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NATIONAL WATER COMMISSION

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HEARINGS BEFORE THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS UNITED STATES SENATE EIGHTY-NINTH CONGRESS

SECOND SESSION

ON

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

MAY 16 AND 17, 1966

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NATIONAL WATER COMMISSION

MONDAY, MAY 16, 1966

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The committee met, pursuant to notice, at 10:05 a.m., in room 3110, New Senate Office Building, Senator Henry M. Jackson (chairman) presiding.

Present: Senators Jackson, Anderson, Burdick, Kuchel, Allott, Jordan of Idaho, and Fannin.

Also present: Jerry T. Verkler, staff director; Roy M. Whitacre, professional staff member; Frederick O. Frederickson, special counsel; Ralph Johnson, and Ellary Fosdick, consultants, and E. Lewis Reid, minority counsel.

The CHAIRMAN. The committee will come to order.

This is an open hearing held pursuant to public notice by the Senate Committee on Interior and Insular Affairs to hear testimony on S. 3107, a bill to provide for a comprehensive review of national water resource problems and programs, and for other purposes.

This bill was submitted by the Bureau of the Budget in furtherance and fulfillment of their part of President Johnson's message of February 23, 1966, on preserving our national heritage, in which the President called for the establishment of a National Water Commission to review and advise on the entire range of water resource problems.

I am pleased to say that 44 Senators from both political parties representing every area of the Nation have joined me in cosponsoring S. 3107.

I will direct that the text of this measure, with the names of all the cosponsors, be set forth in the record at this point.

(The bill referred to follows:)

IN THE SENATE OF THE UNITED STATES

MARCH 21, 1966

Mr. JACKSON (for himself, Mr. ANDERSON, Mr. BAYH, Mr. BIBLE, Mr. BOGGS, Mr. CANNON, Mr. CARLSON, Mr. CASE, Mr. CLARK, Mr. COOPER, Mr. EASTLAND, Mr. FONG, Mr. GRUENING, Mr. HARRIS, Mr. HART, Mr. HARTKE, Mr. HAYDEN, Mr. INOUE, Mr. LAUSCHE, Mr. LONG of Missouri, Mr. MAGNUSON, Mr. MANSFIELD, Mr. MCGEE, Mr. MCGOVERN, Mr. METCALF, Mr. MONTOYA, Mr. MORSE, Mr. MOSS, Mr. MUNDT, Mr. MUSKIE, Mrs. NEUBERGER, Mr. PELL, Mr. RANDOLPH, Mr. SCOTT, Mr. TOWER, Mr. WILLIAMS of New Jersey, Mr. YARBOROUGH, Mr. YOUNG of North Dakota, Mr. KENNEDY of New York, Mr. BYRD of West Virginia, Mr. BYRD of Virginia, Mr. RIBICOFF, Mr. DOUGLAS, Mr. ERVIN, Mr. PRUTY, and Mr. BURDICK) introduced the following bill, which was read twice and referred to the Committee on Interior and Insular Affairs

A BILL

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

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

THE NATIONAL WATER COMMISSION

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

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

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

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

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

DUTIES OF THE COMMISSION

SEC. 3. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances such as desalting and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council.

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

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

POWERS OF THE COMMISSION

SEC. 4. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) employ and fix the compensation of such personnel as it deems advisable, in accordance with the civil service laws and the Classification Act of 1949, as amended: *Provided*, That not to exceed five persons may be employed and their compensation fixed at salaries not in excess of GS-18, without regard to such laws; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a) at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner; and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

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

POWERS AND DUTIES OF THE CHAIRMAN

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

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

OTHER FEDERAL AGENCIES

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

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

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C. 46e) shall apply to the collection

of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665(g)) shall apply to appropriations of the Commission: *And provided further,* That the Commission shall not be required to prescribe such regulations.

APPROPRIATIONS

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

The CHAIRMAN. I believe that the Senator from North Dakota, Mr. Burdick, also wishes to be named as a cosponsor and his name will be added in the proper procedure on the floor of the Senate. Also, the text of the executive communication submitting the proposed legislation will be included.

(The communication referred to follows:)

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., March 17, 1966.

HON. HUBERT H. HUMPHREY,
President of the Senate,
Washington, D.C.

DEAR MR. PRESIDENT: In his February 23, 1966, message to Congress on preserving our natural heritage, the President recommended the establishment of a National Water Commission. I am transmitting herewith draft legislation to carry out this recommendation. I urge that it be given early and favorable consideration.

A bountiful supply of clean water is essential to our health, to our industry, to our farms and to the well-being of all Americans. It sustains our prosperity and stimulates our growth. This is a basic truth that the President has emphasized many times before. It is a truth that the administration shall continue to emphasize.

Yet, we are confronted with critical water shortages in many sections of our country. We are faced with the grim fact that pollution infests virtually every river system. No region is immune—from the Pacific, to the Southwest, to the Great Lakes, to the Northeast. These problems grow more complex and more difficult with each passing day.

Water resource problems do not end at local, county, state or even regional lines. Their dimensions are truly national in scope. They require intelligent long-term planning and the assessment and development of a whole range of alternative solutions. They require thorough and systematic analysis to assure that the programs undertaken by the Federal Government contribute to the soundest long-range water objectives.

The National Water Commission bill proposed today provides a new way to meet these urgent needs. It will do more than give us a vital instrument in our search for imaginative ideas. It will help us develop the blueprints for our long-range water resource plans and goals. It will help us assure that the dollars we spend are wisely spent. In the words of the President, the Commission will—

“review and advise on the entire range of water resource problems * * * It will judge the quality of our present efforts. It will recommend long-range plans for the future. It will point the way to increased and more effective water resource measures by the Federal Government, working in close cooperation with States, local communities, and private industry.”

Bringing the Commission into being is an important step that should be taken without delay.

The Commission would consist of seven members appointed by the President from distinguished Americans outside the Federal Government. These members would advise the President and the Water Resources Council. In carrying out its responsibilities the Commission would

1. Identify alternative ways of meeting water requirements, making such projections of water demand as may be necessary and giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic

use of water, interbasin transfers and technological advances such as desalting and waste water purification and reuse.

2. Consider the economic and social consequences of water resource development, including the impact of water resource development on regional economic growth, on institutional arrangements and on aesthetic values affecting the quality of life of the American people.

The National Water Commission would be aided by existing Federal agencies in the water resource field and by river basin commissions created pursuant to Title II of the Water Resources Planning Act.

It would also—

work closely with the Water Resources Council, complementing its activities, cooperate with State and local agencies concerned with water resource development, seeking their advice and assistance.

utilize panels of specialists to assist it in its studies of particular problems.

The creation of the National Water Commission will bring the very best minds and most creative talents in the Nation to bear on our water problems. We need this help if we are to reduce progressively the pollution of our waters and to insure a plentiful supply of water for our commerce, for our daily lives and the lives of our children.

We recommend early enactment of the legislation.

Sincerely,

(Signed) CHARLES L. SCHULTZE,
Director.

The CHAIRMAN. Phenomena such as pollution, floods, and droughts do not respect political boundaries. In recent years, almost every region of the country has experienced an acute water problem in one form or another. To meet the challenge posed by these various water problems, Congress has passed several landmark pieces of legislation. Much of this legislation was considered by this committee, and we can be justifiably proud of what has been accomplished.

Looking at the record, I include among these accomplishments the establishment of the saline water conversion program, with its bright promise for progress in both the domestic and the international fields.

Another significant measure is the Water Resources Research Act, which was favorably reported by our committee. Under this act, water research centers have been established in all 50 States and Puerto Rico. A program of research for each center has been formulated and approved with work well under way on several hundred new research projects.

In the field of water legislation, few measures are more important than the Water Resources Planning Act, which set up machinery for Federal-State cooperation by authorizing river basin planning commissions. It also established the Water Resources Council, composed of the top echelon officials of the Government with respect to water resources development and use.

As I see it, the National Water Commission proposed in S. 3107 can make an invaluable contribution to the development of our country's water resources policy. The mandate of this Commission, composed of seven distinguished citizens from outside of government, will be to study alternative solutions to water resource problems without prior commitment to any interest group, region, or agency of government. The Commission will be charged with the responsibility of reviewing water policy in the light of the broad national interest. It will be called upon to evaluate with care the basic premises underlying the Nation's water resource development policies. With such a mandate, this body can help assure that the continued prosperity

and well-being of our country will not be threatened by failure to make the highest and best use of our water resources.

The task proposed for the Commission is an arduous one. The Commission will have to come to grips with incredibly complex and interrelated problems which have a direct bearing on fulfillment of the economic and social goals of our country.

The late President John F. Kennedy said: "Anyone who can solve the problem of water will be worthy of two Nobel prizes—one for science and one for peace." I hope this Commission, when it has completed its work, will qualify on both counts.

It is my belief that the Congress, through the establishment of this Commission, will take a most significant step toward the conquest of our Nation's water problems. Certainly, the wise counsel of this Commission will help guide an enlightened policy of water resource development.

Senator Anderson has a statement for the record.

**STATEMENT BY HON. CLINTON P. ANDERSON, A U.S. SENATOR
FROM THE STATE OF NEW MEXICO**

Senator ANDERSON. I am pleased to join Senator Jackson, the junior Senator from Washington and chairman of the Senate Interior Committee, as one of the sponsors of S. 3107. This bill would establish a National Water Commission to undertake a comprehensive review of national water resources requirements and supplies and to make recommendations for solving present and future problems relating to our water supply.

For many years the western part of the United States has had serious water supply and distribution problems. During most of this time it was difficult for many people in the East to understand just what it meant to be short of water. There seemed to be an inexhaustible supply of fresh water in our lakes and streams east of the Mississippi. When the Western States were pushing for reclamation projects, there were even a few accusations that we were trying to raid the Treasury. The planning and development of those years has proved farsighted and sound. Conservation and proper distribution of our water in the West has enabled us to grow economically and provide jobs and a place to live for millions of our people.

We have failed to take seriously that the eastern part of the country would ever be confronted with the problem of insufficient fresh water. Therefore, today our Nation faces a crisis. Plenty of good fresh water is scarce. This is due partially to drought conditions in some areas, pollution of streams and lakes in others, and in general the failure to heed warnings and solve these problems in the early stages.

Water problems are not corrected overnight. It sometimes takes years to reach agreements between communities, States, and Federal agencies so that a project can be planned and authorized. We are far behind in the job. Unless we move ahead at faster rate our economy may stagnate. We have sufficient water in North America to meet our needs, but there must be a joining of forces throughout the entire country if we are to keep our water account solvent.

Water policy and planning is, in part, an evolutionary process. There is a constant need to review our water resources by updating

our policies, standards, and procedures. I know that there have been water commissions and councils and other groups that have made studies. Some of these have gathered dust on the shelf. But in recent years we have seen a more widespread interest in our water problems and some of these reports have been taken out and much good information has been found that has helped in recent legislation.

Since our water supply and its quality is national in scope, the Federal Government should take the initiative in providing the information and machinery for working out solutions to these problems. I, therefore, commend the President for his farsightedness in urging that a National Water Commission of private citizens be established to work with his Water Resources Council, the Federal agencies, the Congress, and the States to update our water information. We come closer to a cooperative effort with a Commission of this kind.

I see in this commission possibilities of generating greater public interest and of providing opportunities for wider participation in this far-reaching effort.

Being from an area that has never had enough water I have naturally made water conservation and development one of my chief concerns since coming to the U.S. Senate. It has been my good fortune to sponsor or cosponsor legislation which established some of the early river basin compacts in the Southwest which have resulted in some of our best reclamation projects. Other legislative authorizations that are now moving ahead toward solving our problems are watershed protection acts, saline water developments, water research, river basin planning, and water salvage projects. These all fit together and form a base from which to work on long-range programs. The experience in these areas will be of great assistance to the proposed Commission in its work.

The Commission that is to be set up under the provisions of S. 3107 will be in a position to judge the quality of our present plans and policies. A complete analysis can be made to determine what proposed programs can most efficiently help us reach our goals. I am confident that it will provide us with new and imaginative ideas for meeting the water needs of every section of our country.

In the West we speak of water as being our "lifeblood." Plenty of clean fresh water is the lifeblood of the entire country, for without it we will become ill economically and physically. Therefore, we need to have our very best minds and our most creative talent at work on our water problems now.

I am glad to support this legislation and sincerely hope that we can move rapidly ahead and pass it into law during the present session of Congress.

The CHAIRMAN. Before calling on the Secretary of the Interior are there any comments?

Senator KUCHEL. Only this procedurally, Mr. Chairman, the Senate will have a session today. Presumably there will be one tomorrow. Is it the desire of the chairman to hold afternoon hearings of the committee?

The CHAIRMAN. Yes, it is; because we do have some outside witnesses that have come some distance to testify and we would like to complete the hearings, if we can, at least the witness list that we have. If there

are other witnesses, naturally we will be glad to hear from them tomorrow. We have a 2-day witness list before us at the present time.

Senator KUCHEL. Mr. Chairman, I am not going to interpose any objection in the Senate against our committee meeting. On the other hand, I will be required to spend some time in the Senate both today and tomorrow and this legislation is of extreme importance to the people I represent. So I am going to ask the chairman if we can work out just an informal agreement under which the witnesses whom I would like to examine would testify in the main while I am here.

The CHAIRMAN. Certainly. We will make every effort to accommodate the senior Senator from California. All the members have, I believe, the witness list. If you do not, we have extra copies. Take a look at the list and then you can decide on which ones you would like to interrogate. We will run until 12:30, if there is no objection, and that will give us a chance to go as far as we can.

Senator KUCHEL. We have a new colleague to be sworn shortly after noon, and all my brethren on this side of the table are going to want to be present and I rather imagine that my colleagues over on the right side will want—

The CHAIRMAN. Well, why do we not just move along and I think we can work out our list one way or the other. We will not have any trouble.

Any other comments now?

The Chair has received statements from Senators Bible, Magnuson, Bayh, Muskie, Ervin, Cannon, and Tower for inclusion in the record. All are cosponsors of the bill. The statements will be included in the record at this point.

(The data referred to follows:)

STATEMENT OF HON. ALAN BIBLE, A U.S. SENATOR FROM THE STATE OF NEVADA

Mr. Chairman: As a co-sponsor of Senate Bill 3107, I am pleased to support its principles and goals. A National Water Commission made up of the full range of independent experts on water resource matters—a commission with unlimited vision—can make a valuable contribution to our nation's efforts in providing for the water resource needs of a booming population.

We no longer face the relatively simple conservation and reclamation problems of past generations. Today we need to master the complex scientific and technical skills to control pollution. We must expand and improve our systems of conserving and storing our water supplies. We must look into the future and across a continent for additional resources.

America's water resources problems are so complex and varied that we must examine them with both a telescope and a microscope. In order to maintain a coordinated development program we need an independent commission to complement our various state and federal agencies and the work of the Water Resources Council created last year.

My own state of Nevada presents a graphic example of the wide-ranging complexities of water resource utilization. In the high Sierra, one of the most beautiful lakes in the world—Lake Tahoe—is threatened with pollution as a result of a spurting development and population growth. In the cities and over the arid ranges we maintain a constant battle to conserve and supply the inadequate waters of our rivers, lakes and underground resources.

Men of varied skills and training are needed to combat these unrelated water problems, and a coordinating group with judgment to understand them all is needed to direct the attack.

This is but one example. Water problems are almost always interstate in nature—often international. The United States is on the move as never before and I believe it is too great a nation to be shortsighted over the increasingly critical problems of water resource management.

However, I must emphasize that I could not support the concept of a National Water Commission unless this commission is truly independent and unaligned with any regional interest or policy. If the commission were to become a device for delaying progress on any project proposal its major purpose would, of course, be defeated.

Priorities and needs should be the commission's guide. And on this basis I think the various proposals for tapping the rich water surpluses of the Pacific Northwest, and eventually perhaps the Arctic, must rank high on the list of feasibility studies.

The real value of an independent National Water Commission will be its ability to look fairly and impartially at all the factors involved in such massive and complex proposals.

This is no guessing game. We know we will not have enough water to supply the needs of future generations if we continue to pollute our national supplies and neglect to plan for the projects to conserve and supplement them.

The National Water Commission should be fashioned so that its membership can base its work and its recommendations on all the technology and engineering and all the conservation methods now known and being developed—in truth, viewing our water problems through both the microscope and the telescope.

STATEMENT OF HON. WARREN G. MAGNUSON, A U.S. SENATOR FROM THE STATE OF WASHINGTON

Mr. Chairman. As a co-sponsor, I greatly appreciate this opportunity to submit a statement in support of S. 3107, to provide for a comprehensive review of national water resource problems and programs, and for other purposes. The bill has a total of 45 co-sponsors, coming from all sections of the nation. The diversity of views represented by these co-sponsors equals the complexities of the problems that the nation faces in its water resources program. Their joining together on this bill, however, indicates a common desire to focus on a most important problem.

The passage of this legislation would be very useful in helping to untangle the complex issues and conflicting arguments that have arisen over the subject of water. As you, Mr. Chairman, said when introducing the bill, "We can take a bold step in this direction by establishing a National Water Commission with broad vision capable of exercising independent judgment." "Independent" is a very important word. The creation of an independent group such as this will relieve the mission-oriented agencies of the humanly impossible task of attempting to find final answers for issues that really extend beyond their expertise and jurisdiction. It will also allow all of the related disciplines to be brought to bear on what is basically an environmental problem. The result should be that alternative plans can be developed and given full consideration by a group with no pre-conceived solutions.

I am particularly pleased that section 3(a) would direct the Commission to consider "esthetic values." In the broadest sense, this will allow for consideration of the important "non-consuming uses" of the nation's water resources.

I strongly urge one amendment to the bill. After the word "desalting" in section 3(a), line 10, I recommend that you add the words "weather modification". Although weather modification has greater potential than just precipitation augmentation, it may be very important in this area. Both the Interior Committee and the Commerce Committee have examined this subject in detail.

I again wish to thank the Chairman for the opportunity to submit my views, and I congratulate the Committee on the important work that it has done in this vital area.

STATEMENT OF HON. BIRCH BAYH, A U.S. SENATOR FROM THE STATE OF INDIANA

Mr. Chairman, it is a pleasure to present testimony today on S. 3107 a bill to establish a National Water Commission. This proposal is a necessary supplement to several important laws enacted within the last few years designed to solve our water problems. If passed, S. 3107, will bring additional resources into the struggle to devise and institute sound water management policies. This type of approach is necessary if our society is to continue to prosper and grow.

The day has long passed when we can afford to squander or save water according to the demands of immediate circumstances. For although two-thirds of the earth's surface is covered with water, over 99% of it is in oceans too salty for human consumption or useless and inaccessible in ice caps and glaciers.

As the world's population increases and nations become more industrialized, disproportionate demands are made on our water resources. In the next 20 years the world's demand for water will double.

This disturbing prospect poses difficult problems for the United States. Today over 190 million people inhabit our nation. This number will double in 35 years. In order to meet increased demands of industry, agriculture and private needs by the year 2000 we will need over one trillion gallons of water per day. This is over three times as much water as we currently use. These facts are particularly frightening when one considers that current needs in the northeastern United States are in excess of existing supplies. Although drought conditions have been somewhat eased, a shortage of water is still one of the greatest problems facing an area that stretches from Northern Virginia to Boston, Massachusetts.

It is well known that water is an indispensable resource to the farmer, but few people realize the size of modern agriculture's needs. For instance, it takes 375 gallons of water to grow enough wheat to produce a one pound sack of flour, 3-12 gallons of water each day to sustain a cow, hog, sheep or 100 chickens, and 7,000 gallons of water to process 100 cases of tomatoes.

Of equal concern is the dependence of modern industry on great amounts of water to maintain modern production operations. It takes 65,000 gallons of water to produce one ton of steel, 39,000 to produce one ton of paper and 6,000 gallons to produce 100 kilowatts of electric power. It is easily understood why towns lacking abundant water supplies have great difficulty in attracting large scale industries to their areas.

As society becomes more complex and as the pace of our lives quickens, people are increasingly returning to the outdoors for the type of recreation that permits total relaxation and enjoyment. Studies show that water based recreation activities are preferred by 44% of all people who enjoy the outdoors. Swimming, fishing, boating and water skiing are the type of activity our people are participating in to reduce mental fatigue and maintain physical well being.

The development of sound water management policies will enable both industry and agriculture to expand in order to meet the needs of our people. The increased use of water based recreation will help maintain a healthy society. On the other hand, if left unharnessed and uncontrolled, our nation's waters will take many lives and cost millions of dollars. Last year floods caused \$750 million worth of damage in the United States.

Today rampant pollution threatens the quality of our lives and, in extreme cases, their duration. The Department of Interior estimates that it will cost between \$80 and \$100 billion to clean up our nation's rivers, lakes and streams. The Senate Public Works Committee, of which I am a member, is currently examining eight different bills designed to strengthen our pollution abatement efforts.

Mr. Chairman, the importance of water supply, flood prevention and pollution abatement makes it imperative that the Congress continue to increase the quantity and quality of water resource legislation.

In recent years great progress in the wise use and development of our water resources has been made through the enactment of several laws. I refer particularly to Water Pollution control legislation of 1961 and 1965, amendments to the Small Watershed Act, the Water Resources Planning Act, the Fish and Wildlife Pesticides Control Act, the Wilderness Act, the Water Resource Research Act, the Land and Water Conservation Act, the Rivers and Harbors Authorizations and Appropriations, as well as other significant laws.

We have mobilized a substantial portion of the Federal establishment in efforts to preserve our national resources, construct flood protection devices and abate hazardous pollution. We have also stimulated state and local activity toward these goals.

However, much remains to be done. In particular we have not been very successful in attempts to draw upon the experience and wise counsel of experts in the natural resources disciplines who are not directly connected with government service.

The President wisely realized this oversight and called for the creation of a National Water Commission in his February 23 message to Congress. He said, "In no area of resource management are the problems more complex—or more important—than those involving our nation's water supplies. . . . we must take

every possible step to improve the management of our precious water resources." The President envisioned the establishment of a National Water Commission, comprised of seven distinguished citizens outside of government whose duty it would be "to review and advise on the entire range of water resource problems . . ." The tasks of this commission are outlined in detail in S. 3107, as introduced by Chairman Jackson and cosponsored by myself and thirty-six other members of the Senate.

Section 3 charges this seven-member commission to attempt to identify alternate ways of meeting anticipated national water shortages through the conservation and more efficient use of existing supplies. The commission is charged with the duty to investigate new methods of pollution control, consider possible economic and social consequences of water resource development and advise on problems referred to it by the President.

I am pleased to note that the commission would be empowered to utilize the services of and to consult with all Federal water resource agencies, including the Water Resources Council. The remainder of the legislation deals with specifics of organization and is consistent with customary procedures in such cases.

Let me call the committee's attention, however, to the fact that only five persons may be employed as full time staff members at the GS-18 level to assist the commissioners in their investigation of detailed and difficult problems of crucial importance to our nation. I hope that the Committee will pay particular attention to this point because adequate staffing would be of extreme importance if this commission is to make its maximum contribution. It seems to me that this committee might find it necessary to increase the number of staff authorized in Section 4.

Aside from this particular point, I have no reservation about the enactment of S. 3107. Indeed, I enthusiastically support this bill because it will create a vehicle through which additional talents and skills can be brought to bear on our water problems.

Few matters confronting Congress today are more important than this issue. As temporary inhabitants of this planet, we are creating a natural resources legacy that, regardless of its quality, will be inherited by our posterity. I am confident that under the leadership of this and other congressional committees we can make this legacy one which will insure an abundant, pollution-free water supply, protect our citizens from the ravages of floods, and provide recreational benefits so necessary to the sustenance of a healthy society.

Because S. 3107 would make a substantial contribution towards the attainment of these goals, I trust that it will receive favorable consideration by this Committee.

Thank you.

STATEMENT OF HON. EDMUND S. MUSKIE, A U.S. SENATOR FROM THE STATE OF MAINE

Mr. Chairman, I welcome this opportunity to express my support of S. 3107, a bill to establish a National Water Commission which would undertake a comprehensive review of national water resource requirements and supplies. In my opinion this is one of the most important bills dealing with this country's critical problem of water quality and supply presently being considered by Congress.

In 1965 Congress passed two acts—the Water Resources Planning Act and the Water Quality Act—which are landmarks in the drive to combat the neglect and confusion that has characterized this country's attitude toward its water resources for too long. The passage of these two Acts was indispensable in leading the way to a more coordinated approach to water management.

But when we take a hard look at the overall development and administration of water resource programs in the United States, we still find it divided among—and duplicated by—scattered departments and agencies. In addition, water policy formulation and management has been vested in a number of more or less independent offices or commissions. To a large extent, major decisions are made within a framework of laws which restrict the developing agency to specified purposes. Tradition also plays a role in restricting administrative responsibility for certain resource programs to particular departments and agencies. Finally, political considerations tend to work against

some programs which ought to be judged primarily by relevant social and economic criteria.

Mr. Chairman, the proposals embodied in S. 3107 give us an opportunity to provide the comprehensive planning and development of our national water resources which has been absent from many of our past efforts. I have searched the bill for weaknesses—for wording which might lead to a continuation of the fragmentation and confusion I have discussed. There may be such weaknesses, but I am frank to say I have been unable to discover them. I believe S. 3107 represents a long-needed step forward in providing a comprehensive mechanism which can survey the total needs in this important area, without being hamstrung by bureaucratic or other vested interests.

Section 2 of S. 3107 provides for the President to make appointments to the National Water Commission. I believe this is as it should be. Since this is a five year Commission, and since the procedures set forth in Section 3 provide for direct reporting to the President, I believe it guarantees that the President will receive the benefit of the best available thinking on water resources. If, however, the life of the Commission were to be extended, I would then want to review the Commission's relations with the Water Resources Council to see whether new arrangements are needed.

Section 3 of this bill outlines the duties of the Commission. In reviewing present and future national water resource problems the Commission would be authorized to consider conservation and more efficient use of existing water supplies, reduction of pollution, interbasin transfers, desalination and waste water purification and re-use, among other things. Its duties also would include examination of economic and social consequences of water resource development, including its effect on regional economic growth and institutional arrangements. Although these are challenging subjects, it seems to me that the duties of the Commission are broad enough for it to tackle almost any problem concerning water and land-related resources.

My main concern with this proposal to create a National Water Commission is that we must be careful to weed out any possible source of further friction and delay in providing the most efficient and wise program for the nation. I believe that the Congress, in recent water planning and pollution control legislation—and hopefully in the adoption of S. 3107—is demonstrating its determination to “stop fooling around with this thing”, as President Johnson has put it.

We are still a long way from solving our problem of water management, but we are moving in the right direction. If we are to succeed in this critical area, we must avoid the administrative and legislative errors of the past. We must reduce the intergovernmental conflicts to a minimum. We must constantly review the progress of new agencies created by new legislation. They must be able to demonstrate their capacity for action, not for delay and confusion. In short, we must heed the errors of America's water development history, to avoid repeating them.

S. 3107 deserves the study and support of every member of Congress, and I urge its speedy enactment.

STATEMENT OF HON. SAM J. ERVIN, JR., A U.S. SENATOR FROM THE STATE OF NORTH CAROLINA

Mr. Chairman: At the outset, I wish to commend the Chairman for leadership in a field that has many problems and no easy solution. Water is becoming the number one resource problem in the country. An ever growing need for pure and adequate water supplies makes it so.

I support S. 3107, as a co-sponsor. I do so for a very practical reason. Several years ago, the Senate Select Committee on National Water Resources found that our water supply is diminishing rapidly in relation to our increasing national requirements. The Select Committee found that population and industrial growth will double our water needs by 1980 and triple these needs by the year 2000. This means that we must plan for the day when the demand for water will be more than the existing available supply, and we must use all available water resources to meet our needs.

The Senate Public Works Committee is studying S. 2947 and companion bills to implement legislation to control water pollution. S. 3107, before this Committee, through the establishment of a National Water Commission, will perform

another important function. It seeks to study and advise on the entire range of water resources problems.

We are confronted with water shortages in virtually every area of the country at one time or another. My own State of North Carolina, which has vast water resources, has experienced water shortages during periods of drought because the demands on water supplies are much greater than they once were.

S. 3107 attempts to cope with the problems which are inherent in the civilization we are building by providing long-range plans and goals. Yet, it seeks to bring about workable plans in cooperation with state and local agencies that are vitally concerned with the problems at first hand.

Historians tell us that the fate of nations has often been determined by how well they controlled fresh water supplies, and that civilizations have vanished when they failed to cope with the problem while there was yet time.

I wish to thank the members of the Committee for their interest in this vital subject. I am hopeful that this Congress will take affirmative action to insure adequate water resources for the generations ahead.

STATEMENT BY HON. HOWARD W. CANNON, A U.S. SENATOR FROM THE STATE OF NEVADA

Mr. Chairman and Members of the Interior Committee, I appreciate the opportunity to lend my voice to the growing demand for more coordinated direction and expanded action in the field of national water resources requirements and supplies.

Representing the State of Nevada, I am of course acutely aware of the fact that water is indeed the life blood of any state, and that in my own state more than most we have not a drop to waste. That is why I was eager to join others equally concerned in enacting the Water Resources Planning Act last year which aimed at coordinating all of the activities of the Federal government in its multi-faceted approach to the water crisis confronting this nation.

We need to know more about our requirements and our supply of this valuable resource. It is urgent that we find out how to remove the poison which is found in virtually every major river in this country. We must have the foresight to reach beyond our own borders if necessary and implement every conceivable technology to add to our supply.

My own State of Nevada is constantly working in this field to chart and plan for the maximum development of its exceedingly limited supply, which is the only bar to an assured prosperity and the record growth which has characterized Nevada during the past decade.

But, Mr. Chairman, we recognize increasingly that water knows no local, state or regional boundary. Its flow is nationwide and the consequences of its use and misuse affects all of the United States.

As the President said earlier this year, there is no time to lose in meeting this challenge. S. 3107 would marshal all of the non-Federal forces in the nation seeking to move in this area and lend direction to the often repetitive private efforts being made in this field. We will need all of the help we can get, and our most important contribution will be the new ideas and the creative talents which will be brought to bear on our water crisis.

Just as the menace of pollution grows more serious each day, so are we challenged to move with unanimity and speed in solving the problem. The decisions we make on the Federal level to give direction to the program through such instrumentalities as the National Water Commission will greatly influence the ability of every public and private group now seeking to deal with this problem.

I urge the Committee to give its full support to the creation of the National Water Commission.

STATEMENT OF HON. JOHN G. TOWER, A U.S. SENATOR FROM THE STATE OF TEXAS

Mr. Chairman and members of the Committee on Interior and Insular Affairs: First, I want to extend to the Committee my thanks for this opportunity to inform the distinguished members of this committee of my views on S. 3107.

The first session of the 89th Congress provided positive action on behalf of water resources conservation by passage of the Water Pollution Control Act of

1965 and the Water Resources Planning Act—which created the Water Resources Council. It was my privilege to co-sponsor this legislation.

We now have an opportunity to further advance our national objectives relating to water and water conservation by enacting the subject bill. I am in complete accord with the objectives of S. 3107. This legislation, which I am pleased to be co-sponsoring, reflects the far-sighted approach to the problem of increased demand on our water resources which has characterized the Congress in recent years. It is estimated that in the United States by the end of the century, we may well be using every available drop of fresh water.

The persistent and recurring droughts during recent summers in the Northeast states have called to the attention of the residents of this section the problem which Texans and residents of other water-scarce states have lived with for years.

It is estimated that precipitation in the form of snow, rain and other forms falls in the amount of 4,400 billion gallons on the continental United States every day. Of this amount, about 1,100 billion gallons enter the nation's streams, reservoirs, and lakes.

Presently, we only consume 350 billion gallons of water each day; but by the year 1980 usage is expected to reach 600 billion gallons daily, and by the end of the century Americans will be consuming 1,000 billion gallons daily—leaving an excess of only 100 billion gallons each day. A serious drought would put us over the limit of our capacity, and the prospect is not encouraging to contemplate.

By planning now, we have a good chance of escaping these undesirable consequences. By enacting legislation such as the presently proposed "National Water Commission Act," we can hope to escape the grim prospects of a mounting water shortage in the future. This legislation, I am confident, will provide beneficial review of the plans of the Water Resources Council.

Hopefully, it will assist the Council through imaginative suggestions and alternative solutions. From the variety of ideas and proposals broached, it is to be hoped that our water preservation and conservation goals will be more readily, more wisely, and more effectively realized—at reduced cost to the taxpayer.

The CHAIRMAN. I know of no better way to open these hearings than to call upon the Secretary of the Interior, Stewart Udall, to be our first witness, Mr. Secretary, we are delighted to have you. You have a prepared statement, I believe.

**STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE
INTERIOR; ACCOMPANIED BY HENRY CAULFIELD, DIRECTOR,
FEDERAL WATER RESOURCES COUNCIL**

Secretary UDALL. Yes, I have a prepared statement I would like to have appear in full. I will comment and add to it, and summarize it.

The CHAIRMAN. All right. Fine. The statement of the Secretary will appear in full at the end of his oral presentation.

Secretary UDALL. I would also like to express my pleasure that the Senator from California is back in good health and appears his usual vigorous self.

Senator KUCHEL. Thank you.

