican Government.

Mr. TUNNEY. Where would the water be put into the Colorado River?

Secretary UDALL. Probably above the border with some perhaps blended in at the border.

Mr. TUNNEY. What about the people who are farming just above the border?

Secretary UDALL. Well, it might be put in at a point to benefit them. I am not prejudging that.

Mr. TUNNEY. I don't want to be excessively chauvinistic but I personally am more concerned about American farmers than I am about Mexican farmers.

Secretary UDALL. I would expect you to be.

Mr. TUNNEY. I would anticipate that if there were such a blending, it would take place at a point where it could help American farmers rather than Mexican farmers.

Secretary UDALL. It is not such a problem to begin, for example, at Imperial Valley rather than at the border. What I am saying is if the quality deteriorates to a certain point, it may very well be that the Imperial irrigation district has a problem that is just as severe as the problem that the Yuma farmers and the Mexicali Valley farmers in Mexico have, and that we have to have a solution for all of them.

Mr. DOMINY. As a matter of fact, Congressman Tunney, our reconnaissance study indicates that we probably would have to put that desalted water, whether we got in the Gulf of California or the coast of California in the United States, as far north as Mojave in order to get the kind of mixing that would prevent users from getting desalted water one day and a thousand parts per million the next. This you could not live with under any circumstances.

Mr. TUNNEY. I should ask the Secretary this question:

To your knowledge, Mr. Secretary, are there any serious negotiations, hard negotiations, going on now with the Mexican Government regarding a desalination plant in southern California?

Secretary UDALL. We actually set up the desalination conference in 1966 in Washington. We announced at that time the signing of an agreement with Mexico on that study. The study has been going on since then. We have made some headway on it. It is a big project. We will also have the international atomic energy agency in the picture. So we are working on this. This is not something that is abstract. We are trying to lay out the parameters now and we are very active in this.

Mr. JOHNSON. Would the gentleman yield to the gentleman from Pennsylvania?

Mr. TUNNEY. Yes.

Mr. SAYLOR. Thank you for yielding.

I did not want the Secretary to leave this point of water quality in the river with the implication that the Department has done nothing about it.

Mr. Secretary, you have been complying with the provisions of the Boulder Canyon Project Act all these years, requiring the Bureau of Reclamation to study constantly the water quality of the Colorado River.

Is this not true?

Secretary UDALL. This is correct. I think the water quality of this river has probably been monitored and studied more than any other river in the country. It has had to be.

Mr. SAYLOR. I did not want anybody to get the impression from questions of my colleague from California that the Secretary of Interior was not complying with the Boulder Canyon Project Act which requires him to make these studies every year, constantly.

Mr. TUNNEY. I am glad you cleared the record. It certainly was not my intention to leave that implication.

Mr. SAYLOR. Thank you.

Mr. TUNNEY. What is the target date, Mr. Secretary, for completion of that study you just referred to?

Secretary UDALL. We don't have a target date as such. I just expressed my own hope that we could have a pretty good idea of what kind of project might be possible in a first stage within the next year or so.

Mr. TUNNEY. Is the Government of Mexico cooperating?

Secretary UDALL. It has been cooperative. We have had some delays, but I would say the study has moved along about as you would expect, with a major project of this kind. We have a lot of problems—how you would finance it, how the benefits would be shared. It would be built in Mexico and so on. There will be a lot of very serious problems that have to be worked out.

Mr. TUNNEY. Mr. Secretary, from the point of view of the Department, do you think that right now you favor augmentation in the form of desalinization and weather modification or the importation of water from some other source, wherever that might be?

Secretary UDALL. My answer would be I think we have to be very open minded on this subject now. These are different methods. Two involve new scientific techniques. Another involves massive engineering works which involve not only engineering problems, but also political problems. I think people who are concerned about the long term welfare of the country ought to be open minded at this point, look at alternatives and see what the economics are, what the problems are, and then make judgments at some subsequent time.

Mr. TUNNEY. Well, what date do you think the Department would be ready to make a decision on alternatives? Because this is extremely important to those of us who realize that we are dividing up shortages. I certainly appreciate the philosophy that you have to weigh alternatives. But people have been weighing all alternatives for many years. I would like to know when you feel the Department would be willing to make a solid recommendation.

Now, last year, you had a solid recommendation, or the year before last. Now, there has been a change of philosophy for various political reasons. I am just wondering if you can make any statement today when you think the Department will be prepared to make a solid decision on alternatives?

Secretary UDALL. Congressman, I want to be as candid as I can on this. You have asked a pertinent question.

Here is the way I see it and I am just giving you the personal impression of somebody who sits where many related problems are being studied.

It is going to take us about another 8 to 10 years to perfect weather modification if Congress gives the appropriations we need. It is going to take until 1976, let's say, or 1977, if we move on target to get the Bolsa Island project built and in operation for a year or two. If we have a National Water Commission—and both Houses are committed to that if we can work out the differences—its study is going to take 5 years.

All in all, I think that within 8 to 12 years, in that range, the country and the Congress ought to be in a position where they can begin to make some judgments on these alternatives.

Mr. TUNNEY. I would like to turn to page 15 of your statement. You indicate that—

Our proposals for the Colorado River Basin Project include works to salvage some 680,000 acre-feet of Colorado River water that have constituted river losses in the past.

Now, I know this is a question of hydrology and the studies you have done to determine what the losses are. But one of the things that I would like to ask you is has this hydrology taken into consideration that such places as Imperial Valley and the Coachella Valley, you have to have extensive leaching of the soil and in a sense, it is wasting water if you are going to talk in terms of irrigation in the Midwest, but wasting water to get the salts out of the soil to make it productive.

Now, does this figure constitute a recognition of the leaching that must go on?

Secretary UDALL. Congressman, let me say two things in regard to that:

I would say it does contemplate that. This is a sound irrigation practice. You have to leach out your soils. Hopefully, at least in some areas, as the leaching continues to take place, there will be less dissolved solids that will be picked up and the return flows will improve.

The only other thing that we have omitted here, and I have not had time to ask my people why, is that, in the long run, it may very well be that the biggest saving in water conservation might be lining of the All American Canal. Again, you would have to decide how you did it, what the economics of it were. I think I can say very straightforwardly that the normal leaching associated with sound agricultural practices will have to continue.

Mr. TUNNEY. Does it also contemplate that the water is going to get more saline as the upper basin begins to put in more projects and return flow to the river? This is one of the problems that we face down in that area. As the water gets more saline, you have to use more water to leach the soil.

Secretary UDALL. This is the problem the Commissioner has already mentioned, that the likelihood is that we will have more of a salinity problem. We will have to decide how serious a problem this will be, and that is the reason I deliberately set aside the question of the establishment of water standards. I don't think we know enough in the Department yet so we can sit down and lay this thing out cold. say here is what we face now, here is what we are going to have to face, here is what we are going to have to do, so that everybody understands the consequences of water salinity standards.

Mr. TUNNEY. Can I go to my area, to my district, and say this 680,000 figure was arrived at considering that water was going to get more saline in the river and that there is probably going to have to be an additional use of water for leaching purposes as a result of the increased salinity and that the 685,000 feet contemplated all these factors I have just mentioned?

Can I go down to my area and tell them this is a possible fact, that you said that today?

Mr. DOMINY. The salvage that we are referring to in that figure is actually comprised of phreatophyte control, ground water recovery, channelization, and includes the 170,000 acre-feet that we are saving at Senator Wash which is already being accomplished. None of those actually affect the quality of water for use in your district, Congressman Tunney.

Mr. TUNNEY. Does it assume a reduction in the use of water by irrigators?

Mr. DOMINY. No; as a matter of fact, there have been some rather emotional statements made about the wasting of water. I think the Imperial Irrigation District, for example, has a very commendable record, because all of the research work at Riverside and other irrigation and agricultural experimental stations indicate that on soils of the type that you have in Imperial Valley and the ground water conditions that prevail there, you need an override in your irrigation delivery to the farm of something in the order of 23 to 25 percent in order to take care of the leaching requirements and keep the land in cultivation. And this is about what you are doing.

This last year, the Imperial Irrigation District figures it used about 48,000 acre-feet in total above the 23-percent factor. Our measurements would put it at about 100,000, but that is within the plus or minus margin of error of calculations.

So I think they are doing a very commendable job, actually, in irrigating soils of the character involved.

Mr. TUNNEY. Mr. Dominy, then I can assume that even if we have this saving of 680,000 acre-feet, we would not see Salton Sea dry up.

Mr. DOMINY. No, sir; I think you are going to be putting return flows, from the Coachella and Imperial Valley, into the Salton Sea because of the nature and character of the soils you are irrigating.

Mr. HOSMER. Will the gentleman yield?

Mr. TUNNEY. Yes.

Mr. HOSMER. I understand the Imperial Valley Irrigation District has gone into the Salton Sea problem in considerable detail. We do have a paper before the members of the committee.

Mr. TUNNEY. They have a statement which I am going to have introduced; yes, when I have completed my questioning.

Secretary UDALL. Congressman, let's make the other side of that clear, though, because now having the water pollution control responsibility in my Department, I am much more aware of water quality problems. I would think that your people ought to anticipate that the amount of water that will be going into the Salton Sea from the irrigation district is that amount of water that sound agricultural husbandry in that region requires in terms of leaching and return flows, and that there will not be water that is not needed for agriculture put into the Salton Sea.

Now, I mean we ought to be honest with each other because we are entering into a water shortage era. We are entering into an era where we have to watch water quality and I think everybody ought to know we have these problems.

Mr. TUNNEY. But as I understand the statement of the Commissioner that there is also going to be a flow of water from the farm to the Salton Sea, even if you have a reduction of 680,000 acre-feet in the use of water—

Mr. DOMINY. This is true.

In the last year, for example, 881,000 acre-feet entered Salton Sea from the Imperial Irrigation District. Even if you took the minimum standard of leaching requirements, you would have an excess of 544,000 acre-feet.

Now, we are also getting water from Mexico that flows into the Salton Sea that comes out of the New and Alamo Rivers. There are about 104,000 acre-feet, a little better than that, on an average that comes out of Mexico and drains down across the Imperial Valley and into the Salton Sea.

So what I said a moment ago is that there is only about 100,000 acre-feet more that went into the Salton Sea than would have been under a perfect job of irrigation in the Imperial Valley.

Mr. TUNNEY. Who is going to make the final decisions as to whether or not the irrigation districts in southern California are making proper use of their water or whether they are wasting their water? Is that going to be the Secretary?

Secretary UDALL. Congressman, we have had one experience in 1964 when we had a low water year. This will have to be a joint decision that will be made by the irrigation districts and the Department. What we did that year when we were so short and we had to put ourselves on a very strict regimen was to tighten down as much as we could. The Imperial District took what reduction?

Mr. DOMINY. 10 percent.

Secretary UDALL. They took a 10-percent reduction and they felt that by better management of the water they could get by with that. So we are going to have to be working together closely on what the requirements are. I say it will be a joint decision.

Mr. TUNNEY. I have a few more questions, but Mr. Reinecke, of California, has asked me to yield to him.

Mr. JOHNSON. You are yielding to Mr. Reinecke?

Mr. TUNNEY. Yes.

Mr. JOHNSON. I was going to recognize Mr. Burton before that.

Mr. BURTON of Utah. Mr. Chairman—

Mr. TUNNEY. I would like to reserve the balance of my time, then. Could I just ask a question off the record?

Mr. JOHNSON. We will accomplish the same thing, but I just want to keep this in the proper order. You have reserved the balance of your time. Now I will recognize Congressman Burton, from Utah, and I am sure he will yield to Congressman Reinecke.

Mr. ASPINALL. Mr. Chairman, I want this understood by everyone. I think this is all right if it is all right with Congressman Tunney. Congressman Tunney will be recognized first in the morning.

Mr. TUNNEY. Yes. I yield my time back to the chairman.

Mr. BURTON of Utah. Thank you, Mr. Chairman. I will be able to be here tomorrow morning. I would like to yield to my colleague, Mr. Reinecke.

Mr. REINECKE. I thank all the gentlemen.

Mr. Secretary, three questions:

Will the Bureau of Reclamation have anything to do with management of the proposed powerplant, steamplant, as far as the management is concerned?

Secretary UDALL. The answer to that is, "No."

Mr. REINECKE. How will the customers for the surplus power be determined?

Secretary UDALL. The way we presently contemplate disposal of this very small amount of surplus that would exist is that the plant manager and operator, which would be the Salt River project, will probably have a contract whereby it would, in effect, be responsible for taking care of the surplus to the extent that we didn't use it in banking, didn't use it to help support the Colorado River storage project. It would be up to Salt River, then, to work out the arrangements for disposal.

Mr. REINECKE. I don't think the arrangement calls for Salt River, specifically, does it?

Secretary UDALL. No, but I am simply saying this could be done by contract.

Mr. REINECKE. I see.

But basically, the Bureau or the Department will not have the power to say who the power will be sold to or under what circumstances?

Secretary UDALL. We would have a very considerable say. As I indicated yesterday, we might want to use it to integrate it with the Glen Canyon. We might want to use banking arrangements on some of it. To the extent that there might be a surplus—no one knows what the extent of surplus would be under these circumstances—we would feel the most logical way to handle it would be to let the Salt River project be the purchaser.

Mr. REINECKE. Then the Department will, in one way or another, have a great deal to say about the sale and distribution of this power?

Secretary UDALL. We are purchasing it and we are going to have to, if we do our job. We are going to have to have the full say with regard to how it is used; yes.

Mr. REINECKE. In the statement regarding augmentation or other resources, was there any reason why not a word was said regarding evaporation control?

Secretary UDALL. I had better let the Commissioner answer that.

Of course, the problem on evaporation control is a very tough problem. The two areas where you have large surfaces of water, where you get the most evaporation, are Lake Mead and Lake Powell. We are dedicated to making these recreational areas.

Mr. REINECKE. I guess I could rephrase the question.

Have we given up on evaporation control?

Mr. DOMINY. We have not given up on it but the problems of finding a material that does not pollute the water and make it nonusable for all purposes, including fish and wildlife and doesn't increase temperature unduly, and which stays in place when high winds come is almost insurmountable. We are still seeking that material.

Mr. REINECKE. Weather modification, you estimated an increase of a \$1 or \$1.50 a foot. Where would this come from?

Secretary UDALL. This could come from a number of sources. It could be appropriated directly, or could be repaid from a basin fund.

Mr. REINECKE. That is what I want to get at.

In your opinion, is the operational aspect of the basin fund such that you as Secretary will be able to use that without prior appropriation from Congress?

Secretary UDALL. Undoubtedly, Congress would want to control the appropriation of it. But I would think this would be an ideal situation of how a basin fund could and should be used.

Mr. REINECKE. Well, yes, but when you are talking about a very scarce fund being used at \$1 and \$1.50 an acre-foot, we could perhaps find other sources at that same price that would hopefully yield—

Secretary UDALL. If we could get weather modification water at \$1 or \$1.50 an acre-foot, this could be 50 times as cheap as bringing it in from long distances, from northern California or from any other place.

Mr. REINECKE. On that subject, this report is not to be considered as part of the legislation, is that correct?

Secretary UDALL. No, sir. This is merely a report that was prepared to see what the picture might be if we projected future technology.

Mr. REINECKE. One other question regarding the cost of power.

You indicated, I believe, in the report that the steam plant as proposed would provide power at a rate something like 60 percent less costly than if a private utility did it and 30 percent than if a municipal utility did it?

You are not stating here or trying to impress upon the committee that the Federal Government has the Indian sign on power generation, that you can manufacture power cheaper than a private utility?

Secretary UDALL. No, it just happens that under these particular circumstances, this plant, if we did it the way we propose, is very economical.

Mr. REINECKE. The truth really is then that we are subsidizing Federal power. The point is what we think is the cost is not true cost. If it were all stacked up together, since one of the functionaries of WEST is going to operate this as they might operate any other plant, the power is no cheaper to produce, it is just whether we are willing to admit the full cost of Federal power. Is that right?

Secretary UDALL. One can argue it that way. For example, one of the big reductions we get is from the interest-free aspect of repayment of irrigation costs. This helps a great deal. So there are some distortions in there.

Mr. REINECKE. How will the distribution of the central Arizona project water be handled? By the Bureau?

Secretary UDALL. It will be handled by contracts with the various Arizona entities.

Mr. REINECKE. Is there any plan at the present time to use any spreading in Arizona of existing water from CAP?

Secretary UDALL. No.

Mr. REINECKE. In S. 1004, I believe, it indicates on page 26 a cost of CAP of \$768 million. Is this a figure on which your cost and analysis was based to provide that the project would pay out even without a basin fund at present?

Mr. DOMINY. That is correct.

Mr. REINECKE. My recollection is that the prices we were dealing with earlier were somewhat smaller than this.

On the same page, it is indicated that the prices will be not to exceed \$100 million in drainage distribution and facilities. Is this included in the payout from the basin fund?

Mr. DOMINY. That would be repaid by the water users through separate loans. They would be small project-type loans.

The costs are not part of the estimate cost of CAP. They would be additional obligations picked up on separate contract.

Mr. REINECKE. The Senate bill calls for it in the CAP legislation.

Mr. DOMINY. But it would be separate contracts.

Mr. REINECKE. It is in addition to the \$786 million. I do understand that.

Mr. DOMINY. Yes.

Mr. REINECKE. But I am wondering where the revenue for that would come from?

Mr. DOMINY. It would come under separate contracts for the distribution systems.

Mr. REINECKE. Then the cost analysis which led you to think the project was feasible would be a total cost of \$878 million or the \$787 million figure?

Mr. DOMINY. It would wash out because it would be under separate contract with the full cost being paid by the water district.

Mr. REINECKE. Is this considered subsequent money at interest rate?

Mr. DOMINY. It would be repaid without interest.

Mr. REINECKE. You mentioned earlier something about you may have to line some canals over the California side, I believe. This was 2 days ago. I am interested in knowing what specific areas you are referring to where you feel this might be necessary.

Secretary UDALL. I was referring primarily to the All-American Canal.

Mr. REINECKE. I was under the impression that there was some substantial amount of lining done there and a lot of tests indicate that that might not be necessary.

Mr. DOMINY. There has been some substantial lining and, of course, the Coachella distribution system is a closed pipe system. The difficulty in lining the All-American Canal is the fact that you cannot take it out of use. We are still trying to find a material that can be put in the water to seal the canal.

Mr. REINECKE. Would the funding for this lining also come out of the development fund without prior appropriation?

Secretary UDALL. This is something we would have to determine. We are not proposing it and we have not analyzed it in any fashion to have the answer to that.

Mr. REINECKE. I thank you, Mr. Chairman.

Mr. JOHNSON. We want to thank you, Mr. Secretary, for being here. We understand that you will be with us tomorrow at 9:45. We will start off with Congressman Tunney, when he will be given the balance of his time. Then we will go on and hope to complete the hearings sometime around noontime.

Mr. ASPINALL. Congressman Burton has not yielded his time as the record now stands.

Mr. BURTON of Utah. I yield back the balance of my time to the Chairman, with the understanding that I will be recognized tomorrow.

Mr. JOHNSON. The committee stands adjourned until tomorrow morning.

(Whereupon, at 11:50 a.m., the subcommittee was adjourned, to reconvene tomorrow, Friday, February 2, 1968, at 9:45 a.m.)

COLORADO RIVER BASIN PROJECT

Part II

FRIDAY, FEBRUARY 2, 1968

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:50 a.m., in room 1324, Longworth House Office Building, the Honorable Harold T. Johnson (chairman of the subcommittee) presiding.

Mr. JOHNSON. The subcommittee will come to order.

We will start off this morning with further questioning by Congressman Tunney of California.

Mr. TUNNEY. Thank you very much, Mr. Chairman.

Mr. Secretary, statements have been made in the past by some of my more able colleagues, as well as certain so-called experts in the Southwest, that the Imperial Irrigation District and the Coachella Irrigation District are pouring 1,320,000 acre-feet of usable water into the Salton Sea. Now, if this is true, and inasmuch as there is only a pump lift of about 240 feet from the Salton Sea to the Colorado River, why is it that the Department of the Interior has not suggested a plan to take this water, this used irrigation water, from the New River as it flows into the Salton Sea, and put it back into the Colorado River?

Now, it is my understanding that inasmuch as we are entitled, California is entitled to 4.4 million acre-feet and we also have diversions less returns, if we could only divert 4.4 million acre-feet now, but if we returned the 1,320,000 acre-feet, we would be entitled to a total allotment of 5,720,000 acre-feet from the river. This would satisfy all water needs in southern California.

The whole thrust of the question goes to the statement that has been made that this 1,320,000 acre-feet is usable water and is just flowing into the Salton Sea. Why, if this is true, has not the Department come up with a plan to return this water to the Colorado River today?

STATEMENT OF STEWART L. UDALL, SECRETARY, DEPARTMENT OF THE INTERIOR, ACCOMPANIED BY FLOYD E. DOMINY, COMMISSIONER, BUREAU OF RECLAMATION; EDWARD WEINBERG, DEPUTY SOLICITOR; AND ARLEIGH B. WEST, DIRECTOR, REGION 3, BUREAU OF RECLAMATION

Secretary UDALL. Congressman, that is a question I never had put to me before. It is a very interesting question. Of course, some of the large California irrigation districts, such as Palo Verde, take out a large amount of water, but return a substantial portion to the river for reuse. The consumptive use is what is actually consumed. The natural drainage basin for the irrigation district is not to the river but to the Salton Sea. Those persons who have made developments and investments on the Salton Sea expect to have the drainage water go into the Salton Sea to maintain it.

On the other hand, I think this is a problem, primarily for California, rather than a problem for us, because California has a certain overall entitlement to water and it has, through the seven party agreement which was adopted by the Secretary of the Interior as a part of the Colorado River water contracts with California users, made the order of intrastate priorities.

If the State were to propose a project to accomplish what you suggest, thereby augmenting the supply, say, for the metropolitan area, I would assume that could be considered. I have never heard this proposed before, though.

Mr. TUNNEY. Well, I do not mean to be in any way tricky. But the point is that a statement was made recently by Mr. Les Alexander, who is the associate general manager of the Salt River project in Phoenix, Ariz., and I quote:

Perhaps the outstanding example of usable water being wasted in the lower basin is the 1½ million acre-feet which annually flows into the Salton Sea.

The point is if this is a true statement, why has not the Department come forward with a plan to get this water from the Salton Sea, or from the New River where it flows into the Salton Sea, up the 240 feet into the Colorado River?

