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SENATE

DOCUMENT
No. 7

COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS

THE SIXTH ANNUAL REPORT ON THE STATUS OF THE COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS

TOGETHER WITH

A STATEMENT OF GENERAL PRINCIPLES TO GOVERN, AND OPERATING CRITERIA FOR, GLEN CANYON RESERVOIR (LAKE POWELL) AND LAKE MEAD DURING THE LAKE POWELL FILLING PERIOD, AND RELATED DOCUMENTS

PRESENTED BY SENATOR ANDERSON

MARCH 14, 1963.—Ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE
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S. Res. 72

IN THE SENATE OF THE UNITED STATES,
March 14, 1963.

Resolved, That there shall be printed as a Senate document the "Sixth Annual Report on the Status of the Colorado River Storage Project and Participating Projects," and "General Principles to Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," prepared by the Department of the Interior, with an introductory statement.

Attest:

FELTON M. JOHNSTON,
Secretary.

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Mr. President, under date of December 28, 1962, the Assistant Secretary of the Interior, Hon. Kenneth Holum, transmitted to the President of the Senate the sixth annual report of the Department on the status of the Colorado River storage project and participating projects as required by section 6 of the authorizing act of April 11, 1956 (70 Stat. 105).

The report calls attention to three significant events in the development of the project: First, the substantial completion of the Paonia participating project in western Colorado; second, the receipt of the first operating revenues from the sale of water on the Navajo storage unit in New Mexico; and third, the authorization on June 13, 1962, of the Navajo Indian irrigation and San Juan-Chama projects.

Annually this report has been printed as a Senate document and in conformity with this precedent I am sending forward a resolution authorizing that this report be printed.

In addition, Mr. President, the Glen Canyon Dam, which is one of the key units of the project, is nearing completion, and filling of its mighty reservoir, Lake Powell, is about to start. Because of the great importance of this unit to the development of the entire Colorado River system, I am presenting a statement of the criteria and principles governing the filling and operation of the Glen Canyon Dam and Reservoir to be printed as an appendix to the sixth annual report.

Mr. President, I am certain that every Member of the Congress is aware of how vital to the West and to the Nation is the full development of the Colorado River and its resources. As the dean of the Senate, the distinguished Senator from Arizona, Carl Hayden, so picturesquely expresses it: "The Colorado River is the West's last waterhole."

One of the great forward steps the Congress has taken toward maximum development of this cornerstone of so much of the West's, and the Nation's, prosperity was the enactment in 1956 of the Colorado River Storage Project Act, which is Public Law 485, 84th Congress. Among the participating projects authorized by this monumental legislation, which I had the honor to sponsor, was construction of the Glen Canyon Dam and Reservoir.

As construction of Glen Canyon Dam progressed, Secretary of the Interior Stewart Udall initiated studies, in consultation with all of the diverse interests of the Colorado River Basin, to determine how Lake Powell could be filled with the least possible disruption of the many activities now dependent upon the flow of the river. The Secretary was faced with difficult decisions in formulating the filling

criteria finally adopted. These decisions, made, as I have pointed out, only after the most searching study and exhaustive consultation with the varied Colorado River Basin interests, reflect impartial judgment based on expert advice, and are in the best interests of the Colorado Basin as a whole, I am confident.

Fortunately, the favorable runoff of the Colorado River during 1962 will result in almost ideal conditions for the initiation of storage in Lake Powell. With average or near average flows for the next few years the upper basin reservoirs can be filled with a minimum of effect on downstream interests.

The filling of Lake Powell, which will rival Hoover Dam and Lake Mead in size and capacity, together with the other upper basin storage reservoirs, will be another long step forward in unlocking the door to full development of the upper basin's water resources. In this respect the upper basin structures will serve, in effect, the same purposes that Hoover, Parker, and Davis Dams do for the lower basin. Together, these upper and lower basin reservoirs will approach full control of the once-rampaging Colorado River.

In reaching this objective I sincerely hope that Secretary Udall may have the full cooperation of all basin interests and that the remaining development of the Colorado River Basin can proceed at full speed and in harmony and equity.

I am convinced that the printing, as a Senate document, of the Sixth Annual Report on the Status of the Colorado River Storage Project and Participating Projects and the statement of the principles and criteria arrived at by the Secretary and his expert advisers for the filling of Glen Canyon Reservoir will be of value to the Congress and the Nation.

PART I. BASIC DOCUMENTS

GENERAL PRINCIPLES TO GOVERN, AND OPERATING CRITERIA FOR, GLEN CANYON RESERVOIR (LAKE POWELL) AND LAKE MEAD DURING THE LAKE POWELL FILLING PERIOD

1. The following principles and criteria are based on the exercise, consistent with the law of the river, of reasonable discretion by the Secretary of the Interior in the operation of the Federal projects involved. The case generally styled "*Arizona* v. *California, et al, No. 9 Original*" is in litigation before the Supreme Court of the United States. Anything which is provided for herein subject to change consistent with whatever rulings are made by the Supreme Court which might affect the principles and criteria herein set out. They may also be subject to change due to future acts of the Congress.

2. The principles and criteria set forth hereinafter are applicable during the Lake Powell filling period, which is defined as that time interval between the date Lake Powell is first capable of storing water (estimated to occur in the spring of 1963) and the date Lake Powell storage first attains elevation 3,700 (content 28.0 million acre-feet total surface storage) and Lake Mead storage is simultaneously at or above elevation 1,146 (content 17.0 million acre-feet available surface storage), or May 31, 1987, whichever occurs first. If, in the judgment of the Secretary, the contents of Lake Powell and Lake Mead warrant such action, and after consultation with appropriate interests of the Upper Colorado River Basin and the Lower Colorado River Basin, the Secretary may declare that in not less than 1 year from and after the date of such declaration these principles and criteria are no longer applicable.

3. Sufficient water will be passed through or released from either or both Lake Mead and Lake Powell, as circumstances require under the provisions of principles 7 and 8 hereof, to satisfy downstream uses of water (other than for power) below Hoover Dam which uses include the following:

(*a*) Net river losses.

(*b*) Net reservoir losses.

(*c*) Regulatory wastes.

(*d*) The Mexican Treaty obligation limited to a scheduled 1.5 million acre-feet per year.

(*e*) The diversion requirements of mainstream projects in the United States.

4. All uses of water from the main stem of the Colorado River between Glen Canyon Dam and Lake Mead will be met by releases from or water passed through Lake Powell and/or by tributary inflow occurring below Glen Canyon Dam. Diversions of water directly out of Lake Mead will be met in a similar manner or, if application of the criteria of principles 7 and 8 hereof should so require, by water stored in Lake Mead.

5. The United States will make a fair allowance for any deficiency, computed by the method herein set forth, in firm energy generation at Hoover powerplant. For each operating year deficiency in firm energy shall be computed as the difference between firm energy which, assuming an overall efficiency of 83 percent, would have been generated and delivered at transmission voltage at Hoover powerplant in that year if water has not been impounded in the reservoirs of the Colorado River storage project storage units (Glen Canyon, Flaming Gorge, Navajo, and Curecanti), but excluding the effects of evaporation from the surface of such reservoirs, and the energy actually generated and delivered at transmission voltage at Hoover powerplant during that year adjusted to reflect an overall efficiency of 83 percent. At the discretion of the Secretary, allowance will be accomplished by the United States delivering energy, either at Hoover powerplant or at points acceptable to both the Secretary and the affected Hoover power contractors, or monetarily in an amount equal to the incremental cost of generating substitute energy. To the extent the Upper Colorado River Basin fund is utilized the moneys expended therefrom in accomplishing the allowance, either through the delivery of purchased energy or by direct monetary payments, shall be reimbursed to said fund from the separate fund identified in section 5 of the act of December 21, 1928 (45 Stat. 1057), to the extent such reimbursement is consistent with the expenditures Congress may authorize from said separate fund pursuant to said act. The attached additional regulation No. 1 for generation and sale of power in accordance with the Boulder Canyon Project Adjustment Act, upon issuance, will be made a part of these principles and criteria.

6. In accomplishing the foregoing, Lake Powell will be operated in general accordance with the provisions of principles 7 and 8.

7. Storage capacity in Lake Powell to elevation 3,490 (6.5 million acre-feet surface storage) shall be obtained at the earliest practicable time in accordance with the following procedure:

> Until elevation 3,490 is first reached, any water stored in Lake Powell shall be available to maintain rated head on Hoover powerplant. When stored water in Lake Powell has reached elevation 3,490, it will not be subject to release or diminution below elevation 3,490. The obtaining of this storage level in Lake Powell will be in such manner as not to cause Lake Mead to be drawn down below elevation 1,123 (14.5 million acre-feet available surface storage), which corresponds to rated head on the Hoover powerplant. In the process of gaining storage to elevation 3,490, the release from Glen Canyon Dam shall not be less than 1.0 million acre-feet per year and 1,000 cubic feet per second, as long as inflow and storage will permit.

The operation of Lake Powell above elevation 3,490 and Lake Mead will be coordinated and integrated so as to produce the greatest practical amount of power and energy. In view of the provision for allowance set forth in principle 5 hereof, the quantity of water released through each powerplant will be determined by the Secretary in a manner appropriate to meet the filling criteria.

9. In general, it is not anticipated that secondary energy will be generated at Hoover during the filling period. However, any secondary energy, as defined in the Hoover contracts, which may be generated

and delivered at transmission voltage at Hoover powerplant will be disposed of under the terms of such contracts.

10. In the annual application of the flood control regulations to the operation of Lake Mead, recognition shall be given to available capacity in upstream reservoirs.

Approved, April 2, 1962.

STEWART L. UDALL,
Secretary of the Interior.

(Published in Federal Register, 27 F.R. 6851 (July 19, 1962).)

ADDITIONAL REGULATION NO. 1 TO THE GENERAL REGULATIONS FOR GENERATION AND SALE OF POWER IN ACCORDANCE WITH THE BOULDER CANYON PROJECT ADJUSTMENT ACT

In accordance with the terms and conditions of the act of July 19, 1940 (54 Stat. 774), and article 27 of the General Regulations promulgated May 20, 1941, the following additional Regulation No. 1 is hereby promulgated:

"Commencing with June 1, 1987, charges for electrical energy in addition to such other components as may then be authorized or required under the then existing laws and regulations, and to the extent not inconsistent therewith, shall include a component to return to the United States funds adequate to reimburse the Upper Colorado River Basin Fund for moneys expended from such fund on account of allowances for Hoover diminution during the filling period of the storage project reservoirs authorized by the Act of April 11, 1956 (70 Stat. 105), in accordance with paragraph 5 of the General Principles to Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead during the Lake Powell Filling Period, approved April 2, 1962. Such component shall be sufficient, but not more than sufficient, to provide said reimbursement in equal annual installments over a period of years equal to the number of years over which costs on account of allowance were incurred by the said Upper Colorado River Basin Fund."

(Adopted by Secretary of the Interior Stewart L. Udall on July 12, 1962. Published in Federal Register, 27 F.R. 6850 (July 19, 1962).)

U.S. DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., December 22, 1961.

MEMORANDUM

To: Secretary of the Interior.
Through: Assistant Secretary Kenneth Holum.
From: Commissioner of Reclamation.
Subject: Principles to govern, and operating criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead during the Lake Powell filling period.

By memorandum of June 13, 1961, I transmitted to you revised general principles and operating criteria recommending that you adopt

them subject to whatever considerations, if any, appeared desirable after having afforded the Hoover power allottees an opportunity to present their views on the additional regulation No. 1 which was made a part of the revised general principles and criteria.

You, in turn, made my memorandum of June 13, 1961, together with its attached revised general principles and criteria, available to lower and upper basin interests for review and comment. We have now received the results of that review and have had extensive discussions thereon with Assistant Secretary Holum. Most of the substantive suggestions for further revision of the general principles had already been thoroughly considered previously by the Bureau, and we find no convincing reasons to make any fundamental changes in the revised general principles and operating criteria submitted to you with my memorandum of June 13, 1961. Several suggestions for changes of minor import were received, however, which appear desirable and are acceptable to us.

The general principles and operating criteria transmitted herewith reflect the Bureau's recommendations taking into account the long history of negotiations, discussions, and views received to date. This memorandum, together with my memorandums of January 18, 1960, and June 13, 1961, and the tabular forms for computing Hoover basic firm and the diminution in power generation under the formula of principle 5 as included in my memorandum of June 13, 1961, comprises a formal record, explanation, and background for these recommendations

We are aware that no set of general principles and operating criteria could possibly fully satisfy all of the diverse interests affected. Before proceeding with a discussion of the most recent comments and suggestions received, therefore, I believe it important to reiterate from my June 13, 1961, memorandum that we have proceeded on the basis—

> * * * of securing a practical approach to the problems of filling, as distinguished from what might be considered a legalistic approach involving an attempt on our part to establish principles and operating criteria on the basis of conclusions as to the perimeters of legal rights and obligations, with the consequent hazards which would attend such an approach. Consequently, our feeling is that irrespective of what might or might not be conceived by any party as the outer measure of its rights or obligations, and with no attempt to establish those limits as a basis for these principles and criteria, we propose action purely within a reasonable exercise of Secretarial discretion.

The most substantive of comments on my June 13, 1961, memorandum go to principle 5, which deals with the proposal to make an allowance for a portion of the diminution in power generation at Hoover Dam, with provision for future reimbursement of moneys expended from the Upper Colorado River Basin Fund utilized in accomplishing such allowance. For purposes of this presentation, however, I will discuss the comments and suggestions received on my June 13, 1961, memorandum in the order of the principle which they concern.

Principle 1.—Question has been raised as to whether acquiescence by a Hoover power allottee in the exercise by the Secretary of "reasonable discretion" in the operation of the Federal projects involved would invoke a legal liability on that power allottee in respect to power which it has contracted to supply from its share of Hoover power. We believe that the contractual relationships between a Hoover power allottee

and its customers are outside the realm of secretarial responsibilities, and hence this question is not pertinent to the general principles and criteria.

Principle 2.—It was suggested that the filling criteria should not end automatically when Lake Powell reaches elevation 3,700 unless at the same time Lake Mead is at or above elevation 1,146. We believe this suggestion has merit, and principle 2 had been revised accordingly.

It was suggested also that the Secretary should give prior notice before terminating the filling criteria previous to the attaining of elevation 3,700 at Lake Powell. Periods of 2 and 5 years were proposed. We agree that in the event of such an action by the Secretary he might well give notice a reasonable time in advance. The measure of reasonableness here, we believe, is the time required by the Hoover power allottees to make such arrangements as might be necessary to accommodate any effects on their operations a change in filling criteria might entail. While this obviously would vary, dependent upon the nature of the revision in filling criteria contemplated, we believe that generally 1 year would suffice. We have thus revised principle 2 to provide a minimum of 1 year's notice. The Secretary could give such notice a longer period in advance if he felt the circumstances so justified.

The point was made that the filling criteria are silent as to operating rules after the filling period. This, of course, is correct. The filling criteria could remain in effect from a minimum of 3 or 4 years up to as many as 24 years. Significant changes in power marketing and in the use of Colorado River water may well occur during the filling period which would influence postfilling operations. Further, the operating experience gained during the filling period is certain to provide valuable bases for developing postfilling operating rules. We believe it premature, therefore, to attempt to prescribe postfilling operating criteria at this time. We do believe, however, that this aspect of future river operation should be constantly kept in mind and that postfilling criteria be formulated as far in advance of the termination of the filling period as possible.

The suggestion was advanced that the filling period and the application of the principles should begin on the date when any one of the Colorado River storage project reservoirs is first capable of storing water. The effect of storage in any of the storage project reservoirs other than Lake Powell on lower river flows would be very nominal. For this reason we prefer that the application of the filling criteria begin on the date when Lake Powell is first capable of storing water.

Principle 3.—It was suggested that the terms "net river losses," "regulatory wastes," and "diversion requirements of mainstream projects" should be defined in terms of legality and limitation. We believe that these terms are commonly understood and, in line with our basic pattern of procedure as previously stated, we would be reluctant to attempt legal definition of these terms.

A suggested clarifying editorial change was adopted as follows: After the word "either" insert the words "or both," and following the words "Lake Mead" substitute the word "and" for the word "or".

Principle 4.—The words "Hoover Dam" were suggested as substitutes for the words "Lake Mead" in the first sentence of principle 4. We believe, however, that the second sentence of principle 4 adequately covers diversions from Lake Mead.

The proposal to insert the words "or losses" after the word "uses" was made presumably to cover evaporation from Lake Mead. We

believe the wording now used adequately covers this matter. (See my memorandum of January 18, 1960.) To insert the words "or losses" would, in our opinion, confuse the issue by introducing the aspect of replacing river losses (as distinguished from reservoir losses) for no apparent reason. We have inserted the word "and/" after the words "Lake Powell" as suggested.

Principle 5.—This principle, dealing as it does with partial allowance for diminution of Hoover energy during the filling period and subsequent partial reimbursement of the Upper Colorado River Basin fund, both contains the heart of the solution to formulation of acceptable filling criteria and invokes the most perplexing problems. The recent comments on this principle cover a wide range of previously held positions varying from that of the upper basin States that they are under no obligation to make allowance for Hoover power deficiencies to that of the lower basin States that allowance for deficiencies in diminution of both energy and capacity at Hoover should be provided without reimbursement. Neither extreme, in our opinion, is practical or serves the purposes sought.

Principle 5 as set forth in the revised general principles and filling criteria recommended in my memorandum of June 13, 1961, represents the selection of a middle-ground solution based on an impartial appraisal of all of the issues involved. In essence, it is a product of judgment as to what constitutes a practical procedure. Such judgment must be made, however, and we sincerely hope accepted, if the related issues are to be kept clear of court actions or other long-drawn-out procedures, which, we believe, would work to the advantage of neither the upper nor lower basin interests nor to the overall development of the water resources of the Colorado River Basin. We still believe that principle 5, as proposed and explained in my June 13, 1961, memorandum, is the most practical approach available.

Other points relating to principle 5 were raised that warrant discussion.

The upper basin interests reiterated their proposal that the Colorado River development fund be used either to make necessary replacement energy purchases or to reimburse the Upper Colorado River Basin fund on a current basis. We believe that this proposal has merit and should be further explored. If there is found to be general support for this among the various basin interests, I would recommend that the Department sponsor such legislation as may be required.

The upper basin interests point out that principle 5 provides a guarantee of energy to the Hoover power allottees but only an intent to reimburse the Upper Colorado River Basin fund. As pointed out in my memorandum of June 13, 1961, this is as far as the Secretary can go at this time without additional legislation.

The lower basin interests suggest that evaporation from storage project reservoirs should be taken into account in determining diminution in Hoover energy. This was discussed in my memorandum of June 13, 1961, and the reasons for our position stated therein have not changed.

It was suggested that Hoover replacement energy should be delivered at times as well as at points acceptable to both the Secretary and the Hoover power allottees. As stated in my memorandum of June 13, 1961, if the allowance is made by delivering energy, it will be delivered in a monthly pattern designed to fit those months when

water otherwise would have been released at Hoover. We believe this accommodates the intent of that suggestion.

Principles 6 and 7.—No adverse comments or suggestions were received relating to these principles.

Principle 8.—It was proposed that any water stored in Lake Powell above elevation 3,490 should be subject to release to maintain rated head at Hoover powerplant. We recognize the desirability of maintaining rated head at both Hoover and Glen Canyon powerplants, and one of the operating rules might well recognize this as far as it is consistent with the broad objectives of the filling criteria. It should not be a part of the filling criteria, however.

Lower basin interests indicate that the offsetting of Hoover impairment should have priority on upper basin power output to the extent that the Secretary cannot find replacement energy for purchase. Although we are willing to devote nonfirm energy to this purpose, as previously indicated, we do not believe the proposal should contemplate use of firm energy. We are confident that arrangements for the purpose of replacement energy combined with the availability of energy produced by upper basin powerplants which cannot be marketed at firm power rates will be adequate to meet the proposed formula.

Principles 9 and 10.—No comments or suggestions were received relating to these principles.

Several other comments and suggestions were received that do not relate to any specific principle.

The point was made that the impact of the storage project operations on the Parker-Davis projects received no attention in the filling criteria. The point was made in relation to a possible power rate increase. The likelihood of the filling operations of Lake Powell causing a need for a power rate increase at Parker-Davis is so remote that we consider it unnecessary to relate the filling criteria to these projects.

The suggestion was again advanced that the upper basin should be formally represented on a river operations committee. It was suggested also that working committees should be formed which would include representation of lower basin water users as well as power contractors who would have an effective voice in secretarial decisions in resolving problems which may arise in filling Lake Powell. In both cases it was indicated that congressional authorization of such committees probably would be necessary or desirable. Responsibility for operation of the Federal projects involved is now vested in the Secretary of the Interior and, we believe, properly should remain so. Creation of new bodies with statutory powers which might tend to limit or diffuse this responsibility would, in our opinion, unnecessarily complicate and make more difficult the coordinated operation of a widespread river basin system. As pointed out in my memorandum of June 13, 1961, we would gladly assist in the formation of a group on an informal basis. In our view, that group could function most appropriately in an advisory capacity to the Secretary.

I recommend that—

1. You adopt the attached general principles and criteria subject to whatever reconsideration, if any, may appear desirable after having afforded the Hoover power allottees an opportunity to present their views on the additional regulation No. 1, in

accordance with article 27 of the General Regulations for Generation and Sale of Power in Accordance with the Boulder Canyon Project Adjustment Act; and

2. You authorize me in your behalf to transmit the additional regulation No. 1 to the Hoover power allottees with a request that their views, if any, be transmitted to me within 30 days; and

3. You authorize me in your behalf to transmit the attached general principles and criteria and the additional regulation No. 1 to the Governors of the basin States, to the Upper Colorado River Commission, to the Senators and Representatives of the basin States, to the Hoover power allottees and to other interested parties; and

4. That in transmitting the general principles and criteria to the Governors of the basin States, I solicit their views on the desirability of legislation to permit use of the Colorado River development fund either to make necessary replacement energy purchases pursuant to principle 5 or to reimburse the Upper Colorado fund on a current basis, with the understanding that, if there is general sentiment in favor of such action, the Department will sponsor or support the required legislation.

FLOYD E. DOMINY.

Attachments.
Recommended by:

KENNETH HOLUM,
Assistant Secretary of the Interior.

April 2, 1962.

STEWART L. UDALL,
Secretary of the Interior.

Approved: April 2, 1962.

U.S. DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., June 13, 1961.

To: Secretary of the Interior.
From: Commissioner of Reclamation.
Subject: General principles to govern, and operating criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead during the Lake Powell filling period.

On February 12, 1960, the Department issued proposed general principles and criteria to govern filling of Glen Canyon Reservoir, the principal storage reservoir of the Colorado River storage project. Accompanying the proposed principles was a memorandum of explanation to the Secretary of the Interior from the Commissioner of Reclamation dated January 18, 1960.

In accordance with my recommendations, a series of meetings were held with representatives of the Lower and the Upper Colorado River Basin interests to explain the proposed principles and to receive the reactions thereto. Oral comments and suggestions for modification of the proposed principles were received at meetings held:

In Las Vegas, Nev., March 1960.
In Los Angeles, Calif., May 1960.
In Boulder City, Nev., June 1960.

Written comments from the Upper Colorado River Commission were received by letter dated July 21, 1960, copies of which we under-

stand have been made available to the lower basin interests. In addition, there have been many discussions with interested individuals, correspondence from various Senators and Congressmen, and further meetings as follows:

January 9, 1961, in Salt Lake City, Utah, with the Upper Basin Engineering Committee.

April 20, 1961, in Los Angeles, Calif., with the Hoover power contractors and other lower basin interests.

May 8, 1961, in Denver, Colo., with the Upper Colorado River Commission and advisers.