Secretary UDALL. Mr. Chairman, the idea for a National Water Commission and study really grew out of the very intensive planning work that was engaged in by my own Department with the Bureau of the Budget looking over our shoulder during the months that we worked on what was then called the Pacific Southwest plan. And I think the thing that surfaced during those studies was a major conclusion by everyone concerned that from here on, insofar as the United States is concerned, rather than making our water policy as we have in the past by a whole series of what one might call small or minor de-

cisions, that there were emerging several very large issues and that these issues were of such scope and magnitude that it might be wise to use what I think I might essentially call the Hoover Commission approach because this is the approach that a National Water Commission would take, and to get a small, very high caliber group of disinterested people, the best brains of the country in this field, outside of Government, and to have a very broad look taken at some of these very big policy problems.

I am here this morning testifying not only as the Secretary of the Interior but as Chairman of the new Water Resources Council created by action of this committee, and also having new responsibilities for the water pollution abatement program. And, of course, this committee has given more thought to these problems, this committee and its sister committee in the other body, than perhaps any other in the Congress or in the country—to the problems of water conservation, of reuse of water, of alternate supplies of water, and also the very big problem with regard to large import proposals, taking water from one region to another or from one basin to another.

We have had, and this committee over the years has approved, what we call transmountain diversion projects. In most instances these have been within particular States, so that the issues, once they were resolved within a State—the Fryingpan-Arkansas project is a recent example of this—were relatively easy for the Congress to decide. But we face several large problems that the country must look at in terms of the broad national interest, and must analyze all of the alternatives.

Certainly the problem posed by the upcoming water shortage in the Pacific Southwest and the Colorado River Basin—and I think everyone realizes now that the entire basin faces a water shortage problem down the road, the problem that apparently the Great Lakes region is encountering—are two very big problems that involve whole regions of the country and, in the case of the Great Lakes, involves two nations. And, therefore, the basic conclusion that we came to over a year ago, when it was first expressed in the Bureau of the Budget's letter approving and sending up the Lower Colorado project legislation, was that the time had come to have a National Water Commission created and to have it take a look at these big policy problems and to analyze them, working very closely with the Federal agencies that have water responsibilities, using their expertise for its studies, and giving the country and the Congress the benefit of its views.

So that this was the origin or the idea for a National Water Commission.

In the last year, after reflection and after some of the discussions that have taken place, as far as I am concerned I think the wisdom of such legislation has certainly been confirmed. The fact that Senator Jackson, the chairman of this committee, was able to secure such broad cosponsorship of this legislation I think is further confirmation of the wisdom of this approach.

So that as we envision it, and this is a rather simple piece of legislation, this National Water Commission would address itself to the big broad policy questions with regard to water use and reuse, water conservation, alternate sources of supply for regions of the country which are confronted with water shortages in the future so that we can, in terms of our water stewardship in this country, emerge with broad

policy guidelines leading to policies that will make sense in terms of the national interest.

I would like to think that in another area of resource development, and a very important area, we are already taking action of a kind that in a way sets a pattern for what is proposed here. I refer, Mr. Chairman, to what has been done in the last 2 or 3 years with regard to electric power.

I think the West Coast intertie between the Northwest and Pacific Southwest, and the new WEST plan for electric power generation and transmission with all of the public and private power entities participating, is a further indication of this new type of regional cooperation. It seems to me, therefore, that the stage is set for a commission of this kind, and I think the Commission itself can and should work very closely with the Water Resources Council. It should work very closely with the agencies of the Government that have ongoing water responsibilities and that have carried out and will have in the future responsibility for carrying out studies of various projects and studies designed to take care of the water needs of the various regions.

I think this legislation is in the national interest and I know that the National Water Commission proposal is intimately involved with the Lower Colorado project legislation, which was considered only last week on the House side, and that the relationship of the two of them is of great importance to moving forward with that legislation.

This, I think, is the case for the legislation, and I hope that we can answer any questions that the committee may have with regard to how the Commission would work and what its functions would be.

The CHAIRMAN. Mr. Secretary, you mentioned some of the areas where there are water problems. You mentioned the Southwest and Great Lakes, and I am sure you did not want to leave out the Northeastern United States.

Secretary UDALL. Yes. This is the third area that the Budget Bureau mentioned in their letter and the Northeast is not out of its drought situation. Indeed, as far as I am concerned, even if there were no drought, I think the Northeast faces some big water questions with regard to its own future policies. So that we are really talking about a nationwide broad look at water.

The CHAIRMAN. All of this points up the need for an intellectually honest national review of our water problems, does it not?

Secretary UDALL. I think that the idea of having people who approach these big problems in a completely dispassionate way is the essence of the National Water Commission approach. I think that the effectiveness of the work of the Hoover Commission is justification for believing that this would be a good way to approach the problem.

The CHAIRMAN. You mention in your formal statement the close relationship between the Water Resources Council and the proposed water commission. Do you feel that this close relationship will in any way inhibit independent action by the commission?

Secretary UDALL. I would think that it would not if it functioned the way we envision it because I would think on the one hand the National Water Commission would want to get the benefit of the knowledge and insight of the Water Resources Council and of the agencies that compose it and their expertise. In fact, I think to a great degree in terms of providing data, getting the essential data and facts on

which it will base its ultimate judgments, that it would want to use the Water Resources Council and the expertise that it has as at least a major source of its information.

But I think if the Commission is dispassionate, as I am sure it would be, that would not serve to impair in any way its judgment with regard to the ultimate decisions that it made.

The CHAIRMAN. You see the Water Resources Council playing a cooperative role, I take it, leaving to the National Water Commission, of course, in the last analysis, its right to exercise its own independent judgment.

Secretary UDALL. This I think is the way that the Commission should function. I think you have described it very well.

The CHAIRMAN. Senator Kuchel?

Senator KUCHEL. Mr. Chairman, first of all, I am very glad to welcome to the committee the Secretary of the Interior, who I am proud to call my friend, and without whose painstaking assistance the far-flung area which I represent in part would still have an insurmountable water problem. And I give Stewart Udall very great credit for all that he has done as an American, not as a citizen of one State, in bringing the Pacific Southwest along so far and so well toward an equitable solution of a tragic and ever-worsening problem.

I also want to say on this occasion what I have told the members of this committee before. The 20 million people now living in California have a never-ending debt of gratitude to the Government of the United States. Without reclamation, without multi-purpose projects, water, power and all the other purposes for which Federal reclamation exists, the economy of the State I represent could not exist.

I recognize, as a Senator, Mr. Chairman, I have a responsibility to the people of the country as well as a responsibility to the people of my State. That is why I participated several months ago with great interest in the committee hearing in this room on the problems faced by the people of New York and New Jersey and Pennsylvania, hopefully endeavoring to find a way by which the Federal Government might be of assistance to that area on the Eastern seaboard.

Nevertheless, I want also to state frankly to this committee that, in my judgment, the great unsolved problem of sufficient water supply in the Pacific Southwest is one of the most challenging and urgent problems before this Congress and, in my questions of the Secretary, I hope to not only spell out the beneficent purposes of this legislation, but also to assure that we all understand exactly how this would affect, for example, the State from which I come.

I agree with the phraseology which the Secretary used in his statement, to discuss the purpose of the bill before us, to establish a national review of basic water resource problems:

Water resource problems are seldom purely local in scope.

So, as the chairman has indicated, this legislation is designed to provide for a Presidentially appointed group whose responsibility it will be to make reviews of water problems.

Now, do I state correctly the general purpose of this legislation, Mr. Secretary?

Secretary UDALL. I think this is a good general statement of the idea behind the Commission, yes.

Senator KUCHEL. You are Chairman of the Water Resources Council. Has that organization met in the past, Mr. Secretary, to develop some general thinking and guidelines on water problems?

Secretary UDALL. We are still in our first year. We have had organization meetings. We have not had a meeting of the Council to discuss the big national problems up to this point. I should say that to the committee.

Senator KUCHEL. When and if Senator Jackson's bill became law, such a provision as this, then, would govern the problems before the Commission, and I quote from page 3 of the bill, section (b) on line 19:

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

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

Mr. Secretary, how do you describe the manner by which the Commission shall undertake any review of a water problem? May it do it on its own decision or is it required, in your judgment, to await suitable instructions by the Water Resources Council before proceeding?

Secretary UDALL. No. I think the language is quite clear and as far as we are concerned, I think this is a good provision.

I think if I were on such a commission, and you had a tentative report prepared, you would want to have the views and comments of the Water Resources Council and of its experts before making a final decision. So that is taken into account.

Then I think the President, in making his final judgments, ought to have the comments of the Water Resources Council on the report of the Commission. I think again this is the usual procedure we always follow in our own Department, of getting the views of all who have a primary interest, and I think that the Water Resources Council's views should be expressed, but I think the Commission ought to be independent in the sense that it will make its own final judgments.

Senator KUCHEL. Indeed. But to initiate a study any place in the United States, Mr. Secretary, is it your understanding that this bill provides that the Commission itself may initiate a study without waiting for direction from the Council?

Secretary UDALL. Yes. I think this is certainly envisioned, that the Commission will lay out its own area for decision, stake out the problems that it is interested in, and that it can pursue its own course with regard to deciding, so long as it is within the scope of the authorizing legislation, just what particular problems it wants to study.

Senator KUCHEL. Would you say that the Commission might simultaneously study more than one national water resource problem?

Secretary UDALL. Well, I think the Commission might very well want to stage its work, take up particular problems, maybe take up the most pressing problems first. It could very well decide. But that would be a decision either for the Commission itself, or the Congress, if it wanted to, could indicate its own feeling with regard to priorities.

Senator KUCHEL. To use the phrase which you just used, Mr. Secretary, the most "pressing problem" you have in your statement referred

to Mr. Hughes of the Budget Bureau, who stated that the Budget Bureau "would favor acceleration of the review of western water problems with particular emphasis on the Colorado River Basin," by the National Water Commission. And then you go on to say:

We recommend, therefore, that you act favorably on the legislation before you in order that that job be done expeditiously.

Without in any way attempting to put any words into your mouth, is it fair to say, Mr. Secretary, that you feel there is no greater water problem in this Nation today than that which faces the States in the Colorado River Basin?

Secretary UDALL. Well, I think, in terms of impending serious water shortages that have clearly emerged, that certainly this is the first priority area in terms of crisis. If the eastern drought were to get more severe, I think one might say that this would have first priority. But certainly this is a serious, a big problem and we have got to confront it.

Senator KUCHEL. I thank you, sir.

Now, let us assume that the bill is passed, the members of the Commission are appointed, and that the Commission then proceeds to make a study of three or four national water resource problems simultaneously—A, B, C, and D. Assume that, at the end of 2 years, national water resource problem A is completed so far as the Commission is concerned.

What is your understanding of what this bill provides? Does that report of the Commission on problem A then go to the Council for its recommendation?

Secretary UDALL. Well, it would go to the Council for its reviews and comments, back to the Commission, and then the report would go on to the President and we would submit our comments to the President as well.

It was our feeling, and we raised this very seriously with the Bureau of the Budget because they originally were going to leave the Water Resources Council out and the Council came into being in fact after the initial recommendation went up a year ago, that the Council should be in the picture as the Nation's presently constituted major water policy organization, and that the President should have the Council's comments, but that the Commission should operate in an independent way, working and cooperating with the Water Resources Council.

Senator KUCHEL. Now, let us assume that the recommendations of the Water Commission on national water resource problem A include congressional action. In other words, the enactment of reclamation projects.

At what time will the President transmit to the Congress the recommendations of the Commission in which, let us assume, the Council has concurred?

Secretary UDALL. Well, I think that it will be safe to assume that this would be done in a regular or an orderly sequence of events, but certainly if the Commission in its own wisdom wanted to break up its studies and to send them forward to the President in piecemeal fashion—

Senator KUCHEL. Not to the President but to the Council.

Secretary UDALL (continuing). Or to the Council, this would be a workable way of doing it. I think there are several ways of doing it

and it would really depend upon the Commission's judgment with regard to the best way to approach the problem.

Senator KUCHEL. The reason I raise these questions, and I think the intention of the language may be held by all the authors and yet be susceptible to some amendment to make it more clear, is that the bill provides that the President shall transmit the Commission's final report to the Congress together with such comments and recommendations for legislation as he deems appropriate.

Since the Commission's life by this bill is 5 years, I think it is logical to assume that the President's report to the Congress would not take place until near the end of the 5-year period and that represents one of my apprehensions which I think can be allayed by an understanding that when a Commission project is completed, and when the Council has acted, that the President may send to the Congress recommendations for legislation at any time for appropriate action.

Is that not the way you would deem the procedures to be set forth?

Secretary UDALL. I do not see any language here that would restrict the President from acting in whatever way seemed to be prudent. He would not have to wait until the end if this piecemeal approach were used.

Senator KUCHEL. Now, again with particular reference to the central Arizona project, and the problem of water augmentation or importation into the Colorado River Basin, the Bureau of Reclamation and you personally, Mr. Secretary, and your staff have studied that problem for, I guess ever since you were sworn into office, and you have made some particular recommendations with respect to that legislation. The bill, H.R. 4671, Committee Print 19, is now pending in the House Interior Committee and some of us have bills of similar purport pending here in this committee.

I think you, Mr. Secretary, and the Bureau of Reclamation have performed an excellent service in the studies you have made and the feasibility findings you have made in this field.

Would you believe that the Commission, if it saw fit to study this problem, would utilize the Bureau of Reclamation's employees or would it have its own separate staff?

Secretary UDALL. I think the legislation envisions the Commission having a small staff of experts but of using the Bureau of Reclamation, the Corps of Engineers, and other Governmental agencies to provide the raw material that they would work from and, in other words, not be building up a massive group of water engineers or experts to study water policy, but simply have enough staff so that they can make a full analysis of these big policy problems.

The Commission is not going to plan projects, for example. It is going to address itself to big national water questions.

Senator KUCHEL. But would it in so doing be discharging its responsibilities in determining feasibility of curing a water-deficient area in the country by Federal public works? Would that be within its jurisdiction?

Secretary UDALL. Yes, and I think it is going to have to have some engineering data and some engineering answers to some of these questions, but I do not think that its business is to plan particular water projects. I think I ought to make one point very clear just so that we all understand this aspect of it. Under the Federal Water Project Recreation Act as passed last year, under the amendment put in by the

Senate side, we have to come to the Congress through this committee to have all of our water planning, proposed water planning, approved and authorized and then we have to go to the Congress through the Appropriations Committee and get money for those projects.

Senator KUCHEL. You know, Mr. Secretary, I opposed that legislation when it was before this committee.

Secretary UDALL. I know, but it is now law and this is the way we function, and therefore this committee is going to have control throughout of what is done and whether a particular project is to be studied, the way that it will be done, and the timing and everything else is under the control of this committee. I think that the committees of Congress can decide, in terms of what project studies we engage in as we go along, how this would fit in with the work of the National Water Commission. But the National Water Commission is not going to replace the Bureau of Reclamation, for example, as a planner of water projects. We do not envision that.

Senator KUCHEL. That is most important for you to say and I am glad that you have said it. I venture the hope that this session of the Congress may pass the central Arizona project as it is presently written in the draft bill in the House of Representatives.

I am told that that legislation will proceed, with some amendments, to go through the House and will come to this committee here, and I want to go into that with you a bit later this morning, because I think that is most important. I do not want to have anyone feel that the adoption of a bill creating a National Water Commission would in any way affect the travel of the central Arizona bill in the House, which does have the recommendation of your Department, through the Congress.

Secretary UDALL. I think we might as well be candid.

Senator KUCHEL. Do you agree with me, Mr. Secretary, on that?

Secretary UDALL. We might as well be candid, Senator, and I am sure all the members realize that these two are related. It is our hope, at least, that both bills are passed in this session of Congress. Whether they are linked together in a single bill, put together, is a decision that is up to the committees. But I think that we should be honest with each other and face the fact that these two pieces of legislation, the lower Colorado River project and the National Water Commission, are intimately related and that they should be acted on by the same session of the same Congress.

Senator KUCHEL. This is important, and as you say, Mr. Secretary, there must be complete candor here. Last week when your able Assistant Secretary Holum, testified in the House committee, Representative Foley, who comes from the State ably represented by the chairman of this committee, asked this question, and I quote from page 3208 of the transcript of that hearing:

Mr. Secretary and Commissioner, to perhaps clarify the record a little bit in view of some of the questions that have been asked by Mr. Tunney and others, you are coming before the Committee today to recommend that the investigation and studies now contained in Title II of the bill be stricken from the bill and substitute therefore either in this bill or in separate legislation that responsibility and study to vest in the Water Commission.

Mr. HOLUM. That is correct.

Title II, to which Representative Foley referred, is a provision which has the approval of all the States in the Colorado River Basin, in-

cluding, I daresay, the State represented so ably by my Swedish brother, Senator Anderson.

I go so far as to say in my judgment it had the support of the Department of the Interior. At any rate, I ask consent, and I want to refer to it later on, that title II of the House draft, H.R. 4671, House Interior Committee Print 19, be inserted at this point in the record as they now appear in the House Committee on the Interior.

The CHAIRMAN. Without objection, it will be included.

(The document referred to follows:)

TITLE II—INVESTIGATIONS AND PLANNING

SEC. 201. (a) The Secretary is authorized and directed to—

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

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

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

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

(5) investigate means of providing for prudent water conservation practices to permit maximum beneficial utilization of available water supplies; and

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

(b) The Secretary is authorized and directed to prepare planning and feasibility reports of a staged plan for projects adequate, in his judgment, to meet the requirements reported under paragraph (a) of this section, in conformity with section 202.

(c) The plan for the first stage of works to import water into the Colorado River system from outside the natural drainage area of that system shall include facilities to provide two million five hundred thousand acre-feet annually for use from the main stream of the Colorado River below Lee Ferry, including satisfaction of the obligations of the Mexican Water Treaty and losses of water associated with the performance of that treaty. The plan for the first stage may also include facilities to provide water in the following additional quantities:

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

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

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

(d) The Congress declares that the satisfaction of the requirements of the Mexican Water Treaty constitutes a national obligation. Accordingly, the States of the upper division (Colorado, New Mexico, Utah, and Wyoming) and States of the lower division (Arizona, California, and Nevada) shall be relieved from all obligations which may have been imposed upon them by article III(c) of the Colorado River compact when the President issues the proclamation specified in section 304(b) of this Act.

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

SEC. 202. (a) In planning works to import water into the Colorado River system from sources outside the natural drainage area of that system, the Secretary shall make provision for adequate and equitable protection of the interests of the States and areas of origin, including assistance from the development fund established by title IV of this Act, to the end that water supplies may be available for use therein adequate to satisfy their ultimate requirements at prices to users not adversely affected by the exportation of water to the Colorado River system.

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

SEC. 203. (a) The Secretary shall prepare an importation plan, including proposed allocations of costs specified in section 401, and giving effect to the provisions of sections 201 and 202.

(b) On or before December 31, 1970, the Secretary shall submit a proposed report and findings on said plan to the affected States and to Federal agencies as required by law.

(c) Not later than one year after receipts of the comments of State and Federal agencies on such report and findings, the Secretary shall transmit his report and findings to the President and to the Congress. All comments received by the Secretary under the procedure specified in subparagraph (b) shall be included therein. The letter of transmittal and its attachments shall be printed as a House or Senate document.

Senator KUCHEL. I also ask consent, Mr. Chairman, that a discussion of title II by the distinguished Washington lawyer, Northcutt Ely, in its entirety be inserted at this point in the record.

The CHAIRMAN. You mean a Washington, D.C., lawyer?

Senator KUCHEL. Washington, D.C. It is very short.

The CHAIRMAN. I think we do not want, in all fairness—I want to say to my distinguished friend—a trial of the Colorado case here. If we are going to start on that, hold hearings on that subject, we will be going on indefinitely.

I want to be fair but I do not think we ought to get into a lot of collateral issues. Otherwise we are going to have to call witnesses from the Northeast, the Great Lakes, and a whole series of projects, and I think this would be most unfortunate.

I want to be fair about it, but I think there are proper limits here.

Senator KUCHEL. Mr. Chairman, I just read a question from a member of your Washington State delegation, including his comment on this bill.

The CHAIRMAN. No. Not on this—

Senator KUCHEL. When he says “Water Commission,” I find in this—

The CHAIRMAN. All right, but what was the hearing about?

Senator KUCHEL. The hearing was on the central Arizona project legislation in the House.

The CHAIRMAN. And the question was asked, and it was answered, and the answer to it was that the official position of the administration is for deletion of title II of the bill.

Senator KUCHEL. I will inquire into that and the official position of the Senator from California is quite different, and if you are going to have two pieces of legislation, Mr. Chairman, one of which would effectively overrule the provisions in the other, then surely I am within my rights in inquiring into the appropriate sections in both.

The CHAIRMAN. Well, let us keep it within reason because we are not holding a hearing on the Colorado matter here at the present time. We could be here indefinitely, but anything within reason, the Chair is going to be fair. However, I will place the statement in the appendix of the record.

(The statement appears on p. 197.)

Senator KUCHEL. Well, the chairman is my friend and I want to say that this legislation that my friend the chairman has introduced obviously affects the people I represent.

The CHAIRMAN. And 49 other States.

Senator KUCHEL. And 49 other States, and it represents a bill which bears the administration's approval now pending in this committee and on the other side of the Capitol.

Well, Mr. Secretary, I think that what we need to do in order to make progress is to avoid any rigidity. To have any legislation come out of this committee it is going to require some considerably bipartisan, broad-gage agreement by the members of this committee, and so I do not want to get us into positions of rigidity.

The other witnesses from the Colorado River Basin States answered Mr. Foley's question differently from Secretary Holum. Secretary Holum said that title II of H.R. 4671 in the House could be deleted and the Water Commission created by this Senate bill could proceed and the administration would still be for the House bill. The representatives of the States of the Colorado Basin said no; that if title II came out, they would oppose the House legislation, H.R. 4671.

Is it possible, Mr. Secretary, for us to compromise these two divergent points of view in a manner that would permit Congress to create a National Water Commission, and secondly, which would permit Congress to pass the central Arizona project legislation, maintaining title II, but with additional language to provide that the Secretary's inquiry into all potential alternatives for additional water in the Colorado River would be made in conjunction with the Water Commission created here.

Secretary UDALL. Senator, this is a very ticklish question, and I want to answer it as carefully as I possibly can. The House committee, your sister committee, may decide not to take up the National Water Commission issue as separate legislation. They have been considering it and it was discussed, I understand, last week during the House hearings. The House committee may propose to have legislation that would accomplish this purpose as a title or as a section in the Lower Colorado project legislation.

Now, this is not disturbing to me because I have watched the two committees operate too long, and I know their ability to compromise things and I think if the House wants to function that way the issue can be compromised and resolved in due course. I think this is the most important thing to bear in mind. I do not see a deep disagreement here that cannot be resolved. I think there is general support for the idea on both sides, in both bodies, that a National Water Commission is needed and can serve a useful purposes.

I think that there is a feeling also that various types of import plans should be analyzed in a broad way and alternatives explored and that this is the course of wisdom to follow.

I think this is an issue that is readily compromisable. I would like to throw one other word of caution out, if I might, because what is presently the Lower Colorado project legislation actually represents

a series of compromises that have been reached by all of the States in the Colorado River Basin. There is a whole series of them and this is a big piece of legislation with many, many titles and sections in it.

I think we are going to need flexibility and a willingness to compromise among the Senators and the Members of the House and I think that we are going to also need a willingness among the States in the Basin not to be too rigid or to get too attached to every little point that might have been agreed upon. This whole thing has been worked out through negotiations, with Interior not participating directly but looking over the shoulder of the negotiators. I think that it can be kept together, but I think there has to be a little give and take from here on during the remaining course that this legislation follows through the Congress and that the normal amount of compromises will have to be made.

But I do not see the issue as one that is so divisive that it cannot be compromised, not at all.

Senator KUCHEL. The point you and I are discussing in my opinion is not a little point. Indeed, I call it a crucial point. I was hopeful that you might be able to clarify Secretary Holum's answer because is it not true that the present study provisions in title II of the House bill on central Arizona were actually drafted by men in the Department of the Interior, and is it not true that generally that provision in the House bill did represent the Department's point of view?

Secretary UDALL. Well, Senator, I cannot answer you explicitly on that. I will get some help in a moment if I can. But I want to say this with regard to this facet of the legislation. It is something that we have all struggled with in attempting again to work out compromise language that would be agreeable, and on a provision of this kind we rarely take a rigid position that there is only one way to do it and that is the way that the administration proposes that it be done.

I think we have a problem here where the States within the Colorado River Basin have strong views and have reached agreement among themselves. The administration has its views. Members of this committee have their views and I think we just have to all be flexible enough and statesmenlike enough that we can work out compromise language. The basic view I am trying to express here is that I do not see any rigidities that should prevent this committee and its sister committee working with all of us to work out a solution that is satisfactory.

I know that this is an issue on which many people have very strong views but I think that it is very clear what the general solution is and it is clear what the national interest is, and I think that we can work the problem out.

Senator KUCHEL. I am not going to pursue this, but let me see if I can just get an answer to this question. Mr. Secretary, Mr. Holum said that the Department of the Interior would favor the House bill, if the investigation and study provisions of the House bill were completely knocked out. Your comment to the committee would be that you were not rigid on that answer.

Secretary UDALL. Well, this point was covered in the report of the Bureau of the Budget on the legislation a year ago and the provision that you are talking about was the provision that the Department had prepared initially but which was, of course, superseded by the administration position taken by the Bureau of the Budget, which was that a National Water Commission should be created.

Now, the answer, however, I think, to the specific question is that if the House committee should decide in its wisdom that it wants to put some kind of a National Water Commission study provision in the House legislation and not take it up as a separate subject, they have a perfect right to do so, and we would hope that in handling this particular facet of the problem, they would use language that would conform as close as possible to the National Water Commission legislation proposal.

This does not mean that it cannot be modified. We do not present the legislation that is pending here saying that it is perfect and that Congress cannot modify it or change it. So I think that both committees face the problem they usually face of us making our recommendations, and it is now up to you to work your will on it.

In that sense I do not think the administration's position is inflexible in that we say it must be done a certain way and that that is the only way to do it.

Senator KUCHEL. And if the House of Representatives passed legislation which placed a responsibility on your shoulders, which you advocated in the last Congress to make studies of all possible ways of augmenting the supply of Colorado River water, you would not oppose that action and you would not come before this committee and urge that it be deleted?

Secretary UDALL. Well, this committee—

Senator KUCHEL. You must tell me that, Mr. Secretary. You must give me an answer to that.

Secretary UDALL. This committee has authority, either in this legislation or every 2 years when we will now have to come before you, or annually, to authorize what water studies we can make. The committee has complete control over this. If the Congress were to decide that they did not want a National Water Commission but they wanted the Bureau of Reclamation to study imports, I would have to talk to my colleagues in the Bureau of the Budget to decide whether this was unacceptable to the administration. We have taken the present view that the best way to approach this big problem that the country confronts is to have a National Water Commission study the big, broad problems and to let it move out in front.

Senator KUCHEL. Well, I regret deeply that that is not helpful to me because we have a specific bill pending in the House that you and I helped to draft and you and I supported, and I recognize the administration and the Bureau of the Budget are recommending a nationwide Commission which you and I favor, but what I am trying to do here is to develop your thinking and mine, that that specific bill in the House of Representatives which is just about ready to start moving ought not to be eviscerated in any section that you and I originally recommended and that, if it came over here, that you and I would not oppose the section that we helped write.

Secretary UDALL. Well, Senator, the thing that has been very obvious to me from the beginning, and this is the reason I have taken the approach for 3 years now, that we are all going to have to work together in the Colorado River Basin and in the West, and this includes above all the chairman of this committee, if we are to work out legislation looking toward a solution of these big problems. I think this has been the one big basic premise that we have worked from in my

Department in the last 3 years. And I do not think—and I might as well be very candid and say that to one and all right here and now—that you are going to get this legislation that is so badly needed through if you are going to propose at this time studies in any form that are offensive to the Northwest and to the chairman of this committee.

Senator KUCHEL. I am going to say—

Secretary UDALL. And I think that it is important that all of my friends in the Colorado River Basin understand this because I think we can get legislation in this session of Congress, I think we can go all the way to home plate with it, but I do not think we can pick a fight with the people in the Pacific Northwest and with the chairman of this committee and get legislation through.

Senator KUCHEL. Well, I am going to say right now that I am going to start—I am going to continue—trying to be completely inoffensive to my chairman. I recognize the power of the chairman and I think the power of the chairman was used in a most constructive way, not only to his State but to all the States in the West, when he and some of the rest of us participated in the intertie legislation, and I want to work in cooperation with him.

The thought occurred to me that it might be helpful if the members of this committee took a look at the President's nominees. Perhaps the legislation ought to say the Senate should confirm these men, these seven men, who will have, in a way, the power of life and death over this country, over this country's development.

How would you look on that kind of an amendment?

Secretary UDALL. Well, I do not know. I would be curious to know whether the members of the Hoover Commission were confirmed by the Senate myself. I think that would be a precedent. After all, this is not a Commission that is going to make decisions that will become policy. It is going to make recommendations as to policy and maybe from that point of view, confirmation would not be in order. But if the Hoover Commission people were confirmed, maybe this is a good idea. I do not know.

Senator KUCHEL. We have a rather spotty history, I will say to you, Mr. Secretary, in what Congress in the past has done with respect to providing for Senatorial confirmation. It was an idea. I am not jumping up and down about it. I have not mentioned it to the chairman and members of this committee. I thought I would ask you. At least it could be a subject for this committee to inquire into, I am sure.

Secretary UDALL. Senator, just to underscore for the benefit of all the members of the committee my own feeling with regard to this very crucial problem which you have raised, the most important thing, as I said, is for people to not get themselves in rigid positions because I think this issue is compromisable. I think that the chairman of this committee and other members of the committee can at the appropriate time work out a compromise that will enable us to pass a Lower Colorado bill with the Colorado projects in it and at the same time to get the studies going that are going to be needed before you can make any decisions with regard to import programs. And I personally, for my part, admire the flexibility of the position that the chairman of this committee has taken. He could have taken an

adamant position that he was opposed to any studies of any kind. This might have been a position that he could have gotten considerable political mileage out of. He has not done so and I think the thing that all of us need to do is to work along together on this problem and compromise this issue the way we have done on so many tough issues that we have been confronted with in the past.

Senator KUCHEL. Well, I thank you for that and I am going to say that the chairman of this committee is my friend. I am going to say he is important to me. I am going to say he is important to the people of California. I am going to say he is important to the people of the Colorado River Basin. And surely the problems that we have had—

The CHAIRMAN. Do not leave out the State of Washington.

Senator KUCHEL. He has a little responsibility there, too.

No. I recognize that, Mr. Chairman. And I know some of the political bigots who exist in your State as well as mine who have tried to make political capital out of an attempt by some of us to work together in the interests of the entire area, and you have stood up to them and I congratulate you on that.

Well, thank you, Mr. Chairman, very much. And thank you, Mr. Secretary.

The CHAIRMAN. Mr. Secretary, I just want to ask a couple of questions. Is it not quite clear that the administration has faced and has reached a decision on the question on how we should approach these regional water problems and that is, since May 10, 1965, when Mr. Staats sent his letter up in connection with the Colorado project, he made it clear that the official view of the administration is to approach these problems on a national basis and not on a regional basis. So that the real purpose and the heart of this legislation is to look at water problems, not just in one area of the country, but to look at them nationally. Is this not the clear-cut, unequivocal position of the administration?

Secretary UDALL. This was the essence of the approach taken. If you add to that a feeling, with regard to big solutions to the big problems, that it was wise to have dispassionate people not connected with the departments of Government which might have a vested interest take a broad look at the alternatives and make that type of analysis.

The CHAIRMAN. And as a matter of fact, the idea embraced in the bill was to get away from just looking at projects per se, and it is well spelled out in section 3 in connection with the duties of the Commission. I refer to subsection (a) (1), and so on, in which the Commission is empowered to "review present and anticipated national water problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances such as desalting and waste water purification and reuse," and then it goes on, "consider economic and social consequences," and so forth.

I mention this because some of us are interested in looking at this problem from a national point of view to get some intellectually honest answers to troublesome problems and to find out what recommendations should be made. And I think it is quite clear that the admin-

istration made that decision on that date and that is the policy and we are not to try to break up a national study into regional studies that relate to some specific problems, and ignore the rest. I believe I have stated accurately the official views of this administration. Is that not right?

Secretary UDALL. This is essentially our view with only one slight modification, and this was in the more recent letter of the Bureau of the Budget in which it was indicated, and this was the point Senator Kuchel was exploring with me a moment ago, that the Commission could, if it wanted to, or the Congress could write it into the legislation, giving priorities with regard to studies but that would be, as far as I am concerned, a mere detail. But I think the point, Senator, that I would like to make to the other Senators here from the Colorado River Basin and to their people is that whatever the ultimate solution is to the water shortage of the Colorado River, whether it is an import from somewhere in the Northwest, an import from northern California, whether it is desalination, whatever it is, the timing is such in my judgment, and I think this was the judgment expressed by the administration, that we can at this point have a broad study made of the big policy facets of this problem before we get down to the details authorizing specific projects.

So that this is the first step, to get these answers. And then we would decide where we move. And if someone were going to be out of water in 1970 or 1975, I think there would be reason for urgency in moving on but I think there is time to have a broad-gage study of this kind and I think this is basically the reason the administration took the position that it did.