I think the answer is quite clearly why you have not, because it has 3,000 parts per million of salt and it is not usable. Mexico rejects water which has a content of 1,500 parts per million. What I am simply trying to say is that some of the statements that have been made regarding the way we in southern California have wasted water by pouring it into the Salton Sea have no justification in fact.

Secretary UDALL. I would like the Commissioner to comment on this. I do know that particularly with the newer lands that do have a lot of dissolved solids, the leaching process does seriously deteriorate the quality of the water. There is no question that we have a real water quality problem concerning the water that moves across the border. The Commissioner would like to comment.

Mr. DOMINY. You are quite correct, Congressman Tunney, that this drainage water from the Imperial Irrigation District is not considered usable. It has a minimum of 3,000 parts per million of dissolved solids as it flows out of these salty lands of Coachella and Imperial. Many days, it runs about 4,000 parts per million. But as I explained

the other day, I do not think anyone familiar with the type of soils to be irrigated would consider this wasted water. A great deal of research has been done on lands of this type—and incidentally, the Imperial and Coachella Valleys are laboratories for proper use of salted lands for the whole world. People are coming there in ever-increasing numbers to study the manner in which successful irrigation has developed on lands of this character.

I can understand why people from the Salt River Valley in Arizona would not recognize this, because they do not have a similar problem. They have a falling water table, their salts go down naturally, and they have not had serious problems of this nature in the Salt River Valley. But in Imperial and Coachella, you have an entirely different situation. The high water table creates difficult problems of proper irrigation and keeping the salt moving out. This does take from 23 to 25 percent more water than would otherwise be necessary. It is not wasted because of the facts of the case.

Mr. ASPINALL. Would my colleague yield?

Mr. TUNNEY. Yes.

Mr. ASPINALL. This proves that grass is always greener in the other fellow's pasture. Water is always purer in the other fellow's basin, as far as that is concerned.

What interests me is that we have before us the water desalination proposal for ocean water. Nothing has been said about desalting this brackish water here and getting it closer to use than what has been proposed. This could undoubtedly be made part of the conduit system and would be much less expensive than what was proposed in this rather questionable report.

Is it possible, Mr. Secretary or Mr. Dominy, to use any of this water or is there something sacred about keeping the water of the Salton Sea at a certain level?

Mr. DOMINY. Certainly, you have a major problem with regard to the level of Salton Sea.

Mr. ASPINALL. Why is it important to keep a certain level of the Salton Sea? Is it to take care of the birds or the beautiful shores or what?

Mr. DOMINY. There has been extensive development on the shores of the Salton Sea. It has developed into one of the finest recreational areas in the Southwest. I assure you, before a final decision is made as to the best and most economical way of augmenting the Colorado River by desalting, the Salton Sea should be studied much more thoroughly than it ever has been.

However, it is below sea level and it is pretty far south and west. The conveyance would not be appreciably cheaper, in my judgment.

Mr. ASPINALL. After all, if this water is to be used by exchange in the Imperial Valley, you must raise it 300 or 400 feet to put it back upstream again. Certainly, that is a most expensive proposition.

I do not want to argue that. I just wanted to ask the question.

Secretary UDALL. I would like to comment on this, because I think we are really making a record for the long term here. I think the Chairman has raised a very interesting point.

We sometimes lose sight of the fact that the desalting technology is not merely to desalt sea water but also to desalt brackish water. Considering the economic consequences, I think when we start talking

about alternatives, we want to look at all of them. It may very well be that desalting this brackish water might be much more attractive than other alternatives, whether it were for reuse in Imperial or for blending or for other purposes.

An interesting comparison to me is the Great Salt Lake, which has been receding constantly, as Congressman Burton well knows, largely because of use of water for irrigation and industrial and municipal purposes that would otherwise go into the basin, plus, I suppose, the long term drought which has had an effect on it, too.

But there has been a constant shrinking. This is part of the overall process of the region.

Mr. TUNNEY. Thank you.

Speaking as a supplicant, Mr. Chairman, please do not take away our Salton Sea. That was not the point of my line of questioning.

Mr. ASPINALL. This goes to prove how important this is. All that I suggest is that you please do not take away our fresh water when there is an alternative. This is a give-and-take effort and we have to face it in that respect—and each one of us gives.

Mr. TUNNEY. I think California is probably in the process of giving right now on this central Arizona project on many points that before we thought were terribly important to our survival.

I would like to just add as a footnote that the U.S. Public Health Service has established as drinking water standards for consumptive use a 500 parts per million standard of salt and the Imperial Valley now is receiving water that has 945 parts per million. So it is almost twice the amount of salt that the Public Health Service establishes as a standard for desirability in consumptive use.

Mr. Secretary, one point that I would just like to clear up. I questioned you on it yesterday with regard to moving water from a desalting plant in the Gulf of California north to some point where it could sweeten up the water that comes down into the southwestern part of the United States.

In our dialog, we talked about putting the water in, perhaps, at Imperial Dam or putting it in at the Mexican border and then finally Mr. Dominy said that probably the most likely place would be at Mojave.

I would just like to ask Mr. Dominy, is it not true that there is no storage facility available at Ventura? The only storage facility that would be available would be either at Mojave or Lake Mead?

Mr. DOMINY. Yes, that is what we confirmed in this reconnaissance study. In order to have economy of production, the desalting plant must operate around the clock, 24 hours a day on a steady basis. During many days the desalted water would be sufficient to meet all demands and there would be no blending. Without blending, water users would have serious problems operating with desalted water for a few days and then with water of a thousand or so parts per million for the next few days.

In order to make operations feasible, the desalted water should be delivered to the river as far up as Lake Havasu.

Mr. ASPINALL. Have you gone so far on the desalting plant as to determine whether or not there would be a need for the power in the South-

west and Mexico—to determine whether this power would be purchased in the future?

Mr. DOMINY. The projections of the power needs of the Southwest indicate that if the desalting plants were phased over a period as we proposed, the first one in 1990, the second in 2000 and the third one about the year 2010, this schedule would fit in very well with the growing power needs of the Southwest. The power producers that serve the market of the Southwest could very well be interested in installing these power features of the dual purpose plant.

Mr. TUNNEY. One last point I would like to make. This is that yesterday in the discussion, there were figures given that perhaps 640,000 acre-feet of water could be salvaged in the Lower Basin. One of the items that was mentioned as a possibility for salvaging water was the lining of the All-American Canal. To make the record clear on this point, I would like to refer to page 243 of the House Interior Committee hearings of March 13 through 17, 1967, a statement by Robert Carter who is the general manager of the Imperial Irrigation District, which indicates that losses along the main branch of the All-American Canal are within allowable tolerances for a lined canal. The point simply is that if we are thinking in terms of lining a canal that does not lose sufficient water to make this desirable or make it compulsory, then we are talking about just throwing away \$80 million, which is what the cost would be to line this main branch.

Would you not agree, Mr. Commissioner, that your studies indicate that along that main branch, there is not that loss of water?

Mr. DOMINY. I would like Regional Director West to comment on that.

Mr. JOHNSON. Will you come forward and identify yourself, please?

Mr. WEST. I am Arleigh B. West, Director of Region 3, Bureau of Reclamation.

As Congressman Tunney has said, there has been over the last several years a lessening in the losses from the All-American Canal. We undertook some comprehensive studies in cooperation with the district and the USGS which corroborated the figures that were introduced into the record by Mr. Carter last year. We think that perhaps the reason for this is that during the several decades that the All-American Canal has been in service, it has, of course, lost a great volume of water. This is undoubtedly now asserting itself in the form of a hydrostatic head which, in effect, makes it very difficult for water to seep out of the All-American Canal, for the reason that there is underground hydrostatic pressure preventing it.

Mr. TUNNEY. Thank you.

The CHAIRMAN. Thank you.

Mr. Chairman at this point, I would like to ask unanimous consent to introduce into the record a statement by Mr. Bob Carter, general manager of the Imperial Irrigation District, plus some attachments thereto.

Mr. JOHNSON. You have heard the request of the gentleman from California, Mr. Tunney. Is there objection?

(No response.)

Mr. JOHNSON. Hearing none, it is so ordered.

(The material referred to follows:)

IMPERIAL IRRIGATION DISTRICT.
Imperial, Calif., January 26, 1968.

THE HONORABLE COMMITTEE MEMBERS OF THE HOUSE OF REPRESENTATIVES
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

GENTLEMEN: A number of public statements have been made concerning the alleged waste of usable water into Salton Sea, California, by Imperial Irrigation District and Coachella Valley County Water District. Examples are:

"Conservation and Improved Uses of Existing Usable Water in the Lower Basin.—Perhaps the outstanding example of usable water being wasted in the Lower Basin is the one and one-third million acre feet which annually flows into the Salton Sea. This water is unused Colorado River water which is diverted for irrigation use in Imperial and Coachella Valleys—but is permitted to flow unused into the Salton Sea through New River and the Alamo River as 'regulatory waste.'"¹

"Water Salvage.—If someone said he knew a secret underground river which would add right now 1.5 million acre-feet of water annually to the Colorado River—enough to satisfy the Mexican Treaty burden—you would agree to go after it. Such an underground river does not exist, but something about as good does. An annual average of 1,320,000 acre-feet of usable water pours into the Salton Sea in Imperial Valley as waste from the Imperial Valley and Coachella Valley irrigation districts."²

These statements are simply not true. Imperial Irrigation District does, as a matter of fact, divert between 2.9 and 3 million acre-feet of water annually, most of which is a present perfected right, and is not used indiscriminately, but beneficially. The accompanying reports have been prepared to set the record straight and are submitted for that purpose:

"Imperial Irrigation District, Diversion Required at Pilot Knob for Imperial Unit Based on Blaney-Criddle Formula and 1959-1966 Crop Pattern for Historic PPM Salinity Concentration of Irrigation Water."

"Imperial Irrigation District, Diversion Required at Pilot Knob for Imperial Unit Based on Blaney-Criddle Formula and 1964-1966 Crop Pattern for Historic PPM Salinity Concentration of Irrigation Water."

I believe that the most significant information to be derived from the two reports is developed on the final page of each captioned, respectively:

"Imperial Irrigation District, Theoretical Distribution, 'IID Contribution to Salton Sea' 1959-1966."

"Imperial Irrigation District, Theoretical Distribution, 'IID Contribution to Salton Sea' 1964-1966."

I call your attention to the fact that the difference between "Total Theoretical" and "Observed to the Sea" (measured), aggregates on the annual average for the 3-year period, 46,000 acre-feet and on the 1959-1966 report the annual average is 52,000 acre-feet. Since the "Theoretical" does not take rainfall into consideration and the "Observed to the Sea" does include rainfall (for any runoff from rainfall would of necessity have to pass through the measuring instruments logging the quantity of water flowing to the Sea from all measurable sources) and, as the reports indicate, the area irrigated for crops averages 434,000 acres and, assuming that at least two inches of the historic 3-inch average rainfall over the District's system finds its way to the Sea, this would develop approximately 72,500 acre-feet of water per annum. I wish to point out that 72,500 acre-feet is almost one-half again as much as the quantity diverted annually to the Sea which could be classified as that quantity over and above the amount required for beneficial consumptive use based on the consumptive-use formula used in the Arizona vs. California lawsuit, as tabulated.

Imperial Irrigation District feels very keenly about the charges of wasting water to the Salton Sea and it has taken the opportunity of having these two re-

¹ "Central Arizona Project Report" delivered to Mountain States Association, Salt Lake City, by Les H. Alexander, Associate General Manager, Salt River Project, Phoenix, Arizona, September 11, 1967.

² Letter dated October 2, 1967, to Mr. William H. Nelson, Associate Editor, The Daily Sentinel, Grand Junction, Colorado, from Congressman Morris K. Udall of Arizona.

³ "Countdown on the Colorado," a speech by Congressman Morris K. Udall of Arizona, before the Town Hall of California, Biltmore Hotel, Los Angeles, December 19, 1967.

ports checked by the Bureau of Reclamation with the thought in mind of determining differences with respect to the application of the Blaney-Criddle Formula in arriving at consumptive use, leaching requirements, irrigation efficiency, etc. We have been advised by officials of the Bureau of Reclamation that, though we differ in the application of the formula in some respects which has a minor effect on the end result, the total over-all contribution differential to the Sea between Imperial Irrigation District and the Bureau of Reclamation studies is less than 60,000 acre-feet per annum.

It should be noted that this small variation is less than the aggregate difference between the observable and theoretical flow to the Sea of 72,500 acre-feet contributable to rainfall. We do not know whether the Bureau took rainfall into consideration; if not, the 60,000 acre-feet difference would be offset by rainfall with the effect of reducing the difference to zero. But, even if they did take rainfall into account, there would only be an annual difference of 60,000 acre-feet. Compared to our average Pilot Knob diversion of 2,930,000 acre-feet per year, this amounts to only 2.5 per cent, a very low figure for a District which operates from a diversion point 60 miles away on an order placed eleven days in advance at a point 150 miles up the River at Parker Dam. I believe that it is difficult enough to anticipate what we are going to do today, without trying to anticipate what we are going to do ten days hence.

I appreciate the opportunity afforded to me in these few minutes to spread the facts upon the record for one and all to examine at will. Careless and unthinking charges have been made regarding the use Imperial Irrigation District makes of its share and right to Colorado River water. Let there be no doubt that the record of this District is clear, is based on fact and speaks for itself.

Sincerely yours,
R. F. CARTER, General Manager.

[Enclosures]

IMPERIAL IRRIGATION DISTRICT

DIVERSION REQUIRED AT PILOT KNOB FOR IMPERIAL UNIT BASED ON BLANEY-CRIDDLE FORMULA AND 1959-1966 CROP PATTERN FOR HISTORIC PPM SALINITY CONCENTRATION OF IRRIGATION WATER

Double cropping, average 8 years-1959-66 (acres)

Acres in crops : 548,000.
Area irrigated for crops : 434,000.
Double cropped : 114,000 or 20.8% of 548,000 acres-Say 21%.

T-1018.-REQUIRED FOR DELIVERY TO FARMS

Input irrigation water at-	845 p.p.m. ¹ (percent)	Acre-feet per irrigated acre
Average consumptive use per irrigated acre, 1959-66 ²		4.26
Leaching requirement ³	20	5.33
Farm efficiency (leaching requirement).....	95	5.61
System regulation and system loss (historic 8-year average) ⁴	18	6.84
Required for delivery at Pilot Knob per acre irrigated.....		6.8

¹ Average measured salinity, 1959-66.
² Refer T-1030.
³ Based on leaching requirement for historic 8-year average salinity of irrigation water, refer T-1031.
⁴ System loss includes seepage, transpiration, and evaporation losses, unmeasured deliveries to some 1,500 or more service pipes, deliveries to farm homes, and farms less than 2 acres.
⁵ Round to 6.8 acre-feet.

Quantity required at Pilot Knob ¹

	Acre-feet
Consumptive use by crops.....	4.26 × 434,000 = 1,849,000
Leaching requirement and/or irrigation efficiency.....	(5.61-4.26) × 434,000 = 586,000
System regulation and system loss.....	(6.8-5.61) × 434,000 = 516,000
Total required to IID at Pilot Knob ¹	2,951,000

¹ Based on Blaney-Criddle formula.

IMPERIAL IRRIGATION DISTRICT
T-1019.—DISTRIBUTION OF PRESENT USES, IMPERIAL UNIT, 1959-66

	1959	1960	1961	1962	1963	1964	1965	1966	Average 8 yr
To Imperial Irrigation District at Pilot Knob.....thousand acre-feet..	2,898	3,060	3,036	3,006	3,062	2,808	2,688	2,886	2,886
Loss, Pilot Knob to drop 1 (Imperial Irrigation District).....do.....	58	76	79	55	71	37	64	68	64
Loss, drop 1 to EHL.....do.....	36	51	46	41	44	35	43	49	44
Loss, EHL to WSM.....do.....	13	23	24	28	35	18	19	21	23
Gross AA canal loss.....do.....	107	150	149	124	150	90	126	139	139
Canal loss and regulation.....do.....	453	528	394	366	332	283	223	249	339
Total, all Imperial Irrigation District Losses.....do.....	560	478	543	490	482	373	349	388	444
Spill for system regulation.....do.....	88	86	78	70	67	36	27	28	68
Total for system regulation and canal loss.....do.....	648	664	621	560	549	409	376	416	512
Total deliveries to users ¹.....do.....	2,250	2,396	2,415	2,446	2,513	2,399	2,312	2,470	2,408
System efficiency.....percent.....	77.7	78.3	79.5	81.4	82.1	85.4	86.0	85.6	81.8
Gross area of crops.....thousand acres..	564	540	526	525	547	548	554	581	548
Net acreage irrigated.....do.....	440	434	436	430	430	432	432	437	433
Delivered to users:									
Acre-feet per acre of crop.....	3.99	4.44	4.59	4.66	4.59	4.38	4.17	4.25	4.11
Acre-feet per acre irrigated.....	5.11	5.52	5.54	5.69	5.84	5.55	5.35	5.65	5.35
At Pilot Knob: Acre-feet per acre irri- gated.....do.....	6.59	7.05	6.96	6.99	7.12	6.50	6.22	6.60	6.75

¹ Canal loss and regulation includes seepage, transpiration, and evaporation losses, unmeasured deliveries to more than 1,500 or more service pipes, deliveries to farm homes, and farms less than 2 acres.
² Deliveries to users and canal loss and regulation have been corrected to allow for estimated 10 percent undermeasurement of deliveries for years 1959 through 1963.

T-1020.—WATER DISTRIBUTION, 1959-66
[In thousands of acre-feet]

Year	Received at Pilot Knob	Operational loss			Canal loss and regulation ¹				Delivered to users ²
		Main canals	Lateral canals	Total	A.A.C.	Main canals	Lateral canals ¹	Total	
1959.....	2,898	30	58	88	107	245	208	560	2,332
1960.....	3,060	28	58	86	150	232	196	578	2,386
1961.....	3,036	24	54	78	149	206	188	543	2,411
1962.....	3,006	20	50	70	124	190	176	490	2,446
1963.....	3,062	19	48	67	150	186	146	482	2,521
1964.....	2,808	12	24	36	90	81	202	373	2,389
1965.....	2,688	11	16	27	126	67	156	349	2,312
1966.....	2,886	12	16	28	139	76	173	388	2,479
8-year average..	2,930	20	40	60	129	160	181	470	2,460

¹ Canal loss and regulation and deliveries to users have been corrected to allow for estimated 10-percent undermeasurement of deliveries for years 1959 through 1963.

T-1021.—CONSUMPTIVE USE OF AREAS CROPPED, 1959

[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	204,500	5.3	1,083,850
Alfalfa seed.....	2,500	4.7	11,750
Barley.....	101,000	1.8	181,800
Cotton.....	57,000	3.2	184,000
Corn.....	20,500	2.4	49,200
Flax.....	33,000	2.5	82,500
Sesbania.....	4,000	2.3	9,200
Sudan.....	5,000	2.3	11,500
Sugarbeets.....	48,000	2.4	115,200
Miscellaneous field crops.....	8,500	2.5	21,250
Melons.....	12,500	2.3	28,750
Lettuce.....	41,000	1.4	57,400
Carrots.....	6,000	2.2	13,200
Tomatoes.....	4,500	2.1	9,450
Miscellaneous garden crops.....	10,500	2.2	23,100
Citrus.....	2,000	4.0	8,000
Dates ²			
Grapes ²			
Miscellaneous permanent crops.....	2,500	3.7	9,250
Total.....	563,500	3.37	1,899,400

¹ Based on Blaney-Criddle formula.

² Included in miscellaneous permanent crops.

Note: Net acres irrigated, 440,000; consumptive use per acre irrigated, 4.32

T-1022.—CONSUMPTIVE USE OF AREAS CROPPED, 1960

[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	214,500	5.3	1,136,850
Alfalfa seed.....	6,000	4.7	28,200
Barley.....	82,000	1.8	147,600
Cotton.....	58,000	3.2	185,600
Corn.....	26,000	2.4	62,400
Flax.....	16,500	2.5	41,250
Sesbania.....	4,500	2.3	10,350
Sudan.....	5,500	2.3	12,650
Sugarbeets.....	48,500	2.4	116,400
Miscellaneous field crops.....	9,000	2.5	22,500
Melons.....	11,500	2.3	26,450
Lettuce.....	40,500	1.4	56,700
Carrots.....	3,500	2.2	7,700
Tomatoes.....	2,000	2.1	4,200
Miscellaneous garden crops.....	7,500	2.2	16,500
Citrus.....	2,000	4.0	8,000
Dates ²			
Grapes ²			
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	540,500	3.50	1,894,450

¹ Based on Blaney-Criddle formula.

² Included in miscellaneous permanent crops.

Note: Net acres irrigated, 434,500; consumptive use per acre irrigated, 4.36.

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T-1023.—CONSUMPTIVE USE OF AREAS CROPPED, 1961

[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	205,000	5.3	1,086,500
Alfalfa seed.....	8,500	4.7	39,950
Barley.....	86,500	1.8	155,700
Cotton.....	53,500	3.2	171,200
Corn.....	37,500	2.4	90,000
Flax.....	10,500	2.5	26,250
Sesbania.....	1,500	2.3	3,450
Sudan.....	6,500	2.3	14,850
Sugar beets.....	49,500	2.4	118,800
Miscellaneous field crops.....	10,500	2.5	26,250
Melons.....	8,000	2.3	18,400
Lettuce.....	31,000	1.4	43,400
Carrots.....	3,500	2.2	7,700
Tomatoes.....	1,500	2.1	3,150
Miscellaneous garden crops.....	7,000	2.2	15,400
Citrus.....	2,000	4.0	8,000
Dates ²			
Grapes ²			
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	525,500	3.50	1,840,700

¹ Based on Blaney-Criddle formula.
² Included in miscellaneous permanent crops.
Note: Net acres irrigated, 435,500; consumptive use per acre irrigated, 4.23.