Out of these meetings, letters, and discussions have come many suggestions for changes in the proposed general principles and criteria. Our own views have also changed on some aspects in light of information developed subsequent to their issuance.

The proposed general principles and criteria have been reviewed by the Bureau taking into account the various comments of the basin interests as well as our own views. The revised general principles and operating criteria transmitted herewith reflect the Bureau's recommendations.

We have proceeded on the basis of securing a practical approach to the problems of filling, as distinguished from what might be considered a legalistic approach involving an attempt on our part to establish principles and operating criteria on the basis of conclusions as to the perimeters of legal rights and obligations, with the consequent hazards which would attend such an approach. Consequently, our feeling is that irrespective of what might or might not be conceived by any party as the outer measure of its rights or obligations, and with no attempt to establish those limits as a basis for these principles and criteria, we propose action purely within a reasonable exercise of secretarial discretion.

In general, the draft of the proposed general principles and criteria was well received and many of the comments involve editorial perfection and clarification rather than change in substance. The most substantive of comments, and the most difficult to reconcile, go to principle 5 which deals with the proposal to make an allowance for a portion of the diminution in power generation at Hoover Dam. Because of the extent of comments on this principle, this memorandum will deal with that principle first.

One of the comments received was that it should be made clear that the general principles and criteria will apply to all of the authorized storage units of the Colorado River storage project and not to the Glen Canyon unit alone. Since the proposed general principles and criteria are framed around the operations of Glen Canyon Reservoir (Lake Powell), it was decided, in the interest of minimizing the extent of revision, to retain the present format. However, principle 5 of the general principles and criteria has been expanded to make it clear that in computing the allowance for deficiency in firm energy generation at Hoover powerplant the formula will take into account the effect on the stream by impoundment of water in all of the storage units (Glen Canyon, Flaming Gorge, Navajo, and Curecanti) but excluding the effects of evaporation from the surface of such reservoirs. Consistent with principle 2, the computation of and provision for allowance would not apply to Navajo and Flaming Gorge until the filling operation starts at Glen Canyon. Lake Powell will probably

start significant filling during the spring runoff of 1963. Flaming Gorge will probably start filling about the same time. Navajo will be about 1 year earlier. Curecanti is not scheduled to start storing water until the fall of 1965.

Suggestions were made that tabular forms illustrating the application of principle 5, along with explanatory sheets and an accompanying statement of criteria for operation of Lake Mead to determine Hoover basic firm power in computing allowance for deficiency, be made a part of the general principles and criteria by attachment. We fully recognize that it is only through having this information available that a precise understanding of the intended application of principle 5 is gained.

Notwithstanding this, however, we are not inclined to incorporate either the tabular forms or the accompanying explanatory material into the general principles and criteria. We believe such action would give undue significance to a matter which must remain open to the exercise of secretarial judgment, particularly as to the use of forms. There is included with this memorandum, however, the tabular forms and explanatory materials which we would intend to use, at least initially, for the purpose of computing the Hoover basic firm and the diminution in power generation under the formula of principle 5.

The forms included herewith are different from those supplied at the Boulder City meeting in June 1960.

One revision made in the material is in the method of handling the efficiency factor. A further review of the tentative forms supplied at the Boulder City meeting showed that in this respect they followed the present billing process rather than the intent of principle 5, which was to be a theoretical computation based on overall efficiency. Our position on use of the 83 percent efficiency factor is, we believe, well set forth in the January 18, 1960, memorandum and need not be repeated here. Suffice it to say that in the original Hoover firm energy computation made for the general regulations, 83 percent efficiency was applied in satisfaction of the formula—acre-feet times head times efficiency times 1.025 equals kilowatt-hours. It was our intent to again apply the 83 percent efficiency factor in this manner. The tentative forms, however, showed a netting out of service station use, leakage and pumpage which is appropriate for the billing process, but not for the theoretical computation. We do not, of course, intend to change the actual billing process. Another revision made is in the method of handling evaporation losses of the storage project reservoirs. For reasons explained hereinafter, such evaporation is not now included as a part of the theoretical streamflow of the Colorado River at Grand Canyon.

Representatives of the upper basin have expressed concern over the contemplated inclusion of evaporation from the storage project reservoirs as a part of theoretical streamflow used in the formula for computing allowance. We have given this matter considerable attention and have concluded that our past studies on handling of evaporation losses have not been consistent with our handling of stream depletions caused by the participating projects. All factors considered and in the interest of consistency, we have concluded that storage project reservoir evaporation should not be considered as part of the theoretical streamflow to be used in calculating diminution in Hoover generation.

Also suggested was the use of an efficiency factor of 78 percent in computing Hoover basic firm energy. From such a computation, there would then be subtracted the energy actually generated at Hoover adjusted to an efficiency factor of 83 percent. The resulting answer would be considered as the deficiency in firm energy. The difference between this proposal and the explanation of our present proposal contained in the January 8, 1960, memorandum is the use of 78-percent efficiency on one side of the formula and 83 percent on the other. Our present proposal uses 83 percent on both sides. There are, of course, several ways in which the combinations of contract firm, basic firm, and actual generation could be arranged. We have tested five combinations ranging from the above suggestion, which tends to minimize the deficiency, to use of the difference between actual generation and contract firm, which tends to maximize the deficiency. Again, in the interest of a practical solution, we do not believe it appropriate to adopt a formula which would result in either extreme. We intend to maintain the proposal as now explained in the January 18, 1960, memorandum; i.e., use of 83 percent on both sides of the formula.

Principle 5 of the draft of general principles and criteria left to the discretion of the Secretary the method of making the allowance for Hoover diminution. The choice was between delivering energy or making monetary payments to the affected Hoover power contractors. It was contemplated that under the choice of delivering energy two courses might be followed:

(1) Delivery of energy generated at Federal powerplants, and
(2) Purchase of energy generated at plants owned by others and delivered to the contractors.

Consequently under either choice there might be a requirement for money. This would be particularly so during the period Lake Powell is filling prior to installation of generators or the obtaining of dead storage in the lake. Although not so stated in the draft principles themselves, the memorandum of January 18, 1960, contemplated, as an operating cost, using moneys from the upper Colorado River Basin fund, established by the Act of April 11, 1956 (70 Stat. 105), to the extent necessary. It is to the use of this fund that the upper basin directs its main criticism.

As we understand it the concern of the upper basin is twofold; first, it feels that use of the upper basin fund for purchase of energy to replace Hoover diminution carries with it a responsibility on the upper basin for energy deficiency at Hoover, a responsibility it categorically disclaims; and secondly, it is concerned that use of the upper basin fund in the manner contemplated might adversely affect availability of power revenues to aid in repayment of the costs of participating projects.

In no way does the Bureau or the Secretary, by proposing to use the upper basin fund for the purchase of energy for Hoover replacement, intend to declare or infer any responsibility on the upper basin for deficiency in energy generation at Hoover. Contemplation of the use of that fund for this purpose is based solely upon, and exercise of, departmental responsibility in operating a project under its jurisdiction.

The second concern of the upper basin goes to a situation which conceivably could develop if water flows less than average are experi-

enced during the filling period. Assuming a cost of replacement energy of 5 mills per kilowatt-hour, a total of about $1,750,000 would be required to make the allowance under average flow conditions. This is a relatively insignificant amount. Nevertheless, because of the possibility of less than average flows, its concern is understandable and we are therefore making provision in principle 5 for reimbursement to the upper basin fund by the Hoover power allottees for whatever moneys are used from the fund for this purpose.

The word "reimbursed" as used in principle 5 applies only to the moneys expended from the fund. If nonfirm or other energy from the storage project powerplants is used to make the allowance, this is not to be considered a cost to be reimbursed. Notification of the intent to secure reimbursement would be accomplished through an additional regulation for generation and sale of power in accordance with the Boulder Canyon Project Adjustment Act. The additional regulation, as well as being issued formally, is also an attachment to, and a part of, the general principles and criteria.

Consideration was given to including interest in the reimbursement to the upper basin fund. Pursuing this objective would logically call for changes in the method of determining the deficiency for which the allowance is to be made. Taking all factors into account, and in the interst of a practical approach, it is concluded that the reimbursement should consist of a dollar-for-dollar return without interest.

Although the Congress has reserved to itself the right to say how the revenues in the separate fund will be expended within the Colorado River Basin, the responsibility for setting rates, which is the source of revenues in the fund, is in the Secretary. Consequently, the additional regulation is a notification that the rates to charged for electrical energy after 1987 will, among other things, include a component to assure revenues in the fund to accomplish reimbursement. This is as far as the Secretary can go at this time without additional legislation.

Suggestions have been made that the present Colorado River development fund be used either to make necessary replacement energy purchases or to reimburse the upper Basin fund of a current basis. Section 2(d) of the Boulder Canyon Project Adjustment Act provides for the sum of $500,000 annually from Hoover revenues to be available for investigation and construction of projects in the basin. The suggestion then is to use this money for energy replacement purposes rather than for project investigation or construction. To do so would require legislation.

Regardless of what source of funds, if any, may finally be utilized in accomplishing the allowance it is our intent to make minimum use of dollars but maximum use of energy from Federal projects for any required replacement. It is not intended to use firm energy from the storage project powerplants if such energy could otherwise be sold at firm power rates.

If the allowance is made by delivering energy it will be delivered in a monthly pattern designed to fit those months when water otherwise would have been released at Hoover. Stated another way, it is not our intent to force replacement energy on the contractors in those months when downstream releases are generating all, or close to all, of the energy which they might otherwise have expected to receive.

We have also considered a proposal that the Hoover power contracts and regulations might provide a means of securing revenues to pur-

chase replacement energy. Such a proposal would require legislation since it would, among other things, in practical effect involve application of revenues received from Hoover power sales for purposes not consistent with the Boulder Canyon Project Adjustment Act.

By the proposal to make an allowance we are in effect guaranteeing energy to the extent of the deficiency computed by the formula. We have been asked to consider also guaranteeing capacity. It is our understanding that the Hoover power contractors would consider capacity as having been guaranteed if we provided in the criteria that Lake Mead would not be drawn down below elevation 1,146 (17 million-acre-feet available surface storage) at least during the time Lake Powell is filling to dead storage level. It has also been suggested that holding Lake Mead to elevation 1,146, while gaining dead storage in Lake Powell, would provide more of a cushion for downstream water users in the event of a dry year following the year in which Lake Mead may already have been drawn down to 17 million acre-feet. After considering these suggestions, we are, first of the opinion that based upon knowledge of historical operation no undue risk is run when elevation 1,123 (14.5 million acre-feet) is made the minimum draw-down point; second, the important objective of gaining minimum power head at Glen Canyon (elevation 3,490) in the earliest practicable time would be defeated; and third, we have already provided for not drawing Lake Mead below the rated head of the Hoover powerplant. To maintain Lake Mead above elevation 1,123 under all conditions would in effect be guaranteeing overload capacity. Because of these factors no change has been made in principle 7.

Other changes in the present draft are summarized as follows:

To conform with a recent decision, the official name "Lake Powell" has been used in lieu of "Glen Canyon Reservoir."

In principle 1, an insert has been made to indicate that the general principles and criteria might be affected by possible future acts of the Congress.

Principles 2 and 10 have been combined as suggested at the conferences. Old principle 10 has been eliminated, and principle 2 has been expanded. Also, as suggested, provision has been made for the Secretary to consult with both the upper and the lower basin interests before termination of the general principles and criteria for reasons other than attainment of the two specific conditions set forth in principle 2. The Commissioner's memorandum to the Secretary dated January 18, 1960, as well as our oral statements at the three meetings, explained old principle 10 in the light of possible earlier termination of the general principles and criteria due to obtaining sufficient storage to permit cyclical operation. We must also point out that the principle would likewise permit termination under conditions of unsatisfactory filling.

Principle 8 has been shortened by deleting the indented portion. This is in accordance with the suggestions received at the conference. The principle enunciated has not been changed.

Principle 9 has been revised to recognize the possibility that there might be some generation of secondary energy at the Hoover powerplant during the filling period. With the criteria on water releases described in principle 3, it is not likely that there will be any secondary energy generated during the filling period. Nevertheless, should there be incidental secondary energy, it will be disposed of in the same manner as has been the case in the past.

Former principle 11 has now been designated principle 10.

The point made that the upper basin should be represented on a group which will consider the theoretical annual operation of Lake Mead meets with our approval. As the present integration committee is a contractually established body, the upper basin representatives cannot become an official part thereof. We see no reason, however, why an informal group consisting of the present integration committee plus upper basin representatives cannot be formed for the purpose of considering the question of what the theoretical annual operation of Lake Mead would be. We will be glad to assist in forming such a group if it is desired.

In connection with the method of financing the Hoover deficiency as covered in principle 5 as well as all other points contained in the general principles and criteria, we have proceeded within the confines of existing authorities and without regard to the possibilities which are open when we contemplate new legislation. We have already pointed out two proposals for such financing, each of which would require legislation for its implementation. Many others would be available under possible legislation. For example, legislation might provide that in the apportioning of the Upper Colorado River Basin fund in accordance with section 5(e) of the Colorado River Storage Project Act such fund shall be deemed to include any amounts which might have been expended on account of Hoover deficiencies. It is not intended by the provisions included in principle 5 to preclude consideration of the merit of any legislative proposals for dealing with this issue or any other issue raised by the criteria.

I recommend that—

1. You adopt the attached general principles and criteria subject to whatever reconsideration, if any, may appear desirable after having afforded the Hoover power allottees an opportunity to present their views on the additional regulation No. 1, in accordance with article 27 of the general regulations for generation and sale of power in accordance with the Boulder Canyon Project Adjustment Act; and

2. You authorize me in your behalf to transmit the additional regulation No. 1 to the Hoover power allottees with request that their views, if any, be transmitted to me within 30 days; and

3. You authorize me in your behalf to transmit the attached general principles and criteria and the additional regulation No. 1 to the Governors of the basin States, to the Upper Colorado River Commission, to the Senators and Representatives of the basin States, to the Hoover power allottees and to other interested parties.

FLOYD E. DOMINY.

GENERAL PRINCIPLES TO GOVERN, AND OPERATING CRITERIA FOR, GLEN CANYON RESERVOIR (LAKE POWELL) AND LAKE MEAD DURING THE LAKE POWELL FILLING PERIOD

1. The following principles and criteria are based on the exercise, consistent with the law of the river, of reasonable discretion by the Secretary of the Interior in the operation of the Federal projects involved. The case generally styled *"Arizona* v. *California et al., No. 9 Original"* is in litigation before the Supreme Court of the United

States. Anything which is provided for herein is subject to change consistent with whatever rulings are made by the Supreme Court which might affect the principles and criteria herein set out. They may also be subject to change due to future acts of the Congress.

2. The principles and criteria set forth hereinafter are applicable during the Lake Powell filling period, which is defined as that time interval between the date Lake Powell is first capable of storing water (estimated to occur in the fall of 1962 or the spring of 1963) and the date Lake Powell storage first attains elevation 3,700 (content 28 million acre-feet total surface storage), or May 31, 1987, whichever occurs first. If, in the judgment of the Secretary, the contents of Lake Powell and Lake Mead warrant such action, and after consultation with appropriate interests of the Upper Colorado River Basin and the Lower Colorado River Basin, the Secretary may declare these principles and criteria no longer applicable.

3. Sufficient water will be passed through or released from either Lake Mead or Lake Powell, as circumstances require under the provisions of principles 7 and 8 hereof, to satisfy downstream uses of water (other than for power) below Hoover Dam which uses include the following:

(*a*) Net river losses.

(*b*) Net reservoir losses.

(*c*) Regulatory wastes.

(*d*) The Mexican treaty obligation limited to a scheduled 1.5 million acre-feet per year.

(*e*) The diversion requirements of mainstream projects in the United States.

4. All uses of water from the main stem of the Colorado River between Glen Canyon Dam and Lake Mead will be met by releases from or water passed through Lake Powell or by tributary inflow occurring below Glen Canyon Dam. Diversions of water directly out of Lake Mead will be met in a similar manner or, if application of the criteria of principles 7 and 8 hereof should so require, by water stored in Lake Mead.

5. The United States will make a fair allowance for any deficiency, computed by the method herein set forth, in firm energy generation at Hoover powerplant. For each operating year deficiency in firm energy shall be computed as the difference between firm energy which, assuming an overall efficiency of 83 percent, would have been generated and delivered at transmission voltage at Hoover powerplant in that year if water had not been impounded in the reservoirs of the Colorado River storage project storage units (Glen Canyon, Flaming Gorge, Navajo, and Curecanti), but excluding the effects of evaporation from the surface of such reservoirs, and the energy actually generated and delivered at transmission voltage at Hoover powerplant during that year adjusted to reflect an overall efficiency of 83 percent. At the discretion of the Secretary, allowance will be accomplished by the United States delivering energy, either at Hoover powerplant or at points acceptable to both the Secretary and the affected Hoover power contractors, or monetarily in an amount equal to the incremental cost of generating substitute energy. To the extent the Upper Colorado River Basin fund is utilized the moneys expended therefrom in accomplishing the allowance, either through the delivery of purchased energy or by direct monetary pay-

ments, shall be reimbursed to said fund from the separate fund identified in section 5 of the act of December 21, 1928 (45 Stat. 1057), to the extent such reimbursement is consistent with the expenditures Congress may authorize from said separate fund pursuant to said act. The attached additional regulation No. 1 for generation and sale of power in accordance with the Boulder Canyon Project Adjustment Act is hereby made a part of these principles and criteria.

6. In accomplishing the foregoing, Lake Powell will be operated in general accordance with the provisions of principles 7 and 8.

7. Storage capacity in Lake Powell to elevation 3,490 (6.5 million acre-feet surface storage) shall be obtained at the earliest practicable time in accordance with the following procedure:

Until elevation 3,490 is first reached, any water stored in Lake Powell shall be available to maintain rated head on Hoover powerplant. When stored water in Lake Powell has reached elevation 3,490, it will not be subject to release or diminution below elevation 3,490. The obtaining of this storage level in Lake Powell will be in such manner as not to cause Lake Mead to be drawn down below elevation 1,123 (14.5 million acre-feet available surface storage), which corresponds to rated head on the Hoover powerplant. In the process of gaining storage to elevation 3,490, the release from Glen Canyon Dam shall not be less than 1 million acre-feet per year and 1,000 cubic feet per second, as long as inflow and storage will permit.

8. The operation of Lake Powell above elevation 3,490 and Lake Mead will be coordinated and integrated so as to produce the greatest practical amount of power and energy. In view of the provision for allowance set forth in principle 5 hereof, the quantity of water released through each powerplant will be determined by the Secretary in a manner appropriate to meet the filling criteria.

9. In general, it is not anticipated that secondary energy will be generated at Hoover during the filling period. However, any secondary energy, as defined in the Hoover contracts, which may be generated and delivered at transmission voltage at Hoover powerplant will be disposed of under the terms of such contracts.

10. In the annual application of the flood control regulations to the operation of Lake Mead, recognition shall be given to available capacity in upstream reservoirs.

ADDITIONAL REGULATION NO. 1 TO THE GENERAL REGULATIONS FOR GENERATION AND SALE OF POWER IN ACCORDANCE WITH THE BOULDER CANYON PROJECT ADJUSTMENT ACT

In accordance with the terms and conditions of the act of July 19, 1940 (54 Stat. 774), and article 27 of the general regulations promulgated May 20, 1941, the following additional regulation No. 1 is hereby promulgated:

Commencing with June 1, 1987, charges for electrical energy in addition to such other components as may then be authorized or required under the then existing laws and regulations, and to the extent not inconsistent therewith, shall include a component to return to the United States funds adequate to reimburse the Upper

Colorado River Basin fund for moneys expended from such fund on account of allowances for Hoover diminution during the filling period of the storage project reservoirs authorized by the act of April 11, 1956 (70 Stat. 105), in accordance with paragraph 5 of the general principles to govern, and operating criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead during the Lake Powell filling period, approved_____. Such component shall be sufficient, but not more than sufficient, to provide said reimbursement in equal annual installments over a period of years equal to the number of years over which costs on account of the allowance were incurred by the said Upper Colorado River Basin fund.

Explanation of Proposed Procedures for Computing Deficiencies in Firm Power Generation at Hoover Dam During Filling of Colorado River Storage Project Reservoirs

In order to implement principle 5 of the "General Principles To Govern, and Operating Criteria For, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," it became necessary to develop criteria for operating Lake Mead on a theoretical basis as if the Colorado River storage project reservoirs were not impounding water. Principle 5 of the general principles is quoted as follows:

> The United States will make a fair allowance for any deficiency, computed by the method herein set forth, in firm energy generation at Hoover powerplant. For each operating year deficiency in firm energy shall be computed as the difference between firm energy which, assuming an overall efficiency of 83 percent, would have been generated and delivered at transmission voltage at Hoover powerplant in that year if water had not been impounded in the reservoirs of the Colorado River storage project storage units (Glen Canyon, Flaming Gorge, Navajo, and Curecanti), but excluding the effects of evaporation from the surface of such reservoirs, and the energy actually generated and delivered at transmission voltage at Hoover powerplant during that year adjusted to reflect an overall efficeincy of 83 percent. At the discretion of the Secretary, allowance will be accomplished by the U.S. delivering energy, either at Hoover powerplant or at points acceptable to both the Secretary and the affected Hoover power contractors, or monetarily in an amount equal to the incremental cost of generating substitute energy. To the extent the Upper Colorado River Basin fund is utilized, the moneys expended therefrom in accomplishing the allowance, either through the delivery of purchased energy or by direct monetary payments, shall be reimbursed to said fund from the separate fund identified in section 5 of the act of December 21, 1928 (45 Stat. 1057), to the extent such reimbursement is consistent with the expenditures Congress may authorize from said separate fund pursuant to said act. The attached additional "Regulation for Generation and Sale of Power" in accordance with the Boulder Canyon Project Adjustment Act is hereby made a part of these principles and criteria.

In order to develop the criteria for operation of Lake Mead and Hoover Dam, the theoretical study has been divided into two parts: (1) Lake Mead inflow and (2) reservoir operation. These are discussed separately as follows:

LAKE MEAD INFLOW

1. Storage change (including initial accumulation of bank storage) in upstream reservoirs at Lake Powell, Flaming George, Navajo, and the Curecanti system.

2. Recorded flow of the Colorado River at Grand Canyon.

3. The computed theoretical inflow to Lake Mead will be the sum of 1+2. Arrangements would be made to obtain end-of-month contents for the month for each of the upstream filling reservoirs immediately after the end of the month. Records of discharge of the Colorado River at Grand Canyon are available under the present operating methods, so no change would be required to obtain that record.

LAKE MEAD OPERATION

1. The theoretical inflow to Lake Mead would be as computed above.

2. Forecasts of Lake Mead inflow would be made exactly as they are made under present operating criteria, and the release from Hoover Dam to meet predetermined requirements based on (*a*) flood control under regulations being used prior to Glen Canyon; (*b*) irrigation orders and predetermined levels of Lake Mohave; (*c*) energy production schedule as computed from June 1 forecast each year with the firm schedule of generation used if the resulting end-of-December content will stay above 17 million acre-feet. In years of less than firm, as indicated by the theoretical study, that percentage of firm will be generated that will permit the end-of-December content to be 17 million acre-feet or downstream water requirements will be released from Hoover Dam, whichever is the greater. Releases to meet downstream requirements will be made each year regardless of resulting reservoir elevations. The committee on integration and interests of the upper basin will be consulted at the beginning of each operating year, and the proposed theoretical study will be discussed. Actual programs of operation of Hoover Dam will be determined at the regularly scheduled integration committee meetings.

It will be necessary to make some assumptions with respect to distribution of firm energy during a theoretical operation year as actual firm will not usually be attained under the actual operating condition. This distribution of firm energy for the theoretical study will be determined as that which would be produced by the release of water to meet the current estimate of downstream requirements during each of the months of June through September and March through May, and the balance distributed to the months of October through February in a pattern similar to that adopted by the regular integration committee, or a river operation committee if established, for the actual operation of Hoover powerplant during that year of operation.