The CHAIRMAN. I think the legislation is pretty wise in that it left to the Commission the discretion as to how they should move. We would look a little ludicrous, would we not, Mr. Secretary, if a recommendation was made to give first priority to the Colorado River basin when you are talking about a shortage many years hence, but all of a sudden we have another drought in the Northeast and they came to you and ask, "How come you have given top priority to a problem that we are not immediately up against but delay one that we are immediately confronted with, and for this present problem there is no priority?"

Now, I think this points out the need to give to this Commission the kind of discretion that should be given to it if the President has confidence in the people he names as members of that body. Is that not right?

Secretary UDALL. Well, Senator, I have never described anything that a committee of Congress did as ludicrous. I think, however, if the committees want to write the legislation that way it would be a satisfactory way to do it. If you wanted to leave it the way it is, I think that would be satisfactory. If you wanted to put priorities in, I think that also would be satisfactory.

The CHAIRMAN. Senator Anderson?

Senator ANDERSON. Well, a moment ago, Mr. Secretary, you were having some discussion with the Senator from California about the bill of some years ago on importation of water. The Hayden-Goldwater bill said "investigate alternative sources in the State of California," did it not?

Secretary UDALL. I think—you are referring now to some of the earlier bills?

Senator ANDERSON. Yes.

Secretary UDALL. I think Senator Hayden and others sponsored a bill, yes.

Senator ANDERSON. "Investigate alternative sources in the State of California." Later on it said "in planning any works to import water into the Lower Colorado River Basin from alternative sources in California."

Quite a different situation, importing back and forth in California from bringing water from the Pacific Northwest.

Secretary UDALL. It raises a whole series of new problems indeed.

Senator KUCHEL. Who are you suggesting advocated that? I have advocated and the Secretary has advocated inquiring into the availability of water in northern California and every other place. What bill is the Senator referring to?

Senator ANDERSON. The Hayden-Goldwater bill.

Senator KUCHEL. I thought so. That does not bear the administration's approval.

The CHAIRMAN. This is a bill that was reported to the Senate in the last Congress.

Senator ANDERSON. Was something else reported to the Senate?

Secretary UDALL. Our original Pacific Southwest plan had an import plan to bring water in from northern California.

Senator ANDERSON. I recognize that.

Secretary UDALL. And subsequently we suggested looking at other alternatives, including desalting and the Columbia River. And out of all of this discussion came the ultimate position the administration took a year ago as Senator Jackson described it a moment ago.

Senator ANDERSON. And that position is contrary to the suggestion of including section 2, is it not?

Secretary UDALL. It is essentially saying that the National Water Commission approach of some kind should be substituted as the first step toward looking at the long-term solutions.

Senator ANDERSON. And when Secretary Holum was testifying, was he under obligation to support the administration point of view?

Secretary UDALL. Yes, indeed.

Senator ANDERSON. And you would be also, would you not?

Secretary UDALL. I always try to speak for the administration.

Senator ANDERSON. Well, I do not think it comes to that at all. A Cabinet officer can support the administration or resign.

Secretary UDALL. Those are the alternatives, as you well know.

Senator ANDERSON. Well, I always go along with the administration. Now, the whole purpose of the study is not just to consider individual projects, but a whole nationwide program, is it not?

Secretary UDALL. This is the approach that really brought us to the idea of a National Water Commission, because, after all, our water problems are national. When you start talking about water conservation, licking water pollution, re-use of water, these are national problems. They are not regional problems.

Senator ANDERSON. The bill provides for studies about interbasin transfers and innovations to encourage the highest economic use of water.

In my part of the country suppose the Navajo Indians make use of the water. If they should decide it is better for them to have an electric generating station, that is a proper answer to the question, is it not?

Secretary UDALL. Yes. I think that is a very good example.

Senator ANDERSON. Thus far they have been very reasonable about it and your Department has done, I think, a superb job of encouraging these large powerplants in the foregoing section.

I hope these two bills are not tied together. I think a national study is a very fine thing and I hope we have very good hearings and will probably pass the bill for the central Arizona project that is now pending. But I do not seem to see them tied together at all. I have no great questions. I appreciate your testimony this morning. I do hope we move along with this bill and with the other bills that are associated with it.

The CHAIRMAN. Thank you, Senator Anderson.

Senator Allott?

Senator ALLOTT. Thank you, Mr. Chairman. I hope I do not repeat anything that went on before I got here. I was in attendance at the Appropriations Committee before this.

Mr. Secretary, I think I can repeat and associate myself pretty well with the statements of Senator Anderson and my senior colleague on the minority side with respect to this legislation. I personally hope that when we are considering anything as important as the water supply of this country that we can keep it on an objective basis and not regard any particular piece of legislation as an act of depredation on another section of the country as, for example, the section of the country represented by the chairman of this committee.

I recall very well the Water Resources Planning Act, which I had some reservations about in the initial instance as I am sure you recall when you testified before the committee on that, and we came up with what I think is a very good bill. However, in that bill, which is Public Law 89-80, in section 3, subparagraph (d), the law reads:

Nothing in this Act shall be construed as authorizing any entity established or acting under the provisions hereof to study, plan or recommend the transfer of waters between areas under the jurisdiction of more than one river basin committee or entity performing the function of a river basin commission.

And then the statement on the part of the managers of the House of Representatives attached to that discusses this in some detail.

As you recall, that provision was put in in conference in that bill.

Now, other than that limitation, there would be really no reason why the Water Resources Council could not of itself undertake this study except for the statements you made a while ago that there is more desirability in what you would think would be a more objective group.

Secretary UDALL. I think what the country needs, in terms of getting the best advice with regard to alternatives, is to have a Hoover Committee or Water Commission take a very broad-gage look at the Nation's problems and the Nation's water future. But then there should also be available the comments on that report and recommendations by the best water people that the National Government has, and once you have both of these, which the President will have and the country will have when it is through, I think you would have the best possible focus on these big problems.

So it was our feeling, since the Federal Water Resources Council was created after the National Water Commission was originally recommended a year ago, that it ought not to be pushed out of the picture but brought into it playing an important and complementary role to the Commission.

Senator ALLOTT. I think I understand your position, Mr. Secretary, but I think your answer to be "Yes" to my question, which is that except for this provision in Public Law 89-80, this specific provision, and your reservation about what you consider a more objective look at it, there is no reason why the Water Resources Council itself would not be functional?

Secretary UDALL. Yes. I would answer "Yes."

Senator ALLOTT. And able within the concepts of its own powers in the bill to perform its job?

Secretary UDALL. Yes.

Senator ALLOTT. Now, there is one other thing that concerns me. I do associate myself with the remarks of the Senator from California, that I think perhaps we should at least discuss the implications and the possibilities of some kind of a confirmation on this. It is quite true that perhaps some of these other commissions and other committees have not had the approval of Congress. For example, to use a very recent one, the President had an Advisory Committee on Supersonic Transport which is going to have an impact of \$3 billion or \$4 billion upon the economy of this Government in the next few years if it goes forward, and the President did this on his own. He appointed his own committee.

Is there any reason why he could not do that with respect to a Water Commission, without congressional action?

Secretary UDALL. I think, having anything over the duration of 1 year, I think this is the limit within which the President must operate. The other real value, it seems to me, of legislation is the guidelines the legislation lays down, the task that it gives to the National Commission, and the prestige and independence that it would have if Congress sets it up, because it is not answerable to the Executive except to the extent that it wants to cooperate and work with the Executive—which I am sure that it would.

It would have its own staff. Once the President has appointed them, the Commissioners carry out their own deliberations and come to their own broad conclusions and make their report.

Senator ALLOTT. Well, I must say that this particular point that you have just made is of some concern to me. We have no idea of who will be appointed on this Commission and we clothe it with a statutory entity and a statutory authority so that the report or reports that it comes up with will be naturally quite influential in the future.

And this additional question comes up with me at this time: Just a little over a year ago we authorized the Public Land Law Review Commission and the Public Land Law Review Commission met earlier this year, in fact it has met three times this year in formal sessions, and there is no question in my mind that this same subject is going to be covered at some point by the Public Land Law Review Commission.

Now we have an entity, the Water Council, the Water Resources Council, and then we will superimpose above this a Commission.

Going on parallel to that, at the same time, in a very elaborate study is the Public Land Law Review Commission, which I know definitely contemplates deep and detailed studies into the whole subject of water. Are we not getting a little proliferous with our organizations here?

Secretary UDALL. Well, of course, Senator, the Federal Water Resources Council basically is a coordinating mechanism to coordinate water policy of the Federal Government and to enable us to establish working relationships with the States. So that is a primarily on-going thing.

I am not aware of the extent to which the Public Land Law Review Commission is going to go into water. I think certainly they will have to touch on water as a subject. But the Commission Senator Jackson's bill proposes has a completely different focus from the Public Land Law Review Commission in that it asks the big questions about where do we go from here in terms of water policy?

And, therefore, I do not see that there is much overlap really and I think the Public Land Law Review Commission has an important assignment and is carrying it out well. I think this would be a quite proper approach to another big national problem.

Senator ALLOTT. Well, as I recall it, this is a 5-year authorization, is it not?

Secretary UDALL. That is—

The CHAIRMAN. Not to exceed 5 years.

Senator ALLOTT. Not to exceed 5 years. The Public Land Law Review Commission will have reported, unless it is extended, by that time. I cannot say specifically what the Public Land Law Review Commission will get into in this area but since one of the basic elements of composition of the Public Land Law is dealing with water, I do not see how they can avoid getting into the water supply, water laws, everything of this sort, and get into it in great depth.

We would find ourselves in a very peculiar position if, for example, the Public Land Law Review Commission, which is composed of representatives elected by the people, plus Presidential appointments, after their studies, comes out with one recommendation and one direction of approach and then the National Water Commission comes out with another one about the same time. We would have confusion compounded considerably.

Secretary UDALL. I would be surprised if the studies of the Public Land Law Review Commission with regard to water really were directed toward the type of study envisioned here. For that reason, I think this National Water Commission does make sense and would be very useful at this point.

Senator ALLOTT. Well, of course, this particular bill we have under consideration has in it a provision that the National Water Commission will take such matters under advisement as are referred to it by the Water Resources Council. So that we are really putting the National Water Commission over the National Water Resources Council.

Secretary UDALL. No. I do not think—

Senator ALLOTT. In a sense.

Secretary UDALL. I do not really read it that way at all, Senator, because I think we have really parallel responsibilities and I think that the Federal Water Resources Council should work very closely with the National Water Commission, and provide a lot of its facts and

expertise, just as my Department is working intimately with the Public Land Law Review Commission today.

In other words, I do not see a conflict if we work together in the right fashion.

SENATOR ALLOTT. Well, I only wish to point out in these that conflicts are possible, because the Public Land Law Review Commission certainly will go into some closely allied areas of this, at least, if not the same areas, and we could come out with conflicting positions in the Government.

That is all I have at the moment, Mr. Chairman.

THE CHAIRMAN. The Chair would like to observe that we received a letter on this point in connection with the Public Land Law Review Commission from the Chairman of the Commission, Chairman Wayne Aspinall, and I replied to it stating that I was sure that we could avoid any duplication or any difficulty in that regard.

Without objection, the letter from Chairman Aspinall and my reply will be included at the outset of the hearing.

(The communications referred to follow:)

PUBLIC LAND LAW REVIEW COMMISSION,
Washington, D.C., May 6, 1966.

HON. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: In light of the forthcoming hearings by your committee on S. 3107, a bill to establish a National Water Commission, it has occurred to me that questions may arise as to the extent to which the study objectives of the proposed National Water Commission and the Public Land Law Review Commission may overlap. Consequently, I think it might be helpful to you for me to indicate those aspects of water as a resource of the public lands which we believe to be the proper subjects of study by the Public Land Law Review Commission.

My purpose is solely to provide you with information which may be useful in the hearings, not to suggest the need for establishment of jurisdictional limits between the two commissions. We recognize that the proposed National Water Commission would be concerned primarily with the policies for water availability and use generally, while the Public Land Law Review Commission's interest is, obviously, much narrower.

It is our view that while Public Land Law Review Commission studies of water matters will be confined to water originating on or flowing across public lands concerning which the Commission is required to make recommendations, they will include use manipulation, and appropriation of water for all purposes. This embodies what are considered to be the outer limits of the Commission's scope in the water resources field.

At this time we believe that rather limited studies of water resources matters will fulfill the essential requirements of the Public Land Law Review Commission. These would be oriented to those aspects of water resources development and management directly related to federal public land programs, with intensive studies principally in the following areas:

1. Existing law and practices relating to management and availability of water for both federal programs and nonfederal uses on lands concerning which the Commission is called upon to make recommendations.
2. The effect of withdrawals and reservations on the availability of water for beneficial nonfederal uses on private or state lands.
3. The reclamation law as one of the agricultural land laws and its utilization in the development of public lands.

Perhaps the most important study area in the water field, included in topic two mentioned above, would be a review of the legal and policy aspects of the implied reservation doctrine of federal water rights for various kinds of federal reservations most recently enunciated in the Supreme Court's decision in *Arizona v. California*, 373 U.S. 546 (1963). This is considered to be an essential part of our overall review of the existing policies and practices related to executive withdrawals of public lands.

We do not contemplate an intensive review of the overall programs of either the Bureau of Reclamation or the Corps of Engineers. The multiple purpose projects currently constructed under those programs are generally not related to federal public land programs, but primarily benefit identifiable private lands in need of supplemental water, municipal water users, and power users, along with producing other more general benefits such as flood control and recreation. Nor do we think it essential to explore the many facets of the administration of the hydroelectric project licensing provisions of the Federal Power Act, which are unrelated to the FPC's efforts to insure that a proposed project is compatible with public land values in the affected river basin. Needless to say, we do not contemplate review of any federal programs providing financial assistance to nonfederal water resource development programs, e.g., the Small Reclamation Projects Act.

We also hope to avoid becoming involved in the difficult jurisdictional questions which traditionally have highlighted federal-state water rights controversies, e.g., the extent to which existing law may require federal agency compliance with state laws regarding the acquisition or administration of water rights, except to the extent that these questions enter into the three topics mentioned above.

I trust that, during the Committee's consideration of the proposal for a National Water Commission, the foregoing will serve to answer any questions that may be raised as to the scope of the work that may be accomplished by the Public Land Law Review Commission in the water resource field.

Sincerely yours,

WAYNE N. ASPINALL,
Chairman.

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C., May 11, 1966.

HON. WAYNE N. ASPINALL,
Chairman, Public Land Law Review Commission,
Washington, D.C.

DEAR WAYNE: I have your letter of May 6, about which you had previously telephoned me, concerning the hearings by this Committee on S. 3107, to establish a National Water Commission. I will be happy to place your letter in the record of our hearings.

I believe there would be very little overlapping in the missions of these two commissions. It is my conception that, basically, the purpose of the National Water Commission would be to make an independent survey and review of present national water policies and practices and to submit recommendations for improvements or modifications thereof to the President. Its concern will be with all aspects of water throughout the nation and therefore not only as it might relate to our public land laws. Your letter will be helpful in providing your views to my Committee and for the hearing record on this proposal.

As a member of the Public Land Law Review Commission, I share your hope that we can avoid becoming involved in controversial questions relating to Federal-State water rights. I doubt very much whether any such controversy, which is only incidental to a thorough study of the public land laws, would contribute to the main effort to be made in connection with the goal of the Public Land Law Review Commission.

No useful purpose would be served if either of these two commissions are used as any kind of forum for an attack on the reservation doctrine. If it is to be altered, the Congress must do it.

Sincerely yours,

HENRY M. JACKSON,
Chairman.

The CHAIRMAN. Much mention has been made, and I merely make this an observation, about the need for Senate confirmation in connection with this Commission. The chair would just like to observe that in connection with the last three Presidential Commissions considered by this committee there have been no Senate confirmations. I am referring to the Outdoor Recreation Review Commission, the Public Land Law Review Commission, and the Commission on the Status of Puerto Rico.

Senator KUCHEL. Will the Senator yield?

The CHAIRMAN. Yes.

Senator KUCHEL. At least that one, the Public Land Law Review Commission, I say to the chairman, is a little bit different in its composition in that Members of the Congress are included. I would not want this bill to be amended to provide for Members of the Congress sitting on this Commission.

The CHAIRMAN. I just merely make the observation. This question was never raised.

Senator ALLOTT. The chairman is quite correct in that—

The CHAIRMAN. So these are the last three Commissions we looked at and I think my own view is that the President should be completely free—it is a Presidential permission—to name the kinds of people that he feels can be objective and fair without any improper or undue interference.

Senator ANDERSON. May I ask, did you say something about 1 year when we were talking about the Presidential appointments? You mentioned 1 year. What did that refer to?

Secretary UDALL. Well, Mr. Caulfield suggests this is a limitation with regard to the general Presidential power to establish temporary commissions. I am not sure whether that is the case.

Senator ANDERSON. On the Outdoor Recreation Resources Review Commission the members were appointed for as long as the Commission had business to conduct.

Secretary UDALL. No. I am referring to the establishment by the President of his own temporary commissions.

The CHAIRMAN. Nonstatutory.

Secretary UDALL. Nonstatutory.

Senator ANDERSON. That would not have anything to do with this Commission.

Secretary UDALL. No, it would not. None.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

I might say that most of the questions I had have been pretty well answered by the colloquy that has been taking place between the members and the witness. I have questions as to, No. 1, whether the President really needed this authority to set up such a commission. That has been answered, I think.

I had a question as to the possible overlap between the jurisdiction of such a commission and the Water Resources Council and the Public Land Law Review Commission—these have been dwelt upon at some length.

I think, Mr. Secretary, the success of this effort will depend in large measure on the quality of the men who are selected to do the job. I wish the bill were a little more specific in delineating some of the qualifications that these members should have. I notice the bill is very sketchy in this regard. It says the Commission shall be composed of seven members who shall be appointed by the President. Members shall serve at the pleasure of the President.

Then the only qualification, which concept was not a qualification, but it says, "No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States."

I think the bill could very well delineate other qualifications that might be expected.

I see that the report from the Budget Director goes a little further. He says that the Commission would consist of seven members appointed by the President from distinguished Americans.

Now, the bill does not even say that they will come from distinguished Americans. Just outside the Federal Government.

Would you agree that the success or failure of this Commission will depend in large measure on the quality of the men selected to do the job?

Secretary UDALL. I would certainly agree emphatically with that point, Senator. The other point I would like to add, however, is that I would not want to see the committee confine the membership to people who were, one might describe them, water experts or resource experts. It might very well be that you would want a broad spectrum of people. You might want to have some outstanding business leaders of the type that served on the Hoover Commission. In other words, the broader the range of the Commission in terms of type of people, the better, although I would certainly want to see some people that are resource experts and water experts on the Commission. But I would not want all of them to be specialists.

Senator JORDAN. They are authorized under the terms of the bill to draw their employees from various agencies and departments of the Government, are they not? Under section 6 of the bill?

Secretary UDALL. Yes. I think that is correct.

Senator JORDAN. It is quite possible, then, that the people who will be advising them will be the same people who will be working on these other studies, the Water Resources Council and possibly the Public Land Law Review Commission; is that not likely?

Secretary UDALL. Senator, I would expect to see pretty much the same pattern developed that we have developed with the Public Land Law Review Commission. I think this Commission would have its own staff, which would be a small staff, but it would establish a very close working relationship with the Water Resources Council and the Federal Water Agency. They will have to get a lot of their raw material, a lot of their data, from the existing agencies already working day in and day out in the field.

Senator JORDAN. I can see a real advantage, Mr. Secretary, in having an independent commission, broad gaged as you have described it here this morning, reviewing and perhaps consulting with others over the whole national scope of water problems, coming up with some real contributions to this whole effort. But I say that the success of this Commission will depend in large measure on the quality of men who are selected to do it. And I do hope that men of real stature will fill this assignment.

That is all that I have.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Mr. Chairman, I would like to commend the Secretary for the statement this morning and for his widespread activities in the problems that we are discussing today.

I certainly realize the magnitude of the problems that are involved in many areas of the country, but some areas as we know are seriously suffering. I think we will all agree that Arizona probably has more areas suffering and more serious suffering than any place in the coun-

try because Arizona is literally burning in drought-scorched areas. I think you have observed this, Mr. Secretary, in your statement last year. On page 320 of the Central Arizona project hearings you stated:

It is evident, therefore, that the future quantities of water to be available in the Colorado River will not be adequate to meet even present commitments and immediate future demands from the Pacific Southwest. The population of the Pacific Southwest, which stood at almost 11 million in 1960, will we anticipate double within the next four decades and triple by the year 2010. Even under present conditions, major sections of the Pacific Southwest are rapidly depleting their groundwater resources to sustain existing economics. In all these United States I think this is the area where our water problems are most critical.

I think that you pointed out very succinctly just what we are up against, and what I am concerned about is whether we will be able to accomplish, with this legislation, our objectives in having these studies made at the earliest date possible.

I can recall in discussing the Water Resources Council that we did have an all-encompassing membership on that Council. The widespread membership of the Water Resources Council was to contribute to the strength of that Council, as I recall, so that when it did speak, it would speak with the authority of the local areas, States, and nationally.

I am just wondering if in this new legislation we would in any way weaken this voice which would come forth from the many people involved in the Water Resources Council.

Would you like to comment on that?

Senator UDALL. Well, I do not see that the passage of this legislation, the creation of the National Water Commission, would diminish the authority and the work of the Water Resources Council. We would continue right on with our regular work and continue working with the States on setting up river basin commissions, planning, and going ahead with our other Federal planning work.

I think this would give us, would strengthen us over the long haul to have the type of determinations that a commission of this kind would make.

Senator FANNIN. With a smaller number and concentrated, you feel this would be more effective.

Secretary UDALL. Yes.

Senator FANNIN. Do you feel S. 3107 will speed these studies that we need so badly, that we talk about, for instance, the studies that would be involved in the Colorado River project?

Secretary UDALL. Well, I think that this is the right way to approach the problem and that the quickest way to get the type of action that ultimately will be needed is to first get your big basic answers, if you can, develop a national consensus with regard to those answers. And then I think you can move ahead much more readily on the specifics.

Senator FANNIN. Well, now, you stated that the legislation now under consideration, S. 3107, and the legislation that is now in the House where the hearings have been continuing, would not be in conflict. Do you feel that the provision that was in the House bill providing for the separate study would result in an earlier action than would S. 3107?

Secretary UDALL. I think we are dealing with a problem that is both a resource planning problem and a political problem.

Senator FANNIN. I realize that.

Secretary UDALL. And in terms of both, it seems to me that the method the administration has proposed is the wiser course to follow.

I want to reiterate what I said, Senator. I do not know whether you were here when I made the point earlier. I would like to see, and I think it is possible for this Congress in the next 3½ months, to pass a Lower Colorado bill through both houses and to pass a National Water Commission bill as well. And I think the two are interrelated. And how the Congress does that, is up to the Congress.

Senator FANNIN. Yes. I understand.

Secretary UDALL. But I think that we are going to have to make some further compromises if we do expect to get action this year. I think the prospect for action is good at this point.

Senator FANNIN. I understand, Mr. Secretary, that you want flexibility and I am sure that the chairman is going to be very fair in his handling of this matter. I realize the seriousness of all of our problems and certainly in many other areas of the country, but I also realize what we are up against in the State of Arizona and the Pacific Southwest. So I am very appreciative of the remarks that you have made and of your answers. I still am worried about the delays that might come about as a result of the additional legislation.

Now, do we have all the appointments to the Water Resources Council?

Secretary UDALL. Oh, yes. This was provided by statute and we are functioning. Mr. Caulfield here is the Director and we are in full operation at this time.

Senator FANNIN. The Water Resources Council provided for a large membership, many of the appointments to be made by other than the Federal Government, Federal agencies, or the President, and I am just wondering if those have all been completed.

Secretary UDALL. No. The membership of the Council, the Federal membership, was provided by law but with regard to the River Basin Commissions under the Planning Act, this will be done as we move along. We are considering four or five already and these appointments will be made as each region agrees on a river basin planning agency.

Senator FANNIN. So this will be some time in the future.

Secretary UDALL. That is right.

Senator FANNIN. Do you feel that this new legislation would tend to hurry this up?

Secretary UDALL. I think this will be helpful to our overall program.

Senator FANNIN. Thank you, Mr. Secretary.

The CHAIRMAN. Thank you, Senator Fannin. And thank you, Mr. Secretary. We appreciate having your testimony.

Senator ALLOTT. Could I ask just one question before you leave, Mr. Secretary?

I really want to do this for the purpose of getting it more completely in the record.

Referring again to Public Law 89-90, I call attention to section 102 which says:

The Council shall maintain a continuing study and prepare an assessment biennially, or at such less frequent intervals as the Council may determine, of the

adequacy of the supplies of water necessary to meet the water requirements in each water resource region in the United States and the National interest therein, and, (b)—

I think this is the most important part—

maintain a continuing study of the relation of regional or river basin plans and programs to the requirements of larger regions of the nation and of the adequacy of administrative and statutory means for the coordination of the water and related land resources policies and programs of the several Federal agencies. It shall appraise the adequacy of existing and proposed policies and programs to meet such requirements and in shall make recommendations to the President with respect to Federal policies and programs.

I simply wanted to call your attention to it. I know you are acquainted with it but I think, with respect to the discussion I had with you earlier relative to the Water Resources Council and the proposed National Water Commission, that the powers already vested in the Council ought to be noted here at the hearings.

Thank you very much.

The CHAIRMAN. Thank you, Senator Allott.

Any other questions of the Secretary? Thank you, Mr. Secretary.
(The prepared statement referred to follows:)

STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE INTERIOR

Mr. Chairman and members of the Committee, I am delighted to appear before you and to present the views of the Department of the Interior and the Water Resources Council on S. 3107, a bill to establish a National Water Commission.

The bill directs the Commission to review our national water resource problems in terms of projected needs and the alternatives available to satisfy these needs. These alternatives may involve improving the quality of our existing water supplies, discouraging marginal uses of water, redistributing it where appropriate, or augmenting present supplies by desalination, or other processing methods. The Commission is also directed to consider the sociological effects of water development as it affects the many aspects of the quality of our American environment.

As Chairman of the Water Resources Council I can say that the studies and recommendations of the National Water Commission will be of great significance and value to the Council. We expect to be working very closely with the Commission and the bill provides for such a close relationship. The Commission must, of course, report directly to the President, but we expect to participate very closely with the Commission as it prepares its reports as well as providing our views to the President on the Commission's studies presented to him.

This proposal has been under consideration for a considerable time. It was first discussed as a specific proposal in connection with the bills to authorize the Lower Colorado River Basin project. It was also mentioned by Mr. Elmer B. Staats, then Deputy Director of the Bureau of the Budget, in hearings before this Committee on the Northeastern water crisis last September.

We want to make it very clear that we endorse the program that the bill would provide. It affords a welcome means for establishing a national review of basic water resource problems. I do not have to point out to you gentlemen the fact that water resource problems are seldom purely local in scope. We are daily faced, both directly and indirectly, with broad problems of water distribution and supply, pollution control, and augmentation of existing water supplies. These are only a few of many such problems but they are matters of profound concern throughout the Nation. They cannot be treated on a river-by-river or even basin-by-basin approach. They must be considered and dealt with as a national problem, capable of analysis and consideration on a national basis.

I am quite aware that I am telling you nothing of which you are not already fully aware. Your Committee has already indicated this awareness and its concern with the national nature of these problems when it considered and recommended enactment of S. 21 in this Congress, the bill which ultimately became the Water Resources Planning Act. The Commission that this bill will establish will provide a mean for obtaining the opinions and assistance of an independent and informed body of nationally recognized water experts. The duties of the

Commission are set out with some particularity in the bill. Certainly we all recognize that there exists a tremendous job to be done by such a Commission and we are anxious to take every step necessary to get this job started.

You will recall that Mr. Staats' letter of May 10, 1965, to the Chairman of this Committee regarding the Lower Colorado River Basin bills, S. 75 and S. 1019, proposed that Title II of that bill, authorizing certain investigations, be stricken in favor of the studies proposed by that letter to be undertaken by a National Water Commission. This job respecting the Colorado and related problems remains to be done and it is an obvious candidate for one of the first undertakings of the Commission.

In his letter of April 30, 1966, to me commenting on our proposed reports in the Dallas Creek, San Miguel, West Divide, and Animas-La Plata projects, in the Upper Colorado River basin, Deputy Director Hughes of the Bureau of the Budget stated that the Bureau of the Budget "would favor acceleration of the review of western water problems with particular emphasis on the Colorado Basins" by the National Water Commission. We recommend, therefore, that you act favorably on the legislation before you in order that that job may be done expeditiously.

I mention the Colorado and associated problems as only one example of the type of program which must be undertaken by this Commission. There are, of course, many others. I hesitate to enumerate these since to do so might incorrectly be construed as disapproval of those not mentioned. This I most certainly do not wish to do.

We are threatened yearly with water crises in different parts of the country, involving pollution, drought, and floods. Other examples abound of man's urgent need effectively to control the most important of our natural resources: a supply of usable water. S. 3107 takes another important step in the direction of recognizing the national nature of the water problems which we all know exist.

The CHAIRMAN. The Chair wishes to announce, on conferring with the ranking minority member of the committee, that we will reconvene at 1:30 and we will hear at that time from Mr. Hughes, Deputy Director of the Budget; Mr. White, Chairman of the Federal Power Commission, and then go on down the list.

However, the Chair understands that Mr. Roy E. Gaunt, from Westinghouse Electric Corp., will not be able to be here this afternoon and must leave town. The Chair will call on Mr. Gaunt at this time, and then, upon completion of his testimony, we will resume at 1:30 with the witnesses as indicated and make every effort to hear all of the witnesses scheduled for today.

Mr. Gaunt, we are pleased to have your statement. You may proceed.

STATEMENT OF ROY E. GAUNT, MANAGER OF THE WATER PROVINCE DEPARTMENT OF THE WESTINGHOUSE ELECTRIC CORP.

Mr. GAUNT. Thank you, Mr. Chairman and members of the committee.

The CHAIRMAN. You may wish to put your entire statement in the record at this point and then perhaps hit the high points for the benefit of the committee. Proceed in your own way.

Mr. GAUNT. I am Roy E. Gaunt, manager of the water province department of the Westinghouse Electric Corp. We appreciate this opportunity to express our support for S. 3107, the National Water Commission Act.

In the past 2 years, the Congress has passed 14 major acts to improve water resources—to expand research, to provide for more coordinated planning, to strengthen enforcement against pollution, to enhance recreational uses, to expand the saline water program, and so forth. There are at least 22 separate Federal bureaus and offices, scattered

through five cabinet departments and three independent agencies, working in one way or another to improve water resources.

One might well ask how the National Water Commission, as proposed in S. 3107, will contribute anything significant to the many existing Federal water resource programs.

One valuable contribution will be informed, independent, objective advice from outside the Federal Government. It is no criticism of Federal agencies to suggest that they are—quite naturally and properly—somewhat wedded to the particular mission and particular approach of their particular unit. Various regions of the country also have their own special interests.

A private advisory group should be in a position to apply more objective judgments to the totality of the problem. It should help to balance and coordinate missions among particular units within the Federal Government, and among the various levels of government, at the same time helping to insure a proper balancing of all the interests affected by the Government program.

A second advantage, it seems to me, is that the Commission can broaden the scope of the knowledge and background applied to the sticky problems it will consider. Members of the Commission can bring to bear upon water problems distinctive technologies, managerial and economic judgment, and insights into systems analyses which have been developed in private industry, universities, foundations, and other organizations outside the Federal Government. Surely there are valuable resources in these diverse groups which can be helpful. Our water problems are big enough and complex enough to deserve the best thinking and strongest support from all segments of our society.

Aside from these general benefits, it seems to me to be inherent in the nature and purpose of the Commission, as proposed in S. 3107, that it may well serve to focus attention on several broad principles which deserve emphasis in our water resource programs. Let me briefly discuss three of these broad principles.

First, we need planning and management on the most comprehensive scale, as distinguished from a fragmented approach. Wherever we look at water, we are confronted with a somewhat bewildering complexity and diversity. There are many different uses for water—for recreation, for power generation, for irrigation, for homes and industry, for transportation. There are many different threats and problems—floods, shortages, pollution from a seemingly endless variety of sources. There are many possible alternative actions to help to meet these problems; and a myriad of units at all levels of government and in industry, which are involved with water management. Many of these uses, problems, and possible solutions are closely related and intertwined, or even conflicting. So the need for overall planning and management—a balancing of interests and coordination of approaches to achieve the most efficient and realistic overall result—can hardly be overemphasized.

Consider a few of the questions that arise. In mitigating flood damage, what are the relative costs and benefits of improved watershed practices, construction of dams, flood plain zoning, flood forecasting, and even flood insurance? What will be the effects of these various developments upon recreation and scenic attractions, pollution, or

other water supply problems downstream? How do we balance the need for water for irrigation with the increased pollution this is likely to bring? In improving water quality, what are the relative costs and benefits of diluting pollution by increasing stream flow; of aeration or sedimentation within the stream; of more and better municipal and industrial waste treatment; of eliminating wasteful uses of water by homes and industry? What are the prospects for tapping more ground water, or ocean water? Is it more efficient overall to treat wastes partially and discharge them into the stream, or to treat them completely and reuse the water in a closed cycle within a city or plant? How do economic and sociological considerations figure in the use to which stream flow is put? These few questions illustrate the need for a balancing, a trade-off, among interrelated solutions to interrelate problems.