T-1024.—CONSUMPTIVE USE OF AREAS CROPPED, 1962

[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	176,500	5.3	935,650
Alfalfa seed.....	8,000	4.7	37,600
Barley.....	70,500	1.8	126,900
Cotton.....	69,500	3.2	222,400
Corn.....	36,000	2.4	86,400
Flax.....	26,500	2.5	66,250
Sesbania.....	1,500	2.3	3,450
Sudan.....	6,500	2.3	14,850
Sugar beets.....	55,500	2.4	133,200
Miscellaneous field crops.....	10,000	2.5	25,000
Melons.....	9,500	2.3	21,850
Lettuce.....	35,500	1.4	49,700
Carrots.....	5,500	2.2	12,100
Tomatoes.....	1,500	2.1	3,150
Miscellaneous garden crops.....	7,500	2.2	16,500
Citrus.....	2,500	4.0	10,000
Dates ²			
Grapes ²			
Miscellaneous permanent crops.....	2,500	3.7	9,250
Total.....	525,000	3.38	1,774,150

¹ Based on Blaney-Criddle formula.
² Included in "Miscellaneous permanent crops."
Note: Net acres irrigated, 429,500; consumptive use per acre irrigated, 4.13.

T-1025—CONSUMPTIVE USE OF AREAS CROPPED, 1963
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	189,000	5.3	1,001,700
Alfalfa seed.....	6,500	4.7	30,550
Barley.....	75,000	1.8	135,000
Cotton.....	63,000	3.2	201,600
Corn.....	54,500	2.4	130,800
Flax.....	8,500	2.5	21,250
Sesbania.....	1,500	2.3	3,450
Sudan.....	10,500	2.3	24,150
Sugar beets.....	60,000	2.4	144,000
Miscellaneous field crops.....	19,500	2.5	48,750
Melons.....	18,580	2.3	19,550
Lettuce.....	34,500	1.4	48,300
Carrots.....	3,500	2.2	7,700
Tomatoes.....	1,000	2.1	2,100
Miscellaneous garden crops.....	6,500	2.2	14,300
Citrus.....	2,500	4.0	10,000
Dates ²			
Grapes ²			
Miscellaneous permanent crops.....	2,500	3.7	9,250
Total.....	547,000	3.39	1,852,450

¹ Based on Blaney-Criddle formula.
² Included in "Miscellaneous permanent crops."

Note: Net acres irrigated, 430,500; consumptive use per acre irrigated, 4.30.

T-1026.—CONSUMPTIVE USE OF AREAS CROPPED, 1964
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	200,500	5.3	1,062,650
Alfalfa seed.....	8,500	4.7	39,950
Barley.....	74,000	1.8	133,200
Cotton.....	68,000	3.2	217,600
Corn.....	44,000	2.4	105,600
Flax.....	4,500	2.5	11,250
Sesbania.....	500	2.3	1,150
Sudan.....	7,000	2.3	16,100
Sugar beets.....	66,000	2.4	158,400
Miscellenous field crops.....	14,000	2.5	35,000
Melons.....	5,500	2.3	12,650
Lettuce.....	40,000	1.4	56,000
Carrots.....	3,000	2.2	6,600
Tomatoes.....	1,000	2.1	2,100
Miscellaneous garden crops.....	7,000	2.2	15,400
Citrus.....	2,000	4.0	8,000
Dates ²			
Grapes ²			
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	548,500	3.45	1,892,750

¹ Based on Blaney-Criddle formula.
² Included in "Miscellaneous permanent crops".

Note: Net acres irrigated, 431,500; consumptive use per acre rrigated, 4.39.

T-1027.—CONSUMPTIVE USE OF AREAS CROPPED, 1965
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	187,000	5.3	991,100
Alfalfa (seed) ²			
Barley.....	99,000	1.8	178,200
Cotton.....	69,500	3.2	222,400
Corn.....	57,500	2.4	138,000
Flax.....	4,500	2.5	11,250
Sesbania.....	1,000	2.3	2,300
Sudan.....	4,000	2.3	9,200
Sugarbeets.....	64,000	2.4	153,600
Miscellaneous field crops.....	11,000	2.5	27,500
Melons.....	6,000	2.3	13,800
Lettuce.....	35,500	1.4	49,700
Carrots.....	2,500	2.2	5,500
Tomatoes.....	500	2.1	1,050
Miscellaneous garden crops.....	6,500	2.2	14,300
Citrus.....	2,500	4.0	10,000
Dates ¹			
Grapes ¹			
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	554,000	3.32	1,839,000

¹ Based on Blaney-Criddle formula.
² Included in alfalfa.
³ Included in miscellaneous permanent crops.
Note: Net acres irrigated, 432,500; consumptive use per acre irrigated, 4.25.

T-1028.—CONSUMPTIVE USE OF AREAS CROPPED, 1966
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	168,500	5.3	893,050
Barley.....	101,500	1.8	182,700
Cotton.....	39,000	3.2	124,800
Corn.....	116,000	2.4	278,400
Flax.....	2,500	2.5	6,250
Sesbania.....	1,500	2.3	3,450
Sudan.....	4,500	2.3	10,350
Sugar beets.....	62,000	2.4	148,800
Miscellaneous field crops.....	18,000	2.5	45,000
Melons.....	8,500	2.3	19,550
Lettuce.....	45,500	1.4	63,700
Carrots.....	2,000	2.2	4,400
Tomatoes.....	500	2.1	1,050
Miscellaneous garden crops.....	6,500	2.2	14,300
Citrus.....	2,000	4.0	8,000
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	581,500	3.12	1,814,900

¹ Based on Blaney-Criddle formula.
Note: Net acres irrigated, 437,500; consumptive use per acre irrigated, 4.15.

T-1029.—CONSUMPTIVE USE, IMPERIAL UNIT, 1959-1966 AVERAGE

[Use rates, Imperial unit]

Year	Acre-feet per acre			
	Consumptive use per acre of crop ¹	Delivered per acre of crop	Consumptive use per acre irrigated	Delivered per acre irrigated
	(1)	(2)	(3)	(4)
1959.....	3.37	3.99	4.32	5.11
1960.....	3.50	4.44	4.36	5.52
1961.....	3.50	4.59	4.23	5.54
1962.....	3.38	4.66	4.13	5.69
1963.....	3.39	4.59	4.30	5.84
1964.....	3.45	4.38	4.39	5.55
1965.....	3.32	4.17	4.25	5.35
1966.....	3.12	4.25	4.15	5.65
8-year average.....	3.38	4.38	± 4.26	5.53

¹ Based on Blaney-Criddle formula.

± Refer T-1030.

Note: Refer T-1021 through T-1028.

T-1030.—CONSUMPTIVE USE, 1959-66

[Acres in crop to nearest 500 acres]

Year	Acres of crop	Consumptive Use ¹		Acres irrigated	Consumptive use per acre irrigated
		Acre-feet per acre	Total acre-feet		
1959.....	563,500	3.37	1,899,400	440,000	4.32
1960.....	540,500	3.50	1,894,450	434,500	4.36
1961.....	525,500	3.50	1,840,200	435,500	4.23
1962.....	525,000	3.38	1,774,150	429,500	4.13
1963.....	547,000	3.39	1,852,450	430,500	4.30
1964.....	548,500	3.45	1,892,750	431,500	4.39
1965.....	554,000	3.32	1,839,000	432,500	4.25
1966.....	581,500	3.12	1,814,900	437,500	4.15
8-year average.....	548,000	3.38	1,851,000	434,000	± 4.26

¹ Consumptive use based on Blaney-Criddle formula.

±Weighted average.

Note: Refer T-1029.

T-1031.—SALINITY OF IRRIGATION WATER RECEIVED BY DISTRICT AND LEACHING REQUIREMENT, 1959-66

Year	Annual discharge acre-feet ^a	Total salt (tons) ^b	Historic weighted average salinity			Leaching requirement (percent)
			TAF	Parts per million	K×10 ^c	
	(1)	(2)	(3)	(4)	(5)	(6) ^d
1959.....	2,840,173	2,852,019	1.00	735	1,050	17
1960.....	2,983,860	3,162,485	1.06	779	1,110	19
1961.....	2,957,200	3,330,087	1.13	831	1,190	20
1962.....	2,951,266	3,399,464	1.13	845	1,210	20
1963.....	2,991,429	3,378,583	1.13	831	1,190	20
1964.....	2,770,474	3,284,284	1.19	875	1,250	21
1965.....	2,624,363	3,406,457	1.30	956	1,370	23
1966.....	2,817,912	3,650,447	1.30	956	1,370	23
Average.....	2,867,085	3,307,978	• 1.15	• 845	1,210	20

^a Total discharge, all-American Canal below drop 1.
^b Based on weekly salinity samples.
^c Based on conversion factor of 0.7 for parts per million to conductivity (micromhos/cm. to nearest 10).
^d Based on average salt tolerance for 50 percent yield reduction and historic conductance of water delivered to district.
Refer USDA Handbook No. 60 and Bulletin 283. Includes allowance for minimum nonuniformity of application.
• Weighted average.

T-1032.—THEORETICAL DISTRIBUTION "DELIVERED TO USERS," 1959-66

Year	Consumptive use (thousand acre-feet) ¹	Delivered to users ²	Total leaching required ³	Water available for farm effi- ciency-leaching requirement ⁴	
				Thousand acre-feet	Percent
1959.....	1,899	2,250	(5.20—4.32)×440.0=387.....	(—36)	(101. 6)
1960.....	1,894	2,396	(5.38—4.36)×434.5=443.....	59	97. 5
1961.....	1,840	2,415	(5.29—4.23)×435.5=462.....	113	95. 3
1962.....	1,774	2,446	(5.16—4.13)×429.5=442.....	230	90. 6
1963.....	1,852	2,513	(5.37—4.30)×430.5=461.....	200	92. 0
1964.....	1,893	2,399	(5.56—4.39)×431.5=505.....	(1)	(100. 0)
1965.....	1,839	2,312	(5.52—4.25)×432.5=549.....	(—76)	(103. 3)
1966.....	1,815	2,470	(5.39—4.15)×437.5=543.....	112	95. 5
Average.....	1,851	2,400	(5.33—4.26)×433.9=464 ¹		

¹ Based on Blaney-Criddle formula.
² Refer T-1019.
³ (Total in 1,000 acre-feet) refer T-1033 for acre-feet per irrigated acre.
⁴ Represents water that was available for farm loss after leaching requirement and consumptive use had been satisfied.
Weighted average.

T-1033.—WATER FOR CONSUMPTIVE USE AND LEACHING REQUIREMENT AND THEORETICAL FARM EFFICIENCY, 1959-66

Year	Per irrigated acre					Total consumptive use ¹ (col. 1 times col. 2)	Total leaching requirement (col. 1 times col. 2)	Available for farm efficiency ² (col. 6 minus col. 7 plus col. 8)	Farm efficiency percent (col. 6 minus col. 9 divided by col. 6 times 100) ²
	Total irrigated acres (thousands)	Consumptive use	Leaching requirement (percent)	Consumptive use plus leaching requirement (col. 2 times 100 divided by col. 3)	Leaching requirement only (col. 4 minus col. 2)				
1959	440.0	4.32	17	5.20	0.88	1,899	387	(-36)	(101.6)
1960	434.5	4.36	19	5.38	1.02	1,894	443	59	97.5
1961	435.5	4.23	20	5.29	1.06	1,840	462	113	95.3
1962	429.5	4.13	20	5.16	1.03	1,774	442	230	90.6
1963	430.5	4.30	20	5.37	1.07	1,852	461	200	92.0
1964	431.5	4.39	21	5.56	1.17	1,833	505	(1)	(100.0)
1965	432.5	4.25	23	5.52	1.27	1,839	549	(-76)	(103.3)
1966	437.5	4.15	23	5.39	1.24	1,815	543	112	95.5
8-year average--	433.9	4.26	20	5.33	1.07	1,851	464	-----	-----

Note: Cols. 1, 6, 7, 8, and 9 are in 1,000 acre-feet. Col. 2 refer T-1029; col. 3 refer T-1031; col. 6 refer T-1019.

¹ Based on Blaney-Criddle formula.

² Represents water that was available for farm losses after leaching requirements and consumptive use had been satisfied.

³ Weighted average.

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T-1034.—INFLOW TO SALTON SEA, IMPERIAL IRRIGATION DISTRICT AND MEXICO, 1959-66
[In thousands of acre-feet]

Year	From Mexico at international boundary	From Imperial Irrigation District			Total, Imperial Irrigation District and Mexico
		Operational loss	Farm drainage	Total, Imperial Irrigation District	
1959.....	124	88	933	1,021	1,145
1960.....	123	86	973	1,080	1,183
1961.....	117	78	973	1,051	1,169
1962.....	134	70	1,019	1,089	1,223
1963.....	141	67	1,087	1,154	1,286
1964.....	107	36	869	905	1,052
1965.....	113	27	856	883	986
1966.....	104	28	977	1,005	1,109
8-year average.....	120	60	961	1,021	1,141

T-1035.—THEORETICAL DISTRIBUTION "IMPERIAL IRRIGATION DISTRICT CONTRIBUTION TO SALTON SEA"
1959-66
[In thousands of acre-feet]

	1959	1960	1961	1962	1963	1964	1965	1966	8-year average
Leaching requirement ¹	387	443	462	442	461	505	549	543	450
Operational loss.....	88	86	78	70	67	36	27	28	65
85-percent canal loss and regulation ²	476	491	462	417	410	317	297	339	419
50-percent water available for farm efficiency ³		30	57	115	100			56	64
Total theoretical ⁴	951	1,050	1,059	1,044	1,038	858	873	957	988
Observed to sea ⁵	1,021	1,060	1,051	1,089	1,154	905	883	1,005	1,034
Difference.....	-70	-10	+8	-45	-116	-47	-10	-48	-46

¹ Refer T-1033.
² Based on 15-percent allowance for surface evaporation and consumptive use of vegetation along and adjacent to can section in Imperial unit, refer T-1020, "Total canal loss and regulation."
³ Estimated 50 percent of water available for farm losses after leaching requirement and crop consumptive use has been satisfied from amount of "deliveries to users"; refer T-1033.
⁴ Does not include contribution from rainfall.
⁵ Includes contribution from rainfall.

DIVERSION REQUIRED AT PILOT KNOB FOR IMPERIAL UNIT BASED ON BLANEY-CHIDSEY FORMULA AND 1964-1966 CROP PATTERN FOR HISTORIC PPM SALINITY CONCENTRATION OF IRRIGATION WATER

Double cropping, average 3 years—1964-66 (acres)

Acres in crops : 561,000.
Area irrigated for crops : 484,000.
Double cropped : 127,000 or 22.6% of 561,000 acres—Say 23%.

T-1036.—REQUIRED FOR DELIVERY TO FARMS

Input Irrigation water at—	926 p.p.m. ¹ (percent)	Acres-Feet per Irrigated Acre
Average consumptive use per irrigated acre, 1964-66 ²		4.25
Leaching Requirement ³	22	5.46
Farm Efficiency (leaching requirement).....	95	5.75
System regulation and system loss (historic 3-year average) ⁴	15	6.76
Required for delivery at Pilot Knob per acre irrigated.....		6.8

¹ Average measured salinity, 1964-66.
² Refer to T-1043.
³ Based on leaching requirement for historic 3-year average salinity of irrigation water, refer T-1044.
⁴ System loss includes seepage, transpiration, and evaporation losses, unmeasured deliveries to some 1,500 or more service pipes, deliveries to farm homes, and farms less than 2 acres.
⁵ Round to 6.8 acre-feet.

<i>Quantity Required at Pilot Knob</i> ¹		<i>Acre-feet</i>
Consumptive use by crops.....	4. 26×434, 000=	1, 849, 000
Leaching requirement and/or irrigation ef- ficiency.....	(5. 75—4. 26) ×434, 000=	647, 000
System regulation and system loss.....	6. 8—5. 75×434, 000=	456, 000
Total required to IID at Pilot Knob ¹		2, 952, 000
¹ Based on use of Blaney-Criddle formula.		

T-1037.—DISTRIBUTION PRESENT USES, IMPERIAL UNIT, 1964-66
[In thousands of acre-feet]

	1964	1965	1966	Average, 3 years
To Imperial Irrigation District at Pilot Knob.....	2, 808	2, 688	2, 886	2, 794
Loss, Pilot Knob to Drop 1 (Imperial Irrigation District).....	37	64	69	57
Loss, Drop 1 to EHL.....	35	43	49	42
Loss, EHL to WSM.....	18	19	21	19
Gross AA canal loss.....	90	126	139	118
Canal loss and regulation ¹	283	223	249	252
Total all Imperial Irrigation District losses.....	373	349	388	370
Spill for system regulation.....	36	27	28	30
Total for system regulation and canal loss.....	409	376	416	400
Total deliveries to users.....	2, 399	2, 312	2, 470	2, 394
System efficiency, percent.....	85. 4	86. 0	85. 6	85. 7
Gross area of crops, acres ²	548	554	581	561
Net acreage irrigated, acres ³	432	432	437	434
Delivered to users, acre-feet per acre of crop.....	4. 38	4. 17	4. 25	4. 27
Delivered to users, acre-feet per acre irrigated.....	5. 55	5. 35	5. 65	5. 52
At Pilot Knob, acre-feet per acre irrigated.....	6. 50	6. 22	6. 60	6. 44

¹ Canal loss and regulation includes seepage, transpiration and evaporation losses, unmeasured deliveries to some 1,500 or more service pipes, deliveries to farm homes, and farms less than 2 acres.
² Round to 85 percent.
³ In thousand acres.

T-1038.—WATER DISTRIBUTION, 1964-66
[In thousands of acre-feet]

Year	Received at Pilot Knob	Operational loss			Canal loss and regulation				Delivered to users
		Main canals	Lateral canals	Total	A.A.C.	Main canals	Lateral canals	Total	
1964.....	2, 808	12	24	36	90	81	202	373	2, 399
1965.....	2, 688	11	16	27	126	67	156	349	2, 312
1966.....	2, 886	12	16	28	139	76	173	388	2, 470
3-year average..	2, 794	12	18	30	118	75	177	370	2, 394

T-1039.—CONSUMPTIVE USE OF AREAS CROPPED, 1964
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	200,500	5.3	1,062,050
Alfalfa seed.....	8,500	4.7	39,950
Barley.....	74,000	1.8	133,200
Cotton.....	68,000	3.2	217,600
Corn.....	44,000	2.4	105,600
Flax.....	4,500	2.5	11,250
Sesbania.....	500	2.3	1,150
Sudan.....	7,000	2.3	16,100
Sugar beets.....	66,000	2.4	158,400
Miscellaneous field crops.....	14,000	2.5	35,000
Melons.....	5,500	2.3	12,650
Lettuce.....	40,000	1.4	56,000
Carrots.....	3,000	2.2	6,600
Tomatoes.....	1,000	2.1	2,100
Miscellaneous garden crops.....	7,000	2.2	15,400
Citrus.....	2,000	4.0	8,000
Dates ²			
Grapes ³			
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	548,500	3.45	1,892,750

¹ Based on Blaney-Criddle formula.
² Included in "Miscellaneous permanent crops."
Note: Net acres irrigated, 431,500; consumptive use per acre irrigated, 4.39.

T-1040.—CONSUMPTIVE USE OF AREAS CROPPED, 1965
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	187,000	5.3	991,100
Alfalfa (seed) ²			
Barley.....	99,000	1.8	178,200
Cotton.....	69,500	3.2	222,400
Corn.....	57,500	2.4	138,000
Flax.....	4,500	2.5	11,250
Sesbania.....	1,000	2.3	2,300
Sudan.....	4,000	2.3	9,200
Sugar beets.....	64,000	2.4	153,600
Miscellaneous field crops.....	11,000	2.5	27,500
Melons.....	6,000	2.3	13,800
Lettuce.....	35,500	1.4	49,700
Carrots.....	2,500	2.2	5,500
Tomatoes.....	500	2.1	1,050
Miscellaneous garden crops.....	6,500	2.2	14,300
Citrus.....	2,500	4.0	10,000
Dates ³			
Grapes ⁴			
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	554,000	3.32	1,830,000

¹ Based on Blaney-Criddle formula.
² Included in alfalfa.
³ Included in miscellaneous permanent crops.
Note: Net acres irrigated, 432,500; consumptive use per acre irrigated, 4.25.

T-1041.—CONSUMPTIVE USE OF AREAS CROPPED, 1966
[Acres in crop to nearest 500 acres]

	Acres	Consumptive use	
		Acre-feet per acre ¹	Acre-feet
Alfalfa.....	168,500	5.3	893,050
Barley.....	101,500	1.8	182,700
Cotton.....	39,000	3.2	124,800
Corn.....	116,000	2.4	278,400
Flax.....	2,500	2.5	6,250
Sesbania.....	1,500	2.3	3,450
Sudan.....	4,500	2.3	10,350
Sugar beets.....	62,000	2.4	148,800
Miscellaneous field crops.....	18,000	2.5	45,000
Melons.....	8,500	2.3	19,550
Lettuce.....	45,500	1.4	63,700
Carrots.....	2,000	2.2	4,400
Tomatoes.....	500	2.1	1,050
Miscellaneous garden crops.....	6,500	2.2	14,300
Citrus.....	2,000	4.0	8,000
Miscellaneous permanent crops.....	3,000	3.7	11,100
Total.....	581,500	3.12	1,814,900

¹ Based on Blaney-Criddle formula.
Note: Net acres irrigated, 437,500; consumptive use per acre irrigated, 4.15.

T-1042.—CONSUMPTIVE USE, IMPERIAL UNIT, 1964-66 AVERAGE
[Use rates, Imperial unit]

Year	Acre-feet per acre			
	Consumptive use per acre of crop ¹	Delivered per acre of crop	Consumptive use per acre irrigated	Delivered per acre irrigated
	(1)	(2)	(3)	(4)
1964.....	3.45	4.38	4.39	5.55
1965.....	3.32	4.17	4.25	5.35
1966.....	3.12	4.25	4.15	5.65
3-year average.....	3.29	4.27	4.26	5.52

¹ Based on Blaney-Criddle formula.
Note: Refer T-1039 through T-1041.

T-1043.—CONSUMPTIVE USE, 1964-66
[Acres in crop to nearest 500 acres]

Year	Acres of crop	Consumptive use ¹		Acres irrigated	Consumptive use per acre irrigated
		Acre-feet per acre	Total acre-feet		
1964.....	548,500	3.45	1,892,750	431,500	4.39
1965.....	554,000	3.32	1,839,000	432,500	4.25
1966.....	581,500	3.12	1,814,900	437,500	4.15
3-year average.....	561,500	3.29	1,848,900	434,000	4.26

¹ Consumptive use based on Blaney-Criddle formula.
Note: Refer T-1042.