These computations on a monthly basis will be carried on concurrently with the actual recorded operation of Lake Mead and Hoover Dam to compute the deficiency in Hoover firm energy. Attached is a set of computation forms to be used in the determination of the deficiency in firm energy deliveries at Hoover powerplant. The forms will be kept current each month by the Bureau of Reclamation, and copies will be furnished to all interested parties as soon as possible after the end of each month.

[Sheet 1 of 3, June 1, 1961]

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION

Computation of deficiency in Hoover firm energy during the filling of Colorado River storage project reservoirs

Computation sheet for actual Hoover powerplant operation adjusted to 83-percent efficiency

Computed by_____ Date_____
Checked by_____ Date_____

Month	Actual reservoir operations								Adjusted powerplant operations				
	Actual flow of Colorado River at Grand Canyon, 1,000 acre-feet	Actual total net Lake Mead loss, 1,000 acre-feet	Total, Hoover release		Downstream water requirements, 1,000 acre-feet	Lake Mead			Lake Mohave mean monthly elevation, feet	Hoover		Millions of kilowatt-hours	
			1,000 acre-feet	1,000 cubic-feet per second		End of month content, 1,000 acre-feet	End of month elevation, feet	Mean elevation, feet		Average tailwater elevation, feet	Average static head, feet	Total energy at 83-percent efficiency	Firm energy at 83-percent efficiency
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
June													
July													
August													
September													
October													
November													
December													
January													
February													
March													
April													
May													

EXPLANATION OF SHEET 1 OF 3

Column (2): Actual flow of Colorado River at Grand Canyon. Flow measured and data furnished by Geological Survey.

Column (3): Actual total net Lake Mead loss. This is a water budget computation using the measured flow at Grand Canyon as inflow to Lake Mead, the actual release from Hoover Dam and the actual measured storage change in Lake Mead. It includes unmeasured inflow to the river and lake below the Grand Canyon gaging station, evaporation loss from the lake, changes in bank storage, and diversions from the lake to Nevada.

Columns (4) and (5): Total Hoover release. Water flowing in river below Hoover Dam is recorded in this column.

Column (6): Downstream water requirements. This is the minimum monthly downstream water requirement defined in section 3 of operating principles. This requirement will be estimated by months at the beginning of each year, and adjusted to actual at the end of each month.

Column (7): Lake Mead end-of-month content. Surface storage at end of month (changes in bank storage are reflected in column (3)).

Column (8): Lake Mead end-of-month elevation. Elevation corresponding with end-of-month content shown in column (7).

Column (9): Lake Mead, mean elevation. Computed as average of elevations at end of previous month and end of current month.

Column (10): Lake Mohave, mean monthly elevation. Computed as average of elevations at end of previous month and end of current month. This is used in computation of tailwater elevations for Hoover powerplant.

Column (11): Hoover powerplant—average tailwater elevation. Values to be taken from Hoover powerplant tailwater curves, drawing 45–300–59, and will be based upon Hoover release (col. 5) and Lake Mohave mean monthly elevation (col. 10).

Column (12): Hoover powerplant average static head. Computed as column (9) minus column (11).

Column (13): Total energy at 83 percent efficiency. Values are computed by equation: Kw.-hr. = 1.025 × efficiency (83 percent) × static head (col. 12) × release in acre-feet (col. 4).

Column (14): Firm energy. Same as column (13), but not to exceed scheduled firm energy (col. 14, sheet 3). Show annual total only in the event there is no deficiency indicated on basis of total annual generation.

[Sheet 2 of 3, June 1, 1961]

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION

Computation of deficiency in Hoover firm energy during the filling of Colorado River storage project reservoirs

Computation sheet for theoretical inflow and loss for Lake Mead

Computed by _____
Date _____
Checked by _____

Month	Units, 1,000 acre-feet												
	Actual reservoir storage content				Reservoir storage change				Actual flow of Colorado River at Grand Canyon (from col. 2, sheet 1)	Theoretical flow of Colorado River at Grand Canyon (sum of cols. 6 through 10)	Computation of theoretical total net loss from Lake Mead		
	Lake Powell	Flaming Gorge	Curecanti units	Navaho	Lake Powell	Flaming Gorge	Curecanti units	Navaho			Actual total net loss (col. 3, sheet 1)	Adjustment of evaporation loss	Theoretical total net loss
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
June													
July													
August													
September													
October													
November													
December													
January													
February													
March													
April													
May													

EXPLANATION OF SHEET 2 OF 3

Columns (2), (3), (4), and (5): Actual reservoir storage content, Lake Powell, Flaming Gorge, Curecanti units, and Navaho. Values for each of these columns are the actual end of month reservoir surface storage content plus an estimate of initial accumulation of bank storage.

Columns (6), (7), (8), and (9): Reservoir storage change—Lake Powell, Flaming Gorge, Curecanti units and Navaho. Values in these columns are derived from figures in columns (2), (3), (4), and (5).

Column (10): Actual flow of Colorado River at Grand Canyon. Flow of Colorado River measured by, and data reported by Geological Survey.

Column (11): Theoretical flow of Colorado River at Grand Canyon. This is computed as the sum of columns (6) through (10). It is the actual flow of the Colorado River at Grand Canyon increased by reservoir storage changes (algebraic) in the Colorado River storage project reservoirs.

Column (12): Computation of theoretical total net loss from Lake Mead, actual total net loss. This is a water budget computation using the measured flow at Grand Canyon as inflow to Lake Mead, the actual release from Hoover Dam and the actual measured storage change in Lake Mead. It includes unmeasured inflow to the river and lake below the Grand Canyon gaging station, evaporation loss from the lake, changes in bank storage, and diversions from the lake to Nevada.

Column (13): Computation of theoretical total net loss from Lake Mead—adjustment of evaporation loss. This is an adjustment to be applied to the actual total net loss (col. 12) and is the difference (theoretical minus actual) between the theoretical evaporation for the theoretical surface area of the lake which corresponds to the elevation shown in column (9) of sheet 3 and the evaporation computed by the Geological Survey for the actual surface area of the lake. The evaporation rate applied to the theoretical surface area of the lake is the same rate applied by the Geological Survey to the actual surface area.

Column (14): Computation of theoretical total net loss from Lake Mead—theoretical total net loss. Column (12) plus (algebraic) column (13).

[Sheet 3 of 3, June 1, 1961]

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION

Computation of deficiency in Hoover firm energy during the filling of Colorado River storage project reservoirs

Computation sheet for theoretical Hoover powerplant operation assuming no Colorado River storage project and computation of Hoover firm deficiency

Computed by ---------- Date ----------
Checked by ---------- Date ----------

Month	Theoretical flow of Colorado River at Grand Canyon, 1,000 acre-feet (from col. 11, sheet 2)	Theoretical total net loss from Lake Mead, 1,000 acre-feet (from col. 14, sheet 2)	Theoretical reservoir operations						Theoretical powerplant operations					Computed Hoover firm deficiency (col. 14, sheet 3, minus col. 14, sheet 1)
			Total Hoover release		Downstream water requirements, 1,000 acre-feet	Lake Mead			Lake Mohave mean monthly elevation, feet	Hoover		Millions of kilowatt-hours		
			1,000 acre-feet	1,000 cubic feet per second		End of month content, 1,000 acre-feet	End of month elevation, feet	Mean elevation, feet		Average tailwater elevation, feet	Average static head, feet	Total energy at 83 percent efficiency	Firm energy at 83 percent efficiency	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
June														
July														
August														
September														
October														
November														
December														
January														
February														
March														
April														
May														

EXPLANATION OF SHEET 3 OF 3

Column (2): Theoretical flow of Colorado River at Grand Canyon. As computed in column (11) on sheet 2.

Column (3): Theoretical total net loss from Lake Mead. As computed in column (14) on sheet 2.

Columns (4) and (5): Total Hoover release. This is the theoretical release required to produce the predetermined firm energy schedule as shown in column (14) and the theoretical releases for flood control, if required.

Column (6): Downstream water requirements. This is the minimum monthly downstream water requirement. (See explanation sheet 1 of 3, col. 6.)

Columns (7), (8), and (9): These columns show the theoretical end-of-month content, corresponding elevation, and mean elevation for Lake Mead resulting from the computation of theoretical inflow and release shown in columns (2) through (5).

Column (10): Lake Mohave—Mean monthly elevation. Computed as average of elevations at end of previous month and end of current month, and is the same figure as shown in column (10), sheet 1 of 3. This same level can be used because Lake Mohave scheduled levels are predetermined and are followed as closely as possible by adjustment of Hoover releases in the case of actual operations, and by adjustment of Davis releases in the case of theoretical operation which is on the basis of a Hoover power operation schedule. It is used in the computation of tailwater elevations for Hoover powerplant.

Column (11): Hoover powerplant, average tailwater elevation. Values are taken from Hoover powerplant tailwater curves, drawing 45-300-59, and are based upon Hoover release, column (5) and Lake Mohave mean monthly elevation, column (10).

Column (12): Hoover powerplant, average static head. Column (9) minus column (11).

Column (13): Total energy at 83 percent of efficiency. Values are computed by the equation: Kilowatt hours=1.025×efficiency (83 percent) × static head (col. 12) × release in acre-feet (col. 4).

Column (14): Firm energy. Theoretical predetermined schedule of firm energy is entered in this column. (Included as part of total in col. 13). Show annual total only in the event there is no deficiency indicated on basis of total annual generation.

Column (15): Computed Hoover firm deficiency. This is computed as the Difference between the theoretical Hoover firm energy and the actual Hoover production adjusted to 83 percent efficiency—firm energy (col. 14, sheet 3) minus firm energy at 83 percent efficiency (col. 14, sheet 1).

U.S. DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., January 18, 1960.

To: Secretary of the Interior.
From: Commissioner, Bureau of Reclamation.
Subject: Principles to govern, and operating criteria for, filling Glen Canyon, Flaming Gorge, Navajo, and Curecanti Reservoirs.

HISTORICAL

During the stages of formulating the planning report for the Colorado River storage project and participating projects (H. Doc. 364, 83d Cong., 2d sess.), it was recognized that special consideration would need to be given to ways and means of accumulating storage in the reservoirs which were contemplated for authorization and construction. That these were matters for special consideration was pointed out to the committees of the Congress during the extensive hearings leading to authorization of the project. References to the filling period may be found on pages 73, 160, 163, and 164 of House Document 364, 83d Congress, 2d session.

The Congress, by Public Law 485, 84th Congress, 2d session, authorized the Colorado River storage project and participating projects. In so doing, it excluded the Echo Park unit (consisting of Echo Park Dam and Split Mountain Dam) and included the Flaming Gorge, Navajo, and Curecanti units in the initial stage. As a result of this change and because it was felt that administrative people and the Congress were entitled to a reappraisal of the project, the Bureau undertook an economic and financial analysis of the storage project as it had been authorized. This analysis was presented to the Congress and was published as Senate Document 101, 85th Congress, 2d session. In order to make such an analysis, it was necessary that there be assumed certain procedures under which storage would be accumulated in the reservoirs. For this purpose there was prepared what has subsequently become known as the "Hydrologic Bases."

At about this time, there had been indicated widespread interest in the problem of initial filling of the Glen Canyon reservoir. As a result, a meeting was held in Washington, D.C., on October 24, 1957. The Governors or their representatives and other interested persons from the seven states of the basin attended that meeting. At that meeting the statement on "Hydrologic Bases" was presented to the assembled group. That statement was subsequently revised in certain aspects and, as revised, became a part of Senate Document 77, 85th Congress, 2d session. Also at that meeting representatives of Arizona, California, and Nevada offered for consideration the so-called Tri-State Criteria. These criteria, with a slight modification, were published as Senate Document 96, 85th Congress, 2d session.

A second meeting was held on December 4, and 5, 1957, in Las Vegas, Nev. This meeting was also attended by the Governors or, in some cases, their representatives and others from the seven States. At that meeting the Interior Department offered to meet with any of the States singly or jointly upon their request. Subsequent to that meeting there was established a group of engineers representing the States of Arizona, California, Nevada, and the Bureau of Reclamation. This group was to provide additional information of an engineering nature aimed specifically at the filling problem. This engineering group met on the following dates in 1958: February 3 and 4, April 17 and 18; June 25 and 26, September 23 and 24, and December 8 and 9. The group met on March 4 and 5 in 1959, and also met with the upper basin engineers on March 30 and 31 and August 4, 5, and 6, 1959.

During this period the group prepared more than 200 preliminary studies, some by manual process and others by electronic digital computers. These studies were exploratory and, among other things, provided a general framework for the studies subsequently made. An additional 65 operational studies have also been made covering three assumptions of runoff sequence for a 36-year period and 8 general sets of filling criteria. A summary, in report form, of the work of this group was transmitted to you by letter of August 20, 1959, signed by A. J. Shaver for the lower basin engineering group.

By letter of August 27, 1958, the engineering committee of the Upper Colorado River Commission requested that the Department appoint a group of engineers to meet with the committee also for consideration of possible filling criteria. The same Bureau of Reclamation engineers met with the commission's committee. One

meeting on November 6, 1958, was held. The commission's engineering committee subsequently thereto and independently made a large number of operating studies. The summary of its work, in report form, was transmitted to Assistant Secretary Aandahl by letter of September 22, 1959, signed by Ival V. Goslin, chairman, Engineering Committee, Upper Colorado River Commission.

In addition to the foregoing reports, the State of Colorado transmitted a report entitled "Future Operation of Glen Canyon Reservoir, as Related to the Colorado River Compact," which reported upon a study for the Colorado Water Conservation Board by the Colorado Water Investigation Commission. That report is dated July 1959.

WORK OF THE ENGINEERING GROUPS

The studies by both the upper and lower basin engineering groups were prepared on a strictly objective basis, with the purpose of preparing reservoir operation studies in sufficient numbers to permit appraisal of the effect of a wide variety of possible filling conditions. It was not anticipated, at least by the Bureau engineers, that it would be possible to hit on a proposed filling criteria which could be adopted "as is."

For the purposes of this memorandum, it is not believed necessary to brief the results of those many studies. The studies have, nevertheless, been extremely helpful in arriving at the proposed filling criteria which are discussed hereafter. One general observation is that all of the studies show that even a slight change in filling assumptions can create large differences in answers. This dictates that the studies can only be indicative and no one set of detailed regulations can be written in advance to cover all conditions. There must be latitude, therefore, for the Secretary to operate to a great extent on a year-by-year basis.

During the course of the studies and as a result of discussions within the Bureau group and with the upper and lower basin groups certain conclusions became apparent to the Bureau. Neither the upper nor lower basin groups can be expected to agree in all respects with these conclusions. Stated generally, these are as follows:

(1) Nothing should be done at Glen Canyon which would have an adverse effect on the users of water for consumptive purposes below Hoover Dam or use of water from the main stem between Lake Mead and Glen Canyon. The magnitude of these uses will vary from year to year and cannot be accurately forecast on an annual basis.

(2) Secondary energy should not be generated at Hoover Dam except in those times when all reservoirs are full and a spill would otherwise occur.

(3) The obtaining of the minimum power head at Glen Canyon Reservoir, elevation 3,490 (approximately 6½ million acre-feet) at the earliest practicable time should be an objective of any filling criteria.

BUREAU PROPOSAL

Basic to a solution of the filling problem is an answer to what to do about any deficiency that might occur in the firm energy generation at Hoover powerplant incident to filling the storage project reservoirs.

The Bureau of Reclamation, after consideration of all aspects of the

filling problem, has prepared a proposed set of governing principles and operating criteria. This proposal is attached. The proposal is based upon the proposition that an allowance should be made for computed deficiency in firm energy generation at Hoover, which might be caused by Glen Canyon being on the river.

In reading the proposal it is to be noted that it applies specifically to Glen Canyon. It is not necessary that the filling criteria be made applicable to Flaming Gorge and Vavajo, also under construction, or to the Curecanti unit to be constructed in the near future. Since the capturing of water in the reservoirs above Glen Canyon is expected to occur concurrently with the filling of Glen Canyon, this would have the effect of increasing slightly the deficiency in Hoover firm power generation. Under the proposal we would be committed to make an allowance, and the capturing of the additional water is a part of the computed deficiency.

DISCUSSION OF PROPOSAL

Paragraph 1 is a recognition that the Supreme Court in the lawsuit *Arizona* v. *California* could well make findings of fact and conclusions of law which could require different principles and criteria from those proposed. In the final analysis, however, the proposed principles have to be based upon reasonable exercise of secretarial discretion. By this process we are not placed in a position of attempting to define the outer limits of either rights or obligations of any of the States or of the United States.

Paragraph 2 defines the filling period. It being intended that these principles would apply only during a filling period, it is necessary to define that period. Because of the possibility of an adverse hydrologic sequence occurring during the gaining of initial storage, it is conceivable that the filling period could extend to a point where upper basin developments might be such as to dictate a different method of reservoir operation. Consequently, it is felt that it would be premature to attempt to state here what might be termed "long-range operating criteria." The filling period, in general, is considered to be the time it takes to fill Glen Canyon (elevation 3,700). It is essential, however, that there be also a cutoff date. The date of May 31, 1987, has been selected because that is the date on which the Hoover power contracts expire.

Paragraph 3 is the statement of principle that during the filling period uses of water, other than power, below Hoover Dam will be satisfied. This is a broad statement of principle and one which is essential. These uses below Hoover, measured as a release at Hoover, can be met in one of, or a combination of, three ways: by passing through the inflow, by storage release at Glen Canyon, or by storage release at Hoover. Exactly how they would be met in any one year will have to be decided in that year and will depend upon the contents of both reservoirs and the Glen Canyon inflow. Consequently, the sources from which these uses will actually be met must be left open. The releases at Hoover Dam to meet these uses have varied in the past and can be expected to vary in the future. The trend of release during the filling period will likely be upward—as more land is brought under irrigation or a greater use is made for domestic and industrial purposes. At the same time uses in the upper basin also will be

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increasing. There is, of course, a relationship between the extent of upper basin uses and the availability of water to the lower basin. The studies performed by the engineering groups assumed releases at Hoover of 7.5 million acre-feet by the upper basin group, as well as assumptions by both groups of 8.5 million acre-feet in 1962, increasing to 9.3 million acre-feet in 1970 and remaining constant thereafter. What releases for these purposes may be in the future are matters of judgment. All aspects considered, it seems to us that they may be expected to range from 8.2 to 8.5 million acre-feet per year during the filling period.

To be noted is the proposal to hold the scheduled delivery under the Mexican Treaty to 1.5 million acre-feet per year. This is the Mexican Treaty obligation. It serves to put the Mexican users on notice that during this period there likely will not be any water whereby the scheduled delivery could reach 1.7 million acre-feet per year which is permissible under the treaty on an "if available" basis.

Paragraph 4 is similar in content to paragraph 3 in that it repeats the principle that uses of water for consumptive purposes will be met but the paragraph applies to the reach of the river between Glen Canyon Dam and Lake Mead and to the use of water directly out of Lake Mead. It is necessary to separate the uses between Glen Canyon and the upper end of Lake Mead from those which are or might be made directly out of Lake Mead, because the former can be served only by two sources, namely, Glen Canyon releases or tributary inflow, while the latter can be served by both of these sources or from water stored in Lake Mead. The uses of water between Lake Mead and Glen Canyon contemplated are the historical uses including pumping from Lake Mead plus an increased annual use of possibly 100,000 acre-feet for consumptive purposes during the filling period, plus evaporation losses from Lake Mead.

Paragraph 5 is the statement of principle that there will be an allowance for computed deficiency in Hoover firm energy which is created by virtue of the operations of Glen Canyon. This paragraph also defines deficiency for purposes of computing the amount of allowance. Determination of deficiency depends upon two calculations. The first calculation would be one to determine the so-called Hoover basic firm which is that firm energy that would have been produced in that year at Hoover without Glen Canyon on the river. The Hoover basic firm would be determined by starting with the actual content of Lake Mead in the year 1962 and running a simulated operation study of Hoover as if Glen Canyon were not on the river and using an overall efficiency factor for power operation of 83 percent. The second calculation would be to adjust the energy actually generated at Hoover (which even without Glen Canyon on the river, actual operating practice shows would probably be produced at an efficiency varying from 70 to 78 percent) to an efficiency factor of 83 percent. The difference between these two answers would, for purposes of the allowance, be considered as the deficiency in firm energy.

At the present time the operations of the powerplant at Hoover are such as to create relatively low efficiency. This is so because the power allottees are to an extent utilizing the Hoover generators for peaking purposes. We do not believe it appropriate to compensate the allottees for that portion of the use of the Hoover plants which represents a type of operation dictated by their own convenience.

The use of the 83-percent efficiency factor would help prevent this type of payment. The 83-percent efficiency factor is selected because that is the efficiency used in the computations to determine the amount of Hoover firm energy as defined in the "General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act."

The way is left open for the Secretary to determine how the allowance would be accomplished. For example, the Secretary might decide, if it can be worked out, to make a monetary payment therefor. If the incremental cost, which is to say the fuel replacement cost of generating substitute energy, is less than the selling rate for power from the upper basin project, then the upper basin project is better off financially to compensate monetarily than it would be to compensate with kilowatt-hours. On the other hand, it might be simpler and better to compensate with kilowatt-hours. This could be accomplished through the interconnection of the two power systems. It may even be possible that the Hoover power allottees would be willing to have a system of debits and credits on energy. In other words, in those years in which there is a deficiency, the power allottees might be willing to have that deficiency replaced in a subsequent year. Particularly to be noted is the fact that Glen Canyon Reservoir will be available to store water through two flood seasons prior to the availability of the generators at Glen Canyon. If any deficiency is created during this period, it can be compensated only by dollars or by debits and credits, unless some other source of energy is available to the United States. Final decisions on the means of making the allowance is not possible at this time and will need to be based upon negotiations and on results of studies now underway in regard to possible electrical intertie.

In the event of an allowance for computed deficiency, the Hoover power contractors will continue to pay under the Hoover Dam power contracts in the same manner as if the amount of energy involved in the deficiency had been generated at Hoover.

Paragraph 6 is simply a tie between the general principles and the operating criteria.

Paragraph 7 sets forth the method whereby minimum power head (elevation 3,490) would be gained in Glen Canyon. The proposal here is to acquire this storage at the earliest practicable time. However, Lake Mead would not be drawn below the rated head of the Hoover powerplant while acquiring this storage in Glen Canyon. This is a significant point. If the rated head is maintained at Hoover, then only the energy generation at Hoover is affected and not the design capacity.

Paragraph 8 sets forth the principle that the powerplants will be coordinated and integrated and states the general method whereby this will be accomplished. At this time it is not entirely clear whether the coordination and integration need be electrical in addition to hydrologic. Decisions on possible electrical intertie will need to be made later, following additional study. Only very general plans can be set forth in advance. To obtain the greatest practical amount of power and energy, the plants will have to be operated on an annual basis as conditions occur, and there must be therefore freedom to operate without being tied to a specific plan. The proposal for coordinated and integrated operation is deliberately tied to the

provision for allowance. The corollary of a conclusion to provide an allowance for computed deficiency is that the Secretary exercises the discretion to operate in a reasonable manner as he determines.

Paragraph 9: The decision to coordinate and integrate necessarily eliminates secondary energy generation at Hoover. It is conceivable, of course, that if a situation occurs where both reservoirs are completely full and there happens to be an extremely high runoff year, such that water would otherwise spill at Hoover, then secondary energy as defined in the Boulder Canyon project general regulations could be generated.