In Westinghouse, we have seen the need for the coordinated, total system approach I mentioned earlier. To meet that need, we established the water province department to draw upon scientific and engineering resources—people and technology wherever they may be available to us, inside the company or out—for broad analysis of water problems, for research and development, and for production of equipment for waste treatment, water purification, instrumentation, and other water handling problems of both industry and government.

A second general principle is this: In water resources research, we need more emphasis upon pushing through toward practical problem-solving. There are many studies which lead mainly to more studies, to large accumulations of paper data on small fragments of a problem. But too many of these studies are not designed to follow through to explore, or recommend, or test, or demonstrate possible solutions to the problem.

I do not suggest that basic data are not valuable and necessary. It is very helpful, for example, to know the amount of a particular pollutant in a certain portion of the Ohio River; it is more helpful to know the distribution of this pollutant throughout the river; it is even more helpful to know the distribution of many pollutants throughout the river, and where they come from, and how they affect all the uses of the river. But it is most helpful of all to explore, and test, and demonstrate, what can be done about it.

Let me illustrate this point with an example, some work which is now being done in Pennsylvania on a very old and much studied problem, that of acid mine drainage. Over a period of years, vast data were accumulated, but not even technical solutions were developed, let alone economically realistic solutions. In 1965, the direction of the State's program shifted from problem definition to problem solving. In a little over 15 months, working with the Department of Mines and Mineral Industries we have demonstrated conclusively the technical feasibility of adapting the flash evaporation process to the solution of the acid mine drainage problem. Although it is an expensive solution at present, the point is that there is no longer any doubt that it can be done, even though it had long been considered impossible because the water caused scale and corrosion on any equipment it touched. The next step is to assess the economic worth of the technical solution; that is, is the benefit to the public worth the cost it would entail? If not, then further work must be done to bring down the costs in order for the problem to be truly solved.

S. 3107 seems to support this practical approach. The Commission is to project water requirements, review present and anticipated problems, and then identify "alternative ways of meeting these requirements." I would assume it is intended that the Commission's role would include not only "identifying" alternatives, as stated, but also evaluating them and making recommendations aimed at truly practicable solutions.

A third fruitful direction for future emphasis: The innovating technological capabilities of modern industry need to be applied more fully to the analysis and solution of many water problems. It seems to me that industry has a potential for research and development in water purification, in waste treatment, in automation of water systems, and in broad-scale systems analysis which has not been fully tapped. The blame for this, if blame there be, may rest in part with both industry and government. Industry has not shown the initiative in this area which is justified by the magnitude of the problem; and government, perhaps, has been too inclined to turn exclusively to government, or universities. In defense, space, and other fields, government and industry have demonstrated a more effective partnership.

A recent compilation of 1,545 federally supported water resource research projects showed that only 20 private companies were involved. The Office of Water Resources Research, of course, had been restricted from entering into research contracts with industry, but this restriction has been removed by recent legislation; industrial know-how may now be brought into play more fully.

The Government, naturally, already seems to be concentrating much effort upon municipal waste treatment, and important advances seem to be in the offing. But no one seems to have concentrated, across the board, in advanced technology to solve the varied and rapidly growing problems of industrial wastes in our increasingly industrialized society. There has been too little incentive to explore broadly the technology of industrial waste treatment. As industries now begin to come to grips with the problem, they often find that the basic knowledge is inadequate. Moreover, there is not enough cross-fertilization, the application of insights gained in one industry to help solve different but related problems in another.

We must face up to the fact that however tough Government agencies may wish to be in their pollution enforcement programs, we simply do not know how to effectively treat some industrial wastes. In certain other cases, the costs of doing so are truly prohibitive; enforcement of water pollution abatement requirements would simply close a plant. The problem might be eased if all the plants in an industrial complex pooled their wastes for centralized treatment, to obtain economies of scale and avoid duplicate equipment and processing. The merging of industrial and municipal wastes also may offer benefits. But most of all we need breakthroughs in the know-how of industrial waste treatment, through talented and broadscale research and development. I am confident that processes and equipment can be developed to treat industrial wastes economically, but substantial research and development is required. Until we exert our best efforts toward this end, there will be no dramatic progress in the abatement of pollution.

In conclusion, let me say again that we believe the Commission proposed in S. 3107 can play a valuable role in the complex effort

to assure adequate supplies of usable water. The Commission will bring new resources to bear in the quest to provide a commodity which we can no longer take for granted, and a commodity which offers almost countless benefits to our developing society.

Thank you.

Senator ANDERSON (presiding). Thank you, Mr. Gaunt.

On page 2 you mention the fact that there are many different uses of water. This Board which might be set up by the President will be able to give us a somewhat broader view of that than many communities themselves might have, would it not?

Mr. GAUNT. Yes; that is our feeling.

Senator ANDERSON. I think that is the most important part of it because, as I mentioned a while ago on the question of the Indians, they might want water for irrigation and they might think that was the best use for it and this might be true as of today, but a very fine nationally based board could say, "No, things are coming your way for greater development in chemical plants, and you should have the water for that day."

Would that not be a useful function?

Mr. GAUNT. Yes, it would, Senator. Water is a limited resource. We must recognize that, and we must use it wisely if we are to get the greatest benefits from it.

Senator ANDERSON. Thank you very much for testifying.

We will recess now until 1:30 p.m.

(Whereupon, the hearing recessed at 12:05 p.m., to reconvene at 1:30 p.m., the same day.)

AFTERNOON SESSION

The CHAIRMAN. The committee will come to order.

Our first witness this afternoon is Mr. Phillip S. Hughes, Deputy Director of the Bureau of the Budget.

Mr. Hughes, we are delighted to have you and you may proceed in your own way.

STATEMENT OF HON. PHILLIP S. HUGHES, DEPUTY DIRECTOR OF THE BUREAU OF THE BUDGET

Mr. HUGHES. Thank you, Mr. Chairman. I am happy to be here. I have a statement prepared which I believe the committee has. I would be happy to have that placed in the record if you wish and try and review a few particularly relevant portions in the light of this morning's discussion.

The CHAIRMAN. Very well. Without objection the statement will be included in full at the end of your review.

Mr. HUGHES. Thank you, Mr. Chairman.

First of all, while we recognize the rather substantial achievements of this Congress in the water resources field, we feel that a truly enlightened and responsible record of achievement by the Congress would not be complete unless the National Water Commission, that the administration has proposed, is established. And I am here to urge favorable consideration by the committee of this legislation.

The President stated the case for the Commission in his message on Preserving Our National Heritage. He referred to the complexity of

the water resources problem, went on to point out that the Commission would "review and advise on the entire range of water resource problems, from methods to conserve and augment existing water supplies to the application of modern technology such as desalting, to provide more usable water for our cities, our industries and our farms."

That is a quotation from the message. He also pointed out that "this Commission will be composed of the very best minds in the country. It will judge the quality of our present efforts. It will recommend long-range plans for the future. It will point the way to increased and more effective water resource measures by the Federal Government, working in close cooperation with States, local communities and private industry."

The Commission's job is, as I think was made amply clear this morning, a most difficult one. It will, first of all, have to focus the national spotlight on some of our major water resource problems and programs and we would hope on the full range of these problems. The Commission should foster a national review, and ultimately, we hope, lead toward a national consensus on broad objectives in the water resources field and the alternative means of achieving these objectives. These would be used as a guide by the President and the Congress in developing future water resource programs for each region of the country.

In my prepared statement, Mr. Chairman, I refer to the Colorado Basin as a specific problem which would be within the charter of the Commission. The Commission was first suggested in our report of May 10 on S. 75 and S. 1019. These were bills to authorize the construction, operation, and maintenance of the Lower Colorado River Basin project and for other purposes. I assume, Mr. Chairman, that that report will be a part of the record of the committee hearings. It did state our position with respect to that legislation.

In our report on these bills, we recommended that the National Water Commission should review proposals to augment the natural water supply of the Colorado River. These proposals have a potential impact which extends far beyond the Colorado Basin or even the West. The budgetary implications, for example, of the proposed importation of some 8.5 million acre-feet annually into the Colorado River, as contained in the revision of S. 1019, will affect every region of the country.

Thus the Commission will need to consider the best use of additional natural water which might be brought into the Colorado Basin, whether for industry and homes or for agriculture.

Relevant also, as we see it, are the terms of use by claimants—priorities, prices, costs, and conservation practices. If more water is considered desirable to achieve our objectives in the Colorado Basin, the Commission will wish to identify alternative sources of supply, balancing the promises and problems of transporting water over long distances against the promises and problems of major gains in desalting technology and in waste water purification and reuse as well as conservation and more efficient use of existing supplies.

Importation also raises other questions in our view—the nature and magnitude of appropriate compensation, if any, to areas of origin, and the impact of importation on the legal responsibility for maintaining our treaty obligations to Mexico.

The controversy that has been generated by the proposed construction of dams in the Colorado Gorge is also suitable for study and recommendation by the Commission. The Bureau has already recommended that a review of Bridge Canyon Dam be undertaken in order to fully evaluate the need for additional power and the desire for additional revenues in the Lower Colorado River Basin account. The Grand Canyon is, in the words of Brooks Atkinson, one of the supreme spiritual resources of America, and the people of America, as we see it, have the right to be assured that any proposed encroachment would in no way compromise the purpose for which Grand Canyon National Park was established.

There was a good deal of discussion this morning, Mr. Chairman, of the relationships between Colorado Basin problems and problems in other parts of the Nation, and we feel this is a most relevant consideration. The Potomac River Basin problems which confront us in this area are ample evidence that our water resource problems are nationwide, in fact, and that the problems of innerbasin exchange, and the problems of water shortages, are not isolated to any particular area.

There also was a good deal of discussion this morning of the relationship between the Commission and existing agencies, including the Water Resources Council, and unless the committee wishes, I will not refer to that portion of my statement. I will just proceed to the summary.

We, on behalf of the Administration, consider it essential that action be taken now to assess and develop the full range of alternative solutions to the long-term water problems of the Nation and its various regions as contemplated in S. 3107. A national approach is needed because the problems of water shortage and poor water quality are national problems. They are not confined to a single region. And only a Presidential Commission of outstanding citizens with diverse backgrounds, unencumbered by official commitment to prevailing concepts and current problems, can highlight and focus public attention on the consistent courses of action which will be necessary to assure that water resource development will effectively play the key role that it must in the continuing economic and social development of this Nation.

Thank you.

The CHAIRMAN. Thank you, Mr. Hughes, for a very fine statement. Also I want to take this opportunity to congratulate you on your new appointment succeeding Mr. Staats.

Mr. HUGHES. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Thank you. I, too, want to commend you for a fine statement. I especially like the way you summarized the statement you make here, that you point up a national approach is needed and you allay some of my fears about the quality of the membership, the quality and background of the members who are likely to be appointed. You say a Presidential Commission of outstanding citizens with diverse backgrounds, unencumbered by official commitment to prevailing concepts. I hope this is what we get because the whole success or failure of the work of the Commission will depend on the quality of the personnel assigned to it. I do hope that men of this stature are the ones who are selected.

Thank you, very much.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Thank you, Mr. Chairman, and Mr. Hughes. I did not hear your complete statement, but I read part of it, and I appreciate the summary and agree that a national approach is needed, although we must recognize that we have great problems in the Pacific Southwest. I am sure you are familiar with the problem we have in the State of Arizona, where we are in dire need of immediate relief. We have acreage not only going out of production but we have cities that are going to be in great need of water and unless we start now those cities will be destitute for water supplies. Tucson, Ariz., is among the cities that depend completely on subsurface—on underground water, not having surface water—so it is a matter of great consideration that we not delay any studies that might be involved with relieving that area.

There is legislation now progressing in the Congress, and do you feel that this should be exempt from the bill S. 3107? Legislation that is now in progress and underway, and which has been through the Senate previously. Would you think that could be exempt from S. 3107?

Mr. HUGHES. No, Senator. Our position with respect to so-called southwest water plan was expressed some time ago. We continue of the view that we have expressed before to this committee. We feel that some of the proposals contained in the bill that was before this committee should be further reviewed before authorization by a body such as the National Water Commission. We are aware in general terms, not formally, of some of the further amplifications and modifications of that legislation as the House consideration of it has progressed, and we feel that at least some of these additional features also warrant the type of study which only a national water commission could bring to bear.

Senator FANNIN. Would you not agree, though, that the water shortage areas involved and the ones having these great problems, now depending on underground water, should have a priority in these studies?

Mr. HUGHES. As Secretary Udall indicated this morning, we have supplemented our earlier comments on the Commission by indicating that some priorities with respect to western problems and perhaps the Colorado basin in particular would be acceptable to us and appropriate.

We do feel, however, that certain of the proposals with respect to the Colorado Basin would require very careful study by the Commission before they were authorized.

You had mentioned the problem of meeting the water needs of the existing economy of the State of Arizona, and I presume you have in mind the central Arizona project.

Senator FANNIN. Yes.

Mr. HUGHES. As we had indicated previously in our report to the committee, we would favor proceeding with this project and with that portion of the southwest water plan. That is, we do not regard the central Arizona project as a matter which should await the Commission's review.

Senator FANNIN. Thank you.

The CHAIRMAN. Senator Kuchel?

Senator KUCHEL. I apologize for coming in late.

Mr. HUGHES. That is all right, sir.

Senator KUCHEL. One of the questions which Senator Fannin asked of you I was going to ask you to repeat. These two pieces of legislation which are related, the one to the other, commencing to pass through the legislative process, presumably crossing and continuing on the journey down to the White House, they are going to have to be—assuming that happens—they are going to have to be treated together. That is to say, one cannot block out the other or vice versa.

Yet the fact is that the study features of the House bill generally bear the stamp of approval of the administration, is that not so?

Mr. HUGHES. Well, with respect to study per se, Senator Kuchel, I think our position is quite clear that additional review of certain aspects of the southwest water plan is necessary and desirable before that plan proceeds. Insofar as the linkage of the two is concerned, our concern is simply that a national review of these issues be undertaken, a review on a nationwide basis and a review in the light of the broad perspective that will permit a reasonable solution to the problem.

I think the issue to be dealt with here, in perhaps oversimplified terms, is how far Colorado Basin development can proceed without some sort of national review by a commission of the kind that we are proposing.

We tried in the earlier report on the Colorado bill to indicate the steps which we thought could be undertaken at this point without the necessity for a commission-type review.

The problems, however, of importation of water and of the relationships between the problems of the different basins, whether they are in the West or the East, seemed to us did require this further study.

Senator KUCHEL. I think that is true. You do use the phrase 8.5 million acre-feet as a possibility for importation. Actually the scheduled importation, if that were to be the case, in the House bill is considerably lower than that, and would make beneficially available to the lower basin, I take it, somewhere in the order of 2.5 million.

Mr. HUGHES. I am not completely current on the House bill. I think it does contemplate 8.5 million acre feet.

Senator KUCHEL. Where did that 8.5 million come from?

Mr. HUGHES. It is reflected in an interim piece of legislation that came out in the form of a committee print. I believe, Committee Print No. 19 of the House, but that is not a final print as I understand it, Senator, although it was issued I think more or less formally by the committee to reflect a stage in its thinking.

As the hearings have progressed, it is my understanding that there have been some additional applicants, so to speak, for water, and just what this effect would be I am not sure. These were spokesmen for the bench area in Texas who thought perhaps if importation was to be considered, that there should be additional waters considered for them, but again this is not final.

Senator KUCHEL. I remember our early discussions, informal, on the Bureau's comments on the bill that many of us introduced here in the Senate—

Mr. HUGHES. Yes.

Senator KUCHEL. [Continuing]. Which considered the difficulties involved in the Mexican Treaty burden and an acceptance, I think I may use that word, by the Bureau of what we had proposed in the bill under certain limitations that were spelled out, the problems between Arizona and California which happily have been solved, in which the Bureau approved, if that were the way Congress were to find it.

The only question I think that I should like to ask you specifically is, if the type of phraseology which is now used in the House bill relative to the problems of survey by the Secretary of the Interior of all alternatives, together with the guarantee for protection of the area of origin in case importation were finally recommended, if that language were to stay in the House bill at the same time that the Congress passed this Senate bill of Senator Jackson's, in about the same fashion, I suppose there would be a sort of impasse between them, would there not, which might—

Mr. HUGHES. There is a conflict of sorts.

Senator KUCHEL. And the last time the Congress would speak might have a bearing on it. But to eliminate that sort of a problem, is it possible to synchronize these two pieces of legislation with respect to the problem that I have just outlined? Is it possible to have the Secretary continue as he is authorized to do in the House bill under some type of agreement or direction or consultation with the Commission as set up in the Senate bill?

Is that possible, or if it were worked out—of course, it is possible. If it were worked out, would the Bureau accede to what the Congress might do?

Mr. HUGHES. Well, certainly, Senator, it is our hope that the two bills can be made to fit one another and we are confident that that can be accomplished.

Senator KUCHEL. Good.

Mr. HUGHES. I certainly do not want to appear arbitrary with respect to the exclusion of any appropriate language from the Colorado Basin bill. On the other hand, I think we come back to what seems to me to be the fundamental question of how far we can go with Colorado Basin development without some review of these broader problems that we see. It would seem to me that the Commission bill language, or perhaps the legislative history, could be worded to meet the priority need, as we see it and as the Congress sees it, of the West and the Colorado Basin in particular.

Senator KUCHEL. Yes, because that part of the House bill which deals with the responsibility of the Secretary to make feasibility studies and surveys is precisely what could be the responsibility of the Secretary under this Senate bill if the Commission authorized the Bureau of Reclamation to make those same feasibility studies.

Mr. HUGHES. The two could cover the same ground, that is correct.

Senator KUCHEL. Indeed. And this morning Secretary Udall indicated that in his view, the intent of this legislation is not to create suddenly a great new bureaucracy but as it says in so many words and phrases, to utilize the technical skills which would be available in the agencies including the Bureau of Reclamation.

Mr. HUGHES. We certainly agree with that, Senator. The Commission's role as we see it is to take the detached long-range view, if you

will, that is very difficult for those of us who are concerned with day-to-day problems from the standpoint of a particular agency.

Senator KUCHEL. There is only one more thing. Having said that, and as one who wants to see action taken, indeed on both these pieces of legislation, the fact does remain that most of the representatives of the States of the Basin who testified last week in the House committee and who were asked the question, "Assume that the survey and feasibility study sections are deleted from the bill, are you still for the bill?", I think I am right in saying most of them said no. Some declined to comment.

So I do want to say that in order to have any legislation adopted, we need to, to use the word—it has been used around this town—we need consensus and we do not have that.

Mr. HUGHES. We certainly, Senator, will be glad to work on both pieces of legislation to achieve what we think are obviously desirable objectives.

Senator KUCHEL. Well, I think that is fine. Thank you.

Mr. HUGHES. The problem here again, I think, is the linkage, how much linkage is tolerable in terms of the need to get the broad perspective on national water resource problems that we think is necessary.

Senator KUCHEL. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Allott?

Senator ALLOTT. Yes.

Mr. Hughes, following up another thought of the Senator from California, if there is a hiatus in water development, the report on S. 21, the Water Resources Planning Act, indicates that there will be an inadequate water supply in 1980 in the Basin, even with the full development of water resources presently available in the Colorado River Basin, Great Basin, Utah, Nevada, California, Upper Rio Grande, Pecos, and the Upper Missouri River Basin.

Now, if we were to figure the final report of the National Water Commission by late 1971, the Bureau of Reclamation makes feasibility report by 1973 or 1974, authorizing legislation, if we are very lucky, by 1975, and advanced engineering and construction in 1976, and another 8 to 12 years if we are real lucky for construction, that puts us up in the years 1984 to 1988. So in looking across this whole area, willy-nilly, undirected, uncoordinated approach to this, puts us a long way ahead with any serious consideration of this or any actuality of it, in which time the population growth will be stifled in all of the areas which I have suggested. I am sure you have thought of this, have you not?

Mr. HUGHES. While I think judgment as to the timetable which you have outlined can vary somewhat, we certainly recognize the need for priority attention to the problems of the areas which you enumerated. Our hope would be and our expectation would be that with the type of development in this area which we outlined in our earlier report on the Southwest water plan, the needs of the area during this intervening period could be adequately met. We would hope, too, that a national water commission of the competence that we expect, could proceed to deal with these problems somewhat sooner than your timetable suggested, and that the initial 5-year

reporting date which you suggested could be shortened somewhat by earlier and advance reports dealing with particular priority problems.

Senator ALLOTT. I gave you this time schedule, which anyone can quarrel with and probably legitimately, but based upon my own personal experience in this field which has extended over some 35 years, over 10 years on this committee, I do not think that I have overstated the situation too much, Mr. Hughes, although the specific dates, of course, are open to question by anybody and legitimately so, because no one knows.

Now, there is one question that I would ask. On page 7 of your statement, in the last paragraph, you say, "Only a Presidential Commission of outstanding citizens with diverse backgrounds."

Now, it has been my experience that people who have not dealt with water and lived with problems of water conservation and water use have very little concept of how to deal with this problem.

What do you really mean by "diverse backgrounds"? This is one of the things that bothers me about the bill. I would like to know a little bit more about the people who are going to—and you cannot give me any guarantees about this, I know—but I would like to know a little bit more. I can think of a recent report, a year or so ago, on oil shale and we got some people with some diverse backgrounds who did not know any more about the oil shale business after they got through than they did before they started. So I am sort of concerned about this "diverse."

How diverse are you thinking of?

Mr. HUGHES. We are thinking quite diverse, I guess, Senator, as the starting point, at least. We feel that water expertise exists in large amounts within the executive branch of the Government and as you point out, in the Congress itself, both bodies. We think, however, that some of these problems should be looked at by persons whose involvement may not be as direct and intimate and continuing with water resource problems as may have been the involvement of these people within the executive branch or the Congress, but who do have some knowledge of water problems in a broad sense and who can bring to the Commission's review other specializations as perhaps in the field of economics, of broad national goals, pollution and waste treatment which, while water-related, are somewhat new fields from a traditional water engineering standpoint.

We would hope also that the Commission, either through its membership or its consultation, would include points of view of persons with a conservation viewpoint, not necessarily water conservation per se but from the standpoint of conservation and recreation.

Senator ALLOTT. Well, let us say conservation because land and soil conservation is getting about as little attention in the last few years as anything and real conservation is not getting attention in this country. Recreation is, but not conservation.

Mr. HUGHES. Senator, it seems to me that the broader the representation and the broader the viewpoints embodied in the Commission, the more satisfactory its results are apt to be from the standpoint of the Congress, the executive branch and the Nation as a whole.

Senator ALLOTT. If they are not too broad.

The point I want to make is that we do need, among other things, some people who are extremely knowledgeable in water resource—

Mr. HUGHES. Certainly so. No question.

Senator ALLOTT (continuing). On such a commission.

The CHAIRMAN. And who are objective and unbiased in their approach.

Senator ALLOTT. Yes, and yet, Mr. Chairman, I come back in this respect to the problem which we have often faced. I suppose the most graphic illustration is in our labor areas where you say you want to get a man who is completely objective, for example, on the National Labor Relations Board and yet who is knowledgeable and if you pick one, you have to pick one who has either been associated with the unions on one side or management on the other for the most part or you do not find a man who is knowledgeable in this area. I think the same thing will apply in trying to get objective people who really are knowledgeable.

Just one other question, Mr. Hughes, if you would clear this up for me. In the following part of that sentence, you say, "unencumbered by official commitment to prevailing concepts."

Now, I want to read to you from your report to Secretary Udall dated April 30 on projects in Colorado, and I am going to tie this prevailing concept into the statement you made there, because I think you will want to explain it.

On the second page you say :

Further, the situation is somewhat different in the Upper than in the Lower Colorado Basin. In the Lower Basin an established economy is faced with an intermediate water crisis accelerated by the pressures of population growth.

Now, I hope you are not saying in that sentence that that, in turn, interprets prevailing concepts, that you are thinking in any terms of an abdication or a revision or a modification of the Colorado River Compact, the Upper River Colorado Compact, or any of the decisions which have implemented either of those compacts. Or the Upper River Colorado Project Act, for that matter.

Mr. HUGHES. No. It seems to me that the National Water Commission will need to work within the world as it is, the statutory world as well as the practical world, the political realities of our Nation.

The point that I was trying to make in this statement was simply that we in the executive branch represent the Bureau of the Budget or the Department of the Interior or Department of Agriculture or perhaps the Federal Power Commission as the case may be. Each of us come to your committee and come to these problems with our own problems very much in the forefront of our minds, and it is difficult for us to think sufficiently freely of these problems to get the kind of perspective and to give the kind of perspective that we think is necessary in dealing with these tremendous and very complicated problems.

That was my point.

Senator ALLOTT. I think it was, and I understand it, but I just wanted to get it laid out, because when you say "unencumbered by official commitment to prevailing concepts," I am sure you understand how your other language bothered those of us in the upper basin States.

Mr. HUGHES. Indeed.

Senator ALLOTT. Part of the prevailing concepts are a recognition of the presently existing legal rights to the use of the river.

Mr. HUGHES. Yes. Certainly we are not in a position to dispute those. I think the Commission, if it is the kind of commission that we

think necessary and desirable, may want in one way or another to consider some of the premises within which we, the executive branch, and you in the Congress work. But this is certainly a matter up to the Commission, and the Commission, again, even though it may think big, is going to have to think in realistic and practical terms either within the framework of existing law, it seems to me, or whatever modifications of existing law it regards as feasible.

Senator ALLOTT. Thank you very much, Mr. Hughes, for your replies to my questions.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. I do not know whether the question has been asked or not, but one question that comes to my mind is how does this legislation dovetail or fit with the River Basin Commissions that may be established?

The CHAIRMAN. I think Secretary Udall went into it in some detail.

Senator BURDICK. Do not bother then.

Mr. HUGHES. It seems to me the Commission, this Commission, if it does its job and the job that we hope it would, would establish a framework, policy framework, for recommendation to the Congress and the executive branch and in turn in a sense to these River Basin Commissions for their activities. These are two somewhat diverse activities with the National Water Commission having the larger, broader responsibility and in a sense the more freedom of action.

The CHAIRMAN. Thank you, Mr. Hughes. We appreciate having your statement. Sorry we could not get you on earlier.

Mr. HUGHES. Thank you, Mr. Chairman.

(The statement referred to follows:)

STATEMENT OF HON. PHILLIP S. HUGHES, DEPUTY DIRECTOR OF THE BUREAU OF THE BUDGET

Mr. Chairman and members of the committee, I deeply appreciate the opportunity to appear before this committee on behalf of the Bureau of the Budget to urge favorable consideration of S. 3107, the Administration's bill to establish a National Water Commission.

The 89th Congress has already enacted water resources legislation of national significance: the Water Resources Planning Act, the Water Quality Act, and an accelerated and expanded desalting program. Still other water resource programs of enormous importance to the Nation are before the Congress—the "clean rivers" bill and the Colorado River Basin legislation, for example—with the latter proposal under current consideration by the counterpart of this committee in the House of Representatives. But I believe that the truly enlightened and responsible record of this Congress will be incomplete unless the National Water Commission is established. Therefore, on behalf of the Bureau of the Budget and the Administration I urge prompt favorable action on S. 3107.

THE PRESIDENT'S RECOMMENDATION

In his February 23, 1966, message on preserving our natural heritage, the President proposed the establishment of the National Water Commission, emphasizing once again that "In no area of resource management are the problems more complex—or more important—than those involving our Nation's water supplies."

He went on to say that the Commission would "review and advise on the entire range of water resource problems—from methods to conserve and augment existing water supplies to the application of modern technology, such as desalting, to provide more usable water for our cities, our industries, and our farms."

And he envisioned a Commission composed of our Nation's most distinguished and dedicated citizens—nothing less would suffice for the task he had in mind. He said:

"This Commission will be composed of the very best minds in the country. It will judge the quality of our present efforts. It will recommend long-range

plans for the future. It will point the way to increased and more effective water resource measures by the Federal Government, working in close cooperation with States, local communities, and private industry."

THE FUNCTION OF THE COMMISSION

A Commission is a tried and trusted institution, providing the people of the country with a unique opportunity not only to take stock of where we are in the development and use of our water resources, but to pause and to reflect upon where we have been and where we ought to be going in the future.

The National Water Commission's job will be a difficult one. It will have to focus the national spotlight on our major water resource problems and programs. It will have to educate and inform the people—North and South, East and West, furnishing them with a complete and accurate picture of the impact of water resource development on the basic fabric of the Nation—balancing, on the one hand, the enormous gains in industrial and agricultural productivity and recreational opportunities against, on the other, the pollution of our river and streams and lakes with human and industrial wastes, chemicals, and salts; the exhaustion of precious groundwater supplies; and the damaging or destruction of unique and irreplaceable areas of superb natural beauty.

And finally, the Commission should foster a national discussion—and ultimately forge a national consensus—on the broad objectives, and the alternative means of achieving these objectives, which would be used as a guide by the President and the Congress in developing future water resource programs for each region of the country. To do this, of course, the Commission, working with the Water Resources Council, will have to develop reliable estimates of the long-term water requirements that will be generated in the attempt to achieve alternative objectives, identifying possible means of supply and determining the economic and social costs of their development.

In short, we believe the National Water Commission, like the Public Land Law River Commission, can and should be truly a landmark Commission, establishing reference points and goals for decades to come.

SOME SPECIFIC PROBLEMS—THE COLORADO BASIN

Having outlined the broad charter which the Administration considers necessary for the Commission, I would now like to turn to the Colorado River Basin in order to illustrate some of the specific problems with which the Commission should concern itself. The Committee will recall the National Water Commission was first suggested in our report to you of May 10, 1965, on S. 75 and S. 1019, similar bills "To authorize the construction, operation, and maintenance of the Lower Colorado River Basin project, and for other purposes."

In our report on these bills, we recommended that the National Water Commission should review proposals to augment the natural water supply of the Colorado River. These proposals have a potential impact which extends far beyond the Colorado Basin, or even the West. The budgetary implications, for example, of the proposed importation of some 8.5 million acre-feet annually into the Colorado River—contained in a revision of S. 1019 (found in House Interior Committee Print No. 19)—will affect every region of the country.

Thus, the Commission will need to consider the best use of additional water which might be brought into the Colorado Basin—whether for industry and homes or for agriculture. Relevant also are the terms of use by claimants—priorities, prices, costs, and conservation practices. If more water is considered desirable to achieve our objectives in the Colorado Basin, the Commission will wish to identify alternative sources of supply—balancing the promises and problems of transporting water over long distances against the promises and problems of major gains in desalting technology and in waste water purification and reuse, as well as conservation and more efficient use of existing supplies. And importation raises other questions: the nature and magnitude of appropriate compensation—if any—to areas of origin; and the impact of importation on the legal responsibility for maintaining our treaty obligations to Mexico.

The controversy generated by the proposed construction of dams in the Colorado gorge is also suitable for study and recommendation by the National Water Commission. The Bureau has already recommended that a review of Bridge Canyon Dam be undertaken in order to fully evaluate the need for additional power and the desire for additional revenues in the proposed Lower Colorado River Basin account. Grand Canyon is in the words of *Brooks Atkinson*, one of

the "supreme spiritual resources" of America, and the people of America have the right to be assured that any proposed encroachment would in no way compromise the purpose for which Grand Canyon National Park was established.

Water resource problems are not confined to the West, as is illustrated by our own problems in the Potomac River Basin. However, Sec. 3(b) of S. 3107 authorizes the Commission to prepare and submit interim reports, and since the water problems of the Colorado Basin are so fundamental and their solution may well set precedents elsewhere in the Nation, we would favor acceleration of the Commission's review of western water resource development and of the Colorado Basin in particular.

RELATIONSHIP TO OTHER AGENCIES

The relationship of the Commission to be established under the provisions of S. 3107 to existing agencies is vital. The National Water Commission will not compete with State and Federal water resource agencies; it will have neither the staff, nor the funds, nor the time to do this. Rather, it will focus on the complex problems which are too often set aside for "later consideration."

The National Water Commission, then, will to the extent practical, rely on existing Federal agencies in the water resource field and on river basin commissions created pursuant to Title II of the Water Resources Planning Act in carrying out any detailed studies and in making specific assessments of water problems and alternative solutions. It will work closely with the Water Resources Council, advising the Council and complementing its activities by bringing to bear on water resource problems the fresh viewpoint of experts outside the Government and once removed from its day to day problems. A one-time study by the Commission for example, could help provide a broad framework for seeking specific solutions to regional water problems and thus assist the Council in its continuing concern with water resource policy and comprehensive and related land resource planning. The Commission would also cooperate with State and local agencies concerned with water resource development, seeking their advice and assistance. And the Commission may wish to convene panels of experts from within or outside the Government to assist it in its studies of particular problems.

In summary, the Administration considers it essential that action be taken now to assess and develop the full range of alternative solutions to the long-term water problems of the Nation and its various regions as contemplated in S. 3107. A national approach is needed because the problems of water shortage and poor water quality are national problems; they are not confined to a single region. And only a Presidential Commission of outstanding citizens with diverse backgrounds—unencumbered by official commitment to prevailing concepts—can highlight and focus public attention on the consistent courses of action which will be necessary to assure that water resource development will effectively play the key role it must in the economic and social advancement of this Nation.

The CHAIRMAN. Our next witness is the Honorable L. C. White, Chairman of the Federal Power Commission.

Mr. White, we are delighted to welcome you to the committee, I believe the first time since you assumed your new duties as a member of the Commission and as Chairman.

You have a prepared statement. Do you wish to put it in the record and then hit the high points or would you prefer to read it?