T-1044.—SALINITY OF IRRIGATION WATER RECEIVED BY DISTRICT AND LEACHING REQUIREMENT, 1964-66

Year	Annual discharge (acre-feet) ^a	Total salt (tons) ^b	Historic weighted average salinity			Leaching requirement (percent) ^d
			TAF	Parts per million	K×10 ⁶ • million	
	(1)	(2)	(3)	(4)	(5)	(6)
1964.....	2,770,474	3,284,284	1.19	875	1,250	21
1965.....	2,624,363	3,406,457	1.30	956	1,370	23
1966.....	2,817,912	3,650,447	1.30	956	1,370	23
Average.....	2,737,583	3,447,063	1.26	• 926	1,320	22

^a Total discharge All-American Canal below drop 1.
^b Based on weekly salinity samples.
^c Based on conversion factor of 0.7 for parts per million to conductivity (micromhos/cm. to nearest 10).
^d Based on average salt tolerance for 50 percent yield reduction and historic conductance of water delivered to district. Refer USDA Handbook No. 60 and Bulletin 283. Includes allowance for minimum nonuniformity of application.
• Weighted average.

T-1045.—THEORETICAL DISTRIBUTION "DELIVERED TO USERS," 1964-66

Year	Consumptive use (thousand acre-feet) ¹	Delivered to users ²	Total leaching required ³	Water available for farm efficiency-leaching requirement	
				Thousand acre-feet	Percent
1964.....	1,893	2,399	(5.56—4.39)×431.5—505.....	(1)	(100.0)
1965.....	1,839	2,312	(5.52—4.25)×432.5=549.....	(—76)	(103.3)
1966.....	1,815	2,470	(5.39—4.15)×437.5=543.....	112	95.5
3-year average..	1,849	2,394	(5.46—4.26)×433.8—521.....		

¹ Based on Blaney-Criddle formula.
² Refer T-1037.
³ (Total in 1,000 acre-feet) refer T-1046 for acre-feet per irrigated acre.
• Represents water that was available for farm loss after leaching requirement and consumptive use had been satisfied

T-1046.—WATER FOR CONSUMPTIVE USE AND LEACHING REQUIREMENT AND THEORETICAL FARM EFFICIENCY, 1964-66

Year	Per irrigated acre						Farm efficiency percent (col. 6 minus col. 9 divided by col. 6 times 100)
	Total irrigated acres (thousands)	Consumptive use ¹	Leaching requirement (percent)	Consumptive use plus leaching requirement (col. 2 times 100 divided by col. 3)	Leaching requirement only (col. 4 minus col. 3)	Total delivered to users	
	(1)	(2)	(3)	(4)	(5)	(6)	(10)
1964.....	431.5	4.39	21	5.56	1.17	2,399	(100.0)
1965.....	432.5	4.25	23	5.52	1.27	2,312	(103.3)
1966.....	437.5	4.15	23	5.39	1.24	2,470	95.5
3-year average..	433.8	4.26	22	5.46	1.20	2,394	

¹ Based on Blaney-Criddle formula.
² Represents water that was available for farm losses after leaching requirements and consumptive use had been satisfied.
³ Weighted average.

Note: Cols. 6, 7, 8, and 9 are in 1,000 acre-feet. Col. 2 refer T-1042; col. 3 refer T-1044; col. 6 refer T-1037.

COLORADO RIVER BASIN PROJECT

T-1047.—INFLOW TO SALTON SEA, IMPERIAL IRRIGATION DISTRICT AND MEXICO, 1964-66
[In thousands of acre-feet]

Year	From Mexico at international boundary	From Imperial Irrigation District			Total, Imperial Irrigation District and Mexico
		Operational loss	Farm drainage	Total, Imperial Irrigation District	
1964.....	107	36	869	905	1,012
1965.....	113	27	856	893	1,006
1966.....	104	28	977	1,005	1,109
3-year average.....	108	30	901	931	1,039

T-1048.—THEORETICAL DISTRIBUTION "IID CONTRIBUTION TO SALTON SEA," 1964-66
[In thousands of acre-feet]

	1964	1965	1966	3-year average
Leaching requirement ¹	505	549	543	532
Operational loss.....	36	27	28	30
85 percent canal loss and Regulation ²	317	297	330	315
50 percent water available for farm efficiency ³			56	53
Total, theoretical ⁴	858	873	957	893
Observed to sea ⁵	905	883	1,005	898
Difference.....	-47	-10	-48	-4

¹ Refer T-1046.
² Based on 15-percent allowance for surface evaporation and consumptive use of vegetation along and adjacent to can section in Imperial unit; refer T-1038. "Total Canal Loss and Regulation."
³ Estimated 50 percent of water available for farm losses after leaching requirement and crop consumptive use had been satisfied from amount of "deliveries to users"; refer T-1046.
⁴ Does not include contribution from rainfall.
⁵ Includes contribution from rainfall.

SALINITY OF OUTFLOW TO SALTON SEA, 1959-66		Tons of salt per acre-foot
Year:		
1959.....		3.8
1960.....		3.8
1961.....		3.8
1962.....		3.5
1963.....		3.5
1964.....		4.0
1965.....		4.3
1966.....		4.1

¹ Yearly weighted average of measured outflow including rainfall: 1959-66 8-year average tons per acre-foot, 3.68; 1964-66 3-year average tons per acre-foot, 4.16; 1959-66 8-year average PPM, 2,695; 1964-66 3-year average PPM, 3,057.

Mr. TUNNEY. Thank you, Mr. Chairman. I yield whatever time I have left to Mr. Hosmer.

Mr. JOHNSON. You cannot do that. He has reserved the balance of his time. You wish to reserve the balance of your time, I am sure.

Mr. TUNNEY. No, I do not. I yield back my time.

Mr. JOHNSON. The Chair now recognizes the gentleman from Utah Mr. Burton.

Mr. BURTON of Utah. Thank you, Mr. Chairman.

Mr. Secretary, would you give us a description of what the feasibility of central Arizona would be if there were no development of the upper basin entitlement, including central Utah?

Secretary UDALL. On what time schedule?

Mr. BURTON of Utah. I think you mentioned in your statement, as I recall, Mr. Secretary, 1985 as the target date——

Mr. DOMINY. Yes, we testified earlier, Mr. Burton, that even under full development of the upper basin and even under a more advanced schedule of development for the upper basin than we think possible, the central Arizona project is still a viable undertaking. If the water supply decreases at an earlier date it might be necessary to increase the municipal-industrial water rate somewhat in order to pay out on schedule. But the project would still have a favorable benefit-cost ratio and be justified.

Mr. BURTON of Utah. In your judgment, Mr. Commissioner, this would not be prejudicial to the interests of central Utah, is that right?

Mr. DOMINY. No, sir; I do not think it would be.

Mr. BURTON of Utah. I would like to ask you, Mr. Secretary, or the Commissioner, what the building of this steam-generating plant to finance central Arizona means in terms of the Kaiparowits development we have been talking about for a long time?

Secretary UDALL. Congressman, the WEST group has identified three major areas that have excellent coal deposits that are susceptible of development for these very large plants that they hope to build for the whole Southwest and mountain region, because Colorado and Utah electric power companies are in the WEST organization as well. These are the deposits in the four corners area, the Black Mesa deposits on the Navajo and Hopi Reservations, and the Kaiparowits in southern Utah. There are coal reserves that have been already developed in Colorado and some very fine reserves in Utah, but I am talking about the ones along the river.

Mr. BURTON of Utah. Kaiparowits fits that description, "along the river."

Secretary UDALL. Yes, it does, indeed. As matters now stand, I think for some logical reasons, development began first in the four corners area. We have already put together the Mohave plant in Nevada, where coal will be slurried in. Due to the lack of water, which is the key—you cannot develop this coal without water—the Page plant will be the only other large plant using this Indian coal, as we just do not have enough water to accommodate others. The Kaiparowits coal, which is in Utah and near Lake Powell, is the third major source.

I have corresponded at length with your Governor and others on this. There has never been a problem of developing one or the other, it has merely been a question of which comes first. Powerloads are growing so rapidly that in any event, whether or not Page moves ahead of the first Kaiparowits plant—there would be more than one or two—we are only talking about a difference of 2 or 3 years. I want to make it plain to the Congressman that I do not regard these plants as competing with one another. They are competing only in the sense of which comes first. Since Peabody probably is going to begin stripping and developing the Navaho coal this year, it is logical in order to achieve economies to build both of the plants that will use this Navajo-Hopi coal at one time. Therefore, the judgment was not my judgment. The judgment of the WEST group, those who need the power, was that the Page plant in sequence ought to come before the

first Kaiparowits plant. We are going to get to the Kaiparowits development and I expect it to move forward right on schedule.

Mr. BURTON of Utah. I thank you, Mr. Secretary. That is a most reassuring comment.

And your comment is that it is not a case of one against the other. Secretary UDALL. Exactly.

Mr. BURTON of Utah. My people have a feeling that if development takes place in the Kaiparowits coal, the Indian deal is out completely. I have never been satisfied myself that that is necessarily the case. I think each one is a different project and can stand on its own merits.

Secretary UDALL. My understanding of it, and I think we ought to make the record perfectly clear here, is that the Kaiparowits coal deposits are large, they are of good quality. They are also near the water, and the WEST group, the planners that I have talked with, are very enthusiastic about this. I expect to see this moved in the next phase. If we can put it together, it will certainly be a very fine project.

Mr. BURTON of Utah. I would like to ask you, is this steam-generating power that is proposed at Page really competitive with the hydropower that might have been produced in Hualapai? What is the economic relationship between the two?

Secretary UDALL. A thermal unit produces base load power. The big modern machines operate full time and generate enormous quantities of base load power, as contrasted to hydropower, which is more useful for peaking. The two are different types of electric power and it is hard to compare them. They are both needed and they both have usefulness.

It is safe to say, however, that the 3-mill figure we gave you for irrigation pumping, will depend on the power produced by these very large new thermal units. This has been one of the major developments in the electric power industry in the last few years.

Mr. BURTON of Utah. You are saying, then, for the record, Mr. Secretary, that the thermal power at Page would be relatively competitive with possible hydropower at Hualapai?

Secretary UDALL. Yes, indeed. It is more suited to project pumping needs.

Mr. BURTON of Utah. There is another point I had here, Mr. Secretary.

One of the problems we have had on the river, you know better than anyone else, are the squatters that are there, people who are drawing water out when they have no right to do so.

What is the Bureau doing about that, or what do you intend to do about that?

Secretary UDALL. You mean the Lower Colorado?

Mr. BURTON of Utah. Yes, sir.

Secretary UDALL. Well, this is a problem that I inherited as Secretary and was very familiar with as Congressman from this area. We moved on it 7 years ago when I first became Secretary. I have taken a little pride in this because in recognition of the reclamation, fish and wildlife, recreation and other interests, we set up a Lower Colorado River land use office in Yuma. We developed, working with the counties and with the States, a master plan that is unique for this whole flood plain, with attention to recreation, fish and wildlife, and other things.

We entered into an agreement with almost all of the squatters, some of whom had right of equity, and we heard from both Congressman Udall and Congressman Tunney with regard to those rights rather strenuously. We are in the process of phasing this action out and I think it is working very well.

I think we came out with a solution that is going to work for the long run.

In fact, this land use plan, if you have not seen it, is, I think, a very exciting one, because the lands involved are of increasingly great value to the people for outdoor recreation and other purposes.

I think I can say to you that in a matter of 2 or 3 years that we will have the problem largely resolved.

Mr. BURTON of Utah. Well, that is reassuring to know that you are now in the process of phasing out this problem, because we in the upper basin feel sometimes that we have been supplying this water to people above and far beyond their entitlement or legal right to it.

Another question, Mr. Secretary: Will the passage of your proposal—that is, the steam generating plant to finance central Arizona, necessarily preclude sometime in the future the Hualapai Indians losing out their damsite or building their own dam?

I offer for your attention the fact that I am sure all the other members of this committee as well as myself have received letters from attorneys representing them, indicating that they hope that their rights to the future development would not be impaired by anything we might do here.

Secretary UDALL. Congressman, I think we ought to be quite candid on that point. What has been proposed and what the Senate bill did and what I hope the House does is to reserve the decision on the Hualapai Dam to the Congress. Hualapai Indians do not own the damsite. Their land borders on one side of the river only. I do not think that the Federal Power Commission ought to make the decision on this. I think the Congress of the United States ought to make the decision on it. I think the Congress ought to reserve in this legislation the right to make that decision, because the Hualapais are just like some of the other Indian tribes, where they find themselves on one side of the river but they do not own the damsite. Let's be honest about that.

Mr. SAYLOR. Will the gentleman yield?

Mr. BURTON of Utah. I will be happy to yield in just a second, because it seems to me in H.R. 3300, we have appropriated money to buy the damsite for them, to the tune of \$23 million.

Secretary UDALL. In the previous legislation, there was money to pay damsite value. Now, the lawyers have always said that there is no such value. However, with the approval of this committee, and I think we did the right thing, we paid powersite value to the Crow Indians in Montana in the Yellowtail project. It was proposed to treat the Hualapais the same way in respect to the proposed Hualapai Dam as if they owned a site value.

Mr. BURTON of Utah. I thought with this appropriation we were conceding the fact that they own the damsite.

Secretary UDALL. No, they own land that would be flooded.

Mr. BURTON of Utah. I yield to Mr. Saylor.

Mr. SAYLOR. I call the attention of my colleagues on the committee to an article that just appeared in this month's issue of Venture maga-

zine by the Secretary after he had taken this trip down the Colorado River.

Mr. Secretary, I want to commend you for that article.

Secretary UDALL. Well, you know, we all have our own views. There is no substitute, I have found, for seeing something on the ground. My real feeling, as I tried to say at the end, is that if this hydropower is needed, and I think this is where it stands or falls, you ought to have a high dam. You ought to develop the full potential.

On the other hand, if the needs of the country, in the view of the Congress at some time in the future, are that balancing that need whatever it might be at some future time, against the other values that are present, if the decision is to preserve it, why, then, you can decide it at that time.

But I do strongly feel, as I did when I got through with the trip, that the Congress ought to reserve to itself the right to make this decision and not let it be made by the Federal Power Commission.

Mr. SAYLOR. I want to say, Mr. Secretary, I am delighted you took that trip. I am delighted you relied on your own experience rather than pictures that Mr. Dominy takes.

Mr. HOSMER. Will the gentleman yield?

Mr. BURTON of Utah. I will just recapture the balance of my time to say I think Mr. Dominy takes some darned good pictures. What is more, I intend to send the gentleman from Pennsylvania a copy of an article I wrote following my trip down the river.

I yield to the gentleman from California.

Mr. HOSMER. I would just like to ask the Secretary in terms of modern history, what number were you as a visitor to this area? Number 600 or something?

Secretary UDALL. You mean to go down the river? I don't know. There is a lot of traffic on the river. It is a great trip. You ought to take it.

Mr. HOSMER. I think in all of recorded history, there are less than 2,000 that have ever seen that area.

Secretary UDALL. There are about 2,000 now that take the trip each year.

Mr. HOSMER. Since this legislation came up. It will drop off afterward, I am sure.

Secretary UDALL. I would predict that we are going to have a problem of rationing those trips. You can only accommodate so many people. I am sure the Congressmen that went on the trip would agree. There are only so many camping places. It is a fine trip and there will be 2,000 or 3,000 people every summer who take the trip. I think it is one of the greatest outdoor trips in the Nation, no question about it.

Mr. HOSMER. Was it not you, Mr. Secretary, who pointed out that recreation space was becoming scarce in this country, particularly in the West, that population was increasing and one of the best ways to provide for the most people was to create some lakes on which they could recreate?

Secretary UDALL. Quite frankly, there is no question at all but the fresh water lakes can provide for more use by more people than almost any other recreation facility.

One of the other thoughts I came back with after my trip was a greater appreciation of Lake Powell as a resource. I think if you were

to have a great fresh water lake in that region, Lake Powell is the place to have it, because it has such an enormous shoreline, it has so many points of access. This is one of the things that was very clear to me in making the trip.

Mr. HOSMER. Thank you.

Mr. BURTON of Utah. Mr. Secretary, I would like to say for the record and for the benefit of my colleagues that I have been a pretty good soldier on this central Arizona. When we charged up the Hill when the Department recommended Marble Canyon, I was there in such diverse company as Barry Goldwater and Morris K. Udall. When they dropped Marble Canyon and decided to go for Hualapai, I was in the middle of the canyon, at 15°, with my colleague from Arizona invoking various whammies for rain.

Secretary UDALL. Trying to walk on the water.

Mr. BURTON of Utah. Yes. As a matter of fact, Mr. Secretary, your brother did try to walk on the water and he was unsuccessful. One of my colleagues from the committee suggested that next time he determine if he can walk on the water with "acre-feet."

I assure you that I am trying to learn my proper place in the ranks now that we march toward steam generation. It is nice to be relieved of the withering volleys that are fired from John Saylor and Dave Brower in trying to build a dam.

Now, I sat up Monday and drew up pages and pages of questions that I had intended to ask you, Mr. Secretary; but after you sit through 4 days of hearings and have to follow Wayne Aspinall and John Saylor and Craig Hosmer, there is not a heck of a lot more to be asked.

So, Mr. Chairman, I want to wish the Secretary a happy birthday, last Wednesday, and reserve the balance of my time.

Mr. JOHNSON. The gentleman from Nevada?

Mr. BARING. No questions.

Mr. JOHNSON. The gentleman from Washington, Mr. Foley.

Mr. FOLEY. Mr. Secretary, as my friend from Utah has pointed out, there have been a good many changes over the months and years in which this subject has been discussed. I believe you said that recently, the decisions regarding the dams in the Colorado represented an application of commonsense. I would like to discuss another question that I think involves an element of commonsense, and that is the question of augmentation of the Colorado River.

Would you please relate again the requirements in terms of acre-feet which must be augmented to the Colorado River if the effect of the central Arizona development is to be restored from the standpoint of water?

Secretary UDALL. We are talking about a range of a two to two and a half million acre-feet as the amount of augmentation water that would make the river whole, as it were. We have the Mexican Treaty burden, which was added in 1944, and which is a paramount responsibility of the river and of the whole basin. Based on the present hydrologic record, the river ultimately will be short in the neighborhood of something like 2 million acre-feet if the lower basin States are to receive 7.5 million acre-feet annually for consumptive use.

Mr. FOLEY. In terms of the central Arizona project only?

Secretary UDALL. In terms of the total.

Mr. FOLEY. You are not including in there the effect of mixing the water?

Secretary UDALL. I am including everything. I am including full development in the upper basin, the central Arizona, and full use of California's entitlement. In other words, I am assuming full development and use of the river.

Mr. WYATT. Mr. Chairman, will the gentleman yield?

Mr. FOLEY. Yes.

Mr. WYATT. With the indulgence of my colleague, I have an engagement I have to keep. I wonder if I might interrupt and presume on the committee to ask a few questions at this time?

Mr. FOLEY. I yield to the gentleman.

Mr. WYATT. Thank you, sir.

Mr. Secretary, I am not as suspicious as my good and beloved friend from Florida that what the Department is really intending to do here is go to the Columbia River for augmentation. But I think for the record, perhaps you might like to comment on that and somewhat dispel the charge.

Secretary UDALL. I thought we made a pretty good record about a year ago and I would say the judgment of the administration has not altered since that time with regard to augmentation.

We are basically committed to the idea that there is time and that there is a national interest in having something like the National Water Commission take a broad look at the Nation's future, at the difficult alternatives, at economics, the kind of broad water look that has not been taken, and that we should prudently look at all of the alternatives, study them thoroughly, and make our judgments in a very deliberate way with regard to what we want to do. That means that at this point certain studies of the kind I have indicated are in order, but decisions are not in order until studies are complete, until we know more about it.

Mr. WYATT. What I am really inquiring about is to confirm that there has been no prejudgment as of this time by the Department on the ultimate need to augment by an interbasin transfer?

Secretary UDALL. I would say that is a very good summary of it and I think the whole tenor of our statement has shown that.

Mr. WYATT. I have a few questions of the Commissioner if I may.

Relative to the reconnaissance report, Commissioner Dominy, I am sure the record is clear on this, but what is the projection for the cost of the desalted water at the oceanside?

Mr. DOMINY. Our reconnaissance studies show, based on the advancement of the science that can be expected to occur in the next 25 years in the judgment of the Atomic Energy people and desalinization experts, that we could produce the water from the ocean at the plant at about 9.8 cents a thousand gallons. That is roughly \$30 an acre-foot.

Mr. WYATT. Approximately \$30 an acre-foot.

Mr. DOMINY. Yes, sir.

Mr. WYATT. What is the cost that you have projected for conveyance for pumping the water from the ocean to Lake Mead?

Mr. DOMINY. This would add about another \$50 to it. The conveyance cost, in other words, would be the greater part of the total cost.

Mr. WYATT. Could you state the \$50 in cents per thousand gallons?

Mr. DOMINY. That would be around 15 to 16 cents a thousand gallons.

Mr. WYATT. So actually, the conveyance cost is the greater cost according to your present feelings on it?

Mr. DOMINY. That is correct. Incidentally, that ought to give quite a little aid and comfort to the Northwest, because the length of that conveyance was only 313 miles. The high point at which we would have to lift the water is only 2,800 feet above sea level.

Mr. WYATT. How does that compare to the distance between the Columbia River below Bonneville Dam to Lake Mead, both in distance and lift?

Mr. DOMINY. That would be about 1,200 miles of conveyance aqueduct, and the high point of the lift is about 5,000 feet.

Mr. WYATT. I assume there would be substantially greater conveyance costs, pumping costs, in any diversions from the Columbia River for the reasons you have indicated.

Mr. DOMINY. Not only because of the extra lengths and heights of pumping, but also because of climate conditions, too. We would have a lot of icing and problems like that coming across the northern mountains that we would not have coming across the southern mountains.

Mr. SAYLOR. Will you yield at that point?

Mr. WYATT. Yes; I will yield.

Mr. SAYLOR. Do not tell me, Mr. Dominy, that you admit on the witness stand that you get ice in the mountains? You sat there before this committee and told us when we discussed the Frying Pan-Arkansas project that you didn't worry about ice, that you were going to freeze it over the top and run it through the bottom. Millennium has come to this committee. I never thought I would hear such honesty on the part of the Commissioner.

Mr. DOMINY. I might say, Mr. Saylor, you have frequently attempted to put words in my mouth and twist them a bit. All I am saying in effect is that it does cost more money to handle icing conditions. It is not impossible to handle them, it is not impractical to solve them, and it is not or will not be on the Frying Pan-Arkansas project. But we are relating here to the differences in cost in conveyance from the ocean on the California coast and the cost of conveying the water from the Columbia River below Bonneville Dam.