Paragraph 10 indicates the cutoff date of the filling criteria, and permits earlier cutoff than given in paragraph 2 if such action is warranted. This is desirable because it will likely be possible to obtain full system firm power generation with less than a full Glen Canyon. As soon as this becomes a fact it would be well to close off the filling criteria.

Paragraph 11 is a notification that the flood control regulations at Hoover Dam will be applied in full recognition of the available capacity in the upstream reservoir. The effect of such recognition is to diminish the space which must be held in Lake Mead for the catchment of floods. Such action would, of course, influence cost allocations to be made under section 6 of the act of April 11, 1956.

RESULTS OF THE PROPOSAL

Analyses have been made to appraise the effect of applying these principles and criteria. Any such appraisal can, of course, only be indicative. However, the following results give some indication of the magnitude of deficiencies in Hoover generation which might occur. If it is assumed that a runoff sequence, such as happened in 1930 through 1952 (considered to be an adverse period) should recur starting in 1962, and allowing for increases in upstream depletions, it appears that over that 23-year period the amount of deficiency would be 9,566 million kilowatt-hours, or an average of 415 million kilowatt-hours per year. This is roughly 10 percent of the average Hoover firm energy for the same period. If we assume that runoff conditions such as occurred from 1922 to 1929, inclusive (considered to be a favorable period), occurred in the same sequence, there would be no deficiency in the 8-year period required to fill Glen Canyon Reservoir. If we assume that the sequence starting in 1942 and continuing through 1957 followed by a recurrence of 1922 through 1924 recurred, there would have been a deficiency in 12 of the 19 years, with the total deficiency being about 8 percent of the total Hoover firm.

The period of years which might be involved in filling Glen Canyon under the proposal becomes of lesser significance when the reservoirs are coordinated and integrated for power production, as the objective then is maximum power production and not reservoir filling per se. The study made does show Glen Canyon filling in 23 years under the 1930 sequence, 19 years under the 1942 sequence, and 8 years under the 1922 sequence.

The repayment studies for the upper basin project assume that throughout the period of "Glen Canyon filling" (1) there will be average runoff, and (2) firm generation at Hoover will be maintained to the extent it can be without (*a*) drawing Hoover below 17 million acre-feet, and (*b*) without drawing upon Glen Canyon storage for that

purpose. If assumption (1) is retained but the proposed principles and criteria are substituted for assumption (2) there would be no adverse effect on upper basin payout. To the extent that combined system operation of Hoover and Glen Canyon would increase power production over and above that resulting from the assumptions of the current repayment analysis the upper basin payout would be benefited.

Application of even the adverse runoff cycles of 1930–52 results in storage at Glen Canyon to minimum power head of 6,500,000 acre-feet in from 2 to 3 years. After power generation is initiated at Glen Canyon the objective, as spelled out in the proposed principles and criteria, is to produce the greatest practical amount of power and energy from combined operation. The revenues from all energy generated from the combined system in excess of that required to meet the commitments outlined above for the firm power under the Hoover Dam contracts would be credited to the upper basin project. Thus, it is probable that with allowances for computed deficiency and under integration, and with 1930–52 runoff conditions the rate of upper basin project payout would be somewhat slower for a brief period with the possibility of offsetting gains in later operations.

The Bureau's proposal is an equitable and practicable approach that results in the best use of the natural resource—falling water.

To be recognized is the fact that the proposal states only general priciples and broad operating criteria. It does not attempt to, and should not in our judgment, spell out all of the details which will have to be worked out, many of which would need to be negotiated.

RECOMMENDATION

I recommend that you approve the Bureau's proposal tentatively, and that we carry out the following program:

1. Upon receipt of your approval, copies of the tentative proposal be forwarded to the members of the engineering group, both upper and lower basin, which performed the operating studies. The transmittal would indicate that the proposal is tentative and open for discussion but that it does reflect the principles which the Department presently believes should be adopted. The group would be asked to study the proposal, and after a suitable interval, a meeting would be held with the combined engineering group to discuss and explain the details of the proposal.

2. Following the meeting of the engineers it would be expected that those representing each state would refer the matter to their administrative people and discuss the various considerations involved.

3. After allowing time for discussion and review within the States, a general meeting would be called, preferably in Washington, somewhat similar to the meeting held here in October 1957. At that meeting it would be expected that the States would present their views, both pro and con, following which a final decision would need to be made as to the principles to be followed.

4. Subsequent to the final decision and assuming it is substantially in accord with the present proposal, negotiations on the necessary points would be undertaken immediately.

FLOYD E. DOMINY.

Approved: February 9, 1960.

FRED A. SEATON,
Secretary of the Interior.

PROPOSED GENERAL PRINCIPLES TO GOVERN, AND OPERATING CRITERIA FOR, GLEN CANYON RESERVOIR AND LAKE MEAD DURING THE GLEN CANYON RESERVOIR FILLING PERIOD

1. The following principles and criteria are based on the exercise, consistent with the law of the river, of reasonable discretion by the Secretary in the operation of Federal projects involved. The case generally styled "*Arizona* v. *California, et al., No. 9 Original*" is in litigation before the Supreme Court of the United States. Anything which is provided for herein is subject to change consistent with whatever rulings are made by the Supreme Court which might affect the principles and criteria herein set out.

2. The principles and criteria set forth hereinafter are applicable during the Glen Canyon Reservoir filling period which is defined as that time interval between the date Glen Canyon Reservoir is first capable of storing water (estimated to occur in January 1962) and the date Glen Canyon Reservoir storage first attains elevation 3,700 (content 28 million acre-feet total surface storage), or May 31, 1987, whichever occurs first.

3. Sufficient water will be passed through or released from either Lake Mead or Glen Canyon Reservoir, as circumstances require under the provisions of paragraphs 7 and 8 hereof, to satisfy downstream uses of water (other than for power) below Hoover Dam which uses include the following:

(*a*) Net river losses
(*b*) Net reservoir losses
(*c*) Regulatory wastes
(*d*) The Mexican Treaty obligation limited to a scheduled 1.5 million acre-feet per year
(*e*) The diversion requirements of mainstream projects in the United States

4. All uses of water from the main stem of the Colorado River between Glen Canyon Dam and Lake Mead will be met by releases from or water passed through Glen Canyon Reservoir or by tributary inflow occurring below Glen Canyon Dam. Diversions of water directly out of Lake Mead will be met in a similar manner or, if application of the criteria of paragraphs 7 and 8 hereof should so require, by water stored in Lake Mead.

5. The United States will make an allowance for any deficiency, computed by the method herein set forth, in firm energy generation at Hoover powerplant. For each operating year deficiency in firm energy shall be computed as the difference between firm energy which, assuming an overall efficiency of 83 percent, would have been generated and delivered at transmission voltage at Hoover powerplant in that year if Glen Canyon had not been on the river and the energy actually generated and delivered at transmission voltage at Hoover powerplant during that year adjusted to reflect an overall efficiency of 83 percent. At the discretion of the Secretary, allowance will be accomplished by the United States delivering energy, either at Hoover powerplant or at such other points acceptable to both the Secretary and the affected Hoover power contractors, or monetarily in an amount equal to the incremental cost of generating substitute energy.

6. In accomplishing the foregoing, Glen Canyon Reservoir will be operated in general accordance with the provisions of Sections 7 and 8.

7. Storage capacity in Glen Canyon Reservoir to elevation 3,490 (6.5 million acre-feet surface storage) shall be obtained at the earliest practicable time in accordance with the following procedure:

Until elevation 3,490 is first reached, any water stored in Glen Canyon Reservoir shall be available to maintain rated head on Hoover powerplant. When stored water in Glen Canyon Reservoir has reached elevation 3,490, it will not be subject to release or diminution below elevation 3,490. The obtaining of this storage level in Glen Canyon Reservoir will be in such manner as to not cause Lake Mead to be drawn down below elevation 1,123 (14.5 million acre-feet available surface storage), which corresponds to rated head on the Hoover powerplant. In the process of gaining storage to elevation 3,490, the release from Glen Canyon shall not be less than 1.0 million acre-feet per year and 1,000 cubic feet per second, as long as inflow and storage will permit.

8. The operation of Glen Canyon Reservoir above elevation 3,490 and Lake Mead will be coordinated and integrated so as to produce the greatest practical amount of power and energy. In view of the provision for allowance set forth in section 5 hereof, the quantity of water released through each powerplant will be determined by the Secretary in a manner appropriate to meet the filling criteria. Operation will be generally as follows:

The combined generation at Glen Canyon and Hoover will be at a preestablished annual rate, generally uniform from year to year following an energy build-up period. The obtaining of water in Glen Canyon Reservoir between elevation 3,490 and elevation 3,700 will be accomplished by storing the annual amount by which inflow exceeds release for energy generation at Glen Canyon. To produce the greatest practical amount of power and energy it may be necessary to draw Lake Mead to elevation 1,050. It woud not be practical, however, to draw Lake Mead below elevation 1,050.

9. Because of the coordinated operation, except for energy that would be generated by water which otherwise would be spilled at Hoover Dam, no secondary energy will be generated at Hoover.

10. Whenever Glen Canyon storage has reached elevation 3,700 or May 31, 1987, has occurred, these principles and criteria will no longer be applicable, or if in the judgment of the Secretary the contents of both reservoirs are such as to warrant such action, he may declare these principles and criteria no longer applicable.

11. In the annual application of the flood control regulations to the operation of Lake Mead, recognition shall be given to available capacity in upstream reservoirs.

PART II—COMMENTS RECEIVED AND RELATED CORRESPONDENCE

ADDITIONAL REGULATION NO. 1

By letter of April 4, 1962, the Commissioner of Reclamation requested the comments of the Hoover contractors on additional regulation No. 1. Comments were received from the Arizona Power Authority, California Electric Power Co., Colorado Power Commission of Nevada, city of Los Angeles, Metropolitan Water District of Southern California, and Southern California Edison Co. Comments were not received from the cities of Burbank, Glendale, and Pasadena, Calif.

JUNE 11, 1962.

MEMORANDUM

To: Secretary of the Interior.
Through: Assistant Secretary Kenneth Holum.
From: Commissioner of Reclamation.
Subject: Additional regulation No. 1 to the General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act.

On April 4, 1962, in your behalf, and as required by article 27 of the "General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act," I sent copies of the proposed additional regulation No. 1 to the Hoover power contractors. The contractors' comments on the additional regulation No. 1 were requested within 30 days. The 30 days have now expired and we have received comments from six of the nine contractors. The comments received are as follows:

Arizona Power Authority: Declined to comment and urged discussion of the matters it had previously raised in connection with the filling criteria for Lake Powell.

California Electric Power Co.: Expressed its view that additional regulation No. 1 is unfair in forcing the Hoover power contractors to pay for a power loss caused by the filling of Lake Powell. This cost, it contends, should be paid by the Upper Basin States. If, however, the Hoover contractors must stand the cost, the company prefers to see the funds repaid after 1987, but the moneys used should be repaid without interest.

Colorado River Commission of Nevada: Questions the necessity and/or practicability of considering this proposed regulation at this time since it does not become effective until June 1, 1987.

City of Los Angeles: While it assumes that additional regulation No. 1 contemplates reimbursement without interest, it prefers that the regulation state specifically that such reimbursement is to be without interest.

Metropolitan Water District of Southern California: Withheld its comments pending study of alternative proposal to use Colorado River development fund to make allowance for diminution in Hoover basic firm energy during filling period.

Southern California Edison Co.: States that the provisions contained in article 5 of the filling criteria and in the proposed additional regulation No. 1, relative to reimbursement of the Upper Colorado River Basin fund from charges for electrical energy to be made at the Hoover powerplant subsequent to June 1, 1987, would not appear to be authorized by existing law, but rather to be in conflict therewith.

Comments have not been received from the cities of Burbank, Glendale, and Pasadena, the remaining three Hoover power contractors.

Inasmuch as the comments received, copies of which are attached, either do not object to issuance of additional regulation No. 1, or, in my opinion, do not offer substantive reasons opposing its issuance, I recommend that you now formally promulgate additional regulation No. 1 and that it and the filling criteria approved by you on April 2 be published in the Federal Register. Attached for your signature are the documents necessary to accomplish this.

FLOYD E. DOMINY.

U.S. DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., April 4, 1962.

CHIEF ENGINEER, COLORADO RIVER COMMISSION OF NEVADA,
Post Office Box 1748, Las Vegas, Nev.

DEAR SIR: On behalf of the Secretary of the Interior and as required by article 27 of the "General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act," I enclose for your consideration a copy of additional regulation No. 1 to the "General Regulations." Your comments on this additional regulation are requested within 30 days.

Enclosed also is a copy of "General Principles To Govern, and Operating Criteria for Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," approved by the Secretary on April 2, 1962, of which additional regulation No. 1, upon issuance, will be made a part.

As a third item there is enclosed a set of the tabular forms together with explanatory material, which will be used to compute deficiencies in firm power generation at Hoover Dam during the filling period as provided in principle 5 of the "General Principles."

Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

ARIZONA POWER AUTHORITY,
Phoenix, Ariz., May 1, 1962.

Mr. FLOYD E. DOMINY,
Commissioner, Bureau of Reclamation,
Washington, D.C.

DEAR SIR: Your letter of April 4, 1962, to the Arizona Power Authority, transmitting copies of "Additional Regulation No. 1 to the General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act," of "General

Principles To Govern, and Operating Criteria for Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," and of a set of tabular forms illustrating computations associated with the filling criteria, has been received.

Your letter requests comments on additional regulation No. 1. That regulation is, of course, a byproduct of the filling criteria. Those criteria do not provide sufficient basis for a responsible evaluation of their effect upon Hoover, Davis, and Parker interests. Questions raised in my August 3, 1961, letter to Senator Hayden, a copy of which we understand has been furnished Secretary Udall, remain unanswered.

Consequently, we must decline to comment upon additional regulation No. 1 and continue to urge discussion of the matters raised first in the Bureau's Los Angeles meeting of April 20, 1961, and subsequently in my letter to Senator Hayden.

Sincerely,

ARIZONA POWER AUTHORITY,
C. A. CALHOUN, *Chairman.*

CALIFORNIA ELECTRIC POWER CO.,
San Bernardino, Calif., May 3, 1962.

Hon. FLOYD E. DOMINY,
Commissioner of the Bureau of Reclamation,
Department of the Interior, Washington, D.C.

DEAR MR. DOMINY: We have received your letter of April 4, transmitting copy of "General Principles To Govern, and Operating Criteria for Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," and additional regulation No. 1 concerning the paying back of electrical energy costs after June 1, 1987, if these costs are incurred while filling Lake Powell. You have asked for our comments on this additional regulation.

We would first desire to say that we feel the additional regulation is unfair to the Hoover contractors by forcing them to pay for a power loss caused by the filling of Lake Powell. This cost should be paid for by the upper basin States, who will receive the benefits from Glen Canyon Dam.

If, however, the Hoover contractors must stand the cost, we prefer to see the funds repaid after 1987, but the moneys used should be repaid without interest.

Even though your letter indicates that "General Principles To Govern, and Operating Criteria for Glen Canyon Reservoir and Lake Mead During the Lake Powell Filling Period" has been approved by the Secretary as of April 2, 1962, we desire to inform you that we still feel that Hoover allottees are being discriminated against by allowing Lake Mead to drop to 14½ million acre-feet during the filling of Lake Powell to its highest elevation, rather than 17 million acre-feet which is surface storage you agree to maintain in Lake Mead after Lake Powell is filled.

This low elevation water content will decrease our kilowatt capacity and could seriously decrease the energy available to each contractor.

Also under these general principles, if an allowance is made by delivering energy to an affected Hoover contractor, we desire that such energy be delivered at times needed, as determined by the contractor.

Very truly yours,

W. T. JOHNSON.

COLORADO RIVER COMMISSION OF NEVADA,
Las Vegas, Nev., May 1, 1962.

FLOYD E. DOMINY,
Commissioner, Bureau of Reclamation,
U.S. Department of the Interior, Washington, D.C.

DEAR MR. DOMINY: With your letter of April 4, 1962, you sent us a copy of regulation No. 1 to the "General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act." You asked for our comments thereon.

You also enclosed a copy of "General Principles to Govern, and Operating Criteria for Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period."

Comments to the latter, the filling criteria, have been previously submitted to you through correspondence, the last being in our letter of January 2, 1962, addressed to the Honorable Stewart L. Udall, Secretary of the Interior.

Relative to the consideration of additional regulation No. 1 to the "General Regulations," our only comment is in questioning the necessity and/or practicability of the consideration of this proposed regulation at this time since it does not become effective until June 1, 1987. It would seem to us that this is a matter that may well be given further consideration with an understanding and agreement reached thereon some few years from now since 1987 is not in this particular instance a pressing date.

Very truly yours,

A. J. SHAVER,
Chief Engineer.

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA,
Los Angeles, Calif., May 8, 1962.

FLOYD E. DOMINY,
Commissioner of Reclamation, U.S. Department of the Interior, Bureau of Reclamation, Washington, D.C.

DEAR SIR: Your letter of April 4, 1962, addressed to Governor Brown, suggesting use of the Colorado River development fund for making purchase of energy necessary to satisfy deficiencies of energy at Hoover powerplant resulting from filling of Lake Powell, was referred to the Colorado River Board and is under study.

This district's comments on the proposed additional regulation No. 1 transmitted to this office with your letter of April 4, 1962, are being withheld pending study of your alternate proposal. When a conclusion is reached you will be promptly advised.

However, the district wishes your advice as to the application to the situation confronting the district, of the "General Principles To Govern, and Operating Criteria for Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," transmitted to this office with your letter of April 4, 1962.

Section 5 of the criteria provides that—

> At the discretion of the Secretary, allowance will be accomplished by the United States delivering energy * * *, or monetarily in an amount equal to the incremental cost of generating substitute energy * * *.

It is apparent that the incremental cost of generating substitute energy applies to allottees having generating facilities of their own capable of producing the substitute energy.

However, this district, having no generating facilities, will be compelled to purchase (rather than generate) substitute energy. The quantity of energy so purchased, and the time of use of such energy, will be dictated by the district's operating requirements. Some such purchases may be "on peak" with reference to the sources of energy, and hence may be more costly than possible "off peak" purchases. The cost of substitute energy to the district presumably will be greater than the contract cost of Hoover energy.

It is the view of this district that in interpreting and applying the quoted language of the criteria, "the incremental cost" to the district of substitute energy will be determined with reference to the actual cost of such energy to the district at the time and in the quantity required for district operations.

Your confirmation (or comments) on this construction, at an early date, will be appreciated. Any difficulty relating to determination of incremental costs would be eliminated if substitute energy can be delivered in accordance with the district's operating requirements. The district will much prefer such substitute energy instead of monetary compensation. Your present assurance that such substitute energy can and will be supplied would be most helpful.

Very truly yours,

R. A. SKINNER,
General Manager and Chief Engineer.

DEPARTMENT OF WATER AND POWER
OF THE CITY OF LOS ANGELES,
Los Angeles, Calif., May 2, 1962.

Hon. STEWART L. UDALL,
Secretary of the Interior,
Department of the Interior, Washington, D.C.

Attention of Mr. Floyd E. Dominy, Commissioner of Reclamation.

DEAR SIR: We have your letter of April 4, 1962, transmitting a proposed "Additional Regulation No. 1 to the General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act" and requesting comments thereon.

We observe that the language with respect to reimbursement to "* * * the Upper Colorado River Basin fund for moneys expended from such fund on account of allowances for Hoover diminution * * *" does not make any provision for interest on the moneys so expended from said fund.

While we should prefer that the language explicitly state that the contemplated reimbursement is to be "without interest," we assume that it is your intent to achieve the same result through the omission of any provision for interest and that the language does in fact achieve this result.

What we have said above with respect to the language of the proposed "Additional Regulation No. 1" is, of course, equally applicable to the language contained in section 5 of "General Principles To Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period"

insofar as that section treats of reimbursement to the Upper Colorado River Basin fund.

If we are at all in error in making these assumptions please advise at once.

Respectfully yours,

SAMUEL B. NELSON,
General Manager and Chief Engineer.

SOUTHERN CALIFORNIA EDISON CO.,
Los Angeles Calif., May 3, 1962.

The Honorable the SECRETARY OF THE INTERIOR,
Washington, D.C.

DEAR MR. SECRETARY: Mr. Floyd E. Dominy, Commissioner of Reclamation, has forwarded to us on your behalf, pursuant to article 27 of the "General Regulations for Generation and Sale of Power in Accordance With the Boulder Canyon Project Adjustment Act," a copy of a proposed additional regulation No. 1 to said general regulations. Mr. Dominy also enclosed a copy of "General Principles To Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period" approved by you on April 2, 1962, of which said additional regulation No. 1, upon issuance, is also to become a part.

Representatives of this company participated in several of the meetings which were held by the Bureau of Reclamation in the course of the preparation of the above-mentioned general principles and we are familiar with them. While we are not in agreement with some of the principles and criteria contained therein, we appreciate that it may not be possible to resolve each question in a manner which will be satisfactory to all interests.

We wish at this time to confine our comments to article 5 of these general principles and to the proposed additional regulation No. 1.

Article 5 of the "General Principles to Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period" makes provision for an allowance in kind or in money in the event of a deficiency in firm energy generation at Hoover powerplant by reason of operations under said criteria. The allowances therein specified, of course, may or may not fulfill the contractual obligations of the United States to the contractors for Hoover power, depending among other things upon the timing and quantity of deliveries of substitute energy and the extent that the payment of incremental cost of energy may compensate for the actual cost of the replacement of capacity and energy, including the cost of the purchase thereof, should such be necessary. The province and effect of such regulation, however, would not appear to be to influence the contractual obligations between the United States and the contractors for Hoover power. Rather, such regulation would appear to be the direction of the Secretary as to the manner in which the physical operations of Lake Mead and Lake Powell should be conducted and the allocation of certain expenditures to the Upper Colorado River Basin fund.

On the other hand, however, the provisions which are contained in article 5 of said general principles and in the proposed additional

regulation No. 1, relative to reimbursement of the Upper Colorado River Basin fund from charges for electrical energy to be made at the Hoover powerplant subsequent to June 1, 1987, would not appear to be authorized by existing law, but rather to be in conflict therewith. Section 5 of the Boulder Canyon Project Act, to which reference is made in said article 5, does not authorize such regulation. This section in part reads as follows:

> After the repayments to the United States of all money advanced with interest' charges shall be on such basis and the revenues derived therefrom shall be kept in a separate fund to be expended within the Colorado River Basin as may hereafter be prescribed by the Congress.

The Congress has not taken action up to the present time in this regard excepting in the Boulder Canyon Project Adjustment Act. Section 2 of the Adjustment Act provides in part that all receipts from the project shall be paid into the Colorado River Dam fund and shall be available for the particular matters therein specified, none of which includes reimbursement of the Upper Colorado River Basin fund. In addition, section 7 of the act of April 11, 1956, providing for the Colorado River storage project and participating projects, provides in part that "in the exercise of the authority hereby granted he [the Secretary] shall not affect or interfere with the operation of the provisions of the Colorado River compact, the Upper Colorado River Basin compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and any contract lawfully entered into under said compacts and acts."

Respectfully submitted.

JAMES F. DAVENPORT.

COMMENTS ON JUNE 13, 1961, MEMORANDUM FROM COMMISSIONER OF RECLAMATION TO THE SECRETARY OF THE INTERIOR

Upon receipt of the June 13, 1961, memorandum the Secretary requested the views and comments of various upper and lower basin interests. The following comments were received:

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Albuquerque, N. Mex., August 25, 1961.

Hon. STEWART L. UDALL,
Secretary of the Interior,
Department of the Interior.

DEAR MR. SECRETARY: Thank you for your letter of June 13, 1961, in which you stated that you have received from Commissioner Dominy a firm recommendation concerning the operation of Glen Canyon Dam during the filling period and in which you enclosed a copy of the Commissioner's memorandum and other pertinent data. I appreciate very much the opportunity to submit my comments with reference to this extremely important question.