STATEMENT OF LEE C. WHITE, CHAIRMAN, FEDERAL POWER COMMISSION; ACCOMPANIED BY JAMES STOUT, CHIEF, FEDERAL RIVER BASIN DIVISION; DAVID BARDIN, ASSISTANT GENERAL COUNSEL; MRS. JANE R. MAPES, OFFICE OF GENERAL COUNSEL; AND GEORGE GLEASON, TECHNICAL ASSISTANT TO THE CHAIRMAN

Mr. WHITE. Mr. Chairman, it is fairly brief, but I think the committee has already had two fairly exhaustive sessions with certain

witnesses and I think it would be just as satisfactory, if you have no objection, to let the formal statement be incorporated into the record.

The CHAIRMAN. The statement will be included in full at the end of your oral presentation and you can touch on a few of the high points.

Mr. WHITE. If I may say, Mr. Chairman, I have present in the room with me Mr. James Stout, Chief of our Federal River Basin Division; Mr. David Bardin, the Assistant General Counsel of the Commission; Mrs. Mapes of the Office of the General Counsel, and Mr. George Gleason of my staff. If there are questions, perhaps they would be able to be of assistance.

Very briefly, the Federal Power Commission has gone over the bill and finds it to be a most constructive and most useful proposal. It has no specific recommendations for changes. It believes that it would be most helpful not only to the President and to the administration generally but to the Federal Power Commission in discharging its own responsibilities. We urge its enactment.

The CHAIRMAN. You are generally in accord with the statements made previously here by Mr. Hughes?

Mr. WHITE. I was not present during all of the testimony, but I did not hear anything that presented any problems to me, and I believe would not present any problems to the other members of the Commission.

The CHAIRMAN. Of course, in your capacity as Chairman of the Federal Power Commission, you are concerned with the wisest and best use of our water resources.

Mr. WHITE. Thoroughly and unmistakably, and also in our role as a member of the Water Resources Council.

The CHAIRMAN. In both capacities.

Mr. WHITE. Both capacities.

The CHAIRMAN. And you feel that a commission such as contemplated in the pending proposal represents a good opportunity to make an objective study and analysis and recommendations of a problem which is not just sectional or regional but which is national.

Mr. WHITE. Clearly we are at a point where these major problems, these major issues, can stand a brand new perspective. The Water Resources Council can play a very important role but it seems to me that there is considerable benefit in having individuals who are not in any way associated, as Mr. Hughes said, with department or agency positions or even department or agency problems, bringing to bear on these difficult and complicated problems their own expert knowledge and experience and whatever instincts they have.

I think we cannot delude ourselves about how difficult some of the problems can be and we may get the best minds that are available and they may not be able to come up with programs that everybody will know undoubtedly are going to work. But I think we at least have the obligation to make the effort and this strikes us as a very reasonable manner in which to proceed.

The CHAIRMAN. Thank you, Mr. White.

Senator Kuchel?

Senator KUCHEL. I have no question, Mr. White, except to say I am glad to have the views you give to this committee formally in your statement, and, since I do have an opportunity to see you here, to wish you good luck in a very difficult public responsibility.

My State, the people I represent, as you well know, have a very great interest in the work, the responsibilities which you and your Commission face. You have my best wishes in your position.

Mr. WHITE. Thank you for that, Senator. The problems that come to this Commission are really very fascinating to me personally, and as to their importance and their significance, I think they are somewhat akin to those problems we are talking about here, which lie before the Water Resources Council, before the National Water Commission, if it is created, and basically before the Congress and the American public.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. No questions.

The CHAIRMAN. Senator Allott?

Senator ALLOTT. Nice to see you again, Mr. White.

On page 6 of your statement you refer specifically to the importance of our existing treaty obligations to supply water to Mexico and I hope that this is not in the nature of being picayunish, but I would have been more happy if you had also placed in there that you were fully aware, as I am sure you are, of the compacts, various compacts on the Colorado River which are also controlling in this area.

I am sure it was just an oversight but you are aware of those, I know, and in supporting this legislation, I am sure you do it with a concept that all of these legal and existing rights would have full cognizance taken of them.

Mr. WHITE. I understand your concern, Senator, and I think it would have been appropriate to have referred to the interstate agreements as well as any other legal commitments, and certainly the absence of a reference to them in the formal statement should not be construed to mean the Commission is not interested. They are very important to us, and we in our own daily activities bump into them quite regularly.

Senator ALLOTT. I know you do. Thank you very much.

Mr. WHITE. I appreciate that comment.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Thank you, Mr. Chairman.

Mr. White, I appreciate having this opportunity to hear you respond to questions and also your statement very explicitly states your feeling on the values of having this bill passed to establish the National Water Commission. I doubly appreciate that because I know the importance of water to the programs that you have been working with lately, the relationship of the water and power programs of our Nation.

I do not have any specific questions. I just appreciate having your thoughts on this matter.

Mr. WHITE. Thank you, Senator.

The CHAIRMAN. Thank you, Mr. White. We are delighted to have you and appreciate having your statement and your responses to the questions.

(The statement referred to follows:)

STATEMENT OF LEE C. WHITE, CHAIRMAN, FEDERAL POWER COMMISSION

Mr. Chairman and Members of the Committee:

I am glad to respond to your invitation to testify on S. 3107, the "National Water Commission Act". The Federal Power Commission supports this important legislation. Our formal report has been transmitted to the Committee as

an attachment to my prepared statement and will, I presume, be included in the record.

No greater need confronts America than the need for plentiful, clean water. There really is no alternative—our society must be equal to this great challenge. The time to plan for our future water needs is today. The National Water Commission bill is designed to bring to the consideration of the Nation's water problems the best minds and talents outside the Federal government. Enactment of the Water Resources Planning Act in 1965 (P.L. 89-80) manifested Congressional determination to launch an effective attack on water resources problems by coordinating efforts. Enactment of the National Water Commission Act of 1966 will reaffirm that Congressional resolve by complementing Federal efforts with non-Federal planning capability.

Full development of water resources on a scale adequate to assure the balanced social well-being and economic development of all areas of the Nation now presents critical and difficult issues. The mounting pressures of an expanding population and a growing economy emphasize the urgency of constructive long-term solutions. Water resource problems once of only local concern, have become regional, national and international in scope. An adequate water supply is vital to every aspect of our national life—including health, recreation, industry, agriculture, scenic beauty and the conservation and development of natural resources.

The Nation deserves a careful re-evaluation of our national water effort and the formulation of consistent and effective national policies and programs. S. 3107 provides for such a process within the broad context described by Section 3(a) which will permit a balancing of numerous and sometimes conflicting values to realize the maximum public benefit. Our national water policies will be benefited by the up-to-date, objective review and evaluation of the facts, considering aesthetic, economic, ecological, social and technological criteria, which the bill anticipates.

With enactment of the Water Resources Research Act of 1964, the Water Quality Act of 1965, the Land and Water Conservation Fund Act of 1965, the Federal Water Project Recreation Act, and the Water Resources Planning Act, great strides have already been made in implementing the recommendations in the 1961 Report of the Senate Select Committee on National Water Resources (Kerr Report). The Planning Act created the Water Resources Council, of which the Federal Power Commission is a permanent member, and provided the necessary machinery for coordinating river basin planning on the local, state and Federal level in terms of broad national objectives. The Water Resources Council provides a valuable forum for the exchange of views of Federal agencies concerned with the problems in the water resources field, and S. 3107 would complement this by providing a focal point for the expression, analysis and evaluation of the best and most constructive thinking of private citizens on these matters.

S. 3107 provides for a non-Federal, seven-member National Water Commission of distinguished citizens with broad authority to undertake a five-year comprehensive review of national water resource problems, including present and prospective water requirements and supplies, and to identify alternative ways of meeting those requirements such as conservation, pollution reduction, inter-basin water transfer, technological developments for desalting and waste water purification and re-use and other measures to encourage the highest economic and most efficient use of existing supplies. It will function as an independent, fully staffed advisory body to the President and the Water Resources Council.

As a regulatory agency licensing non-Federal hydroelectric projects, the Federal Power Commission must continually decide questions involving water resource development. Under the Federal Power Act, the Commission is required to determine whether a proposed hydroelectric project is best adapted to a comprehensive plan for improving or developing a waterway. Under the broad criteria which the Act establishes, the Commission considers not only the economic and engineering aspects of the project but its affect on the landscape, fish and wildlife, recreation, and competing water resource requirements. In order to meet these requirements, the Commission has a broad program to collect adequate and current data on river basin resources. Completion of the Water Commission's long-range study of the Nation's water supplies and requirements envisaged by Section 3 of S. 3107 would prove a valuable aid to the Federal Power Commission's work. The Federal Power Commission looks forward to the opportunity provided by S. 3107 for a meaningful water resources dialogue between the Federal agencies and the National Water Commission.

In its review of national water resources problems and its projections of water requirements and supplies, we hope the National Water Commission will consider as broadly as possible available sources of water in North America, as well as existing treaty obligations requiring the United States to supply certain water needs of other countries. The international importance of water resources development is summarized in the President's 1967 Budget Message:¹

Water is a worldwide concern. It is often not available in the proper amount and quality, or at the time it is needed. Lack of water or poor use of it can be a major deterrent to the growth of developing nations. At my request, the Secretaries of the Interior and State, together with other concerned agencies, are preparing a program to cooperate with other nations in finding solutions to the world's water problems.

The practical impact of international policies and commitments on the development of our national water resources should not be ignored. We all appreciate the importance of our existing treaty obligation to supply water to Mexico in the development of a viable water plan for the Pacific Southwest. We are also aware of long-term proposals to develop an agreement with Canada to divert arctic waters to augment the water supply of Canada and the United States. We must seek appropriate means to extend our dialogue to include the sovereign powers which are our good neighbors.

We hope that the National Water Commission will provide a creative voice in the formulation of water resource development policies for the future.

Thank you.

FEDERAL POWER COMMISSION, REPORT ON S. 3107—89TH CONGRESS, 2D SESSION
A BILL "To provide for a comprehensive review of national water resource problems and programs, and for other purposes"

S. 3107, the "National Water Commission Act", would establish for a period of five years an advisory, non-federal, seven-member National Water Commission directly responsible to the President, with authority to undertake a comprehensive review of national water resource problems, including present and prospective water requirements and supplies, and to identify alternative ways of meeting those requirements such as conservation, pollution reduction, interbasin water transfers, technological developments for desalting and waste water purification and reuse, and other measures to encourage the highest economic and most efficient use of existing supplies. In addition to advising on specific water resource matters referred to it by the President and the Water Resources Council, the Water Commission would also consider the economic and social consequences of water resource development on regional economic growth, institutional arrangements and esthetic values. S. 3107 was introduced to implement the President's recommendation² for the establishment of a National Water Commission of distinguished citizens to review and advise on the entire range of national water resource problems. Section 3(b) would direct the President to transmit the Water Commission's final report to Congress, together with appropriate comments and legislative recommendations.

S. 3107 spells out a definitive working relationship between the National Water Commission and the Water Resources Council, which was created by the Water Resources Planning Act³ and designated by Congress as the federal agency with broad authority to study and assess the adequacy of water supplies "to meet the water requirements in each water resource region in the United States and the national interest therein;" including "the relation of regional or river basin plans and programs to the requirements of larger regions of the Nation", and to review the plans of river basin commissions coordinating federal, state and local plans for river basin development. The National Water Commission, for example, would be required to consult with the Water Resources Council regarding its studies and to furnish proposed reports and recommendations to the Council for review and comment. The Council would submit its views on the Water Commission's reports directly to the President. The bill would also require the Water Commission to use the services of Federal water resource agencies, including the Water Resources Council, to the extent practicable, and to this end would direct the head of any Federal department, agency or river

¹ V. 112, Congressional Record, p. 861, January 24, 1966.

² Message from the President, "Preservation of Our National Heritage," House Document No. 387, V. 112, Congressional Record, February 23, 1966, pp. 3519-3523.

³ P.L. 89-80, 79 Stat. 244-254, July 22, 1965.

basin commission established pursuant to Title II of the Water Resources Planning Act to furnish information or personnel upon Water Commission request. In addition, the Water Commission would be expressly authorized to enter into contracts or agreements for studies and surveys with both public and private organizations and to transfer funds to Federal agencies and the above-mentioned river basin commissions to carry out those of its functions which could be appropriately handled in this manner.

In its role as advisor to the President and the Water Resources Council, the proposed National Water Commission would, in the opinion of the Federal Power Commission, greatly strengthen the national effort to develop a sound water use program. The National Water Commission's usefulness to the Water Resources Council is, of course, greatly enhanced by the explicit provisions of S. 3107 describing the working relationship between the Council and the Commission, particularly section 3(b) providing for independent Council review and comment to the President on all Water Commission reports and recommendations.

Completion of the comprehensive, long-range study of the Nation's water supplies and requirements envisaged by section 3 of S. 3107 would be of great assistance to the Federal Power Commission, not only in connection with its statutory responsibilities for comprehensive river basin planning and licensing of hydroelectric power plants, but also in connection with its responsibilities as a permanent member of the Water Resources Council.

The Federal Power Commission recommends enactment of S. 3107.

FEDERAL POWER COMMISSION,
LEE C. WHITE, *Chairman*.

The CHAIRMAN. The Chair wishes to state that Mr. Eugene W. Weber, representing the American Society of Civil Engineers, was unable to stay over this afternoon and he has filed with the committee a statement which will be included in the record at this point.

(The statement referred to follows:)

STATEMENT OF EUGENE W. WEBER, FELLOW, AMERICAN SOCIETY OF CIVIL
ENGINEERS

Mr. Chairman and members of the Committee: I am Eugene W. Weber, a civil engineer recently retired from the position of Deputy Director of Civil Works for Policy of the Army Corps of Engineers. I appear today at the request of the headquarters of the American Society of Civil Engineers to present the views of that Society on S. 3107.

As indicated in a letter of May 3, 1966, from the Society's Executive Secretary to the Chairman and a statement of May 9, 1966, from the Society's Assistant Secretary, copies of which have been furnished the Committee, the establishment of a National Water Commission as proposed in S. 3107 is consistent with a long standing policy of the American Society of Civil Engineers. These statements also suggested that consideration be given to spelling out a requirement for recognized proficiency in the water resource management for the Commission's membership.

At a meeting of the Society's standing Committee on National Water Policy, of which I am a past chairman, it was concluded that one of the most important and urgently needed services that the proposed Commission could provide is a comprehensive and searching review and report to the President and Water Resources Council of laws, policies, institutional arrangements and programs under which water resource development is carried out at the several levels of government.

In summary, we urge favorable consideration by the Committee of this proposed legislation and the addition of strengthening language as suggested on the qualifications and mission of the proposed National Water Commission.

The Society appreciates the opportunity to present these views on proposed legislation which is of great importance to our profession and to the Nation.

The CHAIRMAN. Our next witness is Prof. Ray K. Linsley, professor and executive head of the Department of Civil Engineering, Stanford University, and former Chairman of the Committee on Water Resources Research of the Federal Council for Science and Technology. He also served as assistant to Dr. Hornig, Director of the Office of Science and Technology.

Professor Linsley is one of the Nation's foremost engineers, specializing in water resource development. He has been associated with various other Federal agencies, including the Tennessee Valley Authority and the U.S. Weather Bureau, in that capacity serving as Chief Hydrologist.

Professor Linsley, we welcome you to the committee session this afternoon and look forward to having your testimony.

**STATEMENT OF RAY K. LINSLEY, PROFESSOR AND EXECUTIVE
HEAD OF THE DEPARTMENT OF CIVIL ENGINEERING, STANFORD
UNIVERSITY**

Dr. LINSLEY. Thank you very much, Senator Jackson. Those were very kind words in the introduction.

The CHAIRMAN. They were just factual.

Dr. LINSLEY. I may say I am glad to be here. I have submitted a fairly lengthy statement and with your permission I would like to request that that be inserted in the record and I will try to hit the high spots here.

The CHAIRMAN. Without objection it will be included in full in the record.

Dr. LINSLEY. Gentlemen, I am very much in favor of the creation of a National Water Commission along the lines outlined in Senate bill 3107. I think one of the strongest arguments in favor of this is a feeling which is common in academic circles and even outside of academic circles that we perhaps are not doing the best we could in our water development.

This feeling seems to revolve around the question of whether we are studying all of the alternatives that are available to us as we look at the many problems that confront us. There are many kinds of alternatives. We have alternatives of use. We may elect to leave a stretch of river in its natural state for enjoyment, for recreation, or we may construct a reservoir to produce or conserve water.

There are engineering alternatives, a choice between a high dam and a low dam. There are management alternatives, a choice between a flood control reservoir or flood plain zoning. There are institutional alternatives. Projects can be built by the Federal Government, by the State government, or by cooperative effort between these jurisdictions. And there are alternatives of timing. Projects can be built now, 5 years from now, or 10 years from now. All these alternatives are important and we should be giving them very serious consideration. Their importance lies mainly in the flexibility they give us for dealing with our problems now and in the future, and we do plan our water projects for periods of 50 and 100 years. This is a long time into the future.

We have been primarily in a period of transition for nearly 300 years. For nearly 300 years our country has not really suffered from water shortages. So we have developed a posture on water development that is based, rather, really on a position of abundance. Now, as has been amply brought out in discussion earlier, we do face shortages of increasing severity and we need to adapt policies that are adjusted to this new condition.

One of the most important aspects of this is the possibility of more efficient use of our water—call it water conservation, water saving,

there are many ways to describe it—but we have not done very much in the past to find better ways to use our limited water supplies; how to get more out of a given quantity of water, if I may put it in those terms.

We are also in a period of transition in a technological sense. One needs only to look back 50 years, to 1916 to realize how many changes have taken place in our total capability, technological capability, changes which, if they had been anticipated in 1916 might have made major differences in the planning of water projects at that time.

Our water development is oriented very heavily to the engineering solutions to water problems—construction of dams and aqueducts—and it is interesting to note that these are the very same techniques that were used in the valley of the Tigres and Euphrates over 6,000 years ago.

We have other alternatives now which we should explore as thoroughly as possible. One among these is the possibility of recovery of waste water, using it for any of a number of purposes in place of natural waters, where supply is short. It could be said that most major cities have available to them a continuing supply of water equal to half or two-thirds of their water consumption in the form of their waste water which they can recover. The problem is not technology alone, however. Many are the reasons for not looking at the new technologies.

Our present policies on cost sharing and repayment are such that there is limited encouragement to our citizens to consider water conservation. When water is underpriced we have very little incentive to conserve it.

We are not really sure of the exact value of water in various uses. This makes it difficult to make an effective economic evaluation of projects. We have a number of institutional constraints which prevent our Federal agencies from looking at all of the possible alternatives in particular instances.

It seems to me that a commission of outstanding citizens which could take a detached view of the total water problem, detached in the sense that they were not in the immediate throes of the problems of water development and water management, but they could stand to one side and look at the total problems independently, could recommend new policies, new viewpoints, new alternatives, research; in other words what is required to make the fullest use of our water in the most efficient sense.

I think that if we consider the fact that within a few years we will be sending a spaceship to the moon or beyond, that we will expect the men on this spaceship to start off with a very small quantity of water and to return without any replenishment of that water supply, that we should be able to use this same ingenuity for a very forward look at our own water problems on earth.

I thank you.

The CHAIRMAN. Thank you, Professor Linsley. I would like to ask three or four questions.

I was very much impressed with your statement on page 3, the last paragraph. You state, "The report 'A Ten-Year Program of Federal Water Resources Research' released by the Office of Science and Technology in February indicates that in 1965 the Federal Government spent \$700,000 on research into the conservation of water in agricul-

ture, but nothing whatsoever in research on conservation of water in industrial and domestic uses. In short, something less than 1 percent of our research expenditures in the water resources field were devoted to finding ways to use less water; i.e., to increase our efficiency in use."

I think this is quite an impressive statement and I take it that you feel that a commission of this kind should take a balanced look at this. It seems to be an area that certainly needs to be reviewed and gone into more than it has been in the past.

Dr. LINSLEY. Yes, definitely.

The CHAIRMAN. Now, I wanted to mention too, your statement on page 5 in which you say: "Our goal is really to achieve the best possible economic and social gains for the people of the United States. Our planning should be people-centered, not water-centered." Frequently one hears statements that imply that water development is a good thing for its own sake.

I wonder if you might comment on that.

Dr. LINSLEY. Yes, sir, Senator.

We have no real reason to develop water resources except as we need to put this water to use for the benefit of our people. We should emphasize the needs of the people and not just development of water resources. We do have several large Federal agencies who have missions in the water field and it is natural that they will move forward with plans for various kinds of projects. That is their job. I believe the Commission could take a serious look at this and perhaps in some instances raise questions as to whether these projects are the best expenditure of Federal money. I am not in any sense criticizing all our projects because we have some very important problems which have to be solved and are being solved. The problem is to meet the needs of the people and not to keep the water from running to the ocean or to build a dam because it is a good place to build a dam.

The CHAIRMAN. In any event you feel that these questions should be asked and that answers should be given.

Dr. LINSLEY. Yes, definitely.

The CHAIRMAN. And they are proper questions to be asked.

Also in your statement you mention what I call the postaudit proposal:

The Commission might appropriately undertake some postmortem examinations of completed projects. No major Federal water project has even been reviewed carefully after its construction to determine how closely it has conformed to the predictions which were made for it in the planning stage, or to determine why its performance has departed from that which was expected. Such examinations must be made with care, but it seems possible that some important insights into our operations could be obtained in this way.

I think this is a pretty sound suggestion from the standpoint of having a postaudit and certainly with your long experience, I take it you feel we could profit by such an effort.

Dr. LINSLEY. I think we could, Senator. One point which I did not mention, but is brought out in the report on the Federal Water Resources Research Act is that we spend very little of our research dollar on methods of planning and on the basic information that is needed for planning. It seems to me that postaudit studies—and I like that word better than postmortem—would give us a basis for understanding the accuracy of planning for numbers that go into our studies and a better chance to judge how close to right we are in our

projections. I think we must recognize that every time we plan for water development we are estimating a situation for 50 or 100 years into the future, a very difficult task at best.

The CHAIRMAN. Now, one last question. In your prepared statement you have this: "The best water projects have been built and we are moving into a period where the projects will be less and less efficient as compared to those which we have built in the past."

My question is: What does this suggest for future water supplies?

Dr. LINSLEY. To me it suggests we must be shrewder in the future than we have in the past; that we must give more careful thought and more consideration to our planning in order to get just as much efficiency as we can out of these future projects.

The CHAIRMAN. There is less of a profit margin to be operating under.

Dr. LINSLEY. That is correct.

The CHAIRMAN. Senator Kuchel?

Senator KUCHEL. I have read your statement, Professor Linsley, and I must say I consider it excellent.

Dr. LINSLEY. Thank you.

Senator KUCHEL. I am one of those who feels that a commission could perform a great service in this field. You and I live in a country that is not wholly unacquainted with the problems of water and water shortage—sometimes too much. I remember going to Santa Barbara several years ago and they showed me some of the original waterworks the Indians built which were built of bark and are still used. That is not so far back as your comment on what took place in Persia, but it is an interesting thing, that this business of trying to conserve water has been going on for a long time, and all the various possibilities are possible. The Senator from Colorado had to leave, but in our Appropriations Committee he has taken a very great interest in this possibility of weather modification, something that is fantastic and yet quite possibly may be a source of assistance to our people as we climb in population. That, of course, is a difficulty, and again you and I come from a State which increases 600,000 new people a year, so that our needs are almost unnatural in their sudden and continuing growth. Yet by the same token I recognize that water now becomes, I suppose, a worldwide problem. Anyway, I am delighted that you were able to make this contribution, Professor Linsley.

Dr. LINSLEY. Thank you.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. I enjoyed your testimony. I am just curious about one sentence here, coming from an agricultural State: "Few people realize that in California agricultural waste water may constitute a more serious pollution problem than industrial or urban waste."

Dr. LINSLEY. Well, sir, every time we irrigate a field we leach a certain amount of salt into the water plus probably fertilizer pesticides and other agricultural chemicals. The particular difficulty here is that it is not a concentrated source that we can get at and treat as we can industrial wastes. So that eventually this may become a problem of major proportions.

Senator BURDICK. Thank you, sir.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman. I too want to commend you, Doctor Linsley, on a very fine statement. I am particularly impressed with the language you used here where you say: "If we continue to plunge in with solutions which are less than optimum, solutions which do not leave us flexibility for the future, we may well foreclose important alternatives which could be desirable for the Nation 20, 30, or 50 years from now. If one wonders why we are concerned with the situation 50 years from now, he need only be reminded that our present policies assume that we are planning for 100 years with respect to water—the longest planning horizon used in any aspect of public works."

In that vein, you would agree, I am sure, that at the present time certain areas of the country are farther along in their development, their population growth than other areas of the country.

Dr. LINSLEY. I believe that is true, yes sir.

Senator JORDAN. So it is important that we go ahead not only for the short run but for the long pull, as you look 50 to 100 years ahead, whether we take into account the potential development of an area which may at the moment not require as much water as some other areas, you would agree we must be foresighted in looking into the crystal ball if we can and see what the potential of that area might be if full use of its own water resources were made.

Dr. LINSLEY. Yes, sir.

Senator JORDAN. Thank you.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. I am very much impressed with what you had to say about the technological and scientific development that have gone forward and that you seem to feel should be tied in with this overall program.

I would just like to ask you a question about your statement on page 7 where you say: "No major Federal water project has ever been reviewed carefully after its construction to determine how closely it has conformed to the predictions which were made for it in the planning stage, or to determine why its performance has departed from that which was expected."

Would that statement pertain to a project such as we have in Arizona, the Salt River project?

Mr. LINSLEY. As far as I know, the Salt River project has never been studied intensively.

Senator FANNIN. Mr. Chairman, I would like if I could introduce at this time a statement that has been prepared—a little booklet which gives a report on saving water in Arizona.

The CHAIRMAN. It is not too long, is it? Without objection it will be included in the record at the conclusion of Professor Linsley's prepared statement.

Senator FANNIN. I do not mean to indicate that this booklet is as complete as you might refer to in your statement, but I do think it indicates what ought to be done and I know we have had constant studies in regard to this project. It has been taken as a sample project in many instances as to what can be done and, of course, as you realize, it was one of the first projects of any size in this Nation. We have people who travel from foreign countries to look over our project so I think in that instance there have been vast studies made of the project

and what was contemplated and what has resulted. I would just mention that as an indication of what has been done.

Dr. LINSLEY. The Salt River project is a very important and well-known project. I suspect that conditions which prevail in Arizona now are quite different perhaps than were anticipated by the planners of the project for a very good reason, and it would be interesting to note how they reached their estimate and what has actually happened as a guide to the problem of projecting future plans.

Senator FANNIN. I agree, there have been vast changes come about, both in growth and population, and of course we do have a great problem in other areas of the State that do not have the surface water available as in the Salt River valley. As you know, the Tucson area, where it is all pumping and there is not any surface water available presently, has great need for surface water.

On page 8, you speak of the time margin. This time margin is sufficiently small in some situations that we should not delay a national review very long. But you say, "it is nowhere so pressing as to suggest that there is not enough time for a national review."

Now, I feel that we are in dire need of a program of construction to get underway immediately if we are going to be able to take care of the immediate need, much less the future needs of our State. At the present time we are not replacing a large percentage of the water that is being utilized so we are using water that has been in the surface of the earth for thousands of years. We are now mining water. Do you think that you could say in that instance that we can afford further delay?

Dr. LINSLEY. Senator Fannin, I would hope that the Water Commission would be constructive, not obstructive, and I would assume that going projects, which are already developed and ready to move ahead, would go ahead without delay because of the existence of a commission.

Mr. FANNIN. That is your feeling, that there should not be a delay brought about by any new legislation.

Dr. LINSLEY. I would not propose a moratorium on all projects while the Commission was deliberating.

Senator FANNIN. You realize the dire need for water in Arizona and it is practically burning up in some areas as far as drought is concerned. This has been brought about over a period of years. As I stated, we are mining underground water.

I was interested in your statement about the agricultural waste. I realize this would apply in certain areas and other areas where you do have advantages by the irrigation in utilizing water to carry the salt away. I would think that in some areas it would be detrimental and in other areas would it not be beneficial?

Dr. LINSLEY. It may be beneficial to use the water to carry the salt away but it still gives us a problem of what to do with the salt water.

Senator FANNIN. The leaching, carrying the salt away, will, we hope, take care of the salt that is in the earth. This is the great problem that we have and we hope that the recognition of the problem will help solve it. Increased water upon the land, with the great necessity for leaching, will help to solve that problem.

Dr. LINSLEY. Yes, I think it may.

Senator FANNIN. Thank you very much.

The CHAIRMAN. Thank you, Senator Fannin.

Thank you, Professor Linsley. I want to compliment you on your fine statement and for your appearance here once again in connection with this problem. Your testimony last summer was most helpful. Your full statement will be included at this point and Senator Fannin's insert will follow it.

(The data referred to follow :)

STATEMENT OF RAY K. LINSLEY, PROFESSOR AND EXECUTIVE HEAD, DEPARTMENT OF CIVIL ENGINEERING, STANFORD UNIVERSITY

Senator Jackson and Members of the Committee: It is both flattering and satisfying to be invited to testify before this Committee relative to the National Water Commission Act. Flattering that I have been invited from among all the many possible people who might have been invited. Satisfying in the thought that I may have some small part in assisting the Committee in its decision on a very important matter.

As you gentlemen are probably well aware, it would be hazardous for anyone to predict precisely the outcome of a decision to establish a National Water Commission. What the Commission does and the recommendations it makes will depend very much on who is appointed to the Commission and how the Commission interprets its instructions from the Congress and any constraints its may feel necessary to impose on itself. The actual accomplishments stemming from the Commission's deliberations will depend, of course, on the response of the President, the Congress, the federal agencies, and state and local jurisdictions to the recommendations which the Committee sets forth. I shall merely attempt to give you some of my views on why a Commission is needed and what it might accomplish. It is probably not possible to do justice to all possible aspects of the Commission's potential activities within any reasonable amount of time which I might take up today. I shall therefore limit my comments to areas mainly pointed to the scientific and technological aspects of the Commission's activities, since this is my special area of competence and you will have other witnesses who will be prepared to testify on other aspects of the water resource problem as the Commission might view it.

I believe the main argument for the establishment of a National Water Commission is the fact that there is a substantial amount of public criticism of present water resource management in the United States from sources which can only be considered as highly responsible. Criticism from academic sources is particularly noticeable and should bear particular weight because academicians in general have no axe to grind. They wish only to see that we handle our national problems in the most effective and efficient manner possible. Criticism, however, is by no means limited to academic circles. Criticism and questions are frequently observed in journals of various kinds including the Congressional Record.

One week from today I am to participate in a panel discussion at the annual Water Resources Conference of the American Society of Civil Engineers in Denver on the topic of the "East-West Water Controversy". I am happy to say that I am to be the neutral speaker in this discussion because I don't really believe that there is an East-West water controversy. Certainly there is no argument over the allocation of a specific block of water such as we find in most water controversies. Rather there appears to be a feeling in the East that Western water management leaves something to be desired and this feeling is in turn reciprocated by the Westerners who feel that the East has not done as well as it might in water planning. My position will be that both groups have some valid issues, but that what they are really pointing out are deficiencies in our national water management program. These deficiencies take different forms in the East and in the West because the water problems of the two areas are different. Nevertheless, they seem to be the symptoms of the same ailment.

The various comments made on national water management take many forms, but I think they can all be reduced to one principal point. We do not always select the best alternative solution to particular water management problems. The heart of the planning process is the definition and screening of alternatives. Unless this is done with care and thoroughness, the adopted plan is likely to fall short of the best possible solution for a particular problem.

There are many kinds of alternatives which are encountered in planning. There may be alternate and mutually exclusive objectives which must be considered. Thus a particular reach of river may be developed with dams and reservoirs for the production of power and storage of water, or it may be left

in its natural state for the preservation of its scenic and recreational values. There are engineering alternatives, such as the choice between using reservoirs or levees as a solution to a particular flood problem. There are management alternatives in which we may choose between physical works or flood-plain zoning as devices to reduce flood damage. There are institutional alternatives in which a particular project might be planned and developed by a federal agency or may be done by a state or local jurisdiction, with or without federal aid. There are alternatives of timing and size. A particular project can be built today or it can be postponed ten years to a time when it will more fully realize the potential benefits it offers. A project can be built in stages; a small dam now to meet immediate needs, to be increased in size later as the requirements of the region increase.

These alternatives of timing and size are particularly important, for through them we can achieve a flexibility in dealing with the future which is vitally important. Water projects are often built with a repayment period in the order of 50 years and a potentially useful life which may well exceed 100 years. It is difficult indeed to see 50 to 100 years into the future with any precision. We need only look 50 years behind us to appreciate the vast changes in technology, social attitudes, and population which represent major departures from the conditions assumed by water planners in 1916. To the extent that we can preserve an element of flexibility in our planning—an opportunity to adjust to changing conditions—we have preserved the possibility of keeping abreast of the great changes which we know are ahead of us, even though we cannot now predict precisely the nature or the timing of these changes.