Mr. WYATT. Mr. Commissioner, you have projected in your reconnaissance report 9.8 cent oceanside cost of water.

When the Bechtel Corp. made its study of the MWD project in 1965—I am not sure of the year—their feasibility study was in much detail, based upon the present technology, and forecast 21.9 cents oceanside water, if my memory serves me correctly.

I would like to know for the record just what the people who have made the reconnaissance report know, what factors they include that maybe were not known to Bechtel Corp. or were not included by the Bechtel Corp. in determining their water costs oceanside.

Mr. DOMINY. It is their judgment as to the great improvements and technology that can be expected to be achieved in the next 25 years. If we look back on the past 25 years and see what we have done in this field and marvel at the progress that has been made, I do not think it

is difficult to assume that these judgments may be on the conservative side. The achievements that have been made since that first nuclear chain reaction took place just 25 years ago are tremendous.

Mr. WYATT. You are relying on two basic improvements in technology as I understand.

One of them is the fast breeder reactors and the other is basic improvement in the technology of desalting itself, is that correct?

Mr. DOMINY. Yes; it is both the improvement of the atomic reaction, cheapening of the cost of fuel and the application of it to the heat process, as well as the improvement in the materials and processes of desalting. But who would have thought after that first chain reaction in 1942 that 25 years later, half of the new thermal generation capacity being ordered in the United States would be nuclear plants. In just 25 years we have made that kind of progress.

Mr. WYATT. I have just a couple of questions for the Secretary.

Mr. Secretary, I would like to ask whether or not there is a policy of the administration as to the Mexican treaty obligations, whether this is a national obligation or not?

Is there any policy of the administration in this regard at the present time?

Secretary UDALL. The Mexican treaty was entered into, it was ratified by the Senate. It is a primary treaty and as such, it becomes an obligation of the Nation to honor it. Whether one treats it as a national obligation in the sense that seeing that it is fulfilled, seeing that the water is of a sufficiently good quality and so on, are matters that the Congress itself still can decide. We have indicated that if the Congress by legislation wanted to, in effect, make this a national obligation in a thoroughgoing way, beyond the treaty itself, this could be done.

If it is the judgment of the Congress that it is the national interest to so operate this river that serves one of the most arid and one of the fastest growing regions of the country, the administration has simply indicated that it would have no objection to that.

Mr. WYATT. Mr. Secretary, if there is no policy, we should know it. If there is, I think we should know it.

Is there a policy presently of the administration as to whether or not replacement for water that is diverted to Mexico plus water that is lost in transmission, whether or not replacement of that water is a national obligation?

Secretary UDALL. This is what I am implying when I say that if Congress chose to take that view of the river and in effect of replacing this water, it could do so.

I would like to say, too, that I think already, the way we have handled things, the Nation is assuming an obligation with regard to the Mexican Treaty. I will give you one example: The bypass channel that we built to take care of the very salty water out of the Wellton Mohawk Irrigation District. We did not ask the farmers to pay for this; the National Government did it, and I think quite properly so.

Mr. ASPINALL. Will my colleague from Washington yield to me at the present time?

Mr. FOLEY. Yes, I will.

Mr. ASPINALL. Was that charged to the reclamation fund or did that come out of the general Treasury?

Secretary UDALL. From the general Treasury, and I think quite properly.

Mr. WYATT. What you are really saying, as I take it from your testimony, is that this is a question to be determined by the Congress.

Secretary UDALL. Yes.

Mr. WYATT. Mr. Secretary, is there a present policy, and I am talking about February 1968 of the administration as to whether or not Marble Canyon and Hualapai Dams should be part of this legislation we are considering now?

Secretary UDALL. The administration position is that the Marble Canyon area should go into the Grand Canyon National Park and, as I described a moment ago, Congress should reserve to itself the decision on the Hualapai situation.

The Marble Canyon provision, and we have no objection to this, is not in this legislation. It will be handled separately and I think this is a good way to handle it.

Mr. WYATT. And the decision on Hualapai you think should be reserved, which implies it should not be included in this specific legislation.

Secretary UDALL. That is right, let Congress reserve to itself the right to make that decision.

Mr. WYATT. One final question.

Will you state whether or not the administration has a policy position on whether there should be a study of interbasin transfers in connection with this specific legislation we are considering today?

Secretary UDALL. The administration's basic position, and that is the reason for its support of the National Water Commission, is for broad authority for studies of water problems by such a Commission. This has been our basic position all along.

Mr. WYATT. Of the entire United States?

Secretary UDALL. Of the entire United States and of all aspects of water—economics, water rights, the whole broad picture.

Mr. WYATT. Then by implication, I would assume that you would not specifically favor an interbasin transfer study of this specific area in this specific legislation?

Secretary UDALL. We have not proposed this. If the Congress wants to have some studies made and have them fed through the National Water Commission, I think this is a prerogative of the Congress. But this is not what we have proposed. We have proposed that a National Water Commission be the focus and also that the National Water Resources Council and the Federal Government, too, be in the process.

Mr. ASPINALL. Would the gentleman from Washington yield to me?

Mr. FOLEY. Yes, sir.

Mr. ASPINALL. You already have the authority in the Bureau of Reclamation through the Council to do this very thing, do you not?

Secretary UDALL. You are referring to making reconnaissance studies?

Mr. ASPINALL. Yes.

Secretary UDALL. The answer, I am told, is yes.

Mr. ASPINALL. Why, of course you do, and we put it in the National Water Commission authority. So far, this bill, H.R. 3300, is just duplicating what we already have; is that not right? I just want the record clear.

Secretary UDALL. As far as the reconnaissance studies, I would say that there is not necessarily any conflict.

Mr. ASPINALL. That is right.

Mr. WYATT. I have no more questions.

Thank you, Mr. Secretary, and Mr. Foley.

Mr. JOHNSON. We will now return to Congressman Foley, of Washington.

Mr. FOLEY. Mr. Secretary, almost 2 years ago, I think it was Mr. Dominy who testified that there had been a comparative cost study undertaken by the Bureau of Reclamation balancing the estimated costs of desalting as a method of augmentation of the Colorado River with interbasin transfers.

Is that correct?

Mr. DOMINY. No, sir; I testified that there had never been any real reconnaissance study. There had been the United Western study back about 1950, there had been some reviews of possibilities of moving water from the Pacific Northwest including some directed to the Snake River. Now, everybody recognizes that with the potential developments already underway and planned and under construction, if there is any surplus water in the Columbia, it would have to be assumed to be in the very lower reaches of the river. There have not been any real studies on that basis.

Mr. FOLEY. You did not testify that there had been some studies limited to cost comparisons of desalting and more conventional methods?

Mr. DOMINY. Only the kind of study you might make using existing topographical sheets and very broad judgment calculations.

Mr. ASPINALL. Will the gentleman yield?

Mr. FOLEY. Yes.

Mr. ASPINALL. This cost the U.S. taxpayers about \$500,000, if I am correctly informed, and it took place at the headquarters at Salt Lake City. We do not have these studies available to us here. We do not necessarily need a copy of this, Mr. Dominy, as far as the matters before us at the present time. But would it be possible for you to supply the committee with a copy of the report you made at that time? This is not to be inserted in the record, but just to let the committee have it for its deliberations.

Mr. DOMINY. The United Western report has been made available in the past. We will certainly be happy to make a copy available to the committee.

Mr. ASPINALL. We do not have it. The gentleman from Washington is bringing up, I think, a very fine point with regard to the studies which have been made in the past on what is proposed here—not what has been recommended, but what is proposed.

Mr. DOMINY. We certainly will be happy to make available the United Western report. It went nowhere, and just died on the vine. Of course, the cost statements and everything else would be completely unrealistic as of today.

Mr. SAYLOR. Will the gentleman yield to me?

Mr. FOLEY. Yes.

Mr. SAYLOR. I just wanted to say for the defense at least, to the Director of the Bureau of Reclamation, that I have copies of them. Of course, I got a lot of things that a lot of other people did not

because I hounded all of his predecessors to get some of these things. And some of my pipelines told me certain things were available. So they are available, and I think it would be excellent for all members of the committee to have them as we continue with this discussion and just find out what the Bureau has done.

Mr. FOLEY. My recollection is that whatever cost comparison studies were made of desalting and diversion in recent years, they have been inconclusive; that is, without further investigation it was difficult for the Department to say—

Mr. DOMINY. Yes, I recall the discussion you and I had on this point now. I said we had not made any studies that were definitive at all, but just broad horseback estimates. We could not tell definitely unless we had specific engineering studies of a pretty basic nature.

Mr. FOLEY. Has the trend of that judgment changed to favor desalting in recent years?

Mr. DOMINY. For my own part, this reconnaissance study we just made makes it look more and more apparent that the economics of providing augmentation in the Southwest may well lie in desalting when you compare it with importing water as far away as the Columbia River.

Mr. FOLEY. Even your reconnaissance report suggests that the actual estimated costs of desalting the water are roughly half the costs of transporting it where modest lift distances are involved.

Mr. DOMINY. That is correct.

Mr. FOLEY. As I think you answered in reply to Mr. Wyatt's question, the costs of moving water from; for example, the Columbia Basin area would be very substantially larger because of the distance, lift and climatic conditions?

Mr. DOMINY. That is correct, sir.

Mr. FOLEY. Do you have any general estimates on what we are talking about in terms of acre-feet costs?

Mr. DOMINY. On a straight projection basis, if it costs \$50 an acre-foot to transport the water 313 miles over a lift of 2,800 feet, it looks like it could well cost you \$125 to \$150 an acre-foot to transport it 1,200 miles because of the extra length and extra pumping head to move it from the Columbia.

The one thing that would favor the Columbia, perhaps, would be that you might go for a bigger quantity and build a larger size aqueduct and thereby reduce the unit costs.

Mr. FOLEY. That is an interesting subject, because we have been talking here in terms of meeting the needs of the Colorado River based on the effect of authorizing the central Arizona project. I think you know that part of the concern in the Northwest is that diversions would merely be an excuse for moving infinitely larger quantities of water because of the need for enhancing feasibility.

Mr. DOMINY. To go back to your exchange with the Secretary just a moment ago, all of us who are dealing with this problem and who are making estimates of the depletions and losses and salvageable percentage of the losses are all in agreement that somewhere between 2 and 2.5 million acre-feet augmentation is necessary if we are going to assure the Lower Basin States the consumptive use of 7.5 million acre-feet annually. Anything beyond that would provide water for future growth.

Mr. FOLEY. But amounts above that would not be required to make the Colorado River whole?

Mr. DOMINY. That is right, we would say 2.5 million acre-feet maximum.

Mr. FOLEY. They would be required in order to justify a movement from the Columbia River westward in any kind of feasibility arrangement?

Mr. DOMINY. That is right. The theory I would endorse is that if there is to be an aqueduct from the Columbia River, it would have to be much larger in size to justify what the gentleman suggests.

Mr. HOSMER. Will the gentleman yield?

Mr. FOLEY. Yes.

Mr. HOSMER. Is it not a fact, Mr. Commissioner, that nobody has any idea within reasonable accuracy what in the world it would cost to transport how much water from any place in the West to the Colorado system, from any place in northern California to the Colorado system; that nobody has any hard figures on desalting or any other proposed method of augmentation; and that the purpose of the clauses in this legislation to get in some studies is to give the answers that you are trying to give this morning,

Mr. DOMINY. I am not trying to give definitive answers as to costs. I am giving some judgments which I am confident are realistic.

Mr. HOSMER. Then is it just an idiotic effort to have some studies for the purpose of getting these answers, when you apparently have them.

Mr. DOMINY. No, sir; I have no specific answers as to costs.

Mr. HOSMER. If you do not have them, why don't you tell the gentleman from Washington that you don't have them? You are just making a lot of guesses.

Mr. DOMINY. I merely said it is quite obvious that you can build a conveyance channel for a large quantity of water cheaper per acre-foot than you can build a conveyance for a small quantity of water.

Mr. HOSMER. I would say on construction costs, everybody knows that.

Mr. DOMINY. I have no specific cost estimates.

Mr. HOSMER. Don't you think when these studies are turned out, when they do take in all these alternatives, they will find anything from the Northwest is equally prohibitive, that nobody would consider trying to go that route?

Mr. DOMINY. I think that is right, sir.

Mr. FOLEY. Is it not a fact, Mr. Commissioner, that there is really not much of an impression in your Department that it is economic to move water from the Columbia Basin southwest compared to other available alternatives?

Mr. DOMINY. We have no final judgment and, of course, the quantities involved would play an important part in it.

Mr. FOLEY. If you had to make a present estimate based on the amounts required to make the Colorado River whole, would you judge that transmission of water or diversion of water from the Pacific Northwest is more expensive than any of the other proposals, assuming that they work out as projected?

Mr. DOMINY. Assuming conveyance limited to 2.5 million acre-feet, yes; I would say the cheapest source is in the Southwest rather than to go as far as the Columbia River.

Mr. FOLEY. Actually, in terms of precise answers, you have been able to estimate today down to a tenth of a cent in the reconnaissance study—not a feasibility study—the oceanside cost of desalting. It is not asking too much, then, to get your judgments in these areas without a reconnaissance study; is it?

Mr. DOMINY. I think in the terms of the generalities you and I are discussing, these are within practical limits.

Mr. FOLEY. As the chairman pointed out, there is no limitation on the Department conducting reconnaissance studies.

Mr. DOMINY. That is correct.

Mr. FOLEY. And if reconnaissance studies give you within a 10 percentile accuracy, that ought to be enough in terms of costs?

Mr. DOMINY. Yes.

Mr. FOLEY. Actually, what we are talking about, Mr. Commissioner, in terms of augmentation is not just the availability of quantities of water of such quality. But the critical question is really cost, is it not, when you are talking about augmenting water to the Colorado River?

Mr. DOMINY. Yes; certainly augmentation has to be within the realm of favorable benefit-cost ratio and where pertinent, within the realm of the ability of the users to take it, use it, and pay for it.

Mr. FOLEY. Are there not a number of technologies now that would provide augmentation if attempted?

Mr. DOMINY. Well, the only two that of course—

Mr. FOLEY. Based on projected time needs involved.

Mr. DOMINY (continuing). The only two that we know of at the moment would be the desalinization and of course our continued weather modification with which we hope to add additional snow in the mountains of the drainage system.

Your colleague from California, Congressman Hosmer, mentioned the possibilities of underground atomic explosion to create additional ground water sources. This is the third one that certainly can be looked into.

Mr. FOLEY. With all these available and promising means of augmentation, is not the real question which is the cheapest?

Mr. DOMINY. I think this is true. Of course, we cannot overlook the fact that the future growth needs of the Pacific Southwest would require more than just augmenting the river to the tune of 2.5 million acre-feet.

Mr. FOLEY. But our present focus here is on augmentation, not on responding to the future needs of the Southwest.

Mr. DOMINY. That is right.

Mr. FOLEY. In that context, it is your opinion, is it not, that if we were looking to costs, we would have to place diversions from the Pacific Northwest as the most expensive of the current suggested means of augmentation?

Mr. DOMINY. When you are thinking in terms of 2.5 million acre-feet; I think this is correct.

Mr. FOLEY. Turning for a moment to weather modification, do I understand that the Department continues to be encouraged by studies of the potential of weather modification as a means of augmenting water supply?

Secretary UDALL. As we have indicated all along, we think we have a very fine research program going. If we continue to get the money needed to scale it up and to get all the answers, it is our anticipation

that by 1975 or soon thereafter, we should be ready for large-scale applications. We should know how to do this, how to control it, and how to get the results desired. We think it is promising.

Mr. FOLEY. Do you estimate that by the mid-1970's you think you will have some basis for actual pilot programs?

Secretary UDALL. Yes, something on the order of 7, 8, 10 years, in that range. We should be at a point then where we could be ready, if the Congress desires, to go into large-scale effort.

Mr. FOLEY. If you are correct in this estimate, it would be well within the time limits which you have fixed for some action with respect to augmentation of the Colorado?

Secretary UDALL. Yes, as I indicated yesterday.

Mr. FOLEY. I believe on page 23 of your statement, you indicate the expected unit cost of producing about 1,900,000 acre-feet additional water in the Colorado by weather modification as about \$1.50 an acre-foot.

Secretary UDALL. This is far and away the cheapest method if we can make it work.

Mr. FOLEY. Spectacularly so, is it not?

Secretary UDALL. Spectacularly so, yes, indeed.

Mr. FOLEY. In fact, that would be far beneath the annual costs of even partial diversionary systems; is that not correct?

Secretary UDALL. Yes.

Mr. ASPINALL. Would the gentleman from Washington yield to me?

Mr. FOLEY. Yes.

Mr. ASPINALL. Do I understand that, at the present time, the Department is going out on a limb to the extent that they think their studies might yield a million and a half acre-feet of water by weather modification? Are you willing to go that far?

Secretary UDALL. Mr. Secretary, I pressed Dr. Kahan and the Bureau of Reclamation people very closely on this and they are conservative. They are deliberately conservative. What they say is that on a given watershed they feel they can increase water yield by 10 to 20 percent. These are the limits they give you, somewhere between 10 and 20 percent.

If application is to be made on most of the watershed, then the increased yield is figured on that basis. If it is made only on part of the watershed, the yield is reduced accordingly. They predict 10- to 20-percent increase over the area of application. That is the best I have been able to get out of them.

Mr. ASPINALL. I think they are right, but when you are thinking of that in terms of a basin with limits as large as the Colorado River Basin, you have to think in terms of taking from one part of that basin in order to deposit in another part of the basin. You may be having a diversion and I want to be sure what your present thinking is.

Secretary UDALL. Mr. Chairman, I think we all ought to understand that weather modification which would take water from one region and give it to another will not work. This is not what we are talking about. We are talking about operations on a particular watershed and really not so much rainmaking as snowmaking—in effect, having a heavy winter every year and actually increasing the runoff without decreasing the moisture that others receive. Otherwise we would have a problem we just can't solve.

Mr. ASPINALL. Yes, but you are still in projected scientific operations when you talk about releasing moisture that is in the atmosphere. There is just so much moisture in the atmosphere. It is limited. I think your scientists agree on that.

I am for expanding our knowledge; do not get me wrong, but I want you to be practical. I do not want the record to show that, at the present time, you folks are going out on a limb by suggesting that there could be 1,500,000 acre-feet of water in there by way of modification. I hope that it can prove to be right, because this then could resolve many of our present problems—at least up to the year 2020.

Secretary UDALL. Mr. Chairman, I would like to confine it, because the scientists that are working on this program are conservative and we ask them to be conservative. Rather than quoting a figure, I think we ought to say, as they say to me, 10 to 20 percent increase. I think we just ought to let it go at that, because I do not want to let it go beyond our scientists because I think they are very fine scientists. The methods they hope to use will only augment rainfall or snowfall and not take moisture or rainfall or snowfall away from other basins in other regions. That just will not wash and we all know it.

Mr. FOLEY. Mr. Secretary, let's take a 100-percent factor and assume the cost would be \$3. I am willing to go 100 percent. Even that is substantially below the annual O. & M. cost for any kind of system to divert water by service. I am not talking about construction costs. I am just talking about the annual O. & M. Operation and maintenance costs for any kind of diverted service are twice as much as your scientists give you which you say are conservative.

Secretary UDALL. That is right.

Mr. FOLEY. Is there any reputable scientific opinion that disputes your advice in the Department?

Secretary UDALL. Not to my knowledge.

Mr. FOLEY. Is not this a matter in which the taxpayers should be rightfully interested in terms of the immense costs that are involved in augmentation schemes?

Secretary UDALL. Congressman, I think the whole country, the whole world, is interested in this. If we come up with scientific answers to augment water, this will apply not only to the Colorado Basin but to the whole world. It can be enormously useful. I think this is a program of worldwide significance. We have to perfect it. We have to know what we are doing. We have to know how to control it. But it is real good news. The thing that people always decide to do if they are prudent is to do the cheapest thing, the most effective thing.

Mr. FOLEY. That is a point that I am glad you made, Mr. Secretary, because when we are talking about economy, we are really talking about efficiency, are we not?

Secretary UDALL. That is right.

Mr. FOLEY. We are talking about the application of rational, scientific means to a practical problem.

Secretary UDALL. Quite frankly, this is my own hope. As I have confessed to the committee, I was originally skeptical about the National Water Commission. If it does its job right just as the Outdoor Recreation Commission did and the Public Land Law Review Commission, it would bring to bear very good minds and very good studies and I think we will know more about real parameters and real prior-

ities and economics and so on when we get through. Then we can make the big decisions right in this room.

Mr. FOLEY. These two methods, desalting and weather modification, are the wave of the future, are they not, in the scientific application of producing additional water.

Secretary UDALL. As far as water is concerned, these are the two most hopeful things, yes.

Mr. FOLEY. Compared to that, the idea of moving water by means of aqueducts and tunnels was not new in the time of Caligula, is that not true?

Secretary UDALL. I would say this is true.

Mr. FOLEY. We are talking about Roman methods now.

Secretary UDALL. Romans, yes.

Mr. FOLEY. I would certainly not want this committee to be cast in the role of being unscientific or unprogressive or backward in its approach to these problems.

I want to go back, Mr. Commissioner, if I may, to your estimated cost of conveying $2\frac{1}{2}$ million acre-feet of water from the Pacific Northwest. Is it your testimony on the record that this can be accomplished for \$150 an acre-foot?

Mr. DOMINY. No, sir; I merely said an aqueduct, to carry the same quantities of water from the Pacific Northwest as from the coast of California, based on our reconnaissance studies, would cost two or three times more than an aqueduct from the coast because of the length of the conveyance involved.

Mr. FOLEY. At a minimum; is that not true?

Mr. DOMINY. That is correct.

Mr. FOLEY. At a maximum, it would be many times that much.

Mr. DOMINY. And I also said that in my judgment, if you go to the Columbia, you would have to have a much larger aqueduct in order to reduce the cost per acre-foot.

Mr. SAYLOR. Mr. Commissioner, you were accused yesterday of science fiction in your report and since the gentleman from California is so much interested in things around Los Angeles, I would suggest that you consider looking at the present aqueduct that takes water from the Colorado and goes down to the District of Los Angeles and see whether or not you cannot put it on a seesaw so that one time, you can take water out of the Colorado River and have it flow north to Los Angeles and then, when you are diverting water out of the Pacific Northwest, tilt it to the other way and have it flow down into the Colorado. If we are going to get into science fiction, we might as well carrying things to its ultimate. You will probably find it is a great deal cheaper to do that than to build a whole new set of aqueducts running parallel to the ones already there now.