I will confine my remarks in this letter to those of a general nature, preferring to leave the engineering and hydrologic technicalities to the upper basin engineering committee and the engineers of New Mexico who have been studying this problem for several years.

The Commissioner's memorandum of June 13 proposes that upper basin energy or money that would otherwise accrue to the upper basin

fund be used to make up deficiencies in basic firm energy generation at Hoover powerplants. It proposes further that any money used from the upper basin fund for this purpose would be reimbursed without interest from Hoover power revenues after 1987. It also plainly states that there would be no compensation for upper basin energy used to meet the deficiencies in Hoover generation. No explanation is given for the reasons behind the proposal to reimburse the dollars advanced and the denial of reimbursement for the energy used.

As far as I have been able to ascertain there is nothing in any of the compacts or congressional acts that constitute the "law of the river" that would direct the Secretary of the Interior, or even authorize him, to take either money or energy derived from a subsequent development on the Colorado River, such as that at Glen Canyon, for the benefit of a prior established facility, such as, Hoover Dam and Reservoir. Also, under the Colorado River Storage Project Act, all of the revenues of the basin fund are allocated to specific purposes, and these purposes do not include paying for deficiencies in generation at Hoover as a part of the operation and maintenance at Glen Canyon. Diminutions in generation at Hoover were contemplated at the time of signing the Hoover power contracts. In fact, those Hoover power contracts are between the Secretary and the Hoover power allottees, and the upper basin as a third party has no responsibility under the contracts.

As you can see, I am very much opposed to the concept expressed in principle 5 of your proposed "general principles" that would require the use of upper basin revenues or energy for the purpose of paying for deficiencies in generation at Hoover Dam that might be caused by the operation of Glen Canyon Dam and other upper basin powerplants.

As a result of inquiries made by my office to your solicitor, I understand that the terms of the Boulder Canyon Project Act and the Boulder Canyon Project Adjustment Act and the general regulations promulgated thereunder are not adequate to provide for meeting the so-called deficiency-in-generation problems that might be created at Hoover Dam. It is therefore apparent that if this problem is to be resolved through the use of existing legislation, amendments to these acts may be necessary in order to give the Secretary authority to meet the situation that exists between himself and the Hoover power allottees with respect to fulfilling the Hoover power contracts. If you can propose remedial legislation I would be very happy to examine it and the possibilities of its enactment by the Congress.

If you, as Secretary, find that it is absolutely necessary, due to conditions beyond your control, that revenues of the upper basin fund or energy generated at upper basin powerplants must be used for the purpose of making up deficiencies in basic firm energy generation at Hoover Dam during the filling period of upper basin reservoirs, I feel that it is mandatory that your proposed filling criteria be modified in certain respects. Several suggestions for modification of your proposed criteria have emanated from technicians representing the upper division States, including New Mexico. I feel that these proposals should be given serious consideration by your office as well as by all interested parties in the Colorado River Basin.

In my estimation some of the more logical and important of these suggestions are:

(1) Principle 5 should provide that the upper basin fund would be reimbursed for the cost of nonfirm or "other energy" used from the upper basin powerplants for the purpose of making up Hoover deficiencies at the dollar value of such energy in the same manner that the fund would be reimbursed for money used to purchase replacement energy.

(2) The language of principle 5 should make clear that the upper basin fund will not be used to guarantee generating capacity, and it should also make clear that any money used for the purchase of replacement energy on an incremental fuel cost basis is to be made at a predetermined rate that will not include a component for plant amortization or for the construction of new generating capacity.

(3) Principle 8 and the explanation thereof should be amended to make it clear that the Secretary is not committed to maintain Lake Mead above elevation 1,123 after Lake Powell reaches elevation 3,490. This is probably what is intended because the Dominy letter states that "the principle enunciated has not been changed."

(4) It has been suggested that the Colorado River development fund should be used for purchasing energy to make up the deficiencies in basic firm energy generation at Hoover Dam during the upper basin reservoir filling period. This procedure would fulfill several objectives. First, it would provide a means whereby the Secretary could fulfill his contracts with the Hoover power allottees without reaching into either the basin fund or energy generated by storage units of the upper basin. Second, it would eliminate the accrual of large interest charges against the upper basin fund that would result if reimbursement to the fund were to be postponed until after 1987, because the Hoover power deficiencies could be paid for on a current or almost current basis.

This proposal is discussed in the memorandum dated April 12, 1961, from Ival Goslin, chief engineer and secretary of the Upper Colorado River Commission, to the Honorable James K. Carr, Under Secretary, Department of the Interior, wherein Mr. Goslin discusses the general principles for fulfilling Upper Colorado River Basin reservoirs. I recommend that this proposal be thoroughly explored by the Department.

It appears to me that the inherent weakness of your presently proposed general principles (June 1, 1961) lies in the fact that you guarantee to the lower basin allottees the fulfilling of their power contracts, but have not provided a guarantee of even partial reimbursement to the upper basin fund. You have expressed an intent in your "additional regulation No. 1" to partially reimburse the upper basin fund after 1987, but have provided no means of implementing this intent. It appears to me that some congressional authority through new or amendatory legislation may be required if your criteria are finally adopted.

After further study of this matter I would be glad to have the opinion of the legal division of your Department with regard to my above suggestions and any other comments that you may have. I will be interested in any suggestions that you may have as to the

means to be used for implementing your proposed reservoir filling criteria.

I regret that I have been delayed in transmitting my comments to you, but circumstances beyond my control have prevented my doing so.

Sincerely yours,

CLINTON P. ANDERSON, *Chairman.*

U.S. SENATE,
COMMITTEE ON APPROPRIATIONS,
August 11, 1961.

The Honorable the SECRETARY OF THE INTERIOR,
Department of the Interior,
Washington, D.C.

DEAR MR. SECRETARY: Referring to my letter of July 18 with regard to the proposed "General Principles To Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period," I have now received comments from the Arizona Power Authority and the Arizona Interstate Stream Commission. A copy of these comments is enclosed for your information.

With regard to them, I believe that the following questions are pertinent:

1. In principle 1 there is a question asked as to the liability of the Arizona Power Authority for inability to deliver contracted power. Does the Department have any comment on this?

2. What would be the situation with regard to operation of Lake Powell after the criteria ceased to be effective, either by declaration of the Secretary or by the termination of the criteria on May 31, 1987? Do you see merit in the proposal that the Secretary announce 5 years in advance if he proposes to declare the criteria of no force?

3. Does the Department contemplate the use of Davis and Parker powerplants to supply energy in lieu of that which is now supplied from Hoover Dam?

4. The Arizona organizations insist that to the extent that lieu kilowatt-hours and kilowatts for purchase are not available, offsetting Hoover impairment shall have first priority on power output at Glen Canyon. Can you give assurance that this will be effected?

5. I would be particularly glad to have your comments on the remarks included on page 5 under the heading "Parker and Davis" wherein the statement is made that the Parker and Davis projects are separate and distinct from the Colorado River storage project.

I will appreciate a careful study of these comments and an indication of the feasibility of a discussion between representatives of the Bureau of Reclamation and of the Arizona Power Authority and the Interstate Stream Commission to work out agreement in those areas where differences exist. I doubt that a public meeting would be of any particular value but I certainly think that a sincere effort should be made to get the Arizona agencies and the Department of the Interior into agreement on mutually acceptable filling and operating criteria.

Yours very sincerely,

CARL HAYDEN,
U.S. Senator.

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ARIZONA POWER AUTHORITY,
Phoenix, Ariz., August 3, 1961.

Hon. CARL HAYDEN,
U.S. Senate, Washington, D.C.

MY DEAR SENATOR HAYDEN: Thank you for your letters of July 13 asking for our comments on Secretary Udall's proposed criteria for operation of Glen Canyon Dam and Lake Powell during the filling period. You asked for those comments by July 25, but by telephone we were assured by Mr. Elston that August 7 was an acceptable alternative date.

To give you a complete documented response to the criteria would require a report, not a letter. Moreover, Arizona, Nevada, and California have a common interest in those criteria, and we anticipate that the three States will jointly study the criteria, determine areas of agreement and disagreement, and, as has been the purpose to date, work with the Bureau of Reclamation toward criteria representing reasonable compromise and fairness on the part of all interests. This letter is intended, however, to show you that Arizona cannot afford to acquiesce in the criteria in their current form.

Our comments, discussing the separate principles of the criteria in order, are attached. Most of these comments were made by representatives of Hoover allottees during the April 20, 1961, meeting in Los Angeles called by the Bureau of Reclamation. Adequate answers were not provided in most instances. The material furnished you and which you sent on to us leaves many problems unsolved. In our judgment, Secretary Udall's proposals require much discussion, clarification, general tightening, and documentation before the Hoover allottees come to acquiescence in a final product.

Arizona, and we think California and Nevada, are very disappointed in the lack of Bureau progress in the solving of this complex problem, and over a possible intent to promulgate these criteria without the Bureau's providing the answers sought in the April 20, 1961, meeting. Nevertheless, Arizona and the other Hoover allottees would be willing, we are sure, to work intensively and objectively with the Bureau to avoid the alternative to a negotiated solution: In all sincerity, we urge that negotiation.

The impact of Colorado River storage project operations upon Parker and Davis powerplant operations receives no attention in Secretary Udall's proposals. These plants are important elements in Arizona's economy. Arizona accepts as inevitable a diminution in their output as a result of storage project filling operations. Unless relief is provided, rates must increase. Arizona holds that Parker and Davis are just as distinct from the storage project as though they were under a separate agency of Government, or private enterprises, and that the Secretary of the Interior has not the discretion to subordinate their payout (at the expense of their customers) to the uncertain rights of another project. Accordingly, we have continually urged the Bureau to recognize the Parker-Davis problem, and will continue to do so.

Your recognizing our interest in these matters is appreciated. We assure you, again, of our willingness to work constructively with the Bureau in the development of fair solutions to its problems.

Yours very truly,

C. A. CALHOUN, *Chairman.*

COMMENTS ON GENERAL PRINCIPLES TO GOVERN, AND OPERATING CRITERIA FOR, GLEN CANYON RESERVOIR (LAKE POWELL) AND LAKE MEAD DURING THE LAKE POWELL FILLING PERIOD, JUNE 13, 1961

ARIZONA POWER AUTHORITY AND, ARIZONA INTERSTATE STREAM COMMISSION

Principle 1

The "reasonable discretion" of this principle must be read along with Commissioner Dominy's foregoing of a "legalistic approach" as set out in the sixth paragraph of his communication of June 13, 1961, to the Secretary of the Interior. Arizona, and other Hoover allottees, have always been ready to compromise reasonably toward a practical means of getting Glen Canyon into fruitful operation, but the Arizona Power Authority has, in total effect, contracted away to others the total of Arizona's share of Hoover generation. Can the authority acquiesce in the impairment of that share without becoming liable, legally, to its contractors? "Legalistics" cannot be dismissed lightly.

Principle 2

This principle is suggestive of two implications. The first is the date of May 31, 1987. Quite obviously, this is the date on which the Hoover allottees cease to be able to lean upon their Hoover contracts for defense against adverse operations by the Secretary upstream. Arizona, California, and Nevada may reasonably have interests in Hoover beyond the expiration of current contracts, and subordination of Hoover toward easing possible repayment problems in the upper basin would be prejudicial toward those interests. As you know, there is interest in establishing a lower basin account, with Hoover as the most substantial element; the Bureau of Reclamation and Arizona have exhibited the most interest. Subordination of Hoover would affect a lower basin account adversely. Finally, Congress has an interest in Hoover repayment extending beyond 1987, in that there remain for repayment substantial items of costs, such as unliquidated Boulder City municipal costs, unliquidated costs ascribed to equipment installed after 1937 on a 50-year payout basis, and the flood control allocation of $25 million (unless Congress acts to wipe out that obligation). Subordination of Hoover after 1987 would result in slower payout of Hoover than indicated to Congress at the time of authorization. Accordingly, neither Arizona nor the Congress can acquiesce in criteria still, after several years, silent as to operating rules holding after the "filling" period, or after 1987.

The second disturbing implication of this principle is that the Secretary may declare these criteria no longer applicable at any time at his discretion, after consultation with upper and lower basin interests. Note that only consultation, not agreement, is requisite to a substitution of criteria presently unknown. Arizona cannot afford to acquiesce, uninformed as to the ensuing criteria. If the Secretary were to offer a 5-year notice prior to his changing operating rules, this element of the criteria would be much more palatable.

Principle 3

No comment.

Principle 4

No comment.

Principle 5

This principle would appear to have the United States make the present generation of Hoover contractors "whole" during the "filling" period as to power and energy which would have been generated at Hoover in the absence of impoundments at Glen Canyon, Flaming Gorge, Navajo, and Curecanti Dams. There are details, however, which bear inspection.

The effects of evaporation at these reservoirs is not to be included in the "allowance" made by the United States for impairment of Hoover production. In actual fact, Glen Canyon, Flaming Gorge, and Curecanti are, and will be for many years, purely power projects performing no irrigation or other consumptive use function. Use of water incident to power production has, as you know, the lowest of priorities, and the rights of one basin against the other for water for such use are obscure. This principle would give the upper basin the superior right to such use of water. Arizona considers this an area of possible compromise, but cannot acquiesce in this element of this principle as written.

Allowance for Hoover impairment might be accomplished by the Secretary delivering lieu power and energy at Hoover Power Plant or other mutually acceptable points. The sources of that lieu power and energy are not clearly stated. Ostensibly, the sources are Glen Canyon, Flaming Gorge, and Curecanti in the upper basin. These cannot furnish lieu power and energy while collecting dead storage and simultaneously impairing Hoover generation. Commissioner Dominy uses the terms "Federal powerplants," and "Federal projects." There has been disturbing speculation that the Bureau of Reclamation contemplates the use of Davis and Parker Power Plants to supply lieu energy, and the reluctance of the Bureau to renew Parker-Davis contracts has given weight to this speculation. Such operation would, so far as meeting Arizona's power needs are considered, amount to a substantial diminution of Arizona's power supply. This speculation should be resolved by the Bureau, and must be before Arizona could consider acquiescence.

The Secretary could provide lieu energy by purchase from others. Apparently sufficient kilowatt-hours are available for purchase within Arizona. Such purchase implies legal authority and appropriations available to the Secretary, and the criteria nowhere provide assurance that these are or will be available to him.

Present indications are that lieu kilowatt capacity will not be available for purchase by the Secretary or Arizona should Hoover capacity be impaired. This matter will be discussed further in connection with principle 7.

Under this principle, the Secretary might make direct monetary payments to the separate allottees, in amounts "equal to the incremental cost of generating substitute energy." Arizona assumes that "incremental cost" is used here in the sense that if Hoover energy might have cost Arizona 3.5 mills per kilowatt-hour delivered, and if Arizona paid 5.0 mills for lieu energy delivered, the Secretary would pay Arizona 1.5 mills toward that cost, and relieve Arizona of a commensurate share of Hoover charges. If this is not the meaning intended, the Bureau should make its intent clear. Again, there is no

showing that the Secretary will have the authority and appropriations out of which to make such payments.

Commissioner Dominy states "* * * it is our intent to make minimum use of dollars but maximum use of energy from Federal projects for any required replacements." The Bureau should define "Federal projects" to assure those concerned that Davis and Parker are not included in this statement. He goes on to say: "It is not intended to use firm energy from the storage project powerplants if such energy could be sold at firm power rates." "Firm" is, as you know, a matter of definition. At a meeting in Los Angeles on April 20, 1961, Bureau representatives were asked to give the definition of "firm" applicable here. The answer was: "Any power and energy which can be fitted under the customer's load curve." Pressed, those representatives agreed that power and energy are generated and sold only if it can be fitted under the composite load curve of the customers. They then went on to state that fuel replacement power and energy would be firm in that sense, and specifically referred to the interest of a Colorado-Nebraska-Wyoming group in just such energy. Under such reasoning, any power and energy which could be marketed at any price would be sold rather than assigned to offsetting Hoover impairment.

It may be that the newly added term "firm power rates" may provide the saving grace here. If the Secretary were to substitute for "firm power rates" the expression "6.5 mills at delivery points on the trunk transmission system" the intent would be made clear.

This principle 5 would, in ultimate effect, apparently relieve present Hoover allottees of adverse effects from the "filling" of storage project reservoirs, with the cost of such relief to be borne by succeeding generations of Hoover contractors, and at the expense of extending the Hoover payout period. Arizona fully expects to be one of the future contractors, so the relief held out is for an interim period at best. And there is no assurance that the Secretary is in fact authorized to offer even this interim relief by prolongation of the Hoover payout period.

Principle 6

No comment.

Principle 7

The language of this principle provides that Hoover kilowatt capacity will not be impaired while Glen Canyon is developing dead storage. This Arizona believes most important, for while kilowatt-hours are apparently available in lieu of Hoover generation, lieu kilowatt capacity will in all probability not be available from other Arizona generating sources.

Principle 8

Principle 8 would apparently permit Lake Mead to fall below Hoover rated head level once Glen Canyon has developed dead storage. Two things happen if Lake Mead falls below that level. Kilowatt capacity of the powerplant becomes impaired, and maintenance and replacement costs, particularly of the hydraulic turbines, rise sharply.

Glen Canyon, Flaming Gorge, and Curecanti could provide the lieu kilowatts not available for purchase in Arizona, but Commissioner

Dominy's communication to the Secretary makes it plain that the offsetting of Hoover impairment in kilowatt-hours and kilowatts has a second priority, at best, on Glen Canyon, Flaming Gorge, and Curecanti output. Arizona will be heard to insist that the offsetting of Hoover impairment must have first priority on that output to the extent that the Secretary cannot find lieu kilowatt-hours and kilowatts for purchase.

Arizona will seek assurance of relief from extraordinary maintenance and replacement costs arising out of the Secretary's operating Hoover at less than rated head through exercise of his discretion.

The coordination and integration of Lake Powell above elevation 3,490 and Lake Mead above rated head level (which we believe to be the intent) toward production of the greatest practical amount of power and energy is a worthy purpose which Arizona can endorse. Such coordination and integration implies inevitably the subordination of one or the other of the powerplants from time to time in the interest of achieving that maximum. This principle should be extended to provide for the free flow of credits and debits between the two plants so that both would assuredly share in the benefits of such coordination and integration.

Principle 9

No comment.

Principle 10

No comment.

Parker and Davis

The impact of storage project operations upon Parker and Davis receives no attention in Secretary Udall's proposals. Arizona accepts as inevitable a diminution in their output as a result of storage project filling operations. Unless relief is provided, rates must increase. Arizona holds that Parker and Davis are just as distinct from the storage project as though they were under another agency of Government, or private enterprises, and that the Secretary of the Interior has not the discretion to subordinate their payout (at the expense of their customers) to the uncertain rights of another project. Accordingly, we have continually urged the Bureau to recognize the Parker-Davis problem, and will continue to do so.

Your recognizing our interest in these matters is appreciated. We assure you, again, of our willingness to work constructively with the Bureau in the development of fair solutions to its problems.

ARIZONA INTERSTATE STREAM COMMISSION,
Phoenix, Ariz., August 3, 1961.

Hon. CARL HAYDEN,
U.S. Senate, Washington, D.C.

MY DEAR SENATOR HAYDEN: Under date of July 13, you requested our comments on a memorandum from the Commissioner of Reclamation to the Secretary of the Interior dated June 13, 1961, on the subject of "General Principles To Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake

Powell Filling Period." The comments of the Arizona Power Authority were similarly requested and the staff of the authority has afforded us an opportunity to read a draft of its proposed comments.

Ever since receipt of your letter, key members of our staff have been and, contrary to our expectations, still are, engaged in the final stages of the preparation of Arizona's answering brief in *Arizona* v. *California, et al.*, and could not be detached to review the referenced materials. Accordingly, although our interest in the subject continues unabated and notwithstanding that we shall continue to participate in negotiations and conferences regarding them, we are unable at this time to comment in detail on these filling criteria.

The stream commission is vitally interested in the physical, legal, and economic availability of Colorado River water for utilization in Arizona and the impact thereon of policies to govern the filling and operation of the Glen Canyon Reservoir. It is, of course, essential that criteria, either filling or operating, shall accord with the law of the river, a subject upon which the criteria under discussion are notably silent. It is essential also that they shall have regard for the future development of the basin's last water resource.

As negotiations looking to the development of criteria to govern releases from the Glen Canyon Reservoir have progressed, they have veered away from long-range considerations. The criteria under discussion are concentrated upon problems of hydroelectric power and of compensation for loss of hydropower production during the filling period.

We are deeply concerned over this fact and believe that every effort should be made to return to the objective of long-range operation criteria.

Sincerely yours,

WAYNE M. AKIN, *Chairman.*

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., July 14, 1961.

HON. STEWART L. UDALL,
Secretary of the Interior,
Washington, D.C.

DEAR STEWART: I am transmitting herewith, as you requested, my reaction to the proposed filling criteria for the Glen Canyon Reservoir.

The criticism is intended to be entirely constructive, and I want you to know that I do understand the difficulty in which you and the Bureau of Reclamation are placed in this particular matter.

Whatever your final decisions are, I shall do my very best to be helpful and to see that the program is carried out without unnecessary delay and hindrance.

Again, my appreciation to you.

Sincerely,

WAYNE N. ASPINALL.

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
OFFICE OF THE CHAIRMAN,
Washington, D.C., July 18, 1961.

Hon. STEWART L. UDALL,
Secretary of the Interior,
Department of the Interior, Washington, D.C.

DEAR MR. SECRETARY: This letter is in reply to yours of June 13, 1961, requesting my views with reference to a recommendation that you have received from Mr. Floyd E. Dominy, Commissioner of Reclamation, concerning the operation of Glen Canyon Dam and Reservoir during the initial filling period.

I appreciate your courtesy in permitting me to review the proposed criteria. While I am highly critical of some portions of the proposed criteria, I fully appreciate the complexities of the problem that the forthcoming operation of the Glen Canyon Reservoir poses for your Department. I shall therefore attempt to analyze the criteria in terms of constructive criticism. As Commissioner Dominy stated in his letter of June 13, 1961, the fundamental objections of the upper basin States are to the proposed principle No. 5. This principle requires the United States, through the Department of the Interior, to reimburse Hoover Dam power contractors for so-called power "deficiencies" in Hoover generation at the expense of the Upper Colorado River Basin fund. This point was comprehensively discussed in memorandums of March 20 and April 12, 1961, by Mr. Ival V. Goslin to Under Secretary James K. Carr.

The fundamental guidelines to be followed in this case are contained in the Colorado River compact of 1922. There is nothing in that compact nor in any subsequent compact or act of Congress that places a power delivery servitude on the upper basin in favor of lower basin power contractors.

At a hearing held in Washington, D.C., on April 8, 1941, with Secretary Ickes presiding, Mr. James H. Howard, general counsel, Metropolitan Water District of Southern California and chairman of Conference of Power Contractors, spoke at some length regarding the relation of kilowatt-hours of firm energy to the amortization period, extracted as follows:

"* * * No one asked the United States to 'guarantee' the presence of water in the required amount [to produce defined firm energy]. *That would be obviously absurd.*" [Italic supplied.]

"* * * To agree to pay for the works * * * regardless of the amount of energy actually delivered was not considered good business, particularly in view of the fact *that upstream diversions*, which might contribute to the reduction in firm energy, were not within the control of the power contractors." [Italic supplied.]

I am therefore in disagreement with the premise that the United States is under any obligation to supply a fixed amount of energy to Hoover Dam at the expense of the upper basin fund. Such presumption, as above noted, was correctly described by the power contractors as "obviously absurd" at the very inception of their contractual relationships with the United States.