The critics of present national water programs would suggest several reasons why we are not necessarily attaining the best alternatives in our water management efforts. We are currently in a transition period, from an era of abundant water to an era which threatens water shortage. For nearly 300 years the United States has been concerned in some way with water problems. First with the use of the rivers of the Eastern seaboard and the Ohio-Mississippi system for navigation, then with the use of water to encourage the development of the West through irrigation and power development, and now with the whole wide range of multiple uses from power and irrigation to recreation which our technology and affluence permits. Only within the last decade or two have we come face to face with the fact that an increasingly large population concentrated in great urban centers, combined with a technology which finds an increasing number of uses for water, have led to demands which cannot be guaranteed from the regional sources of supply available to these areas.

Yet we still approach the problem of providing water with the philosophy that water is a free good which should be supplied to all who ask for it in the quantity they request without question or reservation. We ration water and take other steps to reduce demand only when a serious emergency such as the current New England drought faces us and such drastic measures are clearly the only solution available. Yet as a nation we have a good history of conservation. We took major steps to conserve our soil resource when it was threatened. We encourage conservation of our timber resource. We have enacted laws to conserve some of the nation's wild rivers in their natural state. We speak of water conservation, but what we really mean by this term is to store it for use. We have done very little to seek ways in which we might use less water without detriment to the uses to which we put the water.

The report "A Ten-Year Program of Federal Water Resources Research" released by the Office of Science and Technology in February indicates that in 1965 the federal government spent \$700,000 on research into the conservation of water in agriculture, but nothing whatsoever in research on conservation of water in industrial and domestic uses. In short, something less than 1% of our research expenditures in the water resources field were devoted to finding ways to use less water, i.e., to increase our efficiency in use. Techniques of water conservation might offer helpful solutions to the areas where shortages are now a problem. They could reduce the cost of other remedial measures or perhaps avoid some of these measures for several years to come. Even in those locations where water is not yet in short supply, conservation measures could make existing supply systems adequate for a longer time with consequent saving in capital investment and could postpone the day when serious shortages do threaten. Finally, if we use less water we have less waste water to dispose of. This might substantially aid our program of water pollution control which, as you gentlemen are certainly aware, is likely to be a costly and difficult program.

There are, I am sure abundant ways in which water conservation could be

affected. I am told that different brands of ordinary home clothes washers use amounts varying from 15 to 60 gallons of water per cycle. It has probably never been suggested to the manufacturers that water economy might be a useful part of washing machine design. I suspect that most manufacturers could substantially reduce the water use in their machines. What has been said of clothes washers is probably equally true for dishwashing machines. New design for toilet flush tanks and showerheads might affect a savings in water with no loss of utility in these devices. Industry has already demonstrated in a number of instances that it can get by with less water when it is forced to do so by limited supplies or high costs. But no systematic study of industrial water use with an eye toward water economy has ever been undertaken. It seems probable that we could go much farther than we have in searching for ways in which agriculture can reduce its water requirements. Universal metering, cost pricing, local ordinances requiring water saving devices, and similar methods could be used to encourage water economy. Research on possible techniques is urgently needed to point the way.

I was startled recently to read a report which referred to our present "primitive techniques for water development". As a water engineer my hackles rose as I read the quotation, but on reflection I realized that the author was not far from the truth. Basically, present federal policies view water development in the light of dams, aqueducts, and levees. These are the very same techniques used by the ancient Persians in the Valley of the Tigris and Euphrates many thousands of years ago. New materials and new construction techniques make it possible for us to build these things faster, bigger, and more permanent, but we should not let these advances blind us to the fact that they are very old techniques of water management.

This is an age of great technological advance. We contemplate in the not to distant future the landing of men on the moon, and perhaps to other planets beyond. Can we not turn these technological advances into better water management? We will expect these space vehicles to start out on their long journeys with a fixed and rather small supply of water. This water will be continuously recycled and reused to meet the needs of the crew until they return to earth. Two-thirds to three-fourths of the water used in any city is discarded as waste water after one single use. Systems for reclamation and reuse of such waste water could guarantee a city a firm water supply equal to perhaps two-thirds of its normal requirements and the requirements of new water for make-up would be reduced by a factor of three. It is to be noted that a very substantial part of the water we use serves only one function, that of carrying away waste. This is clearly obvious in urban and industrial applications, but it is less obvious that a substantial volume of our irrigation water is applied solely to leach salts from the field. Is it too much to suggest that technology might search for other ways of removing waste which might require no water, or at least much less water than we now use? A satisfactory solution could reduce water requirements and waste treatment loads very substantially.

We have called heavily on technology to attempt to solve our water problems by providing more water through desalting of the oceans. It would be foolish indeed to separate 35,000 parts per million of salt from sea water; use the pure water once and discard it when it contains less than 1,000 ppm of impurities. An equal research effort directed to reclamation of waste water or water economics in use might, in the long run, give us less costly and more satisfactory solutions to our water problems than we can anticipate through the desalting effort.

Frequently one hears statements which imply that water development is a good thing for its own sake. Planning is sometimes approached as if the question were "What water development can we carry out here?" It is frequently said that "We must not let this valuable water resource waste to the oceans." There is certainly no doubt that we must continue development and management of our water resources, but our goal is not merely to develop the resources or to prevent this water from "wasting" to the oceans. Our goal is really to achieve the best possible economic and social gains for the people of the United States. Our planning should be people-centered, not water-centered. We should remember that there are situations when the best alternative is the "do-nothing alternative". There is no compelling need to develop or manage the water of a given stream unless the project contributes positively to the economy of the nation or to the social betterment of its people. Even if a project did provide economic gains and social improvement, it is possible that it should not be built if there is some other way to spend the money which would produce greater gains.

There is no moral obligation to spend money on water if this money could be better spent in some other area. Yet the very existence of many federal and state and local agencies is dependent on doing something about water. A concept of public need must somehow override the agencies' need for survival.

One of our problems in the selection of the best alternative is brought about by the distorted costs which the ultimate beneficiaries encounter. We can hardly expect that a local community faced with a flood problem will opt for flood-plain zoning if they can gain a solution to their problem through a federal flood control project. The federal project requires them to pay the costs of lands, easements, and rights-of-way, but in some states the state government will pick up this small part of the total cost so that the federal project is virtually cost-free to the local interests, whereas the costs of zoning land fall on some or all of the members of the community.

One reason that we have given very little thought to conservation of water in use is the fact that water is generally under-priced. A recent figure of the Department of the Interior shows that their recovery from sales of water amounts to \$1.88 per acre of irrigated land under Bureau of Reclamation projects. With the cost of water so low, is it reasonable to expect that the farmers will be careful in the amount of water they use? The introduction of techniques to minimize their water use might well cost them more than the water they use. Some irrigation districts spread the cost even farther by paying for part of their water through taxes so that the actual water bill to the farmer is even lower than the charge to the district. Municipal water in the city of New York is sold on a flat rate basis. The customer pays no more for water if he is careful about its use than he pays if he is wasteful. There is hardly any incentive to be careful in a system of this kind. While there is no doubt that we must in some fashion meet the real needs of our people with respect to water, we cannot know what their real needs are if we operate under a system in which the value of water is so badly distorted by the price structure. Subsidies in some cases may be well advised, but the amount and nature of the subsidy should be clearly understood and requirements for efficiency in use should be placed on the beneficiaries. It must be remembered the actual cost to the local beneficiary does not differ greatly between the case in which he contributes significantly to the cost of a project or the case in which it is financed solely from federal funds. A recent book by Haveman entitled "Water Resource Investment in the Public Interest" shows that federal investment in water resources has state by state been closely proportional to taxes paid by the state to the Federal government. Requiring a greater local contribution to project cost, either through cost-sharing or reimbursement, would focus the attention of the local beneficiary more explicitly on the project's merits and demerits and might lead to better decisions between alternative solutions.

The final reason for the criticism that we are not getting the best choice between alternatives seems to be based on the fact that we are not getting completely reliable economic evaluations of water resources projects. There are many reasons for this. First, we are none too sure of what water is really worth in all of its many uses. We use arbitrary numbers for the recreation value of water *in situ*, but our basis for these values is most uncertain. We do not really know what it is worth to provide water in a city. The use of the next most costly alternative as a basis of comparison is clearly unsound. The prices at which water is usually sold are no real measure of the value the purchaser places on them because they are so low. We need considerably more research and study into the value of water in alternative uses. A unit of water used in industry normally produces far greater returns and employs far more people than an equal unit of water used in agriculture. These comparisons are rarely made in evaluating project development. A second factor leading to uncertain economic evaluation is the uncertainty attached to all planning. All of the numbers which enter the economic evaluation are based on projections into the future. In general, costs of water projects have been under-estimated in pre-authorization studies. There is evidence that benefits are often over-estimated. In any case, there certainly is as much possibility of an over-estimate of benefits as an under-estimate. With benefits too high and costs too low, projects showing a benefit-cost ratio near 1 have an excellent chance of being uneconomic.

Institutional factors also enter into the economic decisions. The Corps of Engineers has no authority to enact flood-plain zoning ordinances and cannot properly account for the zoning alternative in project planning. The Bureau of Reclamation has no authority to construct nuclear or thermal power plants and therefore does not consider these as alternatives in their projects. It seems

quite possible that Bridge and Marble Canyon Reservoirs are less satisfactory sources of power than other alternatives because of their great distance from the load centers. In addition, evaporation losses from these reservoirs represent a depletion of the Colorado River flow. Clearly, unless our project planning can consider all feasible alternatives and give them an appropriate evaluation, we have no assurance that a particular project selection represents the best choice under the circumstances.

I am most pleased to note that Senate Bill 3107 stresses the responsibility of the National Water Commission to consider the technologic alternatives in water planning. In considering these alternatives they must inevitably deal with the economic aspects of the decision. In carrying out their responsibility they will necessarily listen to both the critics and the proponents of present federal water management methods and will have an opportunity to weigh these views on the points I have mentioned above and on other points which will undoubtedly be developed.

The Commission might appropriately undertake some "post mortem" examinations of completed projects. No major federal water project has ever been reviewed after its construction to determine how closely it has conformed to the predictions which were made for it in the planning stage, or to determine why its performance has departed from that which was expected. Such examinations must be made with care, but it seems possible that some important insights into our operations could be obtained in this way.

As the Bill suggests the Commission could evaluate technology which is under development and might appropriately listen to predictions from outstanding scientists as to technology which might be developed in the future. It could weigh these predictions and present to the Congress recommendations for research programs that could bring forward the important technologies rapidly so that they may contribute at the earliest possible date. It is generally accepted that water planning involves a partnership of federal, state and local jurisdictions. Certainly this is the essence of the Water Resources Planning Act which Congress passed in 1965. But to say that we should have a partnership and to achieve a real working partnership are two quite different things. The Commission could very well look into the problems which have been experienced in developing useful institutional structures for cooperative effort by various jurisdictional levels. As a result of their investigations it is to be expected that the Commission might suggest some restructuring of the mechanisms involved in making the federal, state, and local partnership a working entity.

It is to be hoped that the Commission will allay the fears of water shortage—fears which seem at times to verge on panic. We do have water problems and some of these problems are such as to challenge our abilities to the fullest. At present for the nation as a whole we divert and use about one-fourth of our streamflow, but we consume only about one-fourth of what we divert—roughly one-fifteenth of our surface-water resource. We need to research for new methods of dealing with water problems. We need studies to define what our problems really are. We do not need to let ourselves be forced into an unwise choice of solutions or to employ obsolete methods. In general, we have a margin of time which permits us to think our plans out thoroughly. This margin is sufficiently small in some situations that we should not delay a national review very long, but it is nowhere so pressing as to suggest that there is not enough time for a national review. We speak of our water resources as renewable, but we must remember that the opportunities to use and develop these resources are limited. The best water projects have been built and we are moving into a period where the projects will be less and less efficient as compared to those which we have built in the past. Thus planning for water projects in the future will require increasing skill, caution, and background information. If we continue to plunge in with solutions which are less than optimum, solutions which do not leave us flexibility for the future, we may well foreclose important alternatives which could be desirable for the nation 20, 30, or 50 years from now. If one wonders why we are concerned with the situation 50 years from now, he need only be reminded that our present policies assume that we are planning for 100 years with respect to water—the longest planning horizon used in any aspect of public works.

My comments have been oriented rather heavily to water development, but much the same can be said for pollution control. We do indeed have pollution problems and they are getting worse in some areas. At the moment, however, none of our stream pollution problems appear to threaten a serious health hazard. Pollution certainly does pose economic problems and aesthetic ones. We could

spent very large amounts of money attempting to correct our present pollution problems with methods now available to us. A few years from now there may be better and less costly methods for dealing with some of these problems. We should not rush headlong into great expenditures for pollution control, but rather into a carefully planned program in which control measures are coordinated with research efforts so that we are prepared to use the best techniques available to us at any time. We need also assess rather carefully the nature of our pollution problems. Few people realize that in California agricultural waste water may constitute a more serious pollution problem than industrial or urban waste.

I strongly endorse the Bill to create a National Water Commission. There is clearly a task for such a commission to do and the opportunity exists for the commission to make a major contribution to our national welfare.

SAVING WATER IN ARIZONA

(A report on Water Conservation Practices and Programs in Arizona, January 1966)

SUMMARY

■ Arizona farmers have invested more than \$115,000,000 on ditch lining, land releveling and pump-back systems alone to conserve water.

■ More than 95% of all water delivered to municipal water users in Arizona is metered. Farm irrigation deliveries are also carefully measured by all water districts in Central Arizona.

■ Sixty-four percent of all farm irrigation ditches (7,672 miles of them) in Arizona are lined with concrete to prevent water loss, and lining continues at a rapid rate.

■ More than 2,000 miles of district delivery canals are lined, and more lining is in process each year.

■ The Salt River Project in Central Arizona has spent \$15,000,000 during the last 15 years on works to conserve water and deliver it efficiently.

■ The Central Arizona Project plan specifies that water be delivered only to users having lined canals and ditches.

■ The Salt River Project and U.S. Forest Service will spend approximately \$75,000,000 in the next 25 years to improve the efficiency of water yield on 7,500,000 acres of Arizona watershed lands.

■ Pumped ground water is a major source of irrigation water in Arizona. A common pump lift in Central Arizona is 300-450 feet and the over-all cost from that depth is estimated to be \$12.00-\$18.00 per acre-foot. Irrigators can't afford to waste at that cost.

■ Industrial use of water in Arizona is largely accounted for by the mining industry. For every 1,000 gallons of new water used by this industry, 3,000 gallons are reused. Some of it is reused as many as seven times.

■ Direct reuse of municipal sewage water is at present limited to irrigation of non-foods crops, but intensive research programs are in process to develop feasible means of a higher economic use of all treated effluent from the Phoenix and Tucson systems.

■ To eliminate the current overdraft upon irreplaceable ground water, and provide for increased municipal and industrial needs by the year 2000, Arizona needs an additional 3,000,000 acre-feet annually. Even with this quantity, no agricultural expansion would be possible.

Arizona must have at least an additional 3,000,000 acre-feet of water annually if the current rate of overdraft on ground water reserves is to be eliminated, and if conservatively estimated municipal and industrial needs by the year 2000 are to be met. This figure makes no provision for any agricultural expansion.

The need will exist despite everything that is being done or can be done to conserve presently available supplies. Intensive programs to conserve water and to use it efficiently have produced significant results and will continue to do so in the future, but by no stretch of the imagination can Arizona's great and growing water deficiency be solved alone by conservation of presently available water resources.

Of necessity, Arizona has great interest in the conservation of water, and has an impressive record of achievement. Some highlights of that record are presented here.

AGRICULTURE

As in all Southwestern and Northwestern states, more than 90% of Arizona's annual water supply is used by farmers to irrigate crops. Even so, the supply is so limited that only a little more than one million acres are irrigated.

Generally speaking, Arizona farmers are among the most efficient irrigators in the world. Nationally the average efficiency for irrigation water is about 30%. Many Arizona farmers obtain an average of 70% or better, and technicians of the Soil Conservation Service, the Extension Service and irrigation districts devote full time to improving irrigation efficiencies which generally are above the average for the nation.

DITCH LINING CUTS LOSS

Large amounts of water can be lost by seepage and weed growth in unlined farm ditches. Of the approximate 12,000 miles of farm ditches in Arizona, 7,672 miles (64%) have been lined with concrete or put into pipe. This represents an investment in water conservation by farmers of approximately \$50,000,000. According to the Soil Conservation Service, this reduces seepage losses by an estimated 387,000 acre-feet of water per year; and many more miles of ditch are lined each year. Of course, all irrigation districts in Central Arizona measure water deliveries.

Organized irrigation districts in the State have lined with concrete or piped more than 2,000 miles of delivery canals and laterals to reduce water loss.

The Salt River Project, largest irrigation district in the State, has spent \$15,000,000 during the last 15 years on works to conserve water and deliver it more efficiently. This program is continuing.

Two of the smaller districts in the Salt River Valley have current water-saving programs in process with loans obtained under the Small Reclamation Projects Act. In combination these two projects alone will save in excess of 15,000 acre-feet annually.

The Soil Conservation Service reports that more than half of Arizona's irrigated croplands have been re-leveled to improve efficiency and to prevent waste of water from the lower ends of fields; and 207 pump-back systems have been built (28 of them in 1965) to receive unavoidable waste water in sumps from which it is pumped for reuse. The investment by farmers in these water saving methods is approximately \$65,000,000.

PUMPING CONTROLS

Almost all irrigated land in the State is now included in districts called "critical areas" under the Arizona Ground Water Code of 1948. In these areas it is illegal to drill new wells to bring new land into cultivation.

However, depletion of ground water continues to be a serious problem because of pumping that is essential to maintain the existing economy in areas that were developed for irrigation before the limitations of the Code were applied.

In this connection it must be recognized that in 1928 the Congress allocated to Arizona the right to use 2,800,000 acre-feet of Colorado River water annually, and that since then Arizonans have confidently planned for and expected to use a large part of that water to relieve their ground water overdraft problems. That this has not yet come about is beyond their control.

Reduction of the State's overdraft on ground water is the major purpose of the proposed Central Arizona Project to bring in Colorado River water. The delivery of this surface water would enable Arizona to better manage and conserve its dwindling ground water resources. The Project would deliver no water for expansion of irrigated acreage.

HIGH COST SAVES WATER

The cost of water for irrigation in Arizona also provides a strong motive for its conservation and efficient use. Surface water is of course the cheapest water available.

But in Central Arizona, the great economic heartland of the State, only about 1,000,000 acre-feet of surface water is available annually, while total use simply to maintain the existing economy amounts to approximately 4,500,000. This means that close to 3,500,000 acre-feet are produced by ground water pumping, and the cost of this water is high. Since no irrigation district in Central Arizona has enough surface water to fill more than a part of its needs, the cost of pump water is a conservation factor for all users.

Throughout the Central part of the State the average cost of drilling and equipping a deep well (drilled to 1,000 feet or more) is about \$50,000. All factors considered, the cost of lifting water from 300 to 450 feet (an all too common lift in this area) is from \$12.00 to \$18.00 per acre-foot, according to the University of Arizona and other agencies. Thus, a full supply of four acre-feet costs the farmer from \$48.00 to \$72.00 per acre under these conditions.

\$75,000,000 FOR WATERSHED MANAGEMENT

In 1956 the Arizona Water Resources Committee was organized by a group of citizens to promote more efficient management of the State's vital watersheds. In the same year a Watershed Management Division was established in the State Land Department. Working primarily with the U.S. Forest Service, and with other State and Federal agencies, an extensive research program was undertaken to determine the feasibility of improving watershed efficiency by means of manipulation of vegetative types. This research culminated in 1965 in a contract between the Salt River Project and the U.S. Forest Service for a watershed improvement program on 7,500,000 acres. It will cost approximately \$75,000,000 over a 25-year period, and it is expected to result in an increase of water supply by at least 200,000 acre-feet annually.

Yes, Arizona irrigators conserve water and use it efficiently. They have to, in order to stay in business. They inspire and demand continuing water use research. They are quick to apply better water management practices at great expense, improvements can still be made, and when they can be they will be, because saving water is the way of life in Arizona.

MUNICIPALITIES

Outside of Phoenix and its neighboring cities and towns located on lands included in the Salt River Project, nearly all of Arizona's municipalities depend totally on pumped ground water. This includes the City of Tucson, the State's second largest city, which has no available source of surface water. Even Phoenix, however, produces about 40% of its water supply by pumping ground water. Of the 70 cities and towns in Arizona having a population of 1,000 or more, 59 are completely dependent on pumped ground water.

Under the law of prior appropriative rights to the use of surface water in Arizona, the established right of use is inseparable from the land for which it was first appropriated. Therefore, as land having such water rights is urbanized from agricultural use, the water right attached to the land may become available by contract for urban use. This provides a means of orderly transition from one economic use of water to another. Many authorities agree, however, that urban water requirements in heavily populated areas are not substantially less than for farm irrigation.

NEARLY 100% METERED

More than half of Arizona's population lives in either Phoenix or Tucson and all water delivered by the municipal water systems of these two cities is metered to their customers. Even the City of Yuma, located on the bank of the Colorado River, meters its water deliveries.

Many private water utilities operate throughout the State under license by the Arizona Corporation Commission, and an estimated 97% of consumers served by these utilities are billed on the basis of meter readings.

The very small amounts of water delivered for domestic use without metering are mostly in areas of seasonally occupied homes.

Metering is certainly one of the best means of discouraging waste of water by consumers, and metering can be considered an almost universal practice in Arizona cities and towns.

Cost of water to the urban user of water is also a factor in controlling waste. There is wide variation in metered water rates throughout Arizona depending, of course, on production costs, available supply and municipal policies.

CITY WATER RATES

The range of rates runs from a low of around 28 cents per 1,000 gallons to a high of about \$2.12 (\$91.00 to \$690.00 per acre-foot). Towns for which water must be hauled by tank cars pay even more than this top figure.

The Phoenix municipal metered rate is 60¢ per 1,000 gallons delivered outside the city limits, and 34¢ inside city limits. (This is \$195.00 and \$110.00 per acre-foot, respectively.)

The Tucson municipal metered rate is 59¢ per 1,000 gallons delivered outside the city limits, and 37¢ inside the city limits.

The town of Buckeye (population 12,000) in Central Arizona, obtains its total water supply by pumping ground water which has become so brackish as to be seriously objectionable for domestic use (2,000 ppm of salts). Buckeye became the first town in the United States to totally finance its own desalting plant and to treat its total supply. The \$305,000 plant can provide 650,000 gallons of treated water daily at an average cost to consumers of \$2.12 per 1,000 gallons (\$690.00 per acre-foot).

Approximate current annual water requirement for municipal and industrial uses in Arizona is 350,000 acre-feet. If present per capita rates of use for these purposes remains about the same, reasonable projections indicate a municipal and industrial water requirement of about 750,000 acre-feet annually by the year 1980, and well over 1,000,000 acre-feet by the year 2000.

THOSE SWIMMING POOLS

Contrary to a popular tourist impression, Arizona's 20,000 outdoor swimming pools do not consume large quantities of water. The average pool contains about 17,000 gallons, and the water is recirculated through filters. They are emptied and refilled only once every five years, under normal conditions.

Swimming pools provide healthful family recreation at home for nearly 12 months of the year in the Southwest, and their cost is low enough to appeal to average income families. Pools are concentrated in cities where water is metered.

PLANNING FOR MORE REUSE

Sound management of municipal water includes control, treatment and disposal of return flow to conserve the resource to the fullest extent that is economically and socially feasible. Normally about 50% of the water delivered by a municipal system is discharged as sewage.

Although about 25,000,000 gallons of treated outflow per day from the Tucson and Phoenix metropolitan areas are used for irrigation of nonfood farm crops, and a considerable amount in addition helps recharge ground water, much remains to be done to conserve municipal outflow in Arizona. Since total municipal and industrial use of water in the State is about 350,000 acre-feet per year, there is a theoretical outflow of nearly 175,000 acre-feet to be reclaimed for reuse. Of this theoretical amount only about 30,000 acre-feet annually are currently directly reused. However, whether by design or otherwise, the major portion of the sewage not directly reused finds its way to the ground water and constitutes a significant portion of the present recharge.

Since ground water is the source of most all municipal supplies in Arizona, the use of sewage, even though treated, for ground water recharge by injection through wells directly into aquifers must be approached with extreme caution. However, extensive research related to salvage and reuse of treated sewage is being conducted by the State's universities, the cities of Tucson and Phoenix, the Salt River Project, the State Department of Health, and other agencies.

This source of water for reuse in Arizona is expected to be about 500,000 acre-feet annually by the year 2000, and the Central Arizona Project includes planning for full utilization of the resources. This assumes, of course, that the problem of eliminating the hazard of viruses in treated sewage can be resolved. This source of water would be the cheapest additional supply available in Central Arizona, which assures its economic use as soon as possible.

In general, artificial ground water recharge from available surface water flows appears to have only a very limited potential in Arizona. Under Arizona law surface water flow is subject to appropriation, and practically all surface flow water has long since been appropriated and put to use.

INDUSTRIAL USE OF WATER

Arizona has not attracted heavy industry which uses large amounts of water. Except for mining, most of the industrial use of water is for cooling.

Fortunately, Arizona's mining industry has adopted a very enlightened and responsible attitude toward water use efficiency and conservation. It is estimated that for every 1,000 gallons of new water used by the mining industry in Arizona, 3,000 gallons are reused. By treatment processes some water is reused as many as seven times.

New water costs the mining industry an estimated 17¢ per 1,000 gallons. The cost of its reclaimed water is about 3.5¢ per 1,000 gallons.

LOOKING AHEAD

To conserve water Arizona users will try anything that even remotely shows promise of success. Artificial precipitation (cloud seeding) has been tried both under contract with groups of private landowners and with organized irrigation districts.

The Institute of Atmospheric Physics at the University of Arizona conducts a sustained research program aimed at a basic understanding of atmospheric factors which determine climate, and the potential for inducing increased precipitation on watersheds. Evidence of predictable and dependable results has not been produced, but research continues with full public support.

Experiments with monomolecular films to reduce evaporation losses from reservoirs and stock tanks are being conducted in Central Arizona and, although results have been disappointing, the tests continue, with both private and public funds.

Research and applied management to eliminate waste of water along stream channels by vegetative evapo-transpiration has been pioneered in Arizona. Most recent program is an intensive test by the U.S. Geological Survey on a 15-mile stretch of the Gila River that is infested by waterwasting salt cedars. It is enthusiastically encouraged by water user groups and the Watershed Management Division of the State Land Department.

Irrigation practices are constantly being evaluated by the College of Agriculture at the University of Arizona, the SCS and other agencies, to the end that irrigation may provide optimum crop plant requirements with as little water loss as possible.

The Salt River Project provides a soil moisture measurement service for its farmers, as does the Soil Conservation Service in the 37 Soil Conservation Districts in the State.

The U.S. Water Conservation Laboratory in the Salt River Valley is a potent water-saving research factor from which irrigators avidly draw advanced management practices.

Arizona is indeed intensely aware of water conservation as an economic necessity. But no matter how extensively conservation is practiced now or in the future, the State's true water deficiency can never be eliminated except by the acquisition of additional new water from some source that is not presently available.

The CHAIRMAN. Our next witness is Dr. Jerome W. Milliman, professor of business administration, Indiana University.

Dr. Milliman has a great deal of expertise in the field of water resources development. He has published both books and articles and is greatly respected in this Nation. He has taught at various institutions, including Florida State University, and the University of California at Los Angeles.

Dr. Milliman, we are happy to have you with us this afternoon and look forward to your testimony now. You may place your entire statement in the record. I see you have some equations down here, just glancing through hurriedly, and you may discuss the high points, if that is agreeable with you.

DR. MILLIMAN. Yes, I will accept your invitation, Mr. Chairman.

The CHAIRMAN. Without objection, the statement will be included in full.

STATEMENT OF DR. JEROME W. MILLIMAN, PROFESSOR OF BUSINESS ADMINISTRATION, INDIANA UNIVERSITY

DR. MILLIMAN. I will take advantage of your invitation and I will discuss in a sort of unofficial fashion a few of the points that I am trying to make in the paper.

It runs 16 or 17 pages and it is too long to go through in detail.

I want to, in general, comment upon some of the economic issues of national water policy and these issues, I think, are relevant and might properly be studied by a National Water Commission.

I want to say that many of us feel that the Federal Government needs independent judgments to take a flash look at some of our water problems. The National Water Commission could do a great deal to work with and advise with the Water Resources Council.

In general, I believe we want to give increased consideration to the application of economic principles. I am going to suggest principles that will produce, perhaps, greater efficiency in the use of existing water supplies, and principles which might give us even better guidelines for the development of new water supplies.

However, I am quite concerned that economic principles need to be related to workable and efficient management institutions for carrying out our water resources policies and in a nutshell, I am arguing that our water problems are largely ones of inadequate, insufficient arrangements for the management of water resources on the one hand and perhaps a failure to use more economic principles on the other hand.

I think I might note for the record that in some respects our wide concern about water shortages appear somewhat exaggerated and, perhaps, somewhat unwarranted. There have been studies, careful studies, showing water demand and water supplies that suggest that in most areas water supplies appear more than adequate on a physical level to support anticipated levels of economic growth. I think on the other hand, there are some very important signs that effective management of our water resources are rapidly approaching a crisis stage. Yes, there are enough water supplies to meet most regional and national growth projections, providing we manage these in sensible fashion and providing we begin to make increased use of economic principles in the allocation of supplies and in the development of new supplies.

Some of my concern is from reading the current press and from hearing public statements. I see suggestions for massive spending programs to meet so-called needs or requirements. In New York City, for example, it is often easier to talk about building nuclear desalting plants for new supplies instead of installing meters, stopping leaks, and making more efficient use of existing supplies.

I think we need to recognize that there is competition for the use of water resources, that this competition will increase in the future and that the price of water must go up in the future to provide for efficient use of existing water supplies. I don't think we need belabor the fact that existing processes, institutions, and procedures for managing our water resources perhaps need to be examined.

On pages 4 and 5 I talk about the background of our water resources and point out that our water laws are perhaps inadequate in some of our States to deal with the obvious externalities that are developed from multiple use of interrelated supplies, particularly across the State boundaries, in that our water law in many States has prevented the development of the market system which might make water resources easier to transfer to a higher value of uses such as we have with many kinds of property.

On page 5 you will notice that I suggest perhaps there may be 2 solutions, or solutions to be followed in different combinations. One

is to establish regional systems of water management, the other solution lying in the development of new systems of the water law.

I recognize that both of these solutions are at opposite poles. One involves centralized decisionmaking by public authorities, and the other involves a greater use of market and decisionmaking by private groups and by private individuals.

In the pages that follow—pages 5, 6, 7, and 8—I try to make a case for both of these systems of regional water quality management. I am pleased to note that the Water Planning Act of 1965 marks an important step forward in meeting our regional water problems and establishing a regional management procedure. You will note that I argue along with Dean Trelease of the School of Law at the University of Wyoming. On page 6 greater use of the market in the allocation of water resources and the establishment of improved water use are discussed.

Note on page 7 that I think that drafts of some of the State water codes will probably weaken the already weak property rights in water and I think you will see my argument is for strengthening property rights in water.

You will not at the bottom of page 7 and on page 8, that I think that the system of prior appropriation, as developed in some of the Western States, has many of the elements I suggest to make the system work, and we ought to, as one of our tasks for the National Water Commission, perhaps take a comprehensive look at State water laws and the problem of making our water laws work somewhat better in allocating water resources to higher and better uses.

Now, beginning on page 9, I talk about my favorite subject, which is water resources economics. I acknowledge very frankly that economics alone cannot give us answers to distributional or policy problems. It can give us pretty good answers for suggestions for getting greater efficiency, but it cannot tell us how to distribute gains from increased efficiency. We should recognize that all of the measures taken to deal with water resources—and indeed with all of our resources—also have some important distributional consequences.

Now, essentially, the economics of water resources can be divided into 2 categories: Economics of the use of existing supplies and the economics of the investment in additional supplies.

I think that when we talk about a water shortage we tend to think first about the technology and engineering aspects of obtaining new water supplies. We tend to forget that development of new water supplies should not take place in an economic sense until we have reassured ourselves that existing water supplies are well utilized. In technical jargon, an economist will say, a water supply should be allocated and reallocated until the margin is equalized.

I think it can be shown, or perhaps it is certainly a subject for study by a water commission, whether or not we can obtain better use of existing supplies. A number of studies tend to show that larger percentages of existing water supplies in our southwestern States tend to be used for relatively low value uses when nearby urban areas, capable of using water in greatly more productive uses, are short in supply. Certainly, this question needs to be examined to a greater extent, even if you may not agree with some of my preliminary findings on this matter.

On pages 10 and 11 I discuss two major principles for the use of existing water supplies. These principles, I think, perhaps need increased study in the future. The first principle essentially says that water should be continued to be transferred to higher value of use until the returns at the margin are equalized. For example, economic returns, social-economic returns, from irrigation should not be less than the marginal value of water in a nearby city. If it is, we have almost a *prima facie* case for a malallocation of water resources between alternative uses.

I think, secondly, this question of water prices needs to be examined much more explicitly. You will note that I make a case here that water prices should be paid based upon the marginal cost of water supply. Essentially, water prices should reflect the extra cost of extra water supply. I think the time is now ripe for a reconsideration of some of our reinvestment policies with regard to water supply. I am arguing in general that supplying water to users at less than marginal cost will tend to give us inefficiency in the use of water resources.

On page 13 we turn to the second set of principles, that of principles for investment in new supplies.

There is a general statement, at least among economists, that water investment should be accorded no special status in relation to other social investment. And that the central problem in the evaluation of the benefits in cost is that they must be adjusted to a common time period through the device of a discount.