Mr. HOSMER. Will the gentleman yield?

Mr. FOLEY. I yield to the gentleman.

Mr. HOSMER. As long as we are having suggestions of that nature, I wonder if the Secretary would like a small appropriation for whips so he can beat his scientists into faster progress on these tilting aqueduct and weather modification and application of these other things we are talking about.

Secretary UDALL. I need money, not whips.

Mr. FOLEY. As a matter of fact, Mr. Secretary, at the risk of belaboring the point, you have made fantastic progress, as the Commissioner has pointed out, in the last decade in both the weather modification and desalting fields, have you not?

Secretary UDALL. It is less than the last decade.

Mr. FOLEY. The last 5 years?

Secretary UDALL. Yes; I was going to say the changes in the last 7 years since I have been Secretary have been quite marked. We began the weather modification in 1961. We had none prior to that time. Congress initiated this thing and pushed it on us in a sense. I am glad they did.

As far as desalting is concerned, it kind of amazes me that we are getting ready to build the Bolsa Island plant. We weren't thinking this big at all in 1961.

Mr. FOLEY. As I recall, there was a man in the Department, whose name I will conveniently not remember, who said he did not believe in his lifetime the cost of desalted water would go for less than \$2 a thousand. That is not too many years ago.

Well, on the basis of what you and the Commissioner have said, is it not also a matter of common sense that this committee and the Congress should give a reasonable opportunity for a general study of these problems by the National Water Commission before attempting to make any firm judgment on means of augmentation for the Colorado?

Secretary UDALL. That has been our basic position.

Mr. FOLEY. And your position would be that this committee and the Congress should remain neutral on the various alternatives which might be eventually be chosen to accomplish this end?

Secretary UDALL. I think we all ought to keep an open mind, but we ought not to just sit and do nothing. I think we should be studying the alternatives, keeping a close eye on weather modification, desalting, and looking at the economics of these other things and at the long-term needs.

I think the more our water planning is geared to the long term, the more we exercise foresight, the better. The one reason that southern California has grown the way it has, in my judgment, is that it had a few people there who had foresight and established the Metropolitan Water District. It was really one of the great decisions of the West. They thought big and planned big and so on. This is the truth.

Mr. FOLEY. Well, Mr. Secretary, is there any provision of existing law which prevents you from doing the kind of studies that you are alluding to on any of these things?

Secretary UDALL. No; I think the answer is "No."

Mr. TUNNEY. Would you yield, Mr. Foley?

Mr. FOLEY. Yes.

Mr. TUNNEY. Just one observation.

That is that if Mr. Foley and Commissioner Dominy are convinced that the Columbia River is going to be the most costly and therefore the least likely source of augmentation, I cannot understand why they object too much to studying all alternatives.

Mr. FOLEY. We do not object to studying them. If the gentleman will recall, the Pacific Northwest members on this body supported actively the National Water Commission legislation, which specifically authorizes the Commission to study interbasin transfer. The Secre-

tary will, I think, concur in that. The legislation even spells out interbasin transfers as an area to be studied. We were all for it, it is in the record.

I introduced the bill myself.

There is nothing that prevents the Department, as the chairman pointed out, from presently studying interbasin studies on a reconnaissance study, the same thing that has been done in desalting. It is not a question of study, it is a question of whether this Committee should obviously indicate preference for one means of augmentation over another when the studies have not been done and when the information is not in existence.

Thank you, Mr. Secretary.

Mr. Chairman, I reserve the balance of my time.

Mr. JOHNSON. The gentleman from Kansas, Mr. Skubitz.

Mr. SKUBITZ. I have no questions.

Mr. JOHNSON. The gentleman from Arizona, Mr. Steiger.

Mr. STEIGER. Mr. Chairman, if I could defer for just a moment the very few questions I have for you in order to correct the record.

I know of my colleague from Pennsylvania's penchant for accuracy and his virtual total recall. Earlier in the hearings, in his colloquy with Commissioner Dominy with regard to the recent storm in Arizona, some figures were offered by the gentleman from Pennsylvania. I would like to inform him and for the purpose of the record that the blizzard between December 13 and December 20 of 1967 deposited 84.6 inches of snow on the city of Flagstaff. This, I am sure the gentleman will recognize instantly is 7 feet plus six-tenths of an inch. There were drifts in that area up to 40 feet.

Now, Mr. Saylor, I know that you were quoting an observation made by somebody other than yourself and I know that you will in the future consider it as not quite as reliable as perhaps you may have considered it in the past.

Mr. Secretary, I would like to consider page 21 of H.R. 3300, section 304(c). It is that language which refers to your option to require exchanges between those areas not receiving mainstream water and those areas that do receive it.

I am sure you are familiar with the language, Mr. Secretary. I would ask at this time, is it your opinion that this language protects the water needs of the northern counties of Arizona and clarifies, as far as the Department and the administration are concerned, the so-called exchange principle?

Secretary UDALL. Yes, I think it does, Congressman. We recommended this language. I would like to say, however, because I want the record to be clear on this, and I am very familiar, as the Congressman is, with this particular problem, that this language is not mandatory. It says the Secretary "may" do this.

I think the Arizona people ought to recognize, and we ought to make the record on that, that the Arizona Interstate Stream Commission, the Governor, the people who are going to make policy with regard to the future of Arizona, that they, working with the Secretary, whoever he is, are going to have to make decisions on how Arizona uses its water.

I have thought all along, and I know the Congressman has, that certainly the needs of the northern Arizona and the upstream com-

munities for water for municipal and industrial growth purposes should have a high priority in the State's thinking. I would think the State would want to have a program that is wise enough and broad gaged enough that soon communities could obtain the growth water they need.

The exchange principle probably will come into play with regard to that.

I think every one ought to understand this does not answer all the questions. It lays the framework for the right solutions if the people in Arizona have enough statesmanship to produce them.

Mr. STEIGER. I know the Secretary recalls from his own period at which time he represented these same counties the concern within the counties that their needs will not be met. It has always been my feeling that this language was meant as a backup protection for these people in the event of a place to appeal for justice, as it were, if in the intrastate negotiations, they felt they were being slighted. Is that your feeling?

Secretary UDALL. I think this gives as much protection as can be given in legislation of this kind, because we are talking about the future; we do not know who is going to need what quantity, when and so on, but this lays the framework and opens the door to solutions. The Arizona officials and the Arizona Congressmen and local interests can sit down and work out solutions and I am confident that they will do so.

Mr. STEIGER. It is a credit to you and I think worthy of note in the record here that the people in these areas do feel comfortable with you as the Secretary. They also recognize that there is no possibility of your remaining as Secretary for an eternity. I wonder if, in your opinion, with all the previous records that have been made on this matter and the record that has been made during these hearings, if you feel that it will be of sufficient strength to guide future Secretaries as to their role in this particular matter?

Secretary UDALL. I have already stayed longer in the job than, I guess, three others, at this point. I think that everyone ought to realize that Secretaries come and go and language has to be written so that it is clear and spells out responsibilities and how they are to be discharged.

In terms of the situation and in terms of what might be done with legislation of this kind to take care of this problem, I believe this is as clear a statement as can be made. It provides protection and guidance. I feel confident that for whomever is Secretary, whenever these problems come up, and they will come up over a period of many years, this gives him the guidance and the direction that he would need.

But he alone is not going to make all decisions. He is going to make contracts and he is going to play a role in the decision making. The State people under our water rights system are also going to play a major role and a lot of the responsibility is going to belong right in the State.

Mr. UDALL. Will the gentleman yield?

Mr. STEIGER. Yes.

Mr. UDALL. I know there is a certain restlessness in some northern Arizona counties. As one who also represented those counties for a time, I want to make it clear it is my judgment as a member of the

Arizona delegation that the record made by you and the brothers representing those counties over the years, the statements that the Secretary has made and that I have made, give these people in northern Arizona all the protection that can possibly be given in this legislation. I want to say, that while I continue in the Congress, it is my intention to do everything I can to see that the needs of these northern Arizona areas for municipal and industrial water will be taken care of. I think they will have and must have a high priority.

Mr. STEIGER. I thank the gentleman and I think he recognizes the restlessness.

I have a question on the Hualapai Tribe.

Do you recognize that any language, whether it be reserving the future of the Hualapai Dam site to the Congress or actually including it in some kind of moratorium is at least placing a portion of the Hualapai Tribe's income in jeopardy?

As you are aware, they now receive almost a third of their total income from a lease to the Arizona Power Authority for those damsite rights that they have.

All I would like to establish again for the record is the fact that you, as Secretary of the Interior, recognize this and will be able to plan, through your Bureau of Indian Affairs in some manner, to coordinate the recovery or compensation or recognize the imbalance that this is going to place on the tribe as far as their economics are concerned?

Secretary UDALL. Congressman, let me make a statement about this tribe.

Relatively speaking, this is a small tribe of Indians which has a large Indian reservation.

Mr. HOSMER. How large?

Secretary UDALL. About 1,500 to 2,000 members. They have a large land area, but it is plateau country, primarily useful for cattle grazing. Unfortunately have not struck minerals or petroleum on the reservation. Maybe that will come sometime. In terms of general economic well-being and prospects, as far as Arizona Indians are concerned, they are one of the tribes I worry most about, because they do not have things going their way or things coming up. This probably means that we should give them special attention and I am concerned about it.

But I am afraid I have to say as I said earlier, in all honesty, that they do not have a damsite that can be bought and sold or leased, and I am afraid that the position therefore of saying that Congress should reserve to itself the right forecloses any payment to them at this time.

Mr. STEIGER. But, Mr. Secretary, you are obviously aware of the problem and I am sure Commissioner Bennett is and the very pragmatic fact that they will lose \$24,000 a year, which is a third of their gross income, will be considered in any of your future plans for this particular tribe?

Secretary UDALL. Yes, indeed.

Mr. STEIGER. I thank the Secretary. I would just like to add, Mr. Secretary, that I personally want to commend you both for your testimony here and your patience and good will and your efforts on behalf of the entire Upper and Lower Colorado River Basin.

I thank the Chairman.

Mr. JOHNSON. The gentleman from Washington, Mr. Meeds.

Mr. MEEDS. Thank you, Mr. Chairman.

Mr. DOMINY, if I might ask just some questions here to clarify some things in my own mind, the costs of production of the water at ocean-side, as I recall, are 9.8 cents per thousand gallons?

Mr. DOMINY. Yes, roughly \$30 an acre-foot.

Mr. MEEDS. Is that based on the present state of technology?

Mr. DOMINY. No, sir, that is based on the projection of the technology and the improvements of about 1990 to 1995.

Mr. MEEDS. All right.

This project runs considerably beyond that, does it not?

Mr. DOMINY. Yes, the proposal would be to put the plants in in three stages. The last stage would not come until about 2010.

Mr. MEEDS. And the projections are made on the state of the technology as of 1985.

Mr. DOMINY. 1990-95; yes, sir.

Mr. MEEDS. So that two-thirds of this will come after those projections. Now the state of technology can be that much advanced over that time?

Mr. DOMINY. Yes, that is possible.

Mr. MEEDS. So that it is probable that the cost of the water after that time will be even lower than you have projected, is it not?

Mr. DOMINY. It is certainly possible, because under these kinds of plants, you have to figure a replacement life of only about 30 years. So the replacements would also be made at a higher level of technology and advanced science.

Mr. MEEDS. Right.

And this again is based on the 2 million acre-feet, is it not?

Mr. DOMINY. Yes, two to two-and-a-half million.

Mr. MEEDS. And when we are talking about diversions from the Columbia, we are talking about getting into a substantial greater volume, to even be feasible, are we not?

Mr. DOMINY. That is my judgment, yes.

Mr. MEEDS. If we were talking about substantially greater volumes in desalting, is it not true that the costs would also be lower per thousand acre-feet?

Mr. DOMINY. It would be true on the conveyance, which is the highest cost of movement of water for augmentation in any event.

Mr. MEEDS. Then it is not true that you think you could get the costs down—

Mr. DOMINY. I doubt it would greatly affect the desalting costs, because we are figuring about the optimum size plant for the production of atomic power as well as for desalting.

Mr. MEEDS. OK, let's get to the conveyance portion of this.

Again, in comparing this to what would be needed to even get into the realm of feasibility from the Columbia Basin, you are talking in substantially larger numbers. In the conveyances cost of 15 and 16 cents per thousand gallons at 2 million, is it not true that if you were talking in substantially larger volumes, the conveyance costs would also be down from the desalting process?

Mr. DOMINY. Yes, if I am following you. The unit cost for tunnels, for example, decreases rapidly with size. So if you build them to the most economic size, you can probably move 10 or 15 million acre-feet of water through at a much smaller unit cost than for 2 million.

Mr. MEEDS. You were transporting or talking about transporting 4 million acre-feet of water, the cost per thousand acre-feet would be less than it is at 2 million; would it not?

Mr. DOMINY. That is right; yes, sir.

Mr. SAYLOR. Will the gentleman yield at that point?

Mr. MEEDS. Yes.

Mr. SAYLOR. Mr. Dominy, this is one of the points I tried to bring out in hearings last year, that if you want to make the Mexican water treaty a national obligation, all of the basic costs—right-of-way, tunnel, and everything else—will be charged to the 50 States. All you would have to do would be just to enlarge it a little bit. The increased costs are all the folks out there would have to pay for all the other water they would bring in.

When we had a gentleman from Texas as the Chairman of the Subcommittee, he was going to get seven and a half million acre-feet, plus Mr. Skubitz was to get seven and a half million acre-feet for Kansas; and Oklahoma was going to get in for their little dibble. Of course, most of the people in the Bureau thought that was pretty good, because they could make that real feasible if they did not have to worry about the initial cost and only the increased cost in size, just as Mr. Meeds is pointing out right now.

Mr. HOSMER. Will the gentleman yield?

Mr. MEEDS. Yes.

Mr. HOSMER. In light of the fact that, the difference between 2.5 million acre-feet and 10 million acre-feet is minuscule in comparison with around 195 million acre-feet of Columbia River water that wastes into the sea every year, what are we getting at? I just do not quite understand either his or the other gentleman from Washington's emphasis on this quantity factor.

Mr. MEEDS. I think there would be some disagreement that there are that many acre-feet wasted into the sea every year from the Columbia.

Mr. HOSMER. This is just a study based on clocking the river.

Mr. FOLEY. Will the gentleman yield?

Mr. MEEDS. Yes.

Mr. FOLEY. Is the gentleman aware that there are years when the flow of the Columbia is beneath 15 million feet?

Mr. HOSMER. Oh, yes.

Mr. FOLEY. If the gentleman is aware of that, I think the answer to his question is obvious.

If the gentleman will yield further, we are talking here, I understand, in terms of augmenting the Colorado River as a goal, not necessarily moving the Columbia River for purposes that are best known to the gentleman from California. And the costs that the Federal taxpayer will be asked to bear here do have a relationship to what method of augmentation we use. Is that not correct, Mr. Commissioner?

Mr. DOMINY. Excuse me?

Mr. FOLEY. I am addressing this question to you.

Is it not true that the costs involved are directly related to the method of augmentation we use?

Mr. DOMINY. Certainly. You would certainly want to use the most feasible means of augmentation. That means the most economic that we can find.

Mr. FOLEY. And the estimates on the various methods range from about 3 million a year to many times that for the operation and maintenance of a diversion system to inestimable millions of dollars, probably, to build it; is that not correct?

Mr. DOMINY. It seems so to me.

Mr. FOLEY. And if my friend from California is not concerned about saving the Federal taxpayers several millions of dollars, then I have not heard him correctly on the floor of the House.

Mr. HOSMER. If the gentleman will yield further on that point, we do not happen to be talking at this point about spending any money to build any project, not two nickels' worth of brick and mortar work. All we are talking about is a study to find out the answers to the various questions that are being asked that the witnesses do not have the answers for because the studies have not been made. In this case, I think it is fully obvious which comes first, the chicken or the egg. The studies have to come first before we can blame anybody for wanting to waste money on an uneconomic project.

Mr. MEEDS. I think we would all agree that this matter should be thoroughly and carefully studied. That is the import of question.

Now, on a longer term basis, Mr. Commissioner, I think a realistic look down the road, as the Secretary said, that the long-range needs, even longer than we are here considering of Arizona, are going to increase. It is certainly hopeful. Is it not your opinion that we should be looking to the best method and the most feasible method of augmenting those long-range needs as we are planning this project?

Mr. DOMINY. Yes, I think this all should be considered. It is later than we think in terms of meeting the future water needs of the Pacific Southwest.

Mr. MEEDS. And in any study that is done, it is as essential to study the long-range needs of the receiver or the place that receives the water as it is the long-range needs of where the water comes from?

Mr. DOMINY. Certainly. The Department and the Bureau has consistently taken the view that it would be very shortsighted to be looking for movement of water out of an area that ultimately will have need for it for its own full development potential.

Mr. MEEDS. And considering the potential for desalination, we are talking about, in effect, a whole ocean?

Mr. DOMINY. I think the supply, of course, is unlimited in terms of our needs.

Mr. MEEDS. And no one else's needs in that respect have to be considered?

Mr. DOMINY. I think this is correct with a properly installed plant which handles waste water in a proper manner.

Mr. MEEDS. Thank you.

Mr. JOHNSON. The gentleman from Texas, Mr. Kazen.

Mr. KAZEN. Mr. Secretary, how fast is your research on weather modification going now?

Secretary UDALL. Well, Congressman, we have scaled up from an original appropriation that started the program in fiscal 1962 of \$100,000 to about \$5 million this year. We think the program should go on up to \$25 or \$30 million in the next 7 or 8 years. This is what we have projected. This means getting into larger scale activities. This is a research program that for the most part is farmed out to universities, private research firms, and other Federal agencies.

Mr. KAZEN. I am interested in knowing whether everything possible is being done now as fast as it is scientifically possible to do in this project.

Secretary UDALL. I would have to say, of course, that we would like to have more money. I think we could use more money effectively. But we are in competition with everything else. Congress on the whole and the Appropriations Committees have been pretty good about this program. I think they realize it is significant. We have been able to move it along at a pretty good clip.

Mr. KAZEN. In other words, your only limitation right now is money?

Secretary UDALL. Money and time to carry out these projects. It is a scientific endeavor and we want to run it in a highly scientific way. We have to know what we are doing and how to control what we are doing. That is the reason this takes time. Each year, we get into a new phase of it and we want to keep it on schedule if we can. In fact, if the members of this committee want to encourage this program, I would suggest that they check into it themselves and find out what they think about the results we are getting and let the Appropriations Committees know.

It might even be, I think, Mr. Chairman, that the committee itself has held some hearings in the past on this. You might want to review the program at some time. We think it is a very fine program.

Mr. DOMINY. I would like to comment just a moment more on this. When I first discussed this with the Congress in 1961, I pointed out that we had about a 20-year program that we ought to follow before we would have the answer with certainty; that I thought we could have reasonably good answers possibly in 10 years, but that the research ought to continue for a 20-year program. I urged the Congress not to start it unless the program could proceed on that basis.

I also pointed out that we would have to grow into it slowly because of the lack of knowledge and the lack of trained meteorologists available to work on a project of this character. This is what we have done and as the Secretary has pointed out, we have gradually built from this start of \$100,000 a year up to this \$5 million program. We now have capability of gradually increasing to the \$20 to \$25 million program that would be justified in the immediate future, because we are gaining knowledge in the techniques of mechanization and measurement and other advancements that have been achieved.

Mr. KAZEN. Certainly, money is not the sole consideration, as has been pointed out.

Secretary UDALL. That is right.

Mr. KAZEN. You have to have your technology to a certain point where you have to augment that with whatever it is you need in material.

Secretary UDALL. This will take time.

Mr. KAZEN. Is there any gap between the furthest advanced point scientifically and your money limitation? In other words, are there any gaps to be filled now?

Mr. DOMINY. I do not believe so.

Mr. KAZEN. Or are we at the point where your appropriations and your scientific knowledge are running neck and neck?

Mr. DOMINY. I would say we are right on track now.

Mr. SAYLOR. Would the gentleman yield?

Mr. KAZEN. Yes.

Mr. SAYLOR. I might say there is still quite a gap. If the Secretary of the Interior and the Commissioner of Reclamation had come to this committee instead of going to the Appropriations Committee in the first instance, we might have had a good authorization instead of the track they took. They did not bother to come to this committee. One of the reasons they are in trouble is that this committee does not know what they are doing. They have never come up here and told us that. It is one of the things where the Bureau went behind the backs of the members of this committee and the counterpart on the Senate side and ran right to the Appropriations Committee. They got the \$100,000 from the Appropriations Committee and never asked for any authorization from this committee at all.

Mr. KAZEN. I do not know the background of this project as the gentleman does who has served on the committee for a long time. I have not had the privilege of reviewing any previous hearings on this subject, but it is a subject in which I am vitally interested, coming from the Southwest.

Let's delve into this a little bit more, following up the statement made by the gentleman from Pennsylvania, what kind of trouble are you in?

Mr. DOMINY. I would like to comment on that. There are solicitors' opinion in the record that the weather modification program which we undertook is clearly within the general authority of reclamation law. We have not required specific legislation.

As to the charge of our failure to keep people informed, we have made regular reports. The program has been discussed with this committee many times. I do not believe it is justified to say that we have not informed the Congress as to what we are doing. It has been a matter of record and the solicitor's opinion is a matter of record that we do not need additional legislative authority to pursue this program.

Mr. KAZEN. I certainly would want to impress upon you that at least as one member of the committee, I would like to stay informed on the progress that you make, because if you do get in trouble, I want to help you out of that trouble, because I think this is too vital a program to falter. It means a lot to the future of this country.

Thank you, Mr. Chairman.

Mr. JOHNSON. Mr. Secretary, and your able staff with you. I have a few questions that I would like to ask at this time. They might be a little repetitious, but I think for the interest of California and myself, we should have further answers to them.

The first two questions will relate to the water supply studies.

The first question would be: Are not all the Department of Interior water supply studies for the central Arizona project based on also providing a water supply for existing projects in Arizona, California, and Nevada, with California limited to 4.4 million acre-feet?

Secretary UDALL. That is correct.

Mr. JOHNSON. Now, question No. 2: Is it not true that the Department of Interior studies show the central Arizona project to be economically feasible while at the same time providing a water supply for existing projects in Arizona, California, and Nevada, with California limited to 4.4 million acre-feet per year?