As you know, I am one of the authors of the Colorado River Storage Project Act. The purposes of the act and the allocations of revenues accruing to the basin fund therein established are fully self-explana-

tory. It comes as a shock to me that there is now a proposal to divert either revenues or energy for purposes completely alien to the expressed intention of the act. I cannot believe that such authority is vested in your office in view of the fact that the exercise of discretion must be predicated upon a legal proposition, and the Supreme Court has said that an administrative official must have the bounds and limits of his actions established.

The proposed criteria attempt to provide some reimbursement to the upper basin fund. The suggested return, however, is relatively minor and does not recognize that the diversion of energy from the upper basin powerplants, whether firm or nonfirm, has exactly the same effect as the diversion of dollars from the basin fund. Neither does the suggested reimbursement to the basin fund recognize that the diversion of either upper basin revenues or energy creates a further substantial drain on the fund due to the added interest charges caused by the postponement of the return to the U.S. Treasury of the capital investment in interest-bearing allocations.

The proposed filling criteria provide a guarantee of energy to the Hoover power contractors but do not guarantee even partial reimbursement to the upper basin fund for the costs of making up Hoover power diminutions. I am assuming that you have consulted your Solicitor and have been advised by him that the Secretary under the terms of the Boulder Canyon Project Act or Boulder Canyon Project Adjustment Act does not have the authority to adjust Hoover power rates or defer beyond 1987 the amortization of Hoover Dam costs for the purpose of meeting the Hoover firm power contract deficiencies that might be caused by the Colorado River storage project; and, further, that Congress has reserved unto itself the right to say how Hoover power revenues shall be used after 1987 making it impossible for the Secretary to do anything more about a guarantee to the upper basin at this time than to declare his intent in the "additional regulation No. 1" appended to the proposed criteria. If this assumption is correct, it is clearly evident that in order to implement the criteria, i.e., to carry out the intent to reimburse the upper basin fund, congressional legislation will be necessary.

Mr. Dominy mentioned in his letter to you that suggestions have been made that the Colorado River development fund be used to pay for Hoover power diminutions during the reservoir filling period. The use of this fund was also discussed in the Goslin memo of April 12, 1961, to Under Secretary Carr. This proposal should be given serious consideration. The CRD fund was originally created by the Boulder Canyon Project Adjustment Act, section 2(d). It results from the transfer of $500,000 annually of Hoover power revenues to a special fund in the Treasury authorized to be appropriated by the Congress for project investigations and construction. For the years of operation ending in 1956 to 1987, inclusive, the CRD fund is earmarked for the investigation and construction of projects in and equitably distributed among the States of the upper division and the States of the lower division. Under present procedure it is necessary to request the Congress to appropriate money accrued in the CRD fund before that money can be used. If agreement among the seven basin States can be reached to change the use of the CRD fund and congressional authority therefor obtained, the following would be accomplished:

(*a*) Authorization for the Secretary to look elsewhere (to Hoover revenues) rather than to the upper basin for a source of

revenues or energy with which to fulfill his Hoover power contracts;

(*b*) Elimination of the concept of principle No. 5 of the proposed criteria to which the upper basin objects; and

(*c*) Payment for the Hoover generating diminutions on a current (or almost current) basis, time preventing the accrual of increased interest charges against Glen Canyon.

It has been suggested that the $500,000 per year from the CRD fund might be used by the Secretary either to directly make the necessary replacement energy purchases or to reimburse the upper basin fund for money diverted for making up Hoover generation diminutions. Since the Bureau proposes disregarding the return of the interest cost to the upper basin fund when funds are diverted therefrom, it would be better to allow the Secretary to stay completely away from the upper basin fund in paying for Hoover power diminutions and use the CRD fund for direct purchase of replacement energy. In this manner the added interest burden to the upper basin fund would be eliminated.

Disregarding for the moment the interest charges on the balances remaining annually of the cost of replacement energy and assuming the costs of nonfirm replacement energy and dollar charges that the Bureau of Reclamation used in its Financial and Power Rate Analysis, September 1960 (same as referred to in the Dominy letter) the CRD fund could be applied as follows:

Year	Nonfirm energy cost	Other energy purchases	Total dollars needed	From Colorado River development fund	Balance
1963		$875,000	$875,000	$500,000	$375,000
1964	$50,000	875,000	923,000	500,000	800,000
1965	2,052,000		2,052,000	500,000	2,352,000
1966	1,247,000		1,247,000	500,000	3,099,000
1967	565,000		565,000	500,000	3,164,000
1968				500,000	2,664,000
1969				500,000	2,164,000
1970				500,000	1,664,000
1971				500,000	1,164,000
1972				500,000	664,000
1973				500,000	164,000
1974				164,000	0

I realize, of course, that to change the use of the Colorado River development fund would require congressional amendatory legislation, and that other changes in the Boulder Canyon Project Adjustment Act may be necessary.

In shortening principle No. 8, the indented portion has been omitted, one part of which would have allowed Lake Mead to be drawn to elevation 1,050 after Glen Canyon Reservoir attains elevation 3,490, if necessary, in order to produce the greatest practical amount of power and energy. It is assumed that under the new principle No. 8 this procedure would still be followed because the Dominy letter states, "the principle enunciated has not been changed."

Commissioner Dominy in his letter states that the Bureau of Reclamation approves the idea that the upper basin be represented on a group which will consider the theoretical annual operation of Lake Mead. Representation of the upper basin on such a group is

fine, but in view of the upper basin's interest in the overall operation of the entire Colorado River, the idea does not go far enough. First, the upper basin is interested far beyond the theoretical annual operation of Lake Mead which is largely determined by the application of the filling criteria anyhow. Second, as Mr. Dominy points out, the integration committee for Hoover Dam operations is a contractual body, and representatives of the upper basin are precluded from participation thereon. An informal group consisting of the Hoover integration committee plus upper basin representatives would leave the upper basin without formal, effective status. The upper basin as well as the lower basin is entitled to formal contractual membership on a river operations committee. Amendatory legislation probably would be necessary to accomplish this objective.

Other items about the proposed criteria to which I wish to call your attention are:

(*a*) Mention has been made that the low operating efficiency at Hoover Dam should be corrected or that water released from Hoover should be on the basis of an efficiency ot 83 percent as originally planned when the contracts were made. However, if the Hoover power diminutions are paid from some other source than upper basin energy and/or revenues, or if reimbursement is guaranteed to the upper basin fund, the matter of efficiency at Hoover becomes relatively unimportant insofar as the upper basin is concerned as long as downstream releases of water are controlled.

(*b*) The use of 5 mills for replacement energy has been subject to some question. It is suggested that, if possible, the Bureau of Reclamation should make a firm predetermination of the rate to be paid for replacement energy and explain what it would include.

(*c*) In principle No. 3 the terms "net river losses," "regulatory wastes," and "diversion requirements of mainstream projects" should be defined in terms of legality and limitation. For instances, deliveries of water for these purposes should not include uses for which there are not contracts or water rights, or that are unreasonable, or unaccounted for.

In general, I would say that the Bureau of Reclamation has done as well as can be expected under the circumstances with the current draft of criteria. The fact remains, however, that the criteria provide a guarantee to the lower basin and only an intent to partially reimburse the upper basin, which on the basis of the various compacts, disclaims any responsibility for deficiencies that may occur in power contracts between the Secretary and third parties. It appears that the Bureau has produced a set of criteria within the framework of which there might be involved a choice of important concepts; i.e., payment for Hoover power diminutions without resort to use of the upper basin fund or reimbursement to the upper basin fund if it is used. The fundamental weakness lies in the fact that the means of implementing either of these choices is lacking because they would require amendatory legislation by the Congress.

Under average streamflow conditions it appears that the criteria might be used by the Secretary as an interim means of planning and initiating the filling of upper basin reservoirs, but should not be regarded as final. Due to the need for legislation to implement certain

important parts of the criteria discussed above it is suggested that you seek agreement among the seven Colorado River Basin States on legislation to make operable and effective the use of the CRD fund or other funds to purchase Hoover replacement energy, or to provide a means of guaranteeing reimbursement to the upper basin fund of moneys diverted therefrom for uses other than the allocations made in the authorizing act which did not contemplate the purchase of energy for Hoover replacement as an operating and maintenance charge at Glen Canyon.

It is recognized by everybody concerned that the real objective now before us is to put the generating facilities at the upper basin reservoirs on the line as rapidly as possible in order to assure the financial feasibility of the Colorado River storage project, conserve water, and make possible the full development of the resources of the Colorado River Basin.

Again, thank you for the opportunity to comment on this important question. If I can be of further assistance in obtaining the necessary legislation to effectuate the filling criteria or in any other capacity please let me know.

Sincerely yours,

WAYNE N. ASPINALL, *Chairman.*

OCTOBER 17, 1961.

CALIFORNIA COMMENTS RE JUNE 13, 1961, PROPOSAL OF COMMISSIONER OF RECLAMATION FOR COLORADO RIVER STORAGE PROJECT FILLING PRINCIPLES AND CRITERIA

(Submitted by Senators Engle and Kuchel)

The following comments are submitted on behalf of the State of California and the California agencies with rights and interests in the use of water and power from the Colorado River with respect to the proposal by the Commissioner of Reclamation entitled "General Principles To Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period" submitted to the Secretary of the Interior by the Commissioner on June 13, 1961, with accompanying memorandum.

The proposal of June 13, 1961, a revision of a draft proposal issued on February 12, 1960, does not provide adequate safeguards and contains certain inequities. For example, it does not give proper recognition to the potential loss of kilowatt capacity at Hoover powerplant. The Hoover power allottees in California have insisted from the beginning of the consideration of the problems involved in the filling of Lake Powell and other upper basin reservoirs, that the protection of generating capacity at Hoover Dam in kilowatts is as essential as the continued delivery of the amounts of electric energy in kilowatt-hours.

Attention is invited to the provision in section 7 of the Colorado River Storage Project Act (Public Law 485; 70 Stat. 105):

> The hydroelectric powerplants and transmission lines authorized by this Act to be constructed, operated, and maintained by the Secretary shall be operated in conjunction with other Federal powerplants, present and potential, so as to produce the greatest practicable amount of power and energy that can be sold at

firm power and energy rates, but in the exercise of the authority hereby granted he shall not affect or interfere with the operation of the provisions of the Colorado River compact, the Upper Colorado River Basin compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and any contract lawfully entered unto under said compacts and Acts.

Recommended herewith are certain revisions considered essential to the proper recognition of the rights and interests of the water and power users of California. Attached hereto is a copy of the Commissioner's proposal of June 13 upon which the revisions urged by the California interests are indicated by striking through the recommended deletions and underlining the recommended additions. The recommended revisions are discussed in the paragraphs which follow, in the order in which they occur.

The title and the first sentence of section 2 are changed to make the proposed principles and criteria apply on an equal basis to all the authorized reservoirs in the Colorado River storage project, not to Lake Powell alone. So far as the effect on the lower basin is concerned there is no distinction between water withheld to fill the Flaming Gorge Reservoir, for example, and water withheld to fill Lake Powell. It appears only reasonable, equitable, and consistent that the filling period and the application of the principles should begin on the date when any one of the Colorado River storage project reservoirs, is first capable of storing water. Such intent is indicated in the eighth paragraph of the Commissioner's memorandum of June 13 and in section 5 of the proposed principles and criteria, but section 2 appears to be inconsistent with section 5.

The second revision is in the middle of section 2 to provide that the application of the principles and criteria shall not end automatically when Lake Powell first attains elevation 3,700, unless at the same time Lake Mead storage is at or above elevation 1,146. It is deemed essential that during and after the filling of Lake Powell to elevation 3,700, a reasonable cushion against adverse runoff conditions be provided by stroage in Lake Mead, in order to assure the full meeting of downstream water requirements and the maintenance of rated head at Hoover powerplant. In addition, it appears that the transition from filling to cyclical operations would be more readily and smoothly achieved if the contents of Lake Mead were at a fairly high level at the start.

The next revision in the last sentence of section 2 is to provide that the Secretary shall not at any time previous to the attaining of elevation 3,700 for the water surface in Lake Powell, declare for any other reason that the principles and criteria are no longer applicable, except upon notice to the affected parties a reasonable period in advance. This is so that the lower basin power and water users may have ample time to appraise the situation which would result from cancellation of the criteria, and opportunity to take such action as appears necessary.

Revisions suggested in sections 3 and 4 of the proposed principles and criteria appear to require no special comment or explanation.

The next revision, in line 9 of section 5, reverses the Commissioner's proposal and states that the effects of evaporation from the surface of the upper basin reservoirs shall be included in computing the total effects of the filling of such reservoirs upon the power capacity and energy generation of the lower basin powerplants. The position of lower basin interests upon this item is set forth in a letter dated October 10, 1960, from A. J. Shaver, chief engineer of the Colorado River

Commission of Nevada, on behalf of the lower basin engineering group to the Commissioner of Reclamation. Evaporation from the Colorado River storage project reservoirs is not related to consumptive uses of water in the upper basin until such time as the holdover storage is actually needed for compliance with article III(d) of the Colorado River compact. Reservoir operation studies indicate and spokesmen for the Reclamation Bureau have stated in the record that such time is far in the future. Presumably, it will not occur until after the upper basin reservoirs are filled for the first time. During the filling period there should be no distinction between water that is withheld and remains in the Colorado River storage project reservoirs and water that evaporates from those reservoirs, so far as the effects upon the lower basin are concerned.

The next revision, in the third sentence of section 5, inserting the words "and at times" after "at points", is made for obvious reasons. In that connection it is recommended that the second full paragraph on page 6 of the Commissioner's memorandum, beginning with "If the allowance is made", be changed to read as follows:

If the allowance is made by delivering energy it is not our intent to force replacement energy on the contractors in those months when downstream releases are generating all or close to all of the energy which they might otherwise have expected to receive. Delivery of the replacement energy will be made in accordance with the same schedule, or at other times acceptable to the contractor, by which each contractor would otherwise have used water for the generation of its allotment of Hoover energy were that water not withheld for filling upper basin reservoirs. By the same token when allowance is made for diminution of energy generation at Hoover powerplant by monetary payment to the contractors, such payments will cover the cost to each contractor of generating replacement the energy under the same schedules and at the same times that the contractor would otherwise have used Hoover water for the generation of that energy. In other words, the monetary payment to each contractor would equal that contractor's replacement cost of generating the energy that would otherwise have been available to the contractor were that water not withheld for filling upper basin reservoirs.

The next revision occurs also in the third sentence of section 5, in the last phrase. The purpose is to provide that monetary compensation to the Hoover power contractors shall cover the cost of securing a substitute supply of capacity a well as a substitute supply of energy. The effects of the filling of the Colorado River storage project reservoirs may impair the capacity of the machines available to the Hoover power contractors as well as the quantities of energy available. This capacity has a real value to the Hoover contractors. They should not be penalized by having to supply substitute capacity at their own expense if the necessity for such substitute capacity is a result of the filling of the Colorado River storage project reservoirs. The compensation for lost energy should cover the full cost of replacement, including related capacity.

According to a recent statement by the Commissioner the primary purpose of the installation of generating unit N–8 in Hoover powerplant, scheduled for completion November 30, 1961, is to permit greater peaking capacity at the plant. The additional generator will not increase the annual energy output. It seems illogical to thus increase the peaking capacity at great expense but at the same time to propose reservoir filling principles that would for the most part

ignore in connection with monetary reinbursement the great value of such peaking capacity to the Hoover power contractors.

The last portion of section 5, concerning reimbursement of the upper basin fund after 1987, is stricken through in the attached revision of the Commissioner's proposal of general principles and criteria. The Hoover power contractors in California are opposed to such a provision as they consider that it would be an unfair penalty against lower basin power users in the future.

It is a well-established principle that if the output of existing powerplants is to be impaired by new developments upstream, the financial burden of such impairment rests on the upstream development. To whatever extent Lake Mead storage may be drawn upon to meet downstream requirements, the storage project will benefit by faster filling of the reservoirs and buildup of power head than could otherwise occur.

Section 8 of the proposed principles is revised to include a provision that any water stored in Lake Powell above minimum power pool shall be subject to release to maintain rated head on Hoover powerplant. It is considered imperative that insofar as practicable the kilowatt capacity at the Hoover powerplant be unimpaired by reason of the filling of the storage project reservoirs.

Suggested revisions in the proposed principles and criteria not specifically mentioned or discussed herein are considered self-explanatory.

In addition to the change recommended above, other corollary changes should be made in the Commissioner's memorandum of June 13, 1961, to the Secretary in accordance with the revisions of the actual principles and criteria.

No statement of general principles and criteria can possibly cover all contingencies. It is realized that many of the details of the actual operation of the reservoirs during the period of filling of the Colorado River storage project reservoirs must be left to the discretion of the Secretary of the Interior and his advisers. Additional criteria and more specific operating rules no doubt will be formulated and applied as the procedure evolves. To this end it is recommended and strongly urged that the Secretary in conjunction with the announcement of proposed principles and criteria also provide definite and specific arrangements for the formation of a working committee to collaborate with the Secretary in resolving the problems that are bound to arise and in devising and enforcing specific operating rules to insure that the daily, monthly, and yearly operation of the reservoirs will lead to full observance of the general principles and correct application of the fundamental criteria. Such a committee should include representation of the lower basin water users as well as the power contractors, and the water users and power contractors should be given an effective voice in the decisions to be reached by the Secretary in consultation with the committee. Congressional authorization for constitution of such a committee is desirable. An adequate gaging program to obtain the required information on streamflow, storage, and use would be fundamental to the deliberations of such a committee.

GENERAL PRINCIPLES TO GOVERN *FILLING OF COLORADO RIVER STORAGE PROJECT RESERVOIRS*, AND OPERATING CRITERIA FOR, GLEN CANYON RESERVOIR (LAKE POWELL) AND LAKE MEAD DURING THE [LAKE POWELL] FILLING PERIOD

(Additions in italic; deletions in black brackets)

1. The following principles and criteria are based on the exercise, consistent with the Law of the River, of reasonable discretion by the Secretary of the Interior in the operation of the Federal projects involved. The case generally styled "Arizona v. California, et al., No. 9 Original" is in litigation before the Supreme Court of the United States. Anything which is provided for herein is subject to change consistent with whatever rulings are made by the Supreme Court which might affect the principles and criteria herein set out. They may also be subject to change due to future Acts of the Congress.

2. The principles [and criteria] set forth hereinafter are applicable during the *time interval between the date any of the Colorado River Storage Project Reservoirs (Lake Powell and Flaming Gorge, Navajo and Curecanti Reservoirs)* [Lake Powell filling period, which is defined as that time interval between the date Lake Powell] is first capable of storing water [(estimated to occur in the fall of 1962 or the spring of 1963)] and the date Lake Powell storage first attains elevation 3,700 (content 28.0 MAF total surface storage) *and Lake Mead storage is simultaneously at or above elevation 1146 (content 17.0 MAF available surface storage)*, or May 31, 1987, whichever occurs first. If, in the judgment of the Secretary, the contents of Lake Powell and Lake Mead warrant *or will warrant* such action, and after consultation with appropriate interests of the Upper Colorado River Basin and the Lower Colorado River Basin, the Secretary may declare *that in not less than 2 years from and after the date of such declaration* these principles and criteria *are* no longer applicable.

3. Sufficient water will be passed through or released from either *or both* Lake Mead *and* [or] Lake Powell, as circumstances require under the provisions of principles 7 and 8 hereof, to satisfy downstream uses of water (other than for power) below Hoover Dam which uses include the following:

a. Net river losses.

b. Net reservoir losses.

c. Regulatory wastes.

d. The Mexican Treaty obligation limited to a scheduled 1.5 million acre-feet per year.

e. The diversion requirements of mainstream projects in the United States.

4. All uses *or losses* of water from the main stem of the Colorado River between Glen Canyon Dam and *Hoover Dam* [Lake Mead] will be met by releases from or water passed through Lake Powell *and/*or by tributary inflow occurring below Glen Canyon Dam. Diversions of water directly out of Lake Mead will be met in a similar manner or, if application of the criteria of Principles 7 and 8 hereof should so require, by water stored in Lake Mead.

5. The United States will make a fair allowance for any deficiency, computed by the method herein set forth, in firm energy generation at Hoover Power Plant. For each operating year deficiency in firm energy shall be computed as the difference between firm energy which,

assuming an over-all efficiency of 83 percent, would have been generated and delivered at transmission voltage at Hoover Power Plant in that year if water had not been impounded in the reservoirs of the Colorado River Storage Project storage units (Glen Canyon, Flaming Gorge, Navajo and Curecanti), [but excluding] *including* the effects of evaporation from the surface of such reservoirs, and the energy actually generated and delivered at transmission voltage at Hoover Power Plant during that year adjusted to reflect an over-all efficiency of 83 percent. At the discretion of the Secretary, allowance will be accomplished by the United States delivering energy, either at Hoover Power Plant or at points *and at times* acceptable to both the Secretary and the affected Hoover power contractors, or monetarily in an amount equal to the *replacement* incremental cost of *securing a* substitute *supply of capacity and* energy. [To the extent the Upper Colorado River Basin Fund is utilized the moneys expended therefrom in accomplishing the allowance, either through the delivery of purchased energy or by direct monetary payments, shall be reimbursed to said Fund from the Separate Fund identified in Sec. 5 of the Act of December 21, 1928 (45 Stat. 1057), to the extent such reimbursement is consistent with the expenditures Congress may authorize from said Separate Fund pursuant to said Act. The attached Additional Regulation No. 1 for Generation and Sale of Power in accordance with the Boulder Canyon Project Adjustment Act is hereby made a part of these principles and criteria.]

6. In accomplishing the foregoing, Lake Powell will be operated in general accordance with the provisions of Principles 7 and 8.

7. Storage capacity in Lake Powell to elevation 3,490 (6.5 million acre-feet surface storage) shall be obtained at the earliest practicable time in accordance with the following procedure:

Until elevation 3,490 is first reached, any water stored in Lake Powell shall be available to maintain rated head on Hoover Power Plant. When stored water in Lake Powell has reached elevation 3,490, it will not be subject to release or diminution below elevation 3,490. The obtaining of this storage level in Lake Powell will be in such manner as not to cause Lake Mead to be drawn down below elevation 1,123 (14.5 million acre-feet available surface storage), which corresponds to rated head on the Hoover Power Plant. In the process of gaining storage to elevation 3,490, the release from Glen Canyon Dam shall not be less than 1.0 million acre-feet per year and 1,000 cubic feet per second, as long as inflow and storage will permit.

8. The operation of Lake Powell above elevation 3,490 and Lake Mead will be coordinated and integrated so as to produce the greatest practical amount of power and energy. *Any water stored in Lake Powell above elevation 3,490 shall be subject to release to maintain rated head on Hoover Power Plant.* In view of the provision for allowance set forth in Principle 5 hereof, the quantity of water released through each power plant will be determined by the Secretary in a manner appropriate to meet the filling criteria.

9. In general, it is not anticipated that secondary energy will be generated at Hoover during the filling period. However, any secondary energy, as defined in the Hoover contracts, which may be generated and delivered at transmission voltage at Hoover Power Plant will be disposed of under the terms of such contracts.

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10. In the annual application of the flood control regulations to the operation of Lake Mead, recognition shall be given to available capacity in upstream reservoirs.

COLORADO RIVER COMMISSION OF NEVADA,
Las Vegas, Nev., January 3, 1962.

Hon. STEWART L. UDALL,
Secretary of the Interior, Washington, D.C.

MY DEAR MR. SECRETARY: We have at hand a copy of the June 1961 "General Principles To Govern, and Operating Criteria for, Glen Canyon Reservoir (Lake Powell) and Lake Mead During the Lake Powell Filling Period." It is our understanding that the Secretary of the Interior will be interested in comments thereon from the interested parties.