There is fairly generous agreement and this is one of the subjects that ought to be studied by the National Water Commission—what is the proper discount rate? There is agreement among the academic economists that the proper discount rate is one which reflects the rate of return on alternative investments. When we invest in water resources and use a discount rate which does not correctly reflect the cost of capital to the Government we may be in danger of investing resources in alternatives that have higher returns elsewhere.

I have examined some kinds of investments and I was shocked to learn in our 1960 study, if you will notice in footnote 11, when we examined pricing policies following by some of our major cities, we found that the rate of return on capital was only on the order of 2 percent or 2.5 percent. Perhaps this matter has changed since 1960, but we concluded then that the rates of return on capital were too low and there was a clear indication that the price of water in many of our cities should go up.

I am arguing that there will be overinvestment when we use interest rates which are too low. Because these same capital investments might be put to work, or could be put to work producing goods and commodities valued more highly on the margin by consumers. When consumers' marginal values in use are low in comparison to dollars that could have been spent elsewhere, this is so and it is encouraged when water supplies are given free or when they are given at prices that are seriously under estimated costs.

Too often, I think, in the past we have failed to make better use of existing supplies before we turned to new construction. We have failed to consider the responsibility that we have to adjust in prices when the supply-demand situation changes. Peakload pricing should be encouraged to a much greater extent in water supply systems. Even

the application and the introduction of peak-season prices, which would not require any special metering, would seem to be clearly indicated often when the alternative is to meet only peak-season loads.

I comment that some projects may be guilty of excessive discounting of secondary benefits as well as the question of realistic rates and discounts. I am saying in a nutshell that the economic feasibility of a new supply cannot be established without the study of the use of the existing supplies and without a clear determination that an economic demand exists.

In summary, then, I am arguing that our water problems are largely ones of inadequate institution arrangements for the management of water resources and failure to make increased use of economic principles. I have suggested a choice of two decisionmaking frameworks, the regional basin authority, greater use of the market system through improvement in water law. I suggest three major economic principles to be followed in the use of water resources policy.

I am very pleased to see that the language of S. 3107 charges the Commission with an examination of the institutional arrangements for water resources development. It also charges the Commission with consideration of the economics of water use and water development. I suspect that the time has come for public officials, intelligent laymen, for the water industry itself, to give more thought to the economics of water policy and even more thought to the development of efficient management institutions for the use of water resources.

Thank you, Mr. Chairman.

The CHAIRMAN. Dr. Milliman, I want to compliment you on the comprehensive statement that you have presented to the committee today. It clearly represents a lot of thoughtful effort on your part.

I want to ask you one question on a matter that I do not believe you have covered in your statement, and that is, it is my understanding that you have drafted an article dealing with the subject of desalinization and heretofore questions have been raised as to why not use the desalinization process in connection with polluted waters? I wonder if you could comment on the economics of that approach versus the costs in connection with the desalinization approach, that is, the purification of salt water, brackish water, and so on?

Dr. MILLIMAN. My paper is preliminary and subject to some revision, but I think that the economics, at least at this stage, are fairly clear. The cost of desalting even on a large scale for most areas appear substantially above costs of renovation and reuse of waste waters in some areas. I don't want to say this is true in every case, but the possibility exists in most of our major cities of reclaiming large amounts of waste water at costs perhaps one-third to one-fourth of the lowest figures ever quoted for desalted water.

The CHAIRMAN. Could you supply to the committee—not now, but later—some indication of the relative costs as indicated by experience in desalinization processes and what it may be in connection with the reuse of existing waters?

Dr. MILLIMAN. There are a number of technical problems that need more research in the use of waste waters and reuse of waste waters. The transmission of viruses needs more study. The problem of nitrates and phosphates needs more study.

I am pleased that the group headed by Professor Linsley has suggested that we channel more of our research funds for the study of the possibility of the reuse of waste waters. It has been my opinion standing on the sidelines, that we have been perhaps a little bit overglamorized by the prospects of desalting and that we ought to give increased attention to the reuse of waste water. The economics of desalting is such that it will be most useful for large cities located near seacoasts and these large cities do have at their disposal waste waters which have to be cleaned up anyway. The extra cost of cleaning up waste waters to make them available for many kinds of reuse is extremely low when you are already protecting your beaches.

The CHAIRMAN. Thank you very much.

Senator Jordan?

Senator JORDAN. Dr. Milliman, ordinarily when we speak of desalination we are speaking of taking the solid out of sea water. I ask you, does it cost more to desalt sea water than it would to take just the small amount of salt out of water that is slightly brackish?

Dr. MILLIMAN. It depends on the process and I am not—

Senator JORDAN. Is the cost in any way related to the degree of salt in the water?

Dr. MILLIMAN. Some processes do and some processes don't. With the flash evaporation process, which I discussed, it doesn't make any difference how salty the water is, whereas the electro dialysis and the membrane processes may be radically influenced by the amount of salt in the water.

Senator JORDAN. We have so many return flows from irrigation that are slightly brackish and it seems to me if they could be cleaned up at a relatively low cost it may be a better solution to a water shortage area than looking about for new sources of water. I am thinking about the water, for instance, that we delivered to Mexico under treaty. It is alleged that that water carries quite a heavy volume of salt. I am just wondering if it would be possible to clean it up, or waters of that nature, cheaper than ocean water?

Dr. MILLIMAN. I haven't studied it, Senator, and I know there are processes whose cost is lower. I don't know whether this question has been studied.

Senator JORDAN. Thank you.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. In your statement you recommended that something be done about the change in our water laws. That is more or less a legislative or legal question. What can the Commission do about it under S. 3107?

Dr. MILLIMAN. I think a comprehensive study of water law and how it either hampers or facilitates the reallocation and reuse of water supplies is very important. The Commission, throwing a spotlight on this important area and perhaps deficiency, probably could do a great deal to determine and even encourage reconsideration of some of our water laws. Most of the Eastern States are rushing new water codes into legislation. Some of them may be ill-considered.

Senator BURDICK. Do you think the legislation is broad enough to permit recommendations in regard to changes in water laws?

Dr. MILLIMAN. I am not sure whether it is or isn't. We hope so.

Senator BURDICK. Thank you.

The CHAIRMAN. Thank you, Senator Burdick, and thank you, Dr. Milliman.

We again want to express our appreciation to you for the time, thought, and effort that you have put into your paper and the statement before the committee. I want to compliment you on it. Your full text will be printed at this point.

(The statement referred to follows:)

STATEMENT OF JEROME W. MILLIMAN, PROFESSOR OF BUSINESS ADMINISTRATION,
INDIANA UNIVERSITY, BLOOMINGTON, IND.

SOME OBSERVATIONS ON THE ECONOMICS OF WATER RESOURCES POLICY

Mr. Chairman and members of the committee, I appreciate the opportunity to appear before this Committee to comment upon the economics of water resources policy as background material for your deliberations on S. 3107, a bill for the establishment of a National Water Commission. I want to comment upon some of the important economic issues which are relevant to national water policy and which, therefore, might properly be studied by a National Water Commission.

All of us are concerned about the need for review and study of water problems leading to the development of long-range plans for the future. Water problems should be considered within a broad framework capable of integrating the technological, hydrologic, legal, and economic relationships of water resource management. It would seem especially important that the Federal Government take steps to insure that independent judgment be obtained on a continuing basis. An independent commission could work with the Water Resources Council to advise on the entire range of water resource problems and all of the various alternatives for dealing with them.

I have specialized on the economics of water resources, and it is for this reason that I am here today. In my opinion, increased application of economic principles can produce greater efficiency on the use of existing water supplies. I also believe that economic principles can suggest better guidelines for the development of new supplies. Economic principles, however, can not be employed without relating them to workable and efficient management institutions for carrying out water resource policies. I believe that our water problems are (1) largely ones of inadequate institutional arrangements for management of water resources and (2) failure to use economic principles. In large part, the challenge of the future lies in increased recognition of these twin needs.

WATER CRISIS AS A MANAGERIAL CRISIS

In some respects, the widespread concern about water shortages appears greatly exaggerated and unwarranted. Careful studies of prospective water demands and water supplies in the United States suggest that water supplies appear more than adequate, in a physical sense, to support anticipated levels of economic growth.¹

On the other hand, there are signs that the needs for more effective management of our water resources are rapidly approaching a "crisis" stage. Yes, there are enough water supplies to meet most regional and national growth projections *providing* we manage our water resources in sensible fashion and *providing* we begin to make use of economic principles in allocating existing supplies and in the development of new supplies.

Some of the signs of the "management crisis" can be found in the growing deterioration and degradation of water quality in most of our lakes, rivers, and underground waters. In addition, we are seeing that rapid urban growth is bringing water "shortages" to many cities. I have argued elsewhere, for example, that the cost threshold for municipal water supply in many of our growing urban areas may double in the next generation.²

¹ See Landsberg, Fischman, and Fisher, *Resources in America's Future*, (Baltimore: Johns Hopkins Press, 1963), Chapter 19; Nathaniel Wollman, *Water Supply and Demand*, U.S. Senate Select Committees on Water Resources, Committee Print #32 (Washington: Government Printing Office, 1960).

² J. W. Milliman, "Policy Horizons for Future Urban Water Supply," *Land Economics*, May 1963, p. 112.

However, a study of the public press and some of our leading periodicals reveals that the current concern for these sorts of problems may not lead to better processes of management and to greater use of economic principles in dealing with water problems. Instead of concern for new or improved institutions and procedures for management of our resources, the emphasis is often upon massive crash-spending programs to meet so-called needs or requirements. In New York City, for example, it is easier to talk about building nuclear desalting plants for new supplies instead of installing meters, stopping leaks, and making more efficient use of existing supplies. In our polluted river basins, some political leaders are considering banning waste disposal or instituting large construction programs instead of establishing basin management procedures to balance benefits and costs from alternative uses of rivers among up-stream and down-stream users.

Underlying all of our water problems is the simple fact that there is competition for the use of water resources; this competition will increase and become more intense in the future. But why do we have water problems which are seemingly more pervasive and more difficult to solve compared to the use of most of our other natural resources?³

The answer lies in the fact that existing processes, institutions and procedures for managing our water resources do not lead to results which can be considered satisfactory. We have not yet developed institutions for sensible management of our water resources. Second, we have not, for the most part, applied economic principles to water allocation and water investment. The water problem, then, is not primarily one of water but instead is one of institutions, management, and of economic principles.⁴

NEW MANAGEMENT AND INSTITUTIONAL PROCESSES

The roots of the management problem in water resources go back to the fact that water is usually a fugitive, migratory resource which is variable in distribution over time and space. These features here made it very difficult to develop property rights in water. There is no such thing as federal water law; federal powers over river basins and inland navigation are derived instead from the commerce and proprietary powers. Each state has been permitted to adopt its own system of water law.

The situation has two important features which are responsible in large part for the current poor management of water resources. First, existing water laws usually fail to deal with the obvious externalities which develop from multiple use of common inter-related supplies across state boundaries and even within individual states. Serial uses of river flows and the mining of ground water are inadequately taken into account by existing water law and by existing federal and state agencies. Second, the operation of water law in most states has prevented the development of a market system for water resources which might help with the problem of transferring water supplies to new uses in response to changing economic relationships. In some states water rights are actually tied to specific lands. This means that the transport of water to new uses, particularly to growing urban areas, is sharply restricted.

It seems to me that our concern should be with devising institutions to provide efficient management of water resources which are used in common, which have to be subject to a balancing of gains and costs as the demand for water grows in the future. I suspect that two different sorts of solutions need to be followed in different combinations in different sections of the United States.

One procedure is to establish regional systems of water management; the other solution lies in the development of systems of water law applicable across state boundaries to establish property rights in water so that water markets can help allocate water to its most productive uses. Most clearly, these two solutions are at opposite poles. One involves centralized decision-making by public authorities; the other involves greater use of the market and decision-making by private individuals and groups. Yet, I believe that a set of efficient institutions and process for the management, allocation, and development of our water resources will involve some combination of both kinds of solutions.

³ As an aside, I would emphasize that the problems of air pollution and effective management of our urban airspace are quite similar in nature to water resource management.

⁴ The Water Resources Planning Act of 1965 marks an important step forward in meeting these problems. It provides for the establishment of the Water Resources Council to coordinate the work of Federal agencies. It also provides for the development of river basin commissions which can develop joint state-federal action.

SYSTEMS OF REGIONAL WATER MANAGEMENT

The need to develop regional systems of water management is probably best argued by Allen Kneese in connection with his study of regional water quality problems.⁵ Kneese argues, quite convincingly, that regional authorities should be established to internalize the major off-site costs of water pollution. Such authorities would supply the long-needed coordination between up-stream and down-stream users and be instrumental in devising means to obtain a balancing of gains and costs between various water users on our major streams and tributaries. Kneese has argued that charges be levied upon waste disposal to motivate firms and cities to cut back on discharge. The schedule of effluent charges would presumably be based upon external costs on other users of the stream and, therefore, would vary with stream flow conditions and outfall locations. In addition, the river basin authority would be able to undertake large-scale treatment measures which might not be economical or available to individual firms or cities. The authority might also consider many different kinds of treatment alternatives, other than low-flow augmentation, such as artificial reaeration of streams, in-stream treatment and collective treatment of diverse wastes from diverse sources.

Although Kneese's work is primarily directed toward regional water quality management, it is clear that he thinks that water quality management should be directly related to the *total management of the hydrologic unit*, including use of water for hydro-power, recreation, navigation, flood control and related uses. Moreover, the needs for regional water management should be viewed within the context of overall economic development for the region. Water quality in its broadest sense is another dimension to the overall problem of competition between various uses and users. Apparently, in the United States, only the Delaware River Basin Commission has this sort of broad authority to combine water quality management and water resources development in a single regional authority.

WATER LAW AND MARKET ALLOCATION OF WATER RESOURCES

At the other end of the spectrum is the need to revise our water laws so that the market system can be used to a greater extent to allocate water resources. I have argued elsewhere that some of the present mis-use of water can be traced to imperfections in water law and to its administration.⁶ This occurs primarily because water rights are not clearly defined, do not have the necessary legal certainty, and cannot be transferred with ease as are rights to other types of property. As a consequence, the market processes that ordinarily direct resources to uses that maximize their productivity are severely limited in the case of water. Individuals and local organizations do not have the proper incentives to invest in water when tenure is uncertain. Moreover, economically desirable transfers of water between higher and lower valued uses and among regions, to the mutual advantage of all parties, are discouraged by these imperfections in rights and by the lack of a clear legal basis under which such transfers can be consummated.

The establishment of clear property rights to water does pose difficulties. Water is a fleeting resource. It exists partly as a store and partly as a flow. The development of water law occurred when very little was understood about the phases of the hydrologic cycle from which our supplies are obtained. Then, too, water, until fairly recently, has been in a position of surplus supply in relation to demand, so that it has been a free good or at least a very cheap one. Therefore, little consideration had to be given to its efficient allocation or to the laws governing its use and ownership. With increasing demand, however, even the humid regions have begun to recognize the inadequacy of their doctrines of water law. I believe the wrong direction is being taken in modifying present law, as represented by drafts of "model" state water codes and the recent actions of several states in this connection. These actions tend to attenuate the already weak fabric of property rights in water. The tendency is to arrange matters so that allocation of water can take place only through grants or permits to users by central administrative commissions or by cumbersome court procedures, based on fuzzy criteria of "reasonable" or "beneficial" use. In these circum-

⁵ Allen V. Kneese, *The Economics of Regional Water Quality Management* (Baltimore: Johns Hopkins Press, 1964).

⁶ J. W. Milliman, "Water Law and Private Decision Making: A Critique," *Journal of Law and Economics*, October 1959, pp. 41-63. See also Frank J. Trelease, "Policies for Water Law: Property Rights, Economic Forces and Public Regulation," *Natural Resources Journal*, Vol 5, No. 1, May 1965.

stances, tenure of water rights becomes uncertain, dependent upon the changing wills of the commissions or courts. This line of legal development, I suspect, may lead to serious misallocations of water among competing users; it will, unless revised, seriously weaken or stop altogether the exercise of local and private initiative in the development of water resources.

In my opinion it is justifiable, however, for a state to assume ownership of *unappropriated* water. Rights to this water could then be distributed by auction among the competing claimants against the reservation price representing the value of the state's own public uses. This procedure would allow the state, and ultimately the individual citizen-taxpayer of the state, to receive compensation from the fees paid for the rights to use these unappropriated but potentially valuable water resources.

I believe that the law of prior appropriation as developed in some western states has most of the elements required to make this kind of system work. This type of water law needs to be strengthened primarily in its provisions for the transfer of rights. Under this system the courts would function, as they do for other real property, to adjudicate disputes as to the ownership and extent of the property right and to hear pleas relating to breach of contract in transfers or from parties who consider themselves injured by the actions of the owners of the water rights. The judicial system would be freed of its present inappropriate administrative-economic function of issuing and revising rights to use water on the basis of criteria like "reasonable beneficial use."

What, then, is the place for government entities in a system of water law based on property rights in water? Briefly, that they could perform the same functions for water as they do for other resources. These functions, paralleling those provided by governments for resources such as land, minerals, and petroleum, may be briefly listed as follows:

1. Establish a system of law that permits a clear definition of the extent of property rights in water, particularly adapted to eliminate commonality problems which may pertain with particular force in the case of water.
2. Provide certainty of tenure for these rights and establish a clear basis for their transfer between individuals and private or public agencies under voluntary contractual agreements of purchase and sale.
3. Provide a procedure whereby rights to yet-unowned water may be secured by individuals, private or public agencies, or political entities.
4. Establish rules and procedures for the protection of outside parties against the spillover effects caused by the actions of water-right owners. These rules would be similar to zoning in the case of land use and would protect against harmful effects such as pollution, flooding, and the creation of drainage problems by water-right owners. Alternatively, procedures could be set up whereby injured parties can obtain compensation for damages.
5. Develop and provide information regarding the extent and quality of water resources and the technical and economic factors relating to the various possible sources of supply.

WATER RESOURCE ECONOMICS

The economic effects of any proposed policy can be decided under two headings: effects on *efficiency* and effects on *distribution* of income and wealth. Much of what the existing body of economic thought has to say concerns efficiency effects.

This is, of course, a sense in which greater efficiency—meaning a larger national income—benefits everyone in that it is possible to distribute the gains in such a way that everyone benefits. However, economics alone, cannot give us answers to distributional policy problems. It can show us how to attain efficiency and what the distributional consequences are of attaining efficiency in alternative ways. But it *cannot tell us how to distribute gains from increased efficiency*. It is also true that any particular change in the direction of efficiency will involve a certain intrinsic distribution of gains and losses. In practice it may not be feasible to affect a redistribution such that everyone gains. Nevertheless, I tend to argue for increased efficiency in the management water resource whenever possible and presume generally that the matters of desirable income transfers between groups in our society are usually best handled by general fiscal tools.

The economic principles for the use and development of water resources can conveniently be divided into two categories:

- A) The economics of utilization of existing supplies,
- B) The economics of investment in additional water supplies.

I want to comment briefly on each of these two categories.

It is common for most analysts, when faced with the problem of a water shortage, to think first about the technology and engineering aspects of obtaining new water supplies. This type of thinking is unfortunate because it tends to neglect the economic principles of resource allocation. We, too often, forget that development of new supplies should *not* take place until existing supplies are well utilized. That is to say, existing supplies should be allocated and re-allocated to higher-valued uses until the marginal product of water, in all of its various uses, is equalized. New supplies should not be developed until marginal values in use are equalized and they should exceed the expected long-run marginal costs of the expansion of water supply facilities.

I believe that some of the current emphasis on the use of technology to solve our water problems by huge engineering projects for developing additional water supplies is premature because it can be shown that existing supplies in many areas are not being used efficiently. A well-known case in point exists in some of our Southwestern states where large percentages of existing water supplies are being used for relatively low-valued irrigation purpose while nearby urban areas, capable of using the water in greatly more productive uses, are short in supply.⁷

A. Principles for Use of Existing Supplies

The essence of economic principles to be followed in the allocation of water resources can be summarized in two rules:

1) The total value or product of water can be maximized by equalizing the marginal values in use for alternative uses of water. In other words, if the marginal products of alternative uses of water are equal, no amount of water can be transferred to a higher valued use. That is to say, returns from irrigation at the margin should *not* be less than the marginal value in use of water in a nearby city.

2) Water prices (explicit or implicit) should be made equal to marginal costs. If marginal costs differ among various uses, then prices should differ in corresponding fashion. It would be inefficient, for example, to charge users prices which are less than the extra costs.

If we wish to allocate a flow of water on an annual basis among competing uses, economic theory asserts an almost universal principle: the total value or product is maximized by equalizing the value of the marginal product of water, as defined by its demand schedule, in all of alternative uses. Another name for this principle is "equi-marginal value in use." The *value in use* of any unit of water, whether purchased by an ultimate consumer or by an intermediate consumer, is essentially measured by the maximum amount of resources (dollars) which the consumer would be willing to pay for that unit. Marginal value in use is the value in use of the incremental units consumed and will usually decline as the quantity of water consumed in any period increases. The principle, then, is that a resource should be allocated so that all users or consumers derive equal marginal values in use. *In other words, when the marginal product of alternative uses of water are set equal, no amount of water can be transferred to a higher valued use.*

When the uses of a stream are complementary instead of competing it is necessary to calculate the joint marginal product of the group of complementary uses. Then the joint marginal product of a group of complementary uses can be evaluated in comparison with groups of competing users. Water reserved upstream will result differently higher values for water delivered to locations down-stream because of losses from evaporation and seepage enroute. The value of the marginal product in the first use plus the value of the marginal product from each succeeding return flow should be made equal for all uses and all points of use.⁸

⁷ For evidence on this point see: *The Value of Water in Alternative Uses With Special Application to Water Use in the San Juan and Rio Grande Basins of New Mexico*, edited by National Wollman, (Albuquerque: University of New Mexico Press, 1962); also Vernon W. Ruttan, *The Economic Demand for Irrigated Acreage: New Methodology and Some Preliminary Projections, 1954-1980*, (Baltimore: Johns Hopkins Press, 1965).

⁸ For excellent discussions of these points see: G. S. Tolley and V. S. Hastings, "Optional Water Allocation: The North Platte River," *Quarterly Journal of Economics*, May 1960; L. M. Hartman and D. S. Seastone, "Efficiency Criteria for Market Transfers of Water," *Water Resources Research*, Second Quarter, 1965.

As I suggested above, these optimizing procedures can be accomplished *either* through the device of centralized decision making in the context of a river basin authority *or* through the greater development of markets for water resources. In either context, however, the rule would still hold and point toward procedures for maximizing the total use value of our water resources.

Of course, this does not deny that there are important measurement problems related to water uses which are not normally allocated by the price system. It is difficult to compute willingness to pay or marginal benefits, for example, for outdoor recreation use of water, for environmental aesthetics and for many public health aspects. Nevertheless, even if data are very crude, I would argue that considerable improvement in the allocation of water resources can be achieved by the use of this economic principle. Furthermore, our measurements in these matters are likely to get better over time as more research is carried on with respect to benefit-cost analysis of attaining these sorts of intangible values in alternative ways.

The second economic principle which would promote efficiency allocation of water supplies is the principle of marginal cost pricing. That is to say, on efficiency grounds, consumers or water users should be charged (directly or indirectly) prices which are equal to additional or marginal costs of extra supplies including values in use forgone in alternative water uses. To meet the criterion of equi-marginal value in use, however, the price should be made equal to all consumers. *So the combined rule would be to make prices equal to marginal costs for all users.* Where water is allocated to users at differing locations with differing marginal costs of service differ, then marginal cost prices should differ in corresponding fashion.

There are, of course, a number of problems connected with the determination of marginal costs. One deficiency is that conventional accounting systems do not usually provide direct information with respect to marginal costs. By and large, accountants attempt to work with averages. They attempt to distribute all costs to various classes of output so that it usually requires a careful reassessment of cost data to make meaningful estimates of extra costs of extra water supplies. Furthermore, these conventional accounting practices are sanctioned and usually enforced by the common time-honored procedures followed by various federal agencies and most public utility commissions. In addition, marginal cost, correctly viewed, should take into account social costs of external or off-site effects as well as correctly counting the real costs of capital and other resources used in the construction of facilities and river works. For example, even if funds are provided from public sources we cannot escape the fact that the cost of capital in water supply projects must take into account the loss of alternative values forgone, as well as an appropriate adjustment for risk and uncertainty. Failure to correctly assess marginal costs has undoubtedly led to premature investment in new facilities and also to widespread failure to make better use of existing supplies.

B. Principles for Investment in New Supplies

For investment in new water supplies, there is general agreement that water investment should be accorded no special status in relation to other social investment. Without going into all of the theoretical and practical details, an investment is justified when the benefits can be shown to exceed the costs. The central problem in evaluation of investment is that the benefits and costs must be adjusted to a common time period through the device of discounting. We must determine the present value of future benefits and costs. The proper discount rate is one which reflects the rate of return on alternative investments sacrificed.⁹ If the present value of an investment, discounted or the rate of return of alternatives, foregone, falls short of costs it should not be undertaken.¹⁰

Notice, that the correct rate of return for discounting may be *higher* than the capital costs of a subsidized loan if the rate of return on alternative investments

⁹ For a simple exposition of this point see: Kenneth J. Arrow, "Criteria for Social Investment," *Water Resources Research*, Vol. 1, Number 1, First Quarter, 1965.

¹⁰ A common formulation of the present value rule is:

$$V_0 = -C_0 + \frac{s_1}{(1+i)} + \frac{s_2}{(1+i)^2} + \dots + \frac{s_n}{(1+i)^n}$$

Where C_0 is the immediate outlay; V_0 the net present value; $s_t = (b_t - c_t)$ are net returns in year t ; and i is the discount or interest rate per annum. See: Hirshleifer, DeHaven, and Millman, *Water Supply: Economics, Technology and Policy* (Chicago: University of Chicago Press, Third Printing 1966). Chap. VII, "The Practical Logic of Investment Efficiency Calculations."

foregone exceeds the loan rate. In less-developed countries, for example, rates charged on loans from international lending agencies may be substantially *below* correct discount rates which should reflect the general shortage of capital and rates of return at the margin.

Failure to observe these economic principles can lead to over-investment in water supply: Over-investment for any particular area is indicated when facilities stand idle or else are put to makeshift uses, either to avoid the appearance of idleness or to minimize the losses due to past mistakes. Uneconomic over-investment may be also indicated by relatively low return earned on capital invested in water supply. Here the water is actually being put to use, but the price charged is so low that the revenue to the water enterprise is small in relation to cost. There is over-investment because the same capital investment could have been put to work producing goods and commodities valued more highly on the margin by consumers; consumers' marginal values in use for water are low in comparison with what could have been obtained if the dollars had been spent elsewhere.¹¹

Perhaps the most important of the reasons for over-investment might be simple oversight; that, when the total of water use begins to approach system capacity, administrators simply do not think of attempting to make better use of existing supplies as an alternative to initiating new construction. The possibility of adjusting prices does not often occur to those responsible, even though studies have shown that demand is responsive to prices and the wide divergence of price levels and price structures in American cities suggest, that a schedule currently in effect in a particular city is not necessarily the only one possible, or even the best available one in the circumstances. Peak-load pricing should be used to a much greater extent in water-supply systems. Introduction of a *peak-season* price (in the summer normally) will not require any special metering and seems clearly indicated as an alternative to expensive new construction when it is only the peak-season loads that press on system capacity.

Another major class of error leading to over-investment in water supply is the systematic bias toward excessive construction inherent in conventional techniques of project analysis. An obvious error consists of excessive counting of secondary benefits. Also interesting is the history of over-optimism in estimate of project benefits and costs. Most important of all is the failure to evaluate the future benefits and costs at realistic rates of discount. Commonly, interest rates used for discounting purposes are based upon the borrowing rate of the agency concerned. Consequently, little or no allowance is made for the risks involved in the *particular* project in question.

Although these two sets of economic principles are well understood, scientific and public discussions of water resource problems are often carried on with little recognition of them. I am saying that the economic feasibility of new supply can not be established without a study of the use of existing supplies and without a clear determination that an economic demand exists. Should we expect less when large capital investments are involved? When the level of water prices in a region is substantially *below* the costs of a new supply, there is usually reason to suspect that the economic feasibility of new supply is doubtful or premature. These considerations may not make dramatic headlines but they are basic to wise use of *all* of our resources.

CONCLUSION

Our water problems are largely ones of inadequate institutional arrangements for management of water resources and failure to use economic principles. I have suggested two alternatives which should be given consideration in the choice of decision-making frameworks—the regional basin authority—greater use of the market system through improvement in water law. Each of these institutions has a different set of strengths and weaknesses; each has merit. It would seem that some combination of the two kinds of institutions would be desirable and feasible for greatly improving the management of our water resources.

¹¹ Hirschleifer, DeHaven, and Milliman, *op. cit.*, pp. 107–110, computed the rate of return on capital devoted to municipal water supplies and were surprised to find it only on order of 2 percent or 2.5 percent capital return gross of depreciation. They concluded in 1960 that urban water rates were too low to cover replacement costs and that there was over-investment in urban water supplies because of the subnormal return on capital invested.

The essence of the economic principles to be followed in water resource policy can be summarized in three rules:

1) Total product can be maximized by equating the value of marginal products for all alternative uses of water.

2) Water prices (explicit or implicit) should be made equal to marginal costs. If marginal costs differ among various uses, then prices should differ in corresponding fashion.

3) Investment in new supplies should be undertaken when the present value of the benefits exceeds the cost when discounted at rate of interest which reflects the opportunity-cost of capital.

I am pleased to see that the language of S. 3107 changes the proposed National Water Commission with responsibility for examination of institutional arrangements for water resources development and also for consideration of the economics of water use and water development. It seems fair to observe that public officials, intelligent laymen and the water industry, itself, need to give more thought to the economics of water resource policy and to the development of efficient management institutions for the use of water resources.

The CHAIRMAN. Our next witness is Dr. Spencer Smith, Citizens Committee on Natural Resources.

Dr. Smith, we are happy to welcome you again to the committee, and you may proceed in your own way. You may wish merely to read this.

Dr. SMITH. I have a short statement but I will, in the interest of time and the committee's long activity, simply summarize it.

The CHAIRMAN. The statement will be included in full at the end of your oral presentation.

STATEMENT OF DR. SPENCER SMITH, JR., SECRETARY, CITIZENS COMMITTEE ON NATURAL RESOURCES

Dr. SMITH. The burden of my testimony in regard to S. 3107 was in part to get on the record our informal contributions to a number of dialogs that have been about this whole concept for some time.

As the chairman will recall, there was much discussion as to whether this was in a sense going to duplicate or overlap the activity of the Water Council, which was provided for in Public Law 89-80. I think, in terms of testimony given before this committee and the general attitudes at the present time, it is sufficiently clear that the Commission is going to have an additional role and a role which will be supplemental to and treat some problems which I think should be treated, even if there is an overlap. I think this is one of the reasons for the Commission.

I think, also, several subjects have been brought out by the testimony which indicated the nature of the problems that the Commission will in all probability want to attack, or at least look into to some degree. Certainly, the fact on water uses, the House Committee on Government Operations, in talking about technical research, had a rather extensive survey made of the kind of activities that are going on in water use, and also some ideas as to how technology could be improved. Certainly, as to the same kind of treatments for the water from the general household use, laboratory, or dishes or things of that nature—watering of lawns—the question was, what about the economic feasibility of handling water disposal of this type rather than treating them all with a high degree of treatment that might be required in other kinds of wastes. The alternatives, the economic alternatives and feasibility, really haven't been gone into.

I think another important thing that the Commission would do is to improve the coordination of projects even more so than the Water Council. Part of the problem is to find out what the various bureaus are doing and it seems to me that if there is a Presidential Commission and that this Commission starts to attack a general problem, there will be an area into which the various activities of the respective bureaus can fall. We have a question such as this: In a situation where an industry is located, using water for cooling, there is a question of whether you should have water in ponds to take care of the situation in order to provide more or less water, or whether there is an incumbency upon the firms and industries using the water to provide some of the recycling and recooling on their own. These are economic problems and the feasibility of what water cooling facilities are available and what ones are not sometimes is not generally known.

One bureau may not know what the other one is doing. It seems to me that this is especially acute in a field such as water pollution abatement and that is going on so rapidly—technology is improving in many different parts of the country—that it is especially crucial that we have a continuing up-to-date attitude about what these technological choices are.

So it would appear that though this Commission, as I visualize it, at least, is not going to be an organization that is going to get into the day-to-day nuts and bolts operation of a program, it will have an opportunity to have before it a variety of things that are being done. And I was especially interested in the small amount of research that is actually being done in terms of present water uses.

I think there is little question about the fact, also, that the Commission should look into projects with some genuine interest and on a broad basis—and I was appreciative of the general attitude of witnesses before the committee on this matter—because it is hopeful that an economic basis for some of these allocations be seriously considered. We are not entirely sure that the judgments have always been economic and I would hope that the committee could look with some care into the whole operation of allocations and reallocations. So I think that for better management, the problems of price for instance, because water is coming to a place where it is no longer a free goods—it is highly important as far as industry, urban development, agriculture and the variety of other purposes—should be carefully studied and we are going to have to have some kind of basis by which we can make these decisions. In all due respect to all concerned, these decisions cannot be made on a purely political basis, nor on a legal basis that perhaps was instituted some years ago and now may not be warranted in terms of the problems we face.