Secretary UDALL. The answer to that question is "Yes," also.

Mr. JOHNSON. Now, as it relates to the revenues development fund. In the first question, do you know what percentage of Hoover-Parker-Davis revenues are contributed by California and Nevada power users?

Mr. DOMINY. Arizona has about 23 percent total. For Hoover, Arizona, and Nevada, each have 17.6 percent.

Mr. JOHNSON. That would leave California, then, contributing about 65 percent—64.8.

Mr. DOMINY. 64.8 percent of Hoover revenues; yes.

Mr. JOHNSON. The next question, the bills H.R. 14834 and 14835 introduced by California Congressmen last week, which are not part of this hearing, I might say, because the hearing was limited to the questions asked by the chairman. That was based upon the legislation that had been introduced prior to the introduction of these bills, which, if enacted, would authorize the central Arizona project, provide that any surplus revenues contributed by the California and Nevada power users after payout of Hoover-Parker-Davis projects should be reserved for repayment of any future lower basin augmentation project, while all of the money contributed by Arizona power users would be available to subsidize the central Arizona project. Thus, Arizona would contribute nothing to the augmentation fund for 50 years. California has also agreed to defer Hualapai Dam and severely modify the scope of any augmentation project.

Do you consider these items as significant concessions by California in order to help its neighbor, Arizona, to obtain the central Arizona project?

Secretary UDALL. Congressman, I sat with this committee for 6 years and I have been down in the bear pit for 7. I want to say to the chairman of the subcommittee, the chairman of the full committee, and the ranking minority member, I think that the 3 days we have spent here constitute one of the finest, most constructive hearings I have ever participated in. I think we are here really studying, concentrating on the whole future of a whole region—not just one State or two or three States. I believe the whole attitude that has been expressed by everyone—the tenor of the questions, the discussion—has contributed to some of the best hours for the committee that I have seen in 13 years.

I do not know that I can answer your question with great specificity, Congressman, but I think California has of late shown some inclination to be in a compromising frame of mind. I think this is a good thing.

Mr. UDALL. Will the gentleman yield to me?

Mr. JOHNSON. Yes.

Mr. UDALL. I would answer his question largely in the affirmative. I think there have been very considerable concessions on the part of California and I give credit to the chairman of the subcommittee for helping us get together. I think the things that now divide us are small, the things that unite us are very big.

Mr. JOHNSON. I appreciate the comments of both the Secretary and yourself on this matter.

I have another question in the same field. Do you know how much the revenues contributed to the Hoover-Parker-Davis projects by Arizona power users would amount to during the central Arizona project payout period if the present percentages are contributed and the projected revenues are estimated by the Bureau of Reclamation?

Mr. DOMINY. Yes; Arizona's share of Hoover revenues, based on this 17.6 percent, would be \$78,056,000 by the year 2029.

The Parker-Davis share going to Arizona would be \$46,668,000. The portion of the Pacific Northwest-Pacific Southwest intertie revenues that would be available to Arizona would be \$41,600,000, for a sub-total of \$166,324,000.

That compares with an irrigation assistance required in excess of the irrigators' repayment of \$242,525,000. So there would still be considerable assistance required from the municipal and industrial water rates and from the prepaid power proposal.

Mr. UDALL. Will the gentleman yield for clarification?

Mr. JOHNSON. Yes.

Mr. UDALL. Mr. Dominy said Arizona's share of Hoover was 17.6 percent. If you add Parker-Davis and give a total figure, the Arizona share of the revenues from Hoover-Parker-Davis, as I understand, is 23 percent.

Mr. DOMINY. That is the weighted average. That is where I got my figure a moment ago; the 23 percent. Arizona takes 50 percent of Davis power.

Mr. JOHNSON. The above amount plus your estimate of surplus revenues from the proposed thermal powerplant and the Arizona-Nevada portion of the Pacific Southwest intertie will amount to enough money to eliminate the need for most of the small assessment against the central Arizona project service area proposed by you in the administration bill presented during the 1967 Senate hearings.

Mr. DOMINY. The way H.R. 14834 reads, as near as we can interpret it, and if that were to be followed, I think you are quite right. It could mean that the ad valorem tax would not be needed nor would there be need for a \$56 water rate. It probably would be possible to get back closer to the \$50 water that was originally considered for M. & I. purposes.

Mr. JOHNSON. How does the proposal in the California bill H.R. 14834 and 14835, as outlined above, compare with the boulder Canyon Project Act, whereby California was denied any use of Hoover power revenues to assist in repayment of the All-American Canal or the Metropolitan Water District's Colorado River aqueduct?

Mr. DOMINY. I think in order to consider that in all equity, one must understand that Hoover Dam supplies the regulation and creates a water supply that was not there without the regulation and does so practically for nothing. There is a very small, nominal charge of 25 cents an acre-foot, I believe, that the Metropolitan Water District pays.

It is true, however, that the full cost of Hoover is being repaid from the power revenues.

This has been a good project for the Nation and the people who are using it are paying for it. There is no issue about it.

Mr. JOHNSON. Is it the Department of the Interior's intention that the central Arizona project water users continue to pay the same rates after payout of the central Arizona project in order to contribute money to the development fund for augmentation?

Mr. DOMINY. Certainly if the development fund is established, this would be the case. Absent a development fund, you might not be able to justify continuing those rates. That is the point I made the other day.

Mr. JOHNSON. I think any legislation introduced by the chairman would agree to that.

Mr. DOMINY. I am certainly in favor of it.

Mr. JOHNSON. Should not the bills presently being considered by this subcommittee be modified to clearly state that the central Arizona project water users shall continue to contribute to the development fund after payout?

Mr. DOMINY. If there is a development fund, I would think that would be the case.

Mr. JOHNSON. I have just two more of this particular nature:

Was not the administration's program in 1967 one in which costs allocated to the central Arizona project were to be repaid without subsidy from the Hoover-Parker-Davis revenues?

Secretary UDALL. This was our proposal, yes.

Mr. JOHNSON. How was this to be accomplished?

Secretary UDALL. This would be essentially by raising municipal and industrial rates, or by an ad valorem tax, whichever the Arizona people decided.

Mr. JOHNSON. According to the Department of the Interior studies on the administration bill, Arizona would derive \$89 million of benefits each year from the central Arizona project. In view of these large benefits, do you consider it reasonable that the central Arizona project beneficiaries should pay the minor assessment of 0.6 mills per dollar of assessed valuation?

Secretary UDALL. This is what we proposed. We thought it was right. Of course, the Congress may express its own judgment on this issue.

Mr. JOHNSON. Do you have any further comment, Mr. Dominy?

Mr. DOMINY. No, except to say that we have these benefits from all of our projects. In some cases, we have the requirement in law for a conservancy district-type assessment. In others, we do not. We have had no flat standard on it. In recent years, the tendency has been in this direction. The Upper Colorado River storage project is an outstanding example of where the conservancy district-type assessment is required.

Mr. JOHNSON. I know recently the same methods were used in Oahe project in creating the conservancy district under their enabling legislation to insist on that. I assume these other projects will have to have it.

Secretary UDALL. The difference, of course, with Oahe, is that it involves an entirely new program in an area, as contrasted with supplying water to the Salt River project, which is one of the oldest irrigation projects in the country. Where you have existing projects, you do have a somewhat different situation.

Mr. JOHNSON. I would like to discuss briefly the augmentation part of this or a feasibility study or reconnaissance study.

We are asking for, in the legislation whereby the States and accompanying States have something, I want to agree with you that when we talk merely about 2.5 million acre-feet from any other basin bringing that amount of water in certainly will cost a great deal of money, the same as it would if you were to take it from the coast and move it across and do the job you expect to do here. But I am certain the Department, in considering this, a little reconnaissance was done to

bring in some facts and figures. We are talking about bringing that water down from the Columbia through an area that very badly needs water itself. You take the great area that lies in eastern Oregon, eastern California, all of Nevada, western Utah and part of Idaho; certainly they are to be considered, and it would be a sizable amount of water, I presume, that would be brought from the Columbia and then that portion placed in the Lake Mead, as the final. I imagine this would reduce your figures that the gentlemen from the Northwest seemed to think are too exorbitant at this time.

What would your comment be?

Say that we went to the Columbia and agreed after the National Water Commission, if it is established, makes a recommendation and we would get into the reconnaissance and feasibility study, that the amount should be subdivided at 15 mills an acre-foot.

Mr. DOMINY. I stand on my previous statement that if the import in the first segment is limited to 2.5 million acre-feet, it appears cheaper to get it from somewhere in the Southwest. If the objective is to augment the river to take care of the next 70 or 80 years growth for the Pacific Southwest, then perhaps because of the economies of size, it might be possible to go to the Pacific Northwest, assuming that surplus water is there, at a unit cost comparable with the cost of a smaller import of desalted water for the first two and a half million acre-feet.

Mr. BURTON of Utah. Will the gentleman yield?

Mr. JOHNSON. Yes.

Mr. BURTON of Utah. Mr. Commissioner, is there any reason why any augmentation of water that derives from the basin need be put in Lake Mead?

Mr. DOMINY. At first we thought all that was needed was to bring it over and put it in at Imperial. But we discovered when we got into the study that in order to get the mixing and accommodate the 24 hours a day, 365 days a year input and balance it with the vagaries of the diversion requirements, it was necessary to introduce it up as far as Mojave. When it gets that far north, then there is reason to consider putting it in Lake Mead and generate peaking power from that water coming back down through the generators. That is why we finally selected Lake Mead as the mixing point in this study.

We think that in the feasibility stage of a study, and we are also working on this as the Secretary pointed out in a joint study with Mexico, that consideration should be given to locating the desalting plant at the Gulf of California and conveying the desalted water to a reservoir on the Bill Williams River where the desired mixing could be achieved. We feel this could reduce the conveyance costs substantially.

Mr. FOLEY. Will the gentleman yield?

Mr. JOHNSON. The gentleman from Washington.

Mr. FOLEY. If we are going to think in terms of not the Southwest but irrigating the Pacific Northwest, should we not maybe change the focus a little bit to consider the possibility of a North American plan and irrigate the Western United States?

We have a \$200,000 item in the appropriations budget to move more water to central Texas.

Is this not an example why the entire question of large-scale movement of water has to be considered in the national context by the Na-

tional Water Commission and can't usefully be discussed in the context of the Pacific slope alone?

Mr. DOMINY. I support that completely and the Secretary has endorsed it completely.

Mr. JOHNSON. Just in my time in the Congress, we have had the Pacific Southwest plan before our committee or under consideration for a long period of time. It dealt with the water transfer from some basin within the area; that is, within reasonable reach. I think the Columbia River Basin was the one they were looking to, along with the one we had in California, perfecting—but the proposed park water plan was well known in the Congress, throughout the West.

Mr. FOLEY. I was not trying to be argumentative. I noted with pleasure that your question itself presumes that a study will be made by the National Water Commission.

Mr. HOSMER. Will the gentleman yield?

Mr. JOHNSON. Yes.

Mr. HOSMER. On this quality issue which was brought up momentarily, as to where you add the distilled water, I think that somewhere in your testimony, Mr. Dominy, you were talking about a time when the upper basin uses achieve some point, that the quality of the water at some point in the lower basin would be around 1,400 parts per million sale, were you not?

Mr. DOMINY. Yes, my statement was that under full depletion in the upper basin, absent some measures not now taken generally to improve quality of water, that as a result of diminished flows and of return flow from irrigation, the parts per million would approach 1,400 parts plus at Imperial, unless you achieved dilution through augmentation.

Mr. HOSMER. Now, in order to bring that down to the figure of, say, a thousand parts per million, how much distilled water are you going to have to put in and where?

Mr. DOMINY. Just about 2 million acre-feet to 2.5 million acre-feet at Lake Mead or shortly downstream to get the mixing. This is what we came up with in our study.

Mr. HOSMER. So this augmentation matter is not strictly a quantity matter, it is a quality matter as well.

Mr. DOMINY. That is right.

Mr. HOSMER. Do you know what you have to put in to get it down to 800 parts per million?

Mr. DOMINY. Mr. McCarthy tells me it would take about twice that much desalted water.

Mr. HOSMER. Thus the exchanges of water on the Pacific coastal area is not going to touch this quality question at all.

Mr. DOMINY. That is correct. You have to bring it into the river to get the mixing.

Mr. HOSMER. Thank you.

Mr. JOHNSON. Getting to the power side of this question, when the Hualapai is eliminated as a source of revenues for further development, and they chose to buy a power commitment out of the private and public development, which, as I understand it, is made possible by the use of coal that is there on the public lands today, either Indian land or public domain, which have been placed under lease, I presume, to the private pool people—

Secretary UDALL. That is correct.

Mr. JOHNSON. Waters that are necessary there to perfect their operation is also Federal water from one State or another.

Now, we considered legislation last week or 2 weeks ago wherein the contracts were being asked for a water commitment to provide projects with coal. Now, are you using a portion of New Mexico's water in this case for the three contracts under consideration, and the coal deposits, the last one still under consideration, is that which is held by the Utah Construction & Mining Corp.

That answers, too, I presume, the coal is from public land and the water is from public land.

Secretary UDALL. Most of the coal in the Four Corners area is on Indian land. As to the water, the reason we have to have congressional approval of the contracts is that Congress wrote that requirement into legislation. The water in question is available only for a 35- or 40-year period, as I understand it. The water we are proposing to use at Page is within Arizona's upper basin entitlement and amounts to almost 40,000 acre-feet.

It can be contracted for directly under existing law. We need no additional authority.

Mr. JOHNSON. How about water to supply the venture in Nevada, your slurry coal delivery?

Secretary UDALL. They will use Nevada water for that venture and Arizona Indian coal. That is a unique project.

Mr. JOHNSON. You have purchased, or will if the bill is perfected, this power requirement of the company needs of the Arizona project?

Secretary UDALL. That is correct.

Mr. JOHNSON. Now, I presume that if there were surplus power in this operation, it would be considered as available under reclamation law to preference customers?

Secretary UDALL. Under the way we propose to handle this matter, we do not expect to get into the question of the function of the preference clause, because the power would be taken by the Salt River project if there is surplus. Being a preference agency, no problem would arise.

Mr. JOHNSON. Well, if there was such a thing as surplus power, as I understand it in your testimony in the Senate and also in communications with people like the American Public Power Association in an exchange of letters, you did say that this would be separate reclamation law and it would be available to preference customers.

Now, at the present time in the legislation, some of the bills that have been introduced do not make any mention of these or anything in the legislation.

I would say that in your letter to the American Public Power Associations you did go on record as saying it would be subject to reclamation law and available to preference customers. Maybe they will never come, but this might happen in other instances.

Secretary UDALL. We have not changed our position at all. The Senate wrote language in S. 1004 to clarify this point. If the House wishes to do so, it may do so. However, under the way that we propose to handle the matter, there would be no issue.

Mr. JOHNSON. Well, there is a difference of opinion of some people.

Now, when it comes to power, when you eliminated the Hualapai Dam, we eliminated the cash register in this area for future augmentation works and further revenues into the fund.

That was argued both ways and the dam has been eliminated.

But in every other water development, power has been the big help. I think the Federal Government should have more control over the power. I would have been much better satisfied to have seen the Federal Government build a thermal plant there, where everything that was made available was public—the coal, the water, the rest of it. We could very easily have sold the electricity. Now, in your reconnaissance study here as far as desalinization is concerned, here again, the power end of it is left to someone else. I would say what you have stated in here as far as costs are concerned of production of electric energy, the Government should hold on to that, too, because every one of the projects that are in place today, if it had not been for the power, they probably would not have been there. The power has been a helper as far as financing of these projects.

We can look to the Bonneville project as far as the West is concerned and the Central Valley's project. So I think while this is somewhat in the future, I do not see anything wrong with the Federal Government developing a nuclear power plant and a desalting plant along with it. When you tie the two together and the Government then has the right to dispose of this huge amount of excess power, because authority to desalinate 2.5 million acre-feet of water, you are talking about an awful lot of power. I would certainly like to see the Federal Government protected and this revenue derived from power going to help provide these facilities we are talking about. The facilities we are talking about are going to be very expensive, I presume, whether it is through desalinization or whether we transport sea water into the basin or bring the water from some place else.

I think that is a very, very important item. I can only look to the success of the other projects that are in place now. If it had not been for the power, every one we bring along today in a general tieback to the funds and there is an inability to pay for these, we go to the fund.

I wonder what you have to say about the Federal Government's position.

I think there is a real cash register here that we are talking about.

Secretary UDALL. Congressman, none of us can foresee what will happen. At this time a proposed Federal steamplant of any size is a highly controversial subject. We have tried to not stir up controversy in this proposal. I do not think we have. And as far as surplus power is concerned, we will do three things with it: We would bank it, which is a familiar arrangement to you; we would use it to firm upper basin hydro at Glen Canyon Dam right nearby; and whatever else remained would be sold to the Salt River project.

We are trying to thread the needle here so as to not stir up controversy and this has been our purpose. It may very well be that the thing that you foresee is something that will come up in the future.

The Congress and the administration will have to face up to it then. That will be something that can be discussed as the needs of the Nation arise.

Mr. JOHNSON. Well, in our projects, is there any place now—take the Missouri River or the Columbia River developments or the Central Valley's developments, the matter has been worked out well with the private utilities, I think, in all three areas. But the Government does have control of this particular generating facility that generates the first dollars into the projects, you might say. What they do with the power is sell the power and work out an agreement with the private facilities and public agencies. I think it has worked out very well. I do not think it has harmed anything, and the utilities in those areas are now using all the power and a good portion of it is marketed.

Mr. SAYLOR. Has the gentleman from California ever heard what happened to public utilities in the Tennessee Valley area?

Mr. JOHNSON. That was an act of Congress. I was not here at the time but I think it has helped the area greatly and I think it is one of the finest examples of putting water to use for the people and conserving and developing resources.

Mr. SAYLOR. Right now it might be of interest to my colleague to know that the water development produces 3 percent of the power produced by the Tennessee Valley Authority.

Mr. JOHNSON. They are now utilizing their other resources and I think within the Four Corners area, it accomplished the same thing. I do not say that private utilities would be put out of business. They would probably take and market this power and do a very good job of it. But I do not think we just have to turn over all of our resources to somebody else to develop.

Now, there is a great controversy right within this committee, but that is just my personal opinion. Anybody else may have his own.

But I do think if we are ever going to augment this river if we do it through a desalinization program, it is going to be very expensive and certainly the power should be a contributor to the development.

Mr. HOSMER. Mr. Chairman, in that connection, there will be an awful job absorbing a block of power of this size. One comes in in 1990 for 2,900,000, in 2000, 1,299,000 and in 2010, another 2,900,000 mill kilowatts in one block. That is a tremendous amount of power and there is nothing that will receive something from marketing that power. This is an additional problem. But it is so far off, I did not want to get into it.

Mr. JOHNSON. It might be too far off, because we are going to gain a lot of knowledge on what is put together out there now. If Bolsa Island does what the figures show it could, if private power and public power and the public agencies, the metropolitan water district, Federal Government and a couple of Federal agencies, contribute a little—

Mr. HOSMER. These developments will have to be factored into both public and private systems.

Mr. JOHNSON. I would say through new techniques in long-distance transmission, there has not been any power developed that has not been used. We do not have any surplus power in the United States. If you want to increase the use, all you have to do is make the rate low and the power will be used. I do not want to say we live in—

Mr. DOMINY. The projected generation from the first dual purpose plant, incidentally, is only 1 year's load growth for the Pacific South-west.

Mr. HOSMER. For where?

Mr. DOMINY. For the Pacific Southwest, based on the projections to 1990.

Mr. HOSMER. You are going to have to transmit this through how many States?

Mr. DOMINY. This is just for the Southwest. This is Southern California, Arizona, and Nevada. We are already interconnected and of course, we will have the interties in, too. We think these can be phased in.

Mr. HOSMER. You have not transmission facilities to take a block of power like this now?

Mr. DOMINY. We will have. We will have to keep increasing it.

Mr. HOSMER. This is going to be a real computer problem.

Mr. DOMINY. Right.

Mr. JOHNSON. That is about as much as I have to say in connection with saline water and weather modification that I do hope will come along, because we will need that, too, all that we can get into the basin.

There is one other matter. At this particular point I would ask that the letter the Secretary wrote to the American Public Power Association be made a part of the record.

Is there objection?

(No response.)

Mr. JOHNSON. It is so ordered.

(The material referred to follows:)

U.S. DEPARTMENT OF THE INTERIOR,
Washington, D.C., July 17, 1967.

Mr. ALEX RADIN,
General Manager, American Public Power Association,
Washington, D.C.

DEAR ALEX: Your letter of June 30 inquired as to whether the Department intends to follow the preference clause in marketing prepaid power and energy from the Page plant surplus to Central Arizona Project needs.

Presumably, your inquiry arises because of reports you may have heard regarding what Deputy Solicitor Weinberg advised the Senate Interior Committee during the markup of S. 1004. The Deputy Solicitor said that under the language of the bill, there was a question as to whether the preference clause would be applicable as a matter of law. He went on to advise the Committee, in effect, that in the absence of a contrary instruction in the bill itself or in the legislative history, the Department would observe the command of the preference clause regardless of its technical applicability. I am glad to confirm that position.

We plan, of course, to acquire only enough generating capacity to utilize fully and dependably the capacity of the Granite Reef Aqueduct during those years when adequate water supplies are available. This will mean, of course, that from time to time during those years when the water supplies are inadequate to utilize fully the canal's capacity that some power and energy will be surplus to the project needs. We plan to negotiate power banking arrangements with the utilities in the area to maximize the amount of this thermal capacity which will be used for project pumping purposes. With these arrangements, the output of the prepaid thermal capacity will be substantially committed to project pumping prior to 1990.

After 1990, if nothing is done to increase the supply of water in the river (personally, I am confident that some form of augmentation of the river's flows will occur), the amount of surplus power and energy available will begin to increase gradually. Because this power and energy will be available intermittently when water is not available for pumping, we have concluded that it could best be utilized in close coordination with the Bureau of Reclamation's existing hydroelectric power plants and its extensive transmission system. This conclusion led us to say in the Department's Summary Report of February 1967, page 14, as follows:

"Even though the central Arizona area would be the large commercial load area closest to the power plant, the commercial power production of the plant would not necessarily serve this area alone. The power output of the thermal plant could be integrated with the power production of Reclamation's hydro-

connected hydroelectric power system which extends generally throughout the West. Such coordination could enhance and broaden the usability of the power produced by both the thermal plant and the hydroplants. The coordinated output of these plants could be available to serve loads from Reclamation's interconnected transmission system."