The Colorado River Commission of Nevada, a party to the lower basin engineering group, which has made studies and previously offered comments on the proposed "filling criteria," offers these further comments, commenting only upon those paragraphs which, in our opinion, are subject to revisions:

Section 2: As presently written these criteria apply only to the Lake Powell filling. We suggest that these principles apply during the period defined as the interval when any Colorado River storage project reservoir is capable of storing water and the date on which Lake Powell storage attains an elevation of 3,700 feet, with Lake Mead elevation simultaneously at or above 1,146 feet, or May 31, 1987, whichever occurs first. We believe it was the intent of the Commissioner of Reclamation to apply these principles at the date of the capability of any of the Colorado River storage project reservoirs to store water as indicated in his comments of June 13, and as appear in section 5 of the criteria. Sections 2 and 5 are inconsistent in this respect.

Section 5: The position of the lower basin group, on the item of "evaporation" is set forth in a letter from A. J. Shaver, on behalf of the lower basin engineering group, dated October 10, 1960. We believe that evaporation during the filling period is part and parcel of the total reduction of flow to the lower basin.

Further in section 5, provision is made for the Secretary to make fair allowance for any deficiency in firm energy in Hoover powerplant, either in replacement energy or monetarily. In either event, this replacement should be in accordance with the Hoover contractor's schedule, and at times and in amounts that would have been available to the contractor had water not been withheld in the Colorado River storage project reservoirs.

Nevada must insist also in the recognition of capacity rights in Hoover powerplant, and to storage in Lake Mead to protect those rights. Generating unit N–8, assigned to the State of Nevada, is now producing capacity and energy for the State, The Commissioner recognizes that the installation of this unit, at a rating of 95,000 kilowatts, permits greater peaking capacity, but does not increase the total annual energy delivery to the State. We cannot logically accept criteria that do not consider the value of this peaking capacity unless reimbursement is made in capacity deficiencies as well as in energy deficiencies.

We cannot agree with the theory of reimbursement to the upper basin fund after 1987, at the expense of the Hoover power contractors, as we consider this a penalty imposed against the future power use of the Hoover contractors.

Section 8: We feel that this provision should provide for releases from Colorado River storage project reservoirs to provide for the maintenance of rated head on Hoover powerplant (storage in Lake Mead), so that the capacity of the Hoover units is unimpaired.

May we ask your earnest consideration of these comments and suggestions.

Very truly yours,

A. J. SHAVER, *Chief Engineer.*

COMMENTS ON HANDLING OF EVAPORATION FROM COLORADO RIVER STORAGE PROJECT RESERVOIRS IN COMPUTING DEFICIENCY IN HOOVER BASIC FIRM ENERGY GENERATION

AUGUST 26, 1960.

MR. IVAL GOSLIN,
Chairman, Engineering Committee,
Upper Colorado River Commission,
Salt Lake City, Utah.

DEAR MR. GOSLIN: On February 10, 1960, the Department issued proposed principles and operating criteria to govern filling of Glen Canyon Reservoir, the principal storage reservoir of the Colorado River storage project. Accompanying the proposed principles was a memorandum of explanation to the Secretary of the Interior from the Commissioner of Reclamation dated January 18, 1960.

In accordance with the Commissioner's recommendations, a series of meetings were held with representatives of the Lower and the Upper Colorado River Basin interests to explain the proposed principles and to receive the reactions thereto. Oral comments and suggestions for modification of the proposed principles were received at meetings held in Las Vegas, Nev., March 1960; in Los Angeles, Calif., May 1960; and in Boulder City, Nev., June 1960.

Written comments from the Upper Colorado River Commission were received by letter dated July 21, 1960, copies of which we understand have been made available to the lower basin interests.

I am encouraged by the cooperative spirit that has prevailed at these meetings and by the clearer understanding of the complexities and difficulties inherent in establishing principles and operating criteria that will provide a reasonable measure of equity to all concerned. Although the problems raised are difficult they are not insurmountable, and I am confident that with the continued cooperation of the various basin interests they can be resolved.

At the Boulder City, Nev., meeting it was suggested that the comments from the various interests be reviewed by the Bureau of Reclamation and a revised draft of general principles be prepared for consideration by the basin interests for review and discussion before the principles are prepared in final form. Pursuant to this suggestion representatives of the Bureau and of the Solicitor's Office of the Department of the Interior are now reviewing the proposed principles and operating criteria in light of the comments and suggestions received.

In formulating the proposed principles and operating criteria and in considering possible modifications thereto, our basic objective has been to secure a practical approach to the problems of filling Lake Powell, as distinguished from what might be considered a legalistic approach involving an attempt to establish principles and operating criteria on the basis of conclusions as to the perimeter of legal rights and obligations, with the consequent hazards which would attend such an approach. Consequently, we believe that irrespective of what might or might not be conceived by any party as the outer measure of its rights or obligations, the principles and operating criteria should be so framed that their application through a reasonable exercise of Secretarial discretion will result in equity to all concerned. On this basis it was proposed that a fair allowance be made for any deficiency in basic firm energy generation at Hoover powerplant resulting from the filling of the storage unit reservoirs.

At the Boulder City meeting representatives of the upper basin expressed, particularly, concern over the contemplated inclusion of evaporation from the storage unit reservoirs as a part of the reconstructed streamflow (i.e., the theoretical flow absent upstream storage unit reservoirs) used in the formula for computing allowance for deficiency in firm energy generation at Hoover powerplant during the filling period. Other than this general statement of position on the part of upper basin interests, we do not have the detailed views of any basin group on this specific point. Keeping in mind the observations made in the preceding paragraph, it would be helpful to us in further consideration of possible modification of the proposed principles and operating criteria to have a more detailed statement from the upper basin engineering committee containing its views as to the proper handling of evaporation losses in the determination of allowance to be made for deficiency in firm energy generation at Hoover powerplant. A similar request is being made to the lower basin engineering group.

Upon receipt of these views we hope to complete a tentative revision of the proposed principles and operating criteria for submittal to the Colorado River Basin interests for their consideration and comment prior to recommending to the Secretary adoption of final principles and operating criteria for the filling of the storage unit reservoirs.

Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

UPPER COLORADO RIVER COMMISSION,
Salt Lake City, Utah, January 27, 1961.

Hon. FLOYD E. DOMINY,
Commissioner, Bureau of Reclamation,
Department of the Interior, Washington, D.C.

DEAR COMMISSIONER DOMINY: In your letter of August 26, 1960, you requested that we provide a more detailed statement of our views as to the proper handling of evaporation losses in the determination of allowance to be made for deficiency in firm energy generation at Hoover powerplant. Our engineering committee has had the question of evaporation under study. At our recent meeting on January 9, which was attended by engineers from your staff, the matter was discussed in some detail.

We wish to make it clear, as was done at the Boulder City meeting, that our expression of concern over the inclusion of evaporation from storage project units was cited, not only to call attention to that specific problem, but also to indicate that the upper basin had objections to the proposed "general principles" of January 1960. At Boulder City we did not wish to leave the impression that we were agreeing to the "general principles" by our silence. Likewise, by this reply to your August 26 letter, which is concerned with the evaporation question exclusively, we do not intend to imply that we have no other objections to the proposed "general principles" of January 1960.

Evaporation from upper basin reservoirs should not be included in the reconstructed inflow to Lake Mead that is used in computing the so-called "basic firm" energy and deficiencies in Hoover powerplant generation.

It is a well-documented fact that long-time holdover storage of water in the upper basin is mandatory if the upper basin is to be able to develop the consumptive use of water that has been apportioned to it. There is no doubt in anyone's mind that the negotiators of the pertinent compacts and other documents constituting the "law of the river" recognized this condition and contemplated the storage of water upstream from Lee Ferry. The evaporation from storage units is to be regarded as a diminution of water supply associated with the necessity to store water for consumptive-use purposes in the upper basin. In a sense it is a necessary cost of doing business similar to the cost of snow removal being a necessity cost of providing public transportation. The situation with respect to upper basin reservoirs is no different from that with respect to lower basin reservoirs. Those reservoirs evaporate water, too, and diminish the water supply.

There is no more reason to include evaporation from upper basin storage units in reconstructing the inflow to Lake Mead for the computation of "basic firm" energy than there is for including the water consumptively used by the upper basin participating projects of Public Law 485, or by all of the upstream projects and reservoirs. You would agree that to include these latter mentioned items would be nothing short of ridiculous. In other words, there is no more reason to reconstruct the inflow to partially virgin-flow conditions for the benefit of Hoover powerplants than there is to reconstruct it to absolute virgin-flow conditions.

If upper basin evaporation is to be included in the theoretical Lake Mead inflow, the salvage of water due to the reduction of river losses resulting from the operation of the storage units and additional consumptive-uses in the upper basin should also be considered. This salvage would be substantial during the initial filling period under the proposed general principles.

It should be apparent that our objections to the inclusion of evaporation in the reconstructed inflow are aimed at the principle involved rather than at the amount of water or the magnitude of the additional deficiency in computed Hoover power generation. By the inclusion of evaporation in the inflow, Glen Canyon is forced to pay a penalty for power not generated at Hoover and is also required under the proposed criteria to furnish water during the filling period that is evaporated from the lower basin reservoirs. We fail to see the equity in penalizing the upper basin for exercising a right that belongs to it, the right to store water necessary for its development. It certainly must

have been the intention of the Colorado River compact negotiators to provide equality of opportunity to develop in both basins as well as to protect the deferment of that opportunity in the upper basin.

Perhaps our objection to the method of handling evaporation from upper basin reservoirs should be directed to the definition of "basic firm" of the "general principles" instead of to the method of computation set forth at the Boulder City meeting. If this be the case, "basic firm" should be redefined.

At the January 9, 1961, meeting of Bureau engineers and our committee, the argument was expressed that because all studies made by the engineers representing the Bureau, the lower basin and the upper basin have included evaporation from upper basin reservoirs in the computed inflow to Lake Mead, the reservoir filling criteria should also have the evaporated water included. This line of reasoning is without both foundation and logic. In the first place our office has made studies in which the evaporated water was excluded, and the results of these studies were forwarded to your office. Secondly, at no time has it been intended that the use of any of the basic data constituted an admission of fact. In the very beginning it was emphasized time after time that the studies were to be made for the purpose of determining the relative magnitudes of the effects of various assumed criteria, or, as graphically expressed by one of the Bureau's capable engineers, "to determine the size of the critter."

It was agreed that the same basic data would be used by all engineers in order to have the studies on a comparable basis. The following statement appears on page 8 of the status report "Glen Canyon Filling Studies, March 1959," prepared by the engineering group representing Arizona, Nevada, California, and the Bureau of Reclamation: "The first meeting of the group was devoted to discussing and agreeing upon the basic data and assumptions to be applied in the group studies, in order to provide a greater degree of comparability than was possible in some of the preliminary studies performed separately by the different parties. In all the studies discussed in detail herein the same basic data and assumptions were used. Therefore, results although not absolute owing to inherent limitations in this type of study and in the basic data and assumptions, are comparable and can be used to appraise the advantages and disadvantages of the various filling principles investigated."

Sincerely yours,

IVAL V. GOSLIN,
Chairman, Engineering Committee.

COLORADO RIVER COMMISSION OF NEVADA,
Las Vegas, Nev., October 10, 1960.

MR. FLOYD E. DOMINY,
Commissioner, Bureau of Reclamation,
Department of the Interior, Washington, D.C.

DEAR MR. DOMINY: Your letter of August 26 addressed to me as chairman of the Colorado River Lower Basin Engineering Group has been reviewed by representatives of the group, particularly with respect to a statement regarding evaporation losses as requested in the third paragraph on page 2.

Paragraph 5 of the filling criteria of January 18, 1960, states, in part, that "* * * deficiency in firm energy shall be computed as the difference between firm energy which, assuming an overall efficiency of 83 percent, would have been generated * * * at Hoover powerplant in that year *if Glen Canyon had not been on the river* and the energy actually generated * * * during that year adjusted to reflect an overall efficiency of 83 percent." [italics added.]

The memorandum of January 18, accompanying the proposed criteria (p. 4), allows for computing deficiencies in Hoover generation which might be caused "* * * by Glen Canyon being on the river." Page 6 refers to Hoover basic firm as that generation which would be produced "without Glen Canyon on the river."

It is the position of the lower basin engineering group that the actual reduction in water supply available for energy generation at Hoover, during the filling period, will amount to the quantity withheld in the Colorado River storage project reservoirs regardless of whether the total quantity remains in storage or is in part lost by evaporation. The evaporation is part and parcel of such total reduction.

It is our understanding that evaporation losses are a part of the formula upon which the Secretary would compute these deficiencies.

Very truly yours,

A. J. SHAVER,
Chairman, Lower Basin Engineering Committee.

SIXTH ANNUAL REPORT

TO

THE CONGRESS OF THE UNITED STATES

COLORADO RIVER STORAGE PROJECT

AND

PARTICIPATING PROJECTS

FOR THE FISCAL YEAR ENDED JUNE 30, 1962

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
BUREAU OF SPORT FISHERIES AND WILDLIFE
NATIONAL PARK SERVICE

COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS

LEGISLATIVE AUTHORIZATION

Colorado River Storage Project and Participating Projects Act of April 11, 1956 (70 Stat. 105), and subsequent legislation.

AUTHORIZED FOR CONSTRUCTION

Storage units

- Curecanti
- Flaming Gorge
- Glen Canyon
- Navajo

Participating projects

- Central Utah (initial phase)
- Emery County
- Florida
- Hammond
- La Barge
- Lyman
- Navajo Indian irrigation
- Paonia
- Pine River extension [1]
- San Juan-Chama
- Seedskadee
- Silt
- Smith Fork

STEWART L. UDALL, Secretary of the Interior
FLOYD E. DOMINY, Commissioner of Reclamation

[1] On Sept. 25, 1959, a recommendation was made to the Congress that construction of this project be deferred indefinitely.

CONTENTS

SIXTH ANNUAL REPORT, COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS

INTRODUCTION

The Colorado River storage project and participating projects were initially authorized by the Congress on April 11, 1956 (70 Stat. 105). This act provided for the basinwide development and utilization of the water and land resources of the Upper Colorado River Basin. The authorized facilities will result in control of the flows of the Upper Colorado River in large reservoirs, will produce sizable blocks of hydroelectric power, will bring about irrigation of lands from upper basin tributary streams, and will supply water for municipal and industrial use.

Construction of the project by the Bureau of Reclamation began in 1956 on Glen Canyon Dam, and in 1958 on Flaming Gorge and Navajo Dams. In following years, construction was started on the Curecanti unit, the transmission system, and on the following participating projects: Emery County, Florida, Hammond, Paonia, Seedskadee, Smith Fork, and the Vernal unit of the central Utah project.

Fiscal year 1962 heralds three significant events in the development of the project. First, the substantial completion of the Paonia participating project in western Colorado. Second, the receipt of the first operating revenues from the sale of water on the Navajo storage unit in New Mexico. Third, authorization on June 13, 1962, by Public Law 87-483 of the Navajo Indian irrigation project and the San Juan-Chama project (initial stage) as participating projects.

Section 6 of the authorizing act stipulates that, on January 1 of each year, the Secretary of the Interior shall report to Congress for the previous fiscal year:

(1) Status of revenues from; and

(2) Cost of constructing, operating, and maintaining the Colorado River storage project and participating projects (hereinafter referred to as the "project").

The report is to be prepared so as to reflect accurately the—

(3) Federal investment allocated at that time to power, to irrigation, and to other purposes;

(4) Progress of return and repayment thereon; and

(5) Estimated rate of progress, year by year, in accomplishing full repayment.

Because of the nature of project activities during the fiscal year, this sixth annual report deals primarily with construction progress to June 30, 1962, and only limited comments are furnished with respect to the remaining items required to be reported upon.

1. Status of Revenues

Revenues received during fiscal year 1962 amounted to $6,529. Of this amount, $3,025 represents operating revenues from the sale of water from the Navajo storage unit under short-term water sales contracts, and $3,504 was collected from miscellaneous sources.

Total revenues to June 30, 1962, amount to $46,389 and were derived from the following sources:

Operating revenues: Sale of water	$3,025
Nonoperating revenues:	
Lease of land for grazing and agricultural use	31,765
Miscellaneous	11,599
Total	46,389

2. Cost of Constructing, Operating, and Maintaining the Project

The cost of constructing the project to June 30, 1962, is reflected in the following attached financial exhibits:

Exhibit A—Comparative balance sheets at June 30, 1962, and June 30, 1961.

Exhibit B—Statement of source and application of funds and other credits as of June 30, 1962.

Exhibit A sets forth comparatively the financial condition of the project at June 30, 1962, and June 30, 1961. The cumulative funds and other credits available to the project at June 30, 1962, and the manner in which such funds and credits were used or applied are set forth on exhibit B.

Activities during fiscal year 1962 were directed mainly to construction work on the storage project units, the transmission system, and on the Emery County, Florida, Hammond, Seedskadee, Smith Fork, Paonia, and Vernal unit participating projects. In addition, advance planning continued on the Crystal Dam, Reservoir, and powerplant of the Curecanti storage unit, and on the central Utah, La Barge, Lyman, and Silt participating projects. Costs incurred for these activities constitute the principal items of cost of constructing the project to June 30, 1962, and are summarized as follows:

Activity:	*Cost to date*
Construction work in progress	$278,240,521
Completed plant in service	7,423,214
Service facilities	14,776,879
Investigation costs (undistributed advance planning)	5,299,824
Total	305,740,438

Details with respect to the foregoing, identified by project or activity, are shown respectively on schedules Nos. 1, 2, 3, and 4, attached.

Highlights of certain of the major activities are set forth in the following paragraphs:

CURECANTI STORAGE UNIT, COLORADO

Construction work continued on the relocation of segments of U.S. Highway 50 and Colorado State Highway 92 to bypass the Blue Mesa Reservoir site. The prime contract for construction of the Blue Mesa Dam, powerplant, and switchyard was awarded in April 1962 for $13,706,230. In addition, contracts were awarded for construction of

temporary field office, laboratory, warehouse, and garage buildings. Surveys and preparation of designs are underway for the Morrow Point Dam, powerplant, and switchyard. The prime contract for the Morrow Point Dam will be awarded in the spring of 1963.

FLAMING GORGE STORAGE UNIT, UTAH

Construction of the concrete arch dam on the upper Green River in Utah is 82 percent complete, and by November 1962 the dam will be "topped out" at a height of 502 feet above bedrock. A separate contract was awarded in February 1962 for completion of the powerplant and switchyard. Fabrication of powerplant turbines and generators was well underway with the turbines 64 percent complete and generators 55 percent complete. Closure of the single diversion tunnel will be accomplished in the fall of 1962, and filling of the 91-mile-long reservoir will begin. The first of the three power-generating units is expected to be placed on the line in September 1963. The remaining two units will be in service by March 1964. The powerplant will have a total generating capacity of 108,000 kilowatts.

GLEN CANYON STORAGE UNIT, ARIZONA

Progress on the $133,793,000 prime contract for construction of the 710-foot-high concrete arch dam and the 900,000-kilowatt powerplant is slightly ahead of schedule with physical completion estimated at 75 percent. Glen Canyon Dam is expected to be completed in March 1964.

The contractor has placed 3.4 million cubic yards of concrete of the total 5.4 million required to complete the dam and appurtenant works. Completion of the powerplant, switchyard, and appurtenant works will be under a separate contract for $7,891,272 awarded in June 1962.

Fabrication of the eight powerplant turbines and generators is 22 percent and 7 percent completed, respectively. According to present plans, initial power generation will begin in June 1964.

Closure of Glen Canyon Dam is scheduled early in 1963.

NAVAJO STORAGE UNIT, NEW MEXICO

Navajo Dam has been under construction for 4 years and is nearing completion at June 30, 1962, with 96 percent of the work completed under the $26,196,000 contract. It is expected that the earthfill dam will be substantially completed in August 1962.

Minor work remains under relocation contracts for relocation of powerlines, county roads, and segments of Denver & Rio Grande Western Railroad around the reservoir area.

Navajo Dam will be the first major feature of the storage unit to be completed. Storage of water in the 35-mile-long reservoir began in June 1962. The impoundment of water at Navajo will be the first at any of the storage units of the Colorado River storage project.

TRANSMISSION DIVISION

Construction of the Flaming Gorge to Green Mountain 138-kilovolt transmission lines continued during the year and was 95 percent complete at June 30, 1962. Work was started on the Glen Canyon-Shiprock 230-kilovolt transmission line, the Morrow Point-Curecanti

230-kilovolt line, and the Gunnison-Blue Mesa-Curecanti-Montrose 115-kilovolt transmission line. A contract was awarded in April 1962 for construction of the Vernal substation with completion scheduled for June 1963. Construction contracts were awarded in fiscal year 1962 for the construction of the Glen Canyon-Pinnacle Peak 345-kilovolt line, the Shiprock-Cortez-Curecanti 230-kilovolt line, and the Curecanti-Hayden 230-kilovolt line.

Preconstruction activities are underway on various other transmission lines and interconnection facilities in accordance with the agreements reached with the private utilities and preference customers.

CENTRAL UTAH PARTICIPATING PROJECT, VERNAL UNIT, UTAH

Work on the Steinaker service canal was nearly complete with progress to date estimated at 96 percent. Construction of the Ashley Valley water system is 98 percent complete at June 30, 1962. The earthfill Steinaker Dam, the Fort Thornburgh diversion dam, and the Steinaker feeder canal were all substantially completed in fiscal year 1961.

Irrigation water and municipal water supply will be available from the project works beginning with the 1963 irrigation season.

EMERY COUNTY PARTICIPATING PROJECT, UTAH

Funds were appropriated in fiscal year 1962 to initiate construction activities. Activity during the fiscal year was directed mainly to designs and surveys of project features and the construction of temporary service facilities.

Construction of Joes Valley Dam and Reservoir, the project's main storage facility, is scheduled to begin in fiscal year 1963. Construction of the other major features, including Huntington North Dam and Reservoir, the Swasey diversion dam, about 20 miles of new canals, 10 miles of lining in existing canals, and nearly 25 miles of drains, will follow.

FLORIDA PARTICIPATING PROJECT, COLORADO

Lemon Dam and Reservoir, the major feature of the Florida project, is now under construction, and progress to date is estimated at 40 percent.

A contract for construction of irrigation facilities to be operated in conjunction with the Lemon Dam and Reservoir was awarded in March 1962. These facilities, when completed, will include the Florida Farmers diversion dam on the Florida River which will divert water for irrigation into the existing Florida Farmers Ditch and Florida Canal, both of which will be enlarged and relocated under the contract.

Construction of this project is scheduled for completion before the start of the 1964 irrigation season.

HAMMOND PARTICIPATING PROJECT, NEW MEXICO

Work on the principal features of the Hammond project had been completed by June 30, 1962. These completed features include the Hammond diversion dam on the San Juan River which will divert natural streamflows into the 29-mile-long main canal. Additional

construction work remains on the laterals and the hydraulic pumping plant.

Completion of the entire project except for minor cleanup activities is scheduled for fiscal year 1963. Irrigation water was available in limited amounts beginning with the 1962 irrigation season.

PAONIA PARTICIPATING PROJECT, COLORADO

Construction of the Paonia Dam on the North Fork of the Gunnison River was essentially completed early in 1962, and the 21,000 acre-foot Paonia Reservoir was filled during the spring runoff. Paonia Dam is the main feature of the Paonia project, which has the distinction of being the first participating unit of the five-State Colorado River storage project to be placed in operation. The completed portions of the project were turned over to the North Fork Water Conservancy District on June 1, 1962, for operation and maintenance. Other project features include the Fire Mountain diversion dam and several miles of irrigation canal.

SEEDSKADEE PARTICIPATING PROJECT, WYOMING

The principal features of the Seedskadee project are the Fontenelle Dam and Reservoir on the Green River, a 10,000-kilowatt powerplant and switchyard, a system of canals, two pumping plants, laterals and drainage facilities. Construction of the Fontenelle Dam is 34 percent complete under a construction contract for $8,145,545 awarded in June 1961. Other construction activities were directed mainly to construction of the Fontenelle community.