These are the general frames of reference as I visualize it in the activity of the Commission and I do not feel that the activity of the Commission, as envisioned in S. 3107, is going to interfere or be a burden or a hamper to the Water Council as it would operate under Public Law 89-80.

The CHAIRMAN. The points that you have raised and the questions that you have asked are ones that should be responded to by a commission of this kind, a body that can be completely impartial and intellectually honest in trying to give forth the answers that I think are needed to some of these questions.

Dr. SMITH. One other point. I am not at all sure how firm the 5-year limitation is. It seems to be the 5 years presents two problems in trying to determine the tenure. It is always difficult. It was mentioned this morning by either Senator Kuchel or Senator Allott. There is a tendency if you had 5 years for the Commission to report, that the Commission doesn't really report on many of these issues until the end of 5 years. So there is this tendency to keep the Commission in being too long.

On the other hand, the Commission is going to have to sit in judgment of the kinds of problems this committee has been discussing since the beginning of the hearings.

It seems to me it is a dreadfully short time for them to get into the nuts and bolts of the problem and unless this Commission would behave quite differently from any I have knowledge of, it is going to be a year or perhaps 2 years before they are really operating and off of the ground, fully involved in their studies. I feel that perhaps the real work of the Commission can't really be expressed in the time involved. If there could be some assurances, either in the legislative history, a report, or perhaps spelled out in some other fashion, that if the Commission's work were to be extended it would suggest several reporting times. It should not be proposed on the basis, that we are going to have to wait 5, 10, 15 years before we ever get any answers.

The CHAIRMAN. Your point is that if there are extensions, there should be some provision requiring interim reports?

Dr. SMITH. Very much so.

The CHAIRMAN. So the entire reporting process would not be left to the last day of the life of the Commission.

Dr. SMITH. I think this is one of the reasons people oppose commissions to be extended for any length of time and I feel that perhaps if that obstacle were removed there may be a possibility of extending the time of the Commission. I just find that when these commissions are of 2 or 3 years' duration, that is bad enough, they are almost hardly involved in their operation before their time is up.

The CHAIRMAN. That is a very useful suggestion.

Senator Jordan?

Senator JORDAN. No questions. That is a good statement.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. I have no questions, either, except I want to extend compliments to Dr. Smith, and his opinions and views have always carried weight in this committee.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Dr. Smith, I would just like to ask one question and that is, you state a time period will lapse before accomplishment—I was wondering from what source you judge that?

Dr. SMITH. I am sorry.

Senator FANNIN. You think there is going to be a time lapse before any work is going to be accomplished?

Dr. SMITH. I have no specific source. It is a feeling that I have had. Just the mere physical problem of getting into operation is what I am thinking of. I assume it would be located here in Washington and the pragmatic measures of finding a place, getting people and staff, all seem to be a time-consuming process before the actual business of the Commission is really gotten into. This is what I am concerned about.

Senator FANNIN. Yes; I appreciate your information. With your experience, what time do you think might elapse before specific work can be done?

Dr. SMITH. I don't think it is particularly comparable, but I have been concerned with the Water Council itself. I think Secretary Udall said this morning they had some organizational meetings but they haven't really been into addressing the real problems that will come before the Council and it has been about a year now since Congress enacted that act. It seems to me in the recruitment of whatever staff is necessary to gather and place in business, I think almost a year goes by inevitably. Maybe it can be shortened if this is under a forced draft and maybe it can get started in 6 to 9 months, but it seems to me there is almost always this much time and then probably even after they get into it, they feel their way, and the first few months are really orientation. I would say a good year, Senator, usually is lost in getting themselves into a posture to entertain the problems they seek to analyze.

Senator FANNIN. Before they really get underway, much less achieve any goal?

Dr. SMITH. That is correct.

The CHAIRMAN. Thank you, Senator. Thank you, Dr. Smith, once again, as always, you make a lot of sense. Your full statement will be included at this point.

(The statement referred to follows:)

STATEMENT OF DR. SPENCER M. SMITH, JR., SECRETARY, CITIZENS COMMITTEE
ON NATURAL RESOURCES

Mr. Chairman and members of the committee, I am Spencer M. Smith, Jr., Secretary of the Citizens Committee on Natural Resources, a national conservation organization with offices in Washington, D.C.

We support strongly S. 3107, which provides for a comprehensive review of national water resource problems and programs. The principal means of carrying out the objective of the bill is the establishment of the National Water Commission. The usual administrative arrangements are provided for in Section 2, which authorizes a Commission of seven members appointed by the President, a Chairman, and an Executive Director.

The duties of the Commission have been discussed by many interested in the provisions of the proposed legislation. To the extent that we have participated in this dialogue, it appears obvious that there exists some variation of interpretation as to the function of the Commission, especially when compared with the Water Resources Council as authorized in Title I of Public Law 89-80. There has also been some confusion relative to the River Basins Commission in Title II of the same Act.

We feel the Water Resources Council has the function of planning relative to specific programs as applied to given regions and areas in the United States. The specific charge in Section 102(b) of Title I states, "The Council shall maintain a continuing study of the relation of regional or river basin plans and programs to the requirements of larger regions of the Nation and of the adequacy of administrative and statutory means for the coordination of the water and related land resources policies and programs of the several Federal agencies; * * *"

The function of the Commission, in our judgment, is wider in scope and would deal with a variety of specific problems. While they would be interested in and concerned with all types of water policies administered by all departments and levels of government, their attention would be focused upon research projects which may at times overlap other efforts but would provide an overall evaluation of long range alternative programs. While the Commission would not be removed from the immediacy of the need for effective water programs, it would at the same time be reasonably unfettered from the type of administrative responsibilities that rest upon the Water Resources Council.

The legislation wisely permits the Commission some latitude, which we feel would be required to establish its role in reviewing " * * * present and anticipated national water resource problems * * * ." While there is merit in being concerned as to whether the Commission duplicates the efforts of the Council, this concern should not be pressed to the point of restricting the Commission's inquiry into certain matters that may be under review elsewhere. To us, another function of the Commission is to provide the talents of research and perspective on water resource problems from a vantage point of outside the Government *per se*. Thus, while the Statute does not attempt to isolate the Commission as to function, it does prescribe sufficiently different objectives in order that duplication will not result. By the same token, it is not proposed that the Commission would be left in such a posture as to not have access to information from existing and on-going programs, nor would it be precluded from offering its advice and counsel relative to such matters.

Nothing in the proposal, that is apparent to us, would indicate that the Commission is envisaged as having any administrative authority over any branches of the Federal Government, States and/or Interstate Compacts, and more specifically over the Water Resources Council. It is provided explicitly that the Commission shall cooperate and consult with the Water Resources Council, though the Commission is not administratively responsible to the Council. It seems logical to presume that a close working relationship would, by necessity, develop between the Commission and the Council and this seems readily apparent in a review of S. 3107 and Public Law 89-80.

We feel the objectives of S. 3107 are important and that the substance of this proposal would establish an effective vehicle to achieve such objectives. Our only concern is relative to Section 3(c) which states, "The Commission shall terminate not later than five years from the effective date of this Act." In terms of the objectives and the general administrative problems of initiating such a Commission, we question the advisability of this limitation. We do feel it appropriate to make clear that the activities of the Commission have a termination date—our only question goes to the apparent shortness of time allotted.

We hope the Committee will look with favor on S. 3107 and that the objectives of the Act can begin to be realized at an early date.

The CHAIRMAN. The Chair wishes to announce that when we adjourn today we will resume at 9:30 tomorrow morning so that we would hope to complete the testimony of the witnesses that are scheduled for tomorrow during the morning hours. The Chair will have to be away a little bit and Senator Burdick will preside.

I think our next witness is Mr. John J. Meehan, group manager, Community, Regional, Natural Resources Development Group, Chamber of Commerce of the United States.

Mr. Meehan, delighted to have your statement.

Mr. MEEHAN. Thank you, Mr. Chairman. I have a very short statement here and I think I can take care of it by reading it.

(Whereupon the chairman, Senator Jackson, left the hearing room and Senator Burdick assumed the Chair.)

STATEMENT OF JOHN J. MEEHAN, GROUP MANAGER, COMMUNITY, REGIONAL, NATURAL RESOURCES DEVELOPMENT GROUP, CHAMBER OF COMMERCE OF THE UNITED STATES

Mr. MEEHAN. My name is John J. Meehan. I am the manager of the Community, Regional, and Natural Resources Development Group of the Chamber of Commerce of the United States.

I am here to support the creation of a National Water Commission as proposed in S. 3107 and to urge that the bill be favorably considered by the Congress.

Last week, or 2 weeks ago, I should say, the delegates of the federated member organizations of the national chamber, during their

annual meeting, reaffirmed support of the concept and approach embodied in S. 3107, with the understanding that this action advocated a National Water Commission.

Our support for S. 3107 and its objectives results from a series of studies made by the national chamber's Natural Resources Committee and a number of ad hoc advisory panels. Additional information and insight was developed during the December 8-9, 1965, National Water Conference sponsored by the national chamber.

The seriousness of the myriad of situations concerning management of water resources across the Nation requires the most careful appraisal of what the Nation can and should do to solve the varying problems.

A new, positive attitude must evolve to provide optimum use of water in individual watersheds and throughout the country. This, in turn, requires new knowledge and broadened comprehension of the economic meaning of water to the wealth, as well as to the health, of a region.

We, therefore, endorse the scope of duties of the proposed National Water Commission. These duties would include reviewing present and anticipated national water resource problems, making such projections of water requirements as may be necessary, and identifying alternate ways of meeting these requirements.

We are pleased with the requirements of section 3 that the Commission must give consideration to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, and innovations to encourage the highest economic use of water and waste water purification and reuse.

It is our contention that these objectives will properly assess common aspects of water problems of the Nation and provide a basis for outlining courses of action to achieve efficient utilization of water resources.

We agree with the provisions of the bill that state that the Commission should consist of seven members appointed by the President and that no member of the Commission hold any other position as an officer or employee of the Federal Government.

It is also necessary that the Commission have a competent staff independent of Federal, State, and local governmental water agencies.

The fact that this Commission will not continue indefinitely, is important. Termination of its work no later than 5 years from the effective date is most appropriate.

We are pleased to note that section 6 provides a degree of interrelations with river basin commissions created pursuant to title II of the Water Resources Planning Act. This provision should help insure an adequate flow of information from actual river basin planning groups. We would suggest, however, that this same relationship be extended to river basin planning and operating agencies authorized by interstate compacts or international agreements.

Our endorsement of this legislation in no way argues for delay of current programs or projects, be they Federal, State, local, or private. Rather, our support of this legislation argues for the utilization of a mechanism designed to help solve the complicated planning and financing of the development of our future water resources.

Our very lives, our economic well-being on this continent, are at stake. We need the best possible studies, analyses, and evaluations to

be able to determine what our future course should be. With this in mind, we urge immediate and favorable action on this legislation.

Senator BURDICK. Senator Jordan?

Senator JORDAN. That is a good statement, Mr. Meehan.

I particularly like the statement at the top of page 3 where you say, "this legislation in no way argues for delay of current programs or projects, be they Federal, State, local, or private." This is what we all hope. People are not going to say what we have in the bill better be held up until we get some word back from the new Commission. It is going to have an oversight of a lot of things. I appreciate your position on this.

Senator BURDICK. Thank you, Mr. Meehan. The committee has no doubt as to how the chamber feels about this.

Mr. MEEHAN. Thank you.

Senator BURDICK. Dr. John H. Cover, National Parks Association.

Dr. COVER. Mr. Chairman, I shall try to summarize, although it is a very difficult job.

Senator BURDICK. The whole statement will be received in the record, without objection.

STATEMENT OF DR. JOHN H. COVER, IN BEHALF OF ANTHONY WAYNE SMITH, PRESIDENT AND GENERAL COUNSEL, NATIONAL PARKS ASSOCIATION

Dr. COVER. It is very difficult, of course, called in as a substitute, to summarize someone else's thinking. But I think at the bottom of page 2, the point is made that there is a great need to bring independent thinking into the policy of formulation.

Then, on page 3, the point is taken that there is need also for thinking which transcends the boundaries of specific departments and bureaus. A little later on I should like to insert at the beginning of the next to the last paragraph, under present circumstances, even though the projects of these agencies may be filtered through the Water Resources Council, they may be views of persons of vision whose views are focused especially on their special jobs.

At the bottom of page 4, I am suggesting, however, that the advice and recommendations of an independent commission of the kind proposed in this legislation will be of assistance to the Water Policy Council, the President, and the responsible committees of Congress in preparing measures for the consideration of Congress in the interest of all the people.

At the bottom of page 5, there is an illustration in terms of the Potomac River Basin, which may become a test case to show that water purification should supplant major reservoirs for storage for water supply in more than one large river basin.

On page 6, we ask the question, should we be impounding water to produce hydroelectric power at the expense of the world-famous scenery of the canyons between Glen Canyon Dam and Lake Mead? Should not we be using coal-fired thermal plants instead of hydro-power to pump water into central Arizona?

And, then, should we be constructing hydroelectric powerplants to sell power for the purpose of earning money for future investment in water transfer facilities, or should such improvements be made from

the General Treasury, thus keeping such operations under the control of Congress?

On page 7, the question is raised, how rapidly can the various approaches to the desalination of salt and brackish waters be pushed ahead, thus solving water shortages such as may exist in the future in the Pacific Southwest?

There are serious problems of timing here, hydropower at best can contribute a small fraction of the needed energy, whether baseload or peaking power, coal might fill the need for an interim period, atomic energy might take over later, first fission, then fusion, fresh water might be separated out, or even produced, and pumped by these methods.

Why are we standing on one foot, doing nothing, in research and development on solar energy?

He urges an autonomous commission and says he would have some criticism of the bill that requires the routing of reports through the Water Resources Council; that it would be better to rest on the provision for consultation with the Council, but to provide for direct transmission with comments by the Council to the President. And as to the composition of the Commission, he would hope that the persons with backgrounds in the social and biological sciences would have primary consideration.

The field of ecology, which deals with natural balances among plants, animals, and men, and which is receiving more and more consideration in policy formulation these days, should certainly be represented. One thinks also of ecology, biology, economics, sociology, psychology, history, literature, and philosophy. We are dealing with goal values, with the basic question of the nature of man and his needs, in an industrial society. He urges that political philosophers are also needed.

That, I hope, is the summary of Mr. Smith's points of view.

If permitted, Mr. Chairman, I should like to make one or two comments of my own.

I might say, on page 1, I would suggest that in introducing me, I am an economic consultant to the Parks Association. But my work for a great many years, beginning as consultant to TVA under the first Chairman and, in recent years, I have spent considerable time overseas with some of these problems, including a close connection with the proposal to establish this water policy on the Euphrates in Syria and looked into the Aswan Dam, and I feel that a great many mistakes which have been made in other countries have also been made here, but that we should take advantage of some of the mistakes now being made, let's say, in the Aswan Dam of Egypt.

As you know, the Ruhr Valley has a restudy. I think we need a restudy of TVA. I think I helped to eliminate the plan for the Euphrates Dam by calling in the International Organization of Agriculture and asking them if they would make a soil test of the desert which was to be irrigated under this dam. They showed that the soil was so saline, it would be impossible to raise anything.

There has also been a report by a UNESCO Committee, chaired by the scientist, Mr. Stamp of England. This Committee has also examined our Southwest and points out some of the same problems which they are facing at present in the Aswan Dam, where 40 percent

of the intake is being evaporated and that the deposit of silt is so heavy that within 50 years the dam will be filled with silt.

This Committee, under the chairmanship of Mr. Stamp, points out that many of those problems are now being faced in our Southwest and other arid areas.

One more thing about desaltation. About 10 years ago I made a study of that with reference to other energies and had a chance to look into the experience in the Middle East, Kuwait, and Israel, and so forth, and there is a British company, for instance, that claims they can provide equipment at the present time which, if used on a multi-purpose basis, together with desaltation—and this would be in the Mediterranean or the South Asian Seas—that the potable water, if we include development of hydroelectric power and the use of byproduct salt, could be produced at present costs in the United States in some of our Northeast areas. With the large impoundment approach it would be much cheaper to use desaltation.

There is another thing—and this is off the cuff, but I have been listening to the testimony here and thought that some of these suggestions might be worth considering—the Bethlehem Steel Co. at the present time is using sewage disposal water from Baltimore in its steel plant so that it does not need the degree of purification that would be required for human use.

Another comment which to a degree I, at least, this afternoon, since I have been here, have underestimated, is the reference to our lack of knowledge of ground water, the subsurface water. It is very important when we consider the water which flows underground, across State lines, and realize at the present time, in many jurisdictions, no State or local requirements are insisted upon for well sinking or for otherwise drawing upon subsurface water. You just go out and sink a well. We have no knowledge as to the amount of pollution in the subsurface water. We do know from the census that a great many of our industries draw their water from underground. Some industries draw as much as, I think 95 percent. Others are using city water. But you can't find, I think, in Federal or State data adequate information on this ground water and that is essential, if this Commission is to really undertake its prime job.

Thank you, Mr. Chairman.

Senator BURDICK. Senator Fannin?

Senator FANNIN. Thank you, Mr. Chairman.

First of all, I would like to comment on the part in which I am in agreement, and then I would like to ask you some questions on some of the matters in which I am not in agreement. I do agree we should do more in the study of solar energy and the study of what could be done with atomic energy.

At the same time, I do want you to know that we have been doing a great deal in Arizona on solar energy. I do not know whether you are aware that we have a plant now operating. Also, we have vast studies going on concerning solar energy, and one of the largest and most complete libraries in the world at the Arizona State University.

You mention greater support. I was just wondering where this would be, at Federal or State levels, or by industry?

Dr. COVER. This is my impression from comments with various scientists who have been attempting for a number of years to get ade-

quate financial support, basically from the Federal Government, to carry through further studies of energy, particularly of solar energy.

For instance, you know the Solar Energy Institute at the University of Minnesota. There, one of the outstanding scientists of the world, Farrington Daniels, has been in charge—I think he has probably retired, but will remain as an adviser. Some years ago, at the time that I was making these studies on the alternative energies, he and other members of the Atomic Energy Association stated that they thought for a million dollars they could have a breakthrough in atomic energy.

Senator FANNIN. Atomic or solar?

Dr. COVER. I am sorry, you are quite right, solar energy. I meant solar energy. Because the ultimate source of power is solar energy. Atomic energy is simply a step, an intervening step, and the emphasis in this country has been placed upon atomic energy in large part because of its military significance.

Therefore, these scientists said, if we could only have this money that is going into atomic energy here, we think we could have a breakthrough for general purposes in solar energy.

Senator FANNIN. Fine. I think we should do more in the field of solar energy.

Now, Dr. Cover, when you mentioned the cost of converting sea water by atomic energy and mention Kuwait, I am just wondering where you received your information, and I will tell you why. I do not want to criticize you in any respect, but the representatives from Kuwait were here, including the Prince—he met with members of the Foreign Relations Committee and others. Senator Morse invited me to this luncheon where we discussed this field of endeavor at Kuwait and found that they were looking for our programs rather than to present their programs to us.

In other words, they are almost solely dependent on what we are doing here in the United States and we still have not produced water at an economical price here in the United States. We have been striving to do something with it, but I have not seen water come out of the pipeline at even \$100 an acre-foot and still we have projected programs where they say we can produce water at as low as 22 cents a thousand. At the same time, we do not even have a prototype plant producing water for that price, so when you say we should look to that source rather than depend on hydroelectric power, I just cannot agree with you because we have not any proof that this will come about in the next 50 years.

Dr. COVER. You see, I am confident from observation, the study of this problem right here in the United States and overseas, that the emphasis has been placed first upon immediate production. We don't have an adequate study underway as to future use. We put small plants into production. In the case of Kuwait, for instance, I might comment, that is almost a necessity there. They must have that that way, therefore, they must pay high costs.

Senator FANNIN. The cost of the plant involved there was to be about \$20 million in accordance with what the representative stated.

Dr. COVER. In commenting upon the British estimates, they, of course, have in mind a very large plant, larger than you would have in Kuwait or, let's say, in any of our smaller communities. They are

under the impression, for instance, that the cost to New York City or to Los Angeles, specifying those because they are cities on the ocean, that if you had the combination or multiple uses, which they specify and of course, they are, that they could produce desalted water for human and industrial and agricultural purposes at a cost equivalent to let's say the cost now of getting water into New York City and have the program for future New York City development by the way of impounding, which is under the program of New York State at the present time.

Senator FANNIN. Doctor, at what price would they estimate they can produce water per thousand gallons?

Dr. COVER. I have that in the record. I am talking off the cuff.

Senator FANNIN. Is it in your statement?

Dr. COVER. No. You see, I came to read the statement of the president of the National Parks Association. I asked if I might make these comments as an individual on the side, having heard this discussion this afternoon. I brought nothing with me.

Senator FANNIN. Do not misunderstand me. I greatly appreciate what you have done and I am sure the committee is desirous of cooperating fully with you. At the same time, I would like to have your source of information, because to date we do not have anyone who has proven to us—proven to me—that you can produce water at even the 22 cents a thousand that they are talking about and that would be some \$70 an acre-foot of water. That would be impracticable for irrigation and it would be impracticable for many industrial utilizations. So I am just wondering about your statement, because I certainly would not agree with you that we should replace hydroelectric power and that we should not place these dams on the river.

In the statement that you read it said, Should we be impounding water to produce hydroelectric power at the expense of the world-famous scenery of the canyons between Glen Canyon Dam and Lake Mead? We are not impairing the beauty of that area. I love that State and we are proud of the canyon more than anything in our State. We would be the last to impair the beauty of that area. You know, even from the edge of the canyon, looking down, you cannot even see the water and this would make the lake and the beauty of these canyons accessible to the masses, whereas, now there are very few people who have the privilege of going in to see this scenic area that you are referring to.

Dr. COVER. I understand your position. The official position of the organization would be, of course, that they would be opposed to that and the point made, I think, by the President, is that there is a succession of steps that we are going through now in terms of the development of various types of energy, and that impounding and hydroelectric power is a passing stage. We have had that historically. That is passing out. But the substitution of energy through coal would be temporary, also. Therefore, what is the ultimate use? My suggestion would be that we put some money into this problem of desaltation because I don't think that it has really been given an adequate trial. If we think in terms of large plant and use, then that would be the substitute. It is a long-time substitute, too. It runs into centuries, whereas, the others are outmoded very shortly.

Both of these substitutes, we contend in our argument, even though they provide a little higher per-unit cost, are more than offset by saving the Grand Canyon. We contend that something should be paid for the esthetic value to the American people.

Now, may I make one other statement? As an economist, I would raise the question as to the significance of some of the plans proposed by various persons and groups in Arizona as to the crops which are going to be raised by the use of additional water. For instance, I have been told by the Development Commission that cotton would be one of them. But I wonder whether, if there is one product of which we have surplus in this country, it isn't cotton, and whether it wouldn't simply be a competitive situation, let's say, with Texas and other areas, to begin developing cotton there. I would raise these questions for a real economic study.

Senator FANNIN. Doctor, I am glad you raised it because, if you read the bill, you know it provides that we are not to increase our acreage of agricultural crops. It provides this, but the Indian people, because of their economy, can do so. I do not think that you would want to preclude our Indian people having the advantage of additional water so they can have crops.

Dr. COVER. No, of course, that wouldn't come into consideration.

Senator FANNIN. I would want you to understand that the bill does not provide any additional crop acreage to be planted in Arizona. And there is no plan that this would be done. We have mentioned cities like Tucson that are so dependent on underground water, and need relief, so if we look forward, it is not from the standpoint of crops, it is from the standpoint of satisfying the needs for our people.

Dr. COVER. I know that problem. That can be satisfied from the location of Tucson, for instance, if you develop it.

Senator FANNIN. You mean, you are going to move Tucson?

Dr. COVER. In terms of the location of Tucson.

Senator FANNIN. I would like for you to answer that. How is it going to be satisfied?

Dr. COVER. With the short transmission of the water.

Senator FANNIN. I would very much welcome a report if you made a study of that because to date we have not had any indication that could be done. The transportation of water alone, carrying it that distance, would be a tremendous problem.

Dr. COVER. It would be farther from the proposed plan of the dam, I believe.

Senator FANNIN. But you have a media of carrying it and you have an international problem involved, so you do not have a simple solution, I assure you, because this has been studied very thoroughly by the University of Arizona. They have given me reports on it when I was Governor of the State of Arizona. So I believe some of the statements you made need to be checked. I think it is lack of information that is available to you and I hope that you will obtain this information because I think it will be very valuable.

Dr. COVER. May I ask, is it not true, then, about plans to introduce cotton into Arizona?

Senator FANNIN. Cotton has been grown in Arizona, but they are reducing the acreage constantly by the allotment procedure. So there is not any plan to increase the cotton acreage in Arizona, I can flatly say that.

Dr. COVER. Just last fall I was told in Tucson, by what I understood to be a member of the development commission, that that is one of the crops that they hope to develop extensively, intensively, in Arizona.

Senator FANNIN. Doctor, I am afraid that someone gave you incorrect information because that is absolutely wrong. They do not intend to increase it other than on the Indian reservations. I do not know where crops would be produced. That is an allocation that could be used for agricultural purposes on the Indian reservations.

As far as the other lands are concerned, it would not be possible for them to increase their crops or the utilization for agriculture beyond what they now have in agriculture.

Dr. COVER. Then you do not need very much irrigation water.

Senator FANNIN. But we have it up to a certain point. It depends where you go around the State. There are some areas that have water and some areas that do not have it. The need is to carry water to those shortage areas.

Dr. COVER. It is a long distance, though, is it not, from the area of the Grand Canyon?

Senator FANNIN. It is a long distance from the Colorado River, yes, but this is a feasible project and it will pay off. It is not one that must be subsidized to a very great extent. There is very little subsidy involved.

Dr. COVER. You see, these reports which I referred to, including one made some years ago by John Cook, the famous Philadelphia engineer, followed by this report of UNESCO by Mr. Stamp, the British Chairman, with respect to these arid areas, both point out that these impoundments in our Southwest are of very short duration for the two reasons that I mentioned in connection with the Aswan Dam. One is the evaporation of water which is heavy, 40 percent, for instance, was in this report of Mr. Stamp's, and the other, the siltation. So that it wouldn't be long under this estimate before these two dams proposed on the Colorado would be silted out and wouldn't be usable.

Senator FANNIN. Doctor, that is not verified by the engineers reports. I would refer you to the engineers reports. If you refer to the two dams now under consideration, there is not the storage capacity that is available in the other dams along the river and also they are very narrow areas and we would not have the percentage of evaporation that you are talking about or even close to that percentage. It would be a very slight percentage of evaporation.

Furthermore, during the periods when we have water in quantities, it can be stored to take care of the drought period. So there is a very definite advantage and you know much of the water is used for human consumption.

Dr. COVER. But the siltation is very heavy.

Senator FANNIN. The engineers would not verify your conclusions in that regard.

Dr. COVER. I know the report and I think we need a new study by other engineers.

Senator FANNIN. Thank you.

Senator BURDICK. Thank you, Doctor.

(The prepared statement referred to follows:)

STATEMENT OF DR. JOHN H. COVER, IN BEHALF OF ANTHONY WAYNE SMITH,
PRESIDENT AND GENERAL COUNSEL, NATIONAL PARKS ASSOCIATION

My name is John H. Cover. I am Secretary of the Board of Trustees, and further serve as an economic consultant, to the National Parks Association.

I am presenting this statement in behalf of Association President Anthony Wayne Smith, who is unable to appear at this time.

My name is Anthony Wayne Smith. I am President and General Counsel of the National Parks Association, 1300 New Hampshire Avenue, NW., Washington, D.C. I am an attorney admitted to practice in New York and the District of Columbia, and a professional student of governmental operations, particularly in respect to natural resources management. I appreciate this invitation to testify on the bill to establish a National Water Commission.

The National Parks Association is a private educational and scientific institution concerned primarily with the protection of the national park system but also with the restoration of a natural life environment generally. It has about 33,000 members and publishes the monthly National Parks Magazine.

Legislation along the lines of S. 3107, to create a National Water Commission, seems definitely in the public interest.

The need for the more effective coordination of resources management policies at the inter-departmental and White House levels of the Government has become quite clear.

Recognition of this need led to the creation of the Water Resources Council; this was a step in the right direction, but further measures are called for.

The recently established Water Resources Council should help to integrate the work of the operating agencies concerned with resources management; the danger is however that operating problems and pressures will prevent effective policy formulation.

There is a great need to bring independent thinking into the process of policy formulation; that is, thinking which is not biased in any manner by the preoccupations, commitments, or connections of the operators.

There is great need for the contributions of generalists in public policy with reference to water resources; the country has need of persons whose specialty, if you please, is the formulation of general policy.

There is an imperative need also for thinking which transcends the boundaries of specific departments and bureaus, affording a synoptic view of national trends and needs.

As I see it, the Chief Executive could be greatly aided by the establishment of the proposed commission in respect to water resources. He would have the unbiased viewpoint of persons otherwise not connected with Government to aid him in judging the merits of programs developed by the specialized operating agencies.

Even though the projects of these agencies may be filtered through the Water Resources Council, they remain nonetheless the views of persons whose vision is focused very closely on their special jobs; long years of habituation to settled habits of thought and work may distort policy conclusions; jockeying for prestige, power, function, and appropriations will always be involved.

A fresh and completely independent viewpoint, such as the proposed commission could provide in behalf of the President and the committees of Congress, would be a great contribution to good government.

All the policy decisions of the Government having any relation to legislation must be made in the last analysis by the Congress. The proposals which are set before Congress are customarily the work of Congressional committees. The members of the committees concerned with resources management have developed a broad knowledge of their fields and a high degree of expertise in them; they, like the Chief Executive can be trusted to win now the chaff from the grain in making proposals to the Congress as a whole.

But the President and the Congressional committees are entitled to have proposals placed before them on which highly qualified policy minds have already worked.

Ultimately of course Congress and its committees are responsible to the people.

I am suggesting however that the advice and recommendations of an independent commission of the kind proposed in this legislation will be of assistance to the Water Policy Council, the President, and the responsible committees of

Congress in preparing measures for the consideration of Congress in the interest of all the people.

The provisions that the Chairman will not be a Government employee, and that he should be the top executive of the Commission, are good. The office of the Executive Director, to be paid at a rate which will attract the necessary talent is also essential. The Commission must be independent of the established operating agencies in the water resources field if it is to function as intended; it must be adequately staffed and financed to do its work independently of the other agencies; the bill may not be strong enough in this respect.

The provisions of Section 3(a) of the bill are of interest. In spite of the establishment of the new Water Pollution Control Administration, the Government will be called on to concentrate increased attention on curing and preventing the pollution of water.

The Potomac River Basin may become a test case to show that water purification should supplant major reservoirs for storage for water supply in more than one large river basin. The technology appears to be available now, without waiting for another five, ten, or fifteen years. The policy of maximum purification is gaining wider recognition as the preferable public policy; this general issue should be examined by a commission with a position separate from that of the operating engineering agencies and even from the Water Policy Council and the Water Pollution Control Administration, as far as long-range recommendations of an advisory nature are concerned.

On the Colorado River we are enmeshed in a variety of contradictory policies which need attention at an impartial higher level, free from bureaucratic entanglement. Unless they get attention at that level, a vast waste of public expenditure will almost certainly occur, with public investment being made in facilities which will shortly be outmoded.

Should we be impounding water to produce hydro-electric power at the expense of the world-famous scenery of the canyons between Glen Canyon Dam and Lake Mead? Should not we be using coal-fired thermal plants instead of hydro-power to pump water into central Arizona?

Should we be constructing hydro-electric power plants to sell power for the purpose of earning money for future investment in water transfer facilities, or should such investments be made from the general treasury, thus keeping such operations under the control of Congress?

Should we be subsidizing the irrigation of new land at a time when many crops are still in serious surplus? Should we be subsidizing the transfer of crops from one region of the country to another by reclamation subsidies?

How rapidly can the various approaches to the desalination of salt and brackish waters be pushed ahead, thus solving water shortages such as may exist in the future in the Pacific Southwest?

There are serious problems of timing here: hydro-power at best can contribute a small fraction of the needed energy, whether base-load or peaking power; coal might fill the need for an interim period; atomic energy might take over later, first fission, then fusion; fresh water might be separated out, or even produced, and pumped by these methods.

Why are we standing on one foot, doing nothing, in research and development on solar energy?

These are only examples of a few questions which might be asked. They and many like them need to be answered by an autonomous commission of the kind proposed, in relation to water resources, not unduly influenced by the parochial points of view of the old-line engineering agencies.

In fact, I would have one criticism of the bill, that it requires the routing of reports through the Water Resources Council; it would be better to rest on the provision for consultation with the Council, but to provide for direct transmission, with comments by the Council, to the President.

As to the composition of the Commission, one would hope that persons with backgrounds in the social and biological sciences would have primary consideration. The field of ecology, which deals with natural balances among plants, animals, and men, and which is receiving more and more consideration in policy formulation these days, should certainly be represented. One thinks of ecology, biology, economics, sociology, psychology, history, literature, and philosophy; we are dealing with goal values, with the basic question of the nature of man and his needs in an industrial society. Political philosophers, capable of the long view, but aware of the immediate realities, are what we need. They may even be engineers or lawyers, if they have the broad viewpoint, but in the main,

a professional background in the biological and social sciences and the humanities is imperative.

The establishment of a commission like this would be a great modern innovation in Government, and is