If the supply of water in the Colorado River is not augmented as future upstream depletions increase, it will, of course, mean that additional groundwater pumping will have to occur in Arizona if the existing level of irrigated agriculture is to be maintained.

With this in mind, the Salt River Agricultural Improvement District, a preference customer and one of the group of utilities which has offered to construct the thermal plant, has requested that such power be made available to it and other preference pumping customers in order to meet the increases in their own pumping requirements which would occur at that time. Certainly the Department would give careful consideration to the requirements of this nature if they do, in fact, materialize.

Enclosed for your information is a copy of Mr. McMullin's March 13, 1967, telegram.

Sincerely yours,

STEWART L. UDALL,
Secretary of the Interior.

PHOENIX, ARIZ., March 13, 1967.

HON. FLOYD DOMINY,
*Commissioner, Bureau of Reclamation,
Interior Department,
Washington, D.C.:*

In the draft of proposed bill to authorize the construction operation and maintenance of the Central Arizona project transmitted to the President by Secretary Udall on February 15, 1967, we note that it is proposed to provide low-cost pumping power for the CAP through prepayment for the requisite capacity and associated transmission facilities in a WEST-type arrangement. Section 2B of the draft bill further proposes that power and energy so acquired may be disposed of intermittently when not required in connection with the CAP.

We have all recognized that the CAP has the unique feature of being able to accommodate itself to a fluctuating delivery of water from the Colorado River because in years of maximum diversion from the river we can correspondingly reduce pumping in the CAP area. Conversely in years of low diversion it would be necessary for Salt River project and other similarly situated agencies to materially increase pumping. It occurs to us that the power not required by the Bureau during years of low diversion from the Colorado River might well be used by Salt River and other preference pumping customers in order to assure power availability for the increased pumping that would be necessary during those years. We also understand that beginning about 1990 there may be some firm power available from CAP, although we do not know the terms and conditions under which this power might be disposed of. Would look forward to the possibility of acquiring this power because if the river has not been augmented by that time and the water supplies for diversion through the aqueduct have been materially reduced Salt River and similar agencies are going to have to again resort to increased pumping and will then have materially increased requirements for firms pumping power. Will you please give these matters consideration in further work for CAP.

R. J. McMULLIN,
General Manager, Salt River Project.

JUNE 30, 1967.

Secretary STEWART L. UDALL,
*Department of the Interior,
Washington, D.C.*

DEAR MR. SECRETARY: With respect to the 400 mw of capacity in WEST's Page plant which the Bureau of Reclamation plans to purchase by pre-payment in connection with the Central Arizona Project proposal approved by the Senate Interior Committee, will power and energy surplus to the project pumping requirements be marketed under the preference clause?

I would greatly appreciate it if you could supply me with a prompt answer to this question.

Sincerely,

ALEX RADIN.

Mr. JOHNSON. The next thing I would like to place in the record is just what amounts of water are taken at the present time by California from the river and also their contracts and right to the water; then the facilities that have been placed on the river by various agencies in California; then also show the amount of water that was used in 1967.

Now, in 1967, according to figures we get out there, California used from the river 4,969,000 acre-feet of water.

Now, this water has been stretched out through some very careful recapture of wasted water. I think when the use was dropped on the river, it shows that in 1963, there was a considerable amount more of water used than in 1967. In 1967 through perfecting the way of diverting and using the water, they have conserved a lot of water and their practices are much better. Now, we are vitally concerned, those of us from the State, with the amount of water we are taking now from the river and the amount we are entitled to, and trying to protect all the agencies that are using water. We have a very large investment in the facilities that are on the river at the present time and they are being repaid through various ways.

But I would ask that the chart on the amount of water and the rights to its use be placed in the record at this point.

Mr. UDALL. Reserving the right to object, these are figures and charts, and a statement prepared by the California agencies, I assume?

Mr. JOHNSON. Yes. Certainly they are not mine, because I do not have that expertise. But the people who prepared these put them together and I would ask that they go in as part of the record.

Mr. UDALL. I would have no objection. I have no information to quarrel with them because I have not read them. I just want to make sure that we are not bound by them.

I have no reason to believe they are not correct, but I do not know.

Mr. JOHNSON. I merely want to put them in as part of our position as far as the State is concerned. We are also asking actual unit costs on the water.

Mr. UDALL. I withdraw my objection.

Mr. SAYLOR. Reserving the right to object. I will not object. I wonder if you might not also ask the people who prepared this list to break it down a little farther and tell us the amount of water taken out at the time California passed the Self Limitation Act. This shows what was taken out in 1957-67, but does not show the amounts of water that have been taken since California passed the Self Limitation Act.

Mr. HOSMER. Would that information be of any value?

Mr. SAYLOR. It would be a lot of value.

Mr. HOSMER. To whom?

Mr. SAYLOR. Anybody who wants to take a look at this record as a matter of a hearing.

Mr. HOSMER. We are not building the CAP retroactively, as I understand it. This will come on the line in 1979.

Mr. JOHNSON. That is true. I imagine these figures will be readily available by the people who are concerned.

Mr. SAYLOR. I withdraw my reservation.

Mr. JOHNSON. Any further objections?

(No response.)

Mr. JOHNSON. If not, we will place this in the record at this point.

(The material referred to follows:)

California water rights—as controlled by contracts with Secretary of the Interior and Supreme Court decree

(All of these, except Indian rights, are owned by existing projects, constructed at a cost exceeding \$600,000,000)

	<i>Acre-feet</i>
Contract rights (see detail below)-----	5,362,000
Additional rights decreed to Federal establishments by the Supreme Court:	
Indians -----	70,000
Wildlife refuges ($\frac{1}{2}$ of total)-----	30,000
Miscellaneous present perfected rights protected by decree but not yet under contract-----	5,000
Total -----	5,467,000

Contract rights: Total 5,362,000 acre-feet.

(Note: These are grouped in the following priorities by the Secretary's regulations and contracts.)

1st priority: Palo Verde Irrigation District for water required for 104,500 acres. (Appropriations date from 1877. Served by diversions via Palo Verde weir.)	
2d priority: Yuma project, U.S. Reclamation Bureau—water for 25,000 acres. (Appropriations date from 1905. Served from All-American Canal.)	
3d priority: Imperial Irrigation District. Coachella Valley County Water District, Palo Verde Irrigation District, 3,850,000 acre-feet, less quantities covered by priorities 1 and 2. Appropriations of Imperial and Coachella date from 1895. Both are served by All-American Canal. Of the 3,850,000 acre-feet, California claims that approximately 3,420,000 acre-feet comprise "present perfected rights," protected by the decree in <i>Arizona v. California</i> , Dates of contracts: Palo Verde, 1933; Imperial, 1932; Coachella, 1934-----	3,850,000
4th priority: Metropolitan Water District. Appropriations date from 1924. Contract dated 1931-----	550,000
Subtotal -----	4,400,000
5th priority: Metropolitan Water District-----	662,000
6th priority: Imperial, Coachella, Palo Verde-----	300,000
Subtotal, contract rights-----	5,362,000

Decreed rights, not covered by contract: Indians (translated from diversion rights into consumptive use):

Yuma Indian Reservation (1884)-----	27,300
Fort Mohave Indian Reservation (1890, 1911)-----	7,300
Chemehuevi (1907)-----	6,600
Colorado River Indian Reservation in California (1865, 1873, 1874, 1915)-----	29,000
Subtotal, rounded-----	70,000

Other Federal establishments:

Havasu Lake National Wildlife Refuge, pro rata, $\frac{1}{2}$ of 37,339 acre-feet of consumptive use (1941, 1949)-----	18,600
Imperial National Wildlife Refuge, pro rata, $\frac{1}{2}$ of 23,000 of consumptive use (1941)-----	1,500

Subtotal, rounded-----	30,000
Miscellaneous small present perfected rights, not yet under contract, priorities dating from 1856 to 1928, approximately-----	5,000
Total, approximately-----	5,467,000

COLORADO RIVER BASIN PROJECT

INVESTMENTS BY CALIFORNIA AGENCIES IN COLORADO RIVER PROJECTS ¹

[In millions of dollars]

Agency	Bonds	Taxes, water revenues, and other investments	Contracts with United States and other government agencies	Total
Metropolitan water district.....	297.4	187.5	-----	484.9
Imperial Irrigation District.....	54.0	-----	25.0	79.0
Coachella Valley County Water District.....	-----	-----	26.9	26.9
San Diego County Water Authority.....	32.0	-----	20.3	52.3
Palo Verde Irrigation District.....	30.0	-----	1.7	31.7
Total.....	413.4	187.5	73.9	674.8

¹ As of Dec. 31, 1963.
Source: P. 590, hearings on H.R. 4671, September 1965.

*Diversions less measured returns of California agencies from Colorado River
for water year 1967*

District:	<i>Acre-feet</i>
Palo Verde Irrigation District.....	366,000
Metropolitan Water District.....	1,182,000
Yuma Project Reservation Division.....	48,000
Imperial Irrigation District.....	2,880,000
Coachella Valley County Water District.....	453,000
Total	4,900,000

*Diversions less measured returns of California agencies from Colorado River
for water year 1963 ¹*

District:	<i>Acre-feet</i>
Palo Verde Irrigation District.....	362,000
Metropolitan Water District.....	1,065,000
Yuma Project Reservation Division.....	45,000
Imperial Irrigation District.....	3,053,000
Coachella Valley County Water District.....	537,000
Total	5,062,000

¹ Highest year of record in recent years.

Mr. JOHNSON. Now, I have a letter from our colleague, John Rhodes, from the great State of Arizona. He has asked me to place in the record a statement of Mr. Filmore Carlos, president, Salt River Pima-Maricopa Indian Community Council. This just came in my office before I came over here. I see nothing wrong with the statement of the gentleman. Is there objection?

(No response.)
Mr. JOHNSON If not, it will be put in the record at this point.
(The material referred to follows:)

SALT RIVER PIMA-MARICOPA INDIAN COMMUNITY COUNCIL,
Scottsdale, Ariz., January 29, 1968.

Hon. JOHN J. RHODES,
2355 Rayburn Office Building, Washington, D.C.

DEAR CONGRESSMAN RHODES: We are following with interest, the progress of the Central Arizona project bill as it moves through various stages of consideration.

Our prime interest of course, its the lands that will be taken into the reservoir and easements. It is in this vein of thought that the Salt River Tribal Council respectfully submits a statement on their position for the record attached hereto.

Sincerely yours,
FILMORE CARLOS, President.

[Enclosure]

STATEMENT OF FILMORE CARLOS, PRESIDENT SALT RIVER PIMA-MARICOPA INDIAN COMMUNITY

The Salt River Pima-Maricopa Indian Community, along with its neighbor, the Fort McDowell-Mohave-Apache Indian Community, has been vitally concerned for many years with the proposed dam and reservoir as set forth in S. 1004 and H.R. 14834.

We realize the importance of the Central Arizona Project to the State of Arizona and, as we have previously expressed to Congress, we are prepared as good citizens and native Arizonans to cooperate in an endeavor to bring the CAP into reality. However, we do request that every consideration be given to our views since we, of all Arizonans, are being asked to make major sacrifices in order to bring major benefits not to ourselves but mainly to others.

In order to bring before you once again our position on this matter, we respectfully ask that consideration be given to the following requests and recommendations:

1. That the Salt River Pima-Maricopa Indian Community and the Fort McDowell-Mohave-Apache Indian Community be kept fully informed by the Bureau of Reclamation, or any other governmental agency having to do with the planning of Orme Dam, of all information they have on that part of the CAP known as Orme Dam, including but not limited to engineering features, flood control features and the need for inundation of lands on the respective reservations.
2. That the dam site be at the location known as Granite Reef and not at the confluence of the Salt River and the Verde River.
3. That the Salt River Pima-Maricopa Indian Community be permitted to retain overall planning control of public and private land developments on tribal lands and have a voice in the control of the character of development on National Forest lands along the south shore of the Salt River. The reason for this is that developments on National Forest lands would be a part of the view for reservation land and, therefore, if unattractive could adversely affect that value of reservation land for resort and residential purposes.
4. That the fluctuation of the lake to be formed behind Orme Dam be maintained at the absolute minimum so as not to interfere with proper development of the shoreline.
5. That the Salt River Pima-Maricopa Indian Community have a voice in the public recreational use of the impounded reservoir waters so as to control the "public nuisance" factor insofar as possible. Such items as limiting boat and motor sizes, water speed limits, etc., would fall in this category.
6. Require that the proposed right-of-way for the Granite Reef Aqueduct be granted in return for its location following as nearly as applicable natural contours of the terrain; that it be an underground or covered conduit; and that when necessary to span an area, the conduit and supporting structures conform to an architecturally pleasing style so as to enhance the aesthetics of the Red Mountain area.
7. That the Salt River Pima-Maricopa Indian Community have the right to rigidly control the "public use" of the western reservoir shoreline and that there not be permitted the routing of a public road along the western shore in the area from the dam site up stream to the vicinity of the proper relocation of the Bee-line Highway.
8. That the Salt River Pima-Maricopa Indian Community have the right to elect whether or not on reservation land to install and operate all recreational facilities or install and operate only the concession type facilities and agree to public installation, operation and maintenance of such facilities as picnic areas, campsites, roads and scenic areas, generally considered as being high cost and high usage facilities but low revenue producers.
9. That the Salt River Pima-Maricopa Indian Community maintain all water rights under the Kent Decree and other sources, and be able to apply the water for any purpose or use on the reservation.
10. That the Salt River Pima-Maricopa Indian Community secure rights to Central Arizona Project water for municipal and industrial purposes in order to serve urban development on reservation lands.
11. That the Salt River Pima-Maricopa Indian Community be entitled to just compensation for any lands or interest in lands of the reservation taken or used in connection with the Central Arizona Project and that in the event an agreement cannot be reached by negotiation that proper condemnation proceedings

be brought so the Community and/or its members shall have the same rights as any other person to have the issue tried in the United States District Court as to what is fair and just compensation for the lands so taken.

We respectfully request that the foregoing be made a part of the hearing record.

Mr. JOHNSON. I also would like to put into the record a letter from the attorney general of California to me stating his position in behalf of the legislation on the subject matter that has been before this subcommittee.

Is there objection?

(No response.)

Mr. JOHNSON. Hearing none, it will be so ordered.

(The material referred to follows:)

STATE OF CALIFORNIA,
DEPARTMENT OF JUSTICE,
Los Angeles, January 25, 1965.

HON. HAROLD T. JOHNSON,
House Office Building,
Washington, D.C.

DEAR BIZZ: I appreciate very much receiving your letter of January 19, 1965 regarding California's position on the pending Colorado River legislation.

I am delighted to reiterate what you perhaps already know—that our state is united on the language of a draft bill that is the "Official Recommendation of the State of California." As in the past, the Department of Water Resources, the Colorado River Board, and the Attorney General of California have labored together on it; and we have had the assistance of the Advisory Committee to California's delegation to the Western States Water Council. I understand that the Governor has accepted and supports this position. So long as California remains united, we shall not fail.

As California's lawyer, my chief concern with the pending legislation has always related primarily to its legal aspects. In particular, I have insisted upon adequate priority for California's existing projects as against any new Central Arizona project. Any bill to authorize a Central Arizona project must embody protection for our 4.4 million acre-feet per annum. Sound language to accomplish this result which has been developed by this office, now appears in the draft bill that is the official recommendation of the State of California. This is essentially the same language that has appeared in your prior bills and those of the other California Congressmen and Senators. It is the language that Arizona has agreed to in 1963 and that was then included in the bills introduced by her three Congressmen.

Please feel free to contact Northcutt Ely, Special Assistant Attorney General and my Water Law staff for any further analyses that may be needed on legal matters relating to this important legislation. We want to be of the greatest possible assistance to our congressional delegation.

Sincerely,

THOMAS C. LYNCH, Attorney General

Mr. SAYLOR. Could I ask the Secretary and the Commissioner several questions with regard to a few words that appear in S. 1004 and H.R. 5300 and ask whether or not they are important when we consider these bills.

Mr. Secretary, on page 1 of S. 1004, line 8, the words "exchange of water" appear.

Are these necessary or should it be shown that this only calls for exchange within the basin?

The reason I ask the question is because some people might wonder whether or not this is authorization for exchanging of water outside of the Colorado River Basin.

Mr. WEINBERG. Mr. Saylor, that language has reference to possible water exchanges within the State of Arizona and between Arizona and New Mexico.

Mr. SAYLOR. In other words, at the time we draft our report, if we keep this language, the Department will be satisfied with that sort of explanation?

Mr. WEINBERG. Yes.

Mr. UDALL. To make the record clear, that is Arizona's understanding, too.

Mr. SAYLOR. In H.R. 3300, on pages 27 and 28, sections 305 (e) and (f) refer to imported water, first to be made available from the upper basin and second, imported water not delivered into the Colorado River system but diverted from works constructed to import water from that system shall be made available to water users in accordance with Federal reclamation law.

Are those two sections necessary if we consider H.R. 3300?

Mr. WEINBERG. The references apply to water that would be imported but not required to assure 7.5 million acre-feet of Colorado River water for the Lower Basin States. Such water would be for ordinary disposition, and it has been our thought that there is no reason why it should not be provided under the Federal reclamation law because it would be developed through a Federal reclamation project.

Mr. SAYLOR. But in view of the fact that the Senate bill did not contemplate augmentation at this time, the question in my mind is whether or not it should be included as we consider H.R. 3300.

Mr. WEINBERG. If you are going to follow the format of H.R. 3300 and deal with these matters, then we would recommend, as we have in the past, that the reclamation law be applicable in these instances.

Mr. SAYLOR. If it is the wisdom of the committee that we delete the section with regard to augmentation, then these sections should be deleted and we could deal with this matter of augmentation and the use of that water at a time such legislation is considered.

Mr. WEINBERG. Yes, that is the pattern of S. 1004.

Mr. SAYLOR. Thank you, Mr. Chairman.

I think this will help us considerably when we consider the markup of the bill.

Mr. HOSMER. Mr. Chairman, I would like to ask just briefly relative to the Colorado River Indian tribes.

I imagine there are about 2,000 of them, comparable to Hualapai. According to your figures, they have 99,357 net acres down there that can be worked for agriculture. That would take an annual consumptive use of 397,500 acre-feet of water.

I understand further that you are suing the farmers over in Imperial Valley to enforce the 160-acre limitation. Yet the tribes are leasing acreage on their reservation from 1 to 25 years, sometimes up to 65 years, in transactions as large as 5,000 acres and whoever leases them, will get 5 acre-feet of water per year for only \$9.

There are about 40,000 acres under lease now. I do not know what the annual rental is, but I would imagine that it would be at the most \$40 an acre and probably that is high.

Since the Indians are not farmers, they are just getting money anyway, why does not the Bureau pick up this 390,000 acre-feet of water just by paying the Indians for the land and using the water for CAP, instead of paying \$75 or \$100 an acre-foot for it? Would that not be a good economic way to handle this and still make the Indians happy?

Secretary UDALL. Congressman, I would like to put this in focus as I happen to be personally very familiar with the situation. First of all there are something like 4,000 Indians in the tribe. They happen to have some of the best bottom land on the river and naturally the best water rights. They get their water out of Lake Havasu. They faced the choice 2 or 3 years ago when their water rights were clarified finally by the Supreme Court of how they wanted to go about developing it. They could have come to Congress and gotten little dabs and dabs of money, as we are trying to do with the Navajo project, and had the Federal Government build them a project. Instead they chose the more rapid rate by entering into long-term leases with well-to-do California farmers and others whereby these people would subjugate the land, build the canal systems, and so on. Many of these Indians are also farmers. And I should add, too, that they are very good farmers. We hope more and more of them will get into the farming business.

But they wanted to get their land under production in a hurry. Therefore, they chose to go into these large leases with people who are raising specialty crops there.

The Indians made the decisions. I think they probably made the right decisions because they wanted to move rapidly.

Mr. HOSMER. Well, but they want money. Whether they get it by farming, by leasing acreage, or it drops out of the sky, or it is in the form of a payment for their acreage which releases the water to a higher and better use, probably. I just would like to offer this as a way to pick up considerable numbers of acre-feet of water at a cheap price and still have the Indians better off than they would be otherwise.

Secretary UDALL. Congressmen, they are not just interested in money. They get a lot of jobs out of this. They are putting more land into production themselves. They want to farm this land. I do not think they would be any more interested than the Palo Verde farmers, the Yuma farmers, or others in selling their land.

Mr. HOSMER. The Indians out in Oklahoma like to get the oil royalties.

I do not know if this is an inflexible attitude on their part.

Secretary UDALL. No, they like the land, they want to stay on it, they want to develop it. I would like to have them have that right, if that is what they want to do.

Mr. HOSMER. I suggest perhaps you could educate them.

Thank you.

Mr. JOHNSON. There is one other matter in your reply there on power from the steamplant. I presume it would also be used to back up the firm contractors for users. Could it not?

Secretary UDALL. It could be, yes.

Mr. BURTON of Utah. Mr. Chairman, will you yield to me?

Mr. JOHNSON. Yes.

Mr. BURTON of Utah. I would like to make the observation that does not necessarily need any comment unless somebody wants to comment on it. But we have done a lot of talking in the last few days about making the Colorado River "whole." It seems to me what we are really talking about on that is to make sure the lower basin gets 7.5 million acre-feet and still leaves the upper basin with a little over 6. "Period." "End quote."

Mr. HOSMER. I would make the observation that it would eliminate this knotty problem of who shares the deficit of the Mexican obligation. Therefore, it would benefit the upper basin.

Secretary UDALL. May I make one comment, because I think the one thing we should keep our eye on is that the upper basin is where most of the scientific research is going on related to weather modification.

This would develop additional water where the upper basin could get tremendous benefits. So let's keep that in mind.

Mr. JOHNSON. Any other question from any member of the committee?

Does the staff have any questions?

We want to thank you, Mr. Secretary, and your staff for participating in the hearing. You have given us some very forthright answers and comments. I know you are very well qualified, all of you. We should have enough record made, now, I think.

The hearing will be closed and the next meeting of this subcommittee will be on February 8, where we will go into executive session, followed by the meeting that will start on February 26 and run through that week, following which there will be a markup on the legislation.

All of the materials that were asked for, if you will get that up—
Secretary UDALL. As quickly as possible.

(Whereupon, at 12:35 p.m., the subcommittee was adjourned.)



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