The community is essentially completed and includes housing, both permanent and temporary, for about 30 Reclamation employees and their families, along with shops, garages, an office, fire station, and a laboratory. The permanent facilities will serve as the project operation headquarters after completion of the project.

SMITH FORK PARTICIPATING PROJECT, COLORADO

The Crawford Dam on Iron Creek in west-central Colorado is 88 percent completed at June 30, 1962. Construction is underway on the other project features including the Smith Fork diversion dam which will divert surplus flows from the Smith Fork, a 2¾-mile feeder canal to carry the surplus flow from the Smith Fork to the reservoir, and a new 6.6-mile Aspen Canal to deliver the water to the farmlands in the project area. Work on these features is estimated 81 percent complete.

Initial storage of water is scheduled to begin in the fall of 1962, and irrigation water will be available in limited amounts during the 1963 irrigation season.

ADVANCE PLANNING ACTIVITIES

Definite plan reports on the Silt participating project in Colorado, the Emery County participating project in Utah, and the economic justification report on Crystal Dam, reservoir, and powerplant of the Curecanti unit were completed during the year. Advance planning studies continued on the central Utah project and in Wyoming on

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the Lyman project. Quality of water studies were continued in the Upper Colorado River Basin as authorized by law.

FISH AND WILDLIFE FACILITIES

Fishery rehabilitation programs were initiated on the San Juan and Green Rivers prior to closure of the Navajo and Flaming Gorge Dams. The rough-fish eradication program for approximately 67 miles of the San Juan River and its tributaries was completed in September 1961 in cooperation with both the Colorado and New Mexico fish and game departments. Work was begun under a $150,000 contract with the Utah and Wyoming fish and game departments for a similar program in a 445-mile stretch of the Green River and its tributaries. These measures are intended to assure improved populations of game fish in the rivers and to establish an optimum reservoir fishery during the initial years of impoundment.

A contract was awarded in June for the installation of a pump at the Stewart Lake State Waterfowl Refuge in Utah to replace the source of water impaired by project operations.

Planning activities for future facilities, including appraisal of water supply and site locations for wildlife management areas and fish hatcheries, continued throughout fiscal year 1962.

PUBLIC RECREATION FACILITIES

Activities relative to the provision of visitor facilities consisted primarily of the planning and designing of developments in the Glen Canyon, Flaming Gorge, and Navajo Reservoir areas. These include roads, parking areas, boat-launching ramps, campgrounds, picnic areas, utilities, comfort stations, beach developments, and miscellaneous administrative facilities.

In addition, in the Glen Canyon National Recreation Area, construction of utility and campground projects has been completed and two employee residences are 60-percent complete. In the Flaming Gorge Recreation Area, a temporary office building was completed; and in the Navajo Reservoir Recreation Area, a contract was awarded for construction of the boat-launching ramp.

3. Allocation of Federal Investment

Section 6 of the authorizing act states that upon completion of each unit, participating project, or separable feature thereof, the Secretary shall allocate the total cost of constructing said unit, project, or feature to the various purposes authorized in the act or authorized under reclamation law. No formal allocations to the several purposes to be served by the project have been made of the cost to June 30, 1962. However, tentative allocations have been made of the total estimated cost of projects now under construction (schedule No. 6). The tentative allocations are summarized as follows:

Purpose	Amount (thousands)	Percent
Reimbursable allocations:		
Irrigation	$163,893	19.6
Power	606,057	72.3
Municipal and industrial water	1,469	.2
Total	771,419	92.1
Nonreimbursable allocations:		
Flood control	1,889	.2
Fish and wildlife	30,289	3.6
Recreation	30,267	3.6
Other nonreimbursable costs: Colorado River development fund investigations and non-Federal contributions	4,187	.5
Total	66,632	7.9
Total	838,051	100.0

NOTE.—The above allocation includes only those projects now under construction

4. PROGRESS OF RETURN AND REPAYMENT OF FEDERAL INVESTMENT.

No progress has been made on repayment of the Federal investment as a result of operations. However, repayment contracts which schedule annual payments on irrigation construction facilities have been negotiated and executed with water users organizations on the following participating projects:

	Amount
Central Utah, Vernal unit: Uintah Water Conservancy District, July 14, 1958	$1,500,000
Emery County: Emery Water Conservancy District, May 15, 1962	2,935,000
Hammond: Hammond Conservancy District, Oct. 20, 1959	450,000
Paonia: North Fork Water Conservancy District, Aug. 21, 1957	2,320,000
Smith Fork: Crawford Water Conservancy District, May 10, 1960	1,025,000
Florida: Florida Water Conservancy District, Dec. 29, 1960	1,900,000
Total	10,130,000

5. ESTIMATED RATE OF PROJECT REPAYMENT, YEAR BY YEAR

Final cost allocations of the Federal investment to power, irrigation, and to other purposes have not been made. Accordingly, no estimated rate of progress of project repayment year by year of the investment to be so allocated is included.

COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS

Exhibit A.—Comparative balance sheets

ASSETS

	June 30—		Increase (decrease)
	1962	1961	
Construction work in progress (schedule No. 1) [1]	$278,240,521	$183,307,024	$94,933,497
Plant in service (schedule No. 2)	7,423,214	1,599,704	5,823,510
Service facilities (schedule No. 3)	14,776,879	14,175,124	601,755
Investigation costs (schedule No. 4)	5,299,824	4,348,207	951,617
Current assets:			
Cash and fund balances with U.S. Treasury:			
Operating funds [2]	27,500,671	65,182,547	(37,681,876)
Deposit funds [3]	4,415,751	6,194,466	(1,778,715)
Accounts receivable:			
Government agencies	46,864	14,234	32,630
Other	66,175	64,194	1,981
Materials and supplies	312,542	252,272	60,270
Prepayments and advances (schedule No. 5)	571,336	457,255	114,081
Total current assets	32,913,339	72,164,968	(39,251,629)
Other assets:			
Undistributed and deferred charges	470,787	186,767	284,020
Deferred and unmatured receivables	150,757	305,812	(155,055)
Total other assets	621,544	492,579	128,965
Total assets	339,275,321	276,087,606	63,187,715

LIABILITIES

Net investment:			
United States:			
Congressional appropriations [4]	$307,374,248	$251,981,177	$55,393,071
Transfer of property and services	4,344,490	4,257,029	87,461
Interest during construction capitalized	10,366,381	4,748,975	5,617,406
Total	322,085,119	260,987,181	61,097,938
Less:			
Funds returned to U.S. Treasury	52,175	52,175	
Nonreimbursable expense [5]	206,581	141,530	65,051
Total	258,756	193,705	65,051
Total net investment, United States	321,826,363	260,793,476	61,032,887
Non-Federal contributions	201,740	249,733	(47,993)
Accumulated net nonoperating income	46,389	39,860	6,529
Total net investment	322,074,492	261,083,069	60,991,423
Current liabilities:			
Accrued liabilities	4,415,751	6,189,016	(1,773,265)
Accounts payable:			
Government agencies	280,060	137,761	142,299
Other	12,488,002	8,672,280	3,815,722
Total current liabilities	17,183,813	14,999,057	2,184,756
Other deferred credits	17,016	5,480	11,536
Total liabilities	339,275,321	276,087,606	63,187,715

[1] Construction work in progress: Construction work in progress includes certain completed features, e.g., Glen Canyon bridge and access road, etc., aggregating $13,296,853.

[2] Operating funds:

Amount committed to payment of unliquidated obligations and accounts payable	$23,271,840
Other unobligated balance	4,228,831
Total	27,500,671

[3] Deposit funds:

Retained percentages of contractors' earnings	$4,412,836
Utility deposits	2,915
Total	4,415,751

[4] Congressional appropriations: Total congressional appropriations for the Colorado River storage project amounted to $55,468,000 in fiscal year 1962. During this fiscal year appropriation transfers amounting to $74,929 were turned over to Public Buildings Service, General Services Administration, for lease space rentals in accordance with Public Law 87-141, approved Aug. 17, 1961 (75 Stat. 353), and Bureau of the Budget Bulletin No. 62-4, dated Sept. 29, 1961.

[5] Nonreimbursable expense: Cost of quality of water studies required by sec. 15, Public Law 485, 84th Cong., $206,581.

GENERAL NOTE

Value of repayment contracts: Long-term repayment contracts, no part of which have matured at June 30, 1962, have been executed with water users' organizations for the repayment of the portion of the investment in irrigation. At that date such contracts amounted to $10,130,000.

EXHIBIT B.—*Statement of source and application of funds and other credits, June 30, 1962*

	Total	Storage project units			
		Curecanti	Flaming Gorge	Glen Canyon	Navajo
Source of funds and other credits:					
Congressional appropriations:					
Prior fiscal years	$251,381,177	$2,400,000	$40,213,335	$146,491,358	$31,911,525
Fiscal year 1962	55,393,071	4,652,127	6,278,284	13,736,406	3,630,508
Total direct appropriations	[2] 306,774,248	7,052,127	46,491,619	160,227,764	35,542,025
Transfer appropriations, Bureau of Public Roads	600,000			600,000	
Total congressional appropriations	307,374,248	7,052,127	46,491,619	160,827,764	35,542,025
Non-Federal contributions	201,740	35,000	43,043	60,065	
Net transfers-in of property or services without charge	4,344,490	453,605	230,433	1,040,710	133,958
Interest during construction capitalized	10,366,381	91,610	1,596,647	8,402,224	
Net nonoperating income	46,389		5,343	3,038	4,094
Total	322,333,248	7,632,342	48,367,085	170,333,801	35,680,077
Application of funds and other credits:					
Plant in service:					
Irrigation	2,076,301				
Multipurpose	5,346,913				
Construction work in progress	278,240,521	6,051,943	43,075,623	157,384,450	34,428,337
Service facilities (net)	14,776,879	646,941	3,824,500	8,561,268	239,096
Investigation costs	5,299,824			117,133	
Nonreimbursable expense: Quality-of-water studies	206,581				
Funds returned to U.S. Treasury	52,175		4,882	3,038	910
Working capital (see below)	16,334,054	933,458	1,462,080	4,267,912	1,011,734
Total	322,333,248	7,632,342	48,367,085	170,333,801	35,680,077
Analysis of working capital:					
Current and deferred assets:					
Operating fund balance with U.S. Treasury	27,500,671	2,190,276	3,891,082	8,875,796	1,983,774
Deposit funds with U.S. Treasury	4,415,751	87,720	794,290	2,177,448	407,633
Accounts receivable	113,039	50	53,832	25,618	25,344
Inventories	312,542	149	30,848	274,279	2,892
Prepayments and advances	571,336	103,816	12,379	87,707	18,531
Deferred and unmatured receivables	150,757			150,757	
Deferred and undistributed charges	470,787	107	47,238	18,548	21,279
Total	33,534,883	2,332,118	4,829,669	11,616,153	2,459,453

Current and deferred liabilities:					
Accounts payable	12,768,062	1,360,940	2,573,299	5,153,227	1,040,086
Trust and deposit liabilities	4,415,751	37,720	794,290	2,177,448	407,633
Deferred and undistributed credits	17,016			11,566	
Total	17,200,829	1,398,660	3,367,589	7,342,241	1,447,719
Working capital	16,334,054	933,458	1,462,080	4,267,912	1,011,734

[1] Includes $2,046,867 appropriated to the original Paonia project (authorized June 25, 1947).
[2] Does not include $74,929 representing appropriation transfers to GSA for lease space requirements.

EXHIBIT B.—*Statement of source and application of funds and other credits, June 30, 1962*—Continued

	Participating projects							Transmission division	Advance planning	Fish and wildlife development	Recreational development
	Central Utah	Emery County	Florida	Hammond	Paonia	Seedskadee	Smith Fork				
Source of funds and other credits:											
Congressional appropriations:											
Prior fiscal years	$5,174,000		$862,500	$1,592,500	[1] $7,080,442	$2,209,570	$1,850,500	$6,207,003	$5,388,444		
Fiscal year 1962	1,418,000	$450,000	3,699,228	1,702,500	223,000	3,776,861	2,027,000	9,586,665	1,279,000	$663,000	$2,270,500
Total direct appropriations	6,592,000	450,000	4,561,728	3,295,000	7,303,442	5,986,431	3,877,500	15,793,668	6,667,444	663,000	2,270,500
Transfer appropriations, Bureau of Public Roads											
Total congressional appropriations	6,592,000	450,000	4,561,728	3,295,000	7,303,442	5,986,431	3,877,500	15,793,668	6,667,444	663,000	2,270,500
Non-Federal contributions	3,565	1,436						27	58,604		
Net transfers-in of property or services without charge	501,879	371,732	332,877	286,152	199,023	1,248,386	343,206	164,467	(961,938)		
Interest during construction capitalized	33,582					5,086		237,232			
Net nonoperating income					24,368	8,022			1,524		
Total	7,131,026	823,168	4,894,605	3,581,152	7,526,833	7,247,925	4,220,706	16,195,394	5,765,634	663,000	2,270,500
Application of funds and other credits:											
Plant in service:											
Irrigation					2,076,301						
Multipurpose					5,346,913						
Construction work in progress	6,844,348	475,307	4,717,157	3,272,350		5,656,558	3,934,549	11,742,135		212,284	445,480
Service facilities (net)	52,362	37,519	57,379	91		887,578	142,392	132,313	195,440		
Investigation costs					18,794				5,163,897		
Nonreimbursable expense: Quality-of-water studies									206,581		
Funds returned to U.S. Treasury					36,683	5,397			1,265		
Working capital (see below)	234,315	310,343	120,070	308,710	48,142	698,392	143,765	4,320,946	198,451	450,716	1,825,020
Total	7,131,025	823,169	4,894,606	3,581,151	7,526,833	7,247,925	4,220,706	16,195,394	5,765,634	663,000	2,270,500

Analysis of working capital:											
Current and deferred assets:											
Operating fund balance with U.S. Treasury	372,132	303,962	488,418	363,974	95,659	1,216,527	320,218	4,922,746	241,596	610,663	1,623,848
Deposit funds with U.S. Treasury	104,846	166	266,546	29,590	47,508	235,012	71,941	233,131	9,920		
Accounts receivable	932					1,059		5,612	592		
Inventories						1,656			2,718		
Prepayments and advances	13,768	23,529	22,309	18,380	10,667	72,302	26,176	97,713	64,059		
Deferred and unmatured receivables											
Deferred and undistributed charges	2,069	272	927	33	12	183,061	16	(2,391)	(1,556)		201,172
Total	493,747	327,929	778,200	411,977	153,846	1,709,617	418,351	5,256,811	317,329	610,663	1,825,020
Current and deferred liabilities:											
Accounts payable	154,586	17,420	391,584	73,677	52,746	776,213	202,645	702,734	108,958	159,947	
Trust and deposit liabilities	104,846	166	266,546	29,590	47,508	235,012	71,941	233,131	9,920		
Deferred and undistributed credits					5,450						
Total	259,432	17,586	658,130	103,267	105,704	1,011,225	274,586	935,865	118,878	159,947	
Working capital	234,315	310,343	120,070	308,710	48,142	698,392	143,765	4,320,946	198,451	450,716	1,825,020

SCHEDULE No. 1.—*Construction work in progress, June 30, 1962*

Property class	Total	Storage units			
		Curecanti	Flaming Gorge	Glen Canyon	Navajo
Dams and reservoirs	$202,306,570	$5,671,906	$32,804,939	$112,770,180	$34,428,337
Diversion works	660,488				
Pumping plants	383,064				
Canals and conduits	6,280,603				
Laterals	615,937				
Drains	233,418				
Powerplants, hydro	43,885,149	278,520	7,935,410	35,621,934	
Transmission lines, switchyards, substations	12,835,000	9,907	726,023	590,112	
General property	16,148		12,604		
Interest during construction capitalized	10,366,380	91,610	1,596,647	8,402,224	
Subtotal	277,582,757	6,051,943	43,075,623	157,384,450	34,428,337
Public recreation facilities	445,480		4,734	431,333	9,413
Fish and wildlife facilities	212,284	1,438	172,820		26,378
Total	278,240,521	6,053,381	43,253,177	157,815,783	34,464,128
Summary:					
Total June 30, 1961	183,307,024	1,777,676	25,103,052	110,816,708	27,386,280
Fiscal year activity:					
Additions	100,835,407	4,275,705	18,150,125	46,999,075	7,077,848
Transfers of completed work	(5,901,910)				
Total	278,240,521	6,053,381	43,253,177	157,815,783	34,464,128

[1] Project completed and construction cost transferred to plant-in-service accounts.

Property class	Participating projects							Transmission division
	Central Utah	Emery County	Florida	Hammond	Paonia	Seedskadee	Smith Fork	
Dams and reservoirs	$4,151,340	$305,203	$4,405,027			$4,484,798	$3,284,840	
Diversion works		11,840	46,284	$602,364				
Pumping plants				286,781		96,283		
Canals and conduits	2,596,871	121,304	198,362	2,112,969		601,388	649,709	
Laterals			67,484	265,592		282,861		
Drains	62,555	36,960		1,100		132,803		
Powerplants, hydro						49,285		
Transmission lines, switchyards, substations						4,054		$11,504,904
General property				3,544				
Interest during construction capitalized	33,582					5,086		237,231
Subtotal	6,844,348	475,307	4,717,157	3,272,350		5,656,558	3,934,549	11,742,135
Public recreation facilities								
Fish and wildlife facilities	10,211			1,437				
Total	6,854,559	475,307	4,717,157	3,273,787	(1)	5,656,558	3,934,549	11,742,135
Summary:								
Total June 30, 1961	4,838,512		1,032,253	1,441,949	$5,340,881	1,918,201	1,763,130	1,888,382
Fiscal year activity:								
Additions	2,016,047	475,307	3,684,904	1,831,838	561,029	3,738,357	2,171,419	9,853,753
Transfers of completed work					(5,901,910)			
Total	6,854,559	475,307	4,717,157	3,273,787		5,656,558	3,934,549	11,742,135

SCHEDULE No. 2.—*Plant in service, June 30, 1962*

Property class	Amount
Paonia participating project:	
Dams and reservoirs	$5,346,913
Diversion works	129,489
Canals and conduits	1,946,812
Total	7,423,214

SCHEDULE No. 3.—*Service facilities, June 30, 1962*

Structures	Total	Storage units			
		Curecanti	Flaming Gorge	Glen Canyon	Navajo
Permanent housing	$5,410,159		$1,347,965	$3,670,086	$210,965
Temporary housing	868,779	$60,000	180,199	373,517	
Warehouse buildings	642,171		75,261	540,302	
Administration buildings	525,359		124,053	305,126	
Municipal building	116,001			116,001	
Police buildings, garages, fire stations	409,173	49,710	77,165	239,612	7,884
Sewers, water systems, electrical distribution	3,428,569	15,521	1,153,569	2,080,258	157,486
Streets, street improvements, access roads	3,493,348		1,164,653	2,118,850	
Airstrip	322,650			322,650	
Other structures	1,430,089	442,214	218,513	579,601	85,863
Miscellaneous equipment	2,368,458	95,419	538,961	742,946	134,021
Total	19,014,756	662,864	4,880,339	11,088,949	596,219
Less accumulated depreciation to date (transferred to construction work in progress)	4,237,877	15,923	1,055,839	2,527,681	357,123
Total	14,776,879	646,941	3,824,500	8,561,268	239,096
Additions:					
Prior fiscal years	14,175,124	22,891	4,136,390	8,897,282	344,694
Fiscal year 1962	601,755	624,050	(311,890)	(336,014)	(105,598)
Total	14,776,879	646,941	3,824,500	8,561,268	239,096

SCHEDULE No. 3.—*Service facilities, June 30, 1962*—Continued

Structures	Participating projects							Transmission division	Advance planning
	Central Utah	Emery County	Florida	Hammond	Paonia	Seedskadee	Smith Fork		
Permanent housing						$181,143			
Temporary housing		$4,999				149,835	$100,229		
Warehouse buildings						19,793	6,815		
Administration buildings						92,750	3,430		
Municipal building									
Police buildings, garages, fire stations						34,802			
Sewers, water systems, electrical distribution						21,735			
Streets, street improvements, access roads						206,446	3,399		
Airstrip									
Other structures	$17,629	10,595				72,161			3,513
Miscellaneous equipment	56,746	22,090	$63,529	$109		122,725	29,443	$175,306	$387,163
Total	74,375	37,684	63,529	109		901,390	143.316	175,306	390,676
Less accumulated depreciation to date (transferred to construction work in progress)	22,013	165	6,150	18		13,812	924	42,993	195,236
Total	52,362	37,519	57,379	91		887,578	142,392	132,313	195,440
Additions:									
Prior fiscal years	60,836		41,562	103	$167,201	217,731	11,025	74,024	201,385
Fiscal year 1962	(8,474)	37,519	15,817	(12)	(167,201)	669,847	131,367	58,289	(5,945)
Total	52,362	37,519	57,379	91		887,578	142,392	132,313	195,440

Colorado River storage project and participating projects

SCHEDULE NO. 4.—*Investigation Costs, June 30, 1962 (undistributed)*

Description	Amount
Curecanti storage unit (Crystal)	$145,709
Glen Canyon storage unit (Rainbow Bridge protective works)	117,133
Participating projects:	
Central Utah (excludes Vernal unit)	3,655,565
Lyman	661,586
La Barge	221,707
Pine River extension	136,496
Silt	342,834
Paonia	18,794
Total	5,299,824

Colorado River storage project and participating projects

SCHEDULE NO. 5.—*Prepayments and advances, June 30, 1962*

Advances to other Bureau of Reclamation activities performing services for the project are reflected in the accounting records of such entities in the following manner:

Fund balances with U.S. Treasury:	
Centralized projects activities	$166,045
Denver office	558,843
Accounts receivable: Centralized projects activities	9,314
Accounts payable: Centralized projects activities	(162,866)
Total	571,336

SCHEDULE No. 6.—*Preliminary allocation of Federal investment for units and projects under construction*

[Dollars in thousands]

	Total	Allocation to purposes									
		Reimbursable costs					Nonreimbursable costs			Sec. 8 costs	
		Irrigation	Power		Municipal and industrial water		Flood control	Fish and wildlife	Other [1]	Fish and wildlife	Recreation
			Construction cost	Interest during construction	Construction cost	Interest during construction					
Storage project:											
Curecanti unit, Colorado	$82,133	$2,192	$66,095	$4,074			$1,444		$119	$3,235	$4,974
Flaming Gorge unit, Utah	77,344	12,054	47,949	3,306				$6,679	87	1,194	6,075
Glen Canyon unit, Arizona	363,769	40,545	274,424	23,743				6,122	3,043	200	15,692
Navajo unit, New Mexico	40,228	31,059					197	5,751	65	562	2,594
Transmission division	182,388		176,145	6,143					100		
Total	745,862	85,850	564,613	37,266			1,641	18,552	3,414	5,191	29,335
Participating projects:											
State of Colorado:											
Florida	10,961	9,031					176	1,641	22	10	81
Paonia	7,842	7,541					72		156	10	63
Smith Fork	4,616	4,241						189	72	10	104
State of New Mexico: Hammond	3,838	3,713						107	8	10	
State of Utah:											
Central Utah, Vernal unit	8,043	6,980			$542	$35		148	86	28	224
Emery County	11,910	9,277						2,340	18	205	70
State of Wyoming: Seedskadee	44,979	37,260	4,075	103	837	55		607	411	1,241	390
Subtotal	92,189	78,043	4,075	103	1,379	90	248	5,032	773	1,514	932
Total	838,051	163,893	568,688	37,369	1,379	90	1,889	23,584	4,187	6,705	30,267

[1] Colorado River development fund investigations and non-Federal contributions.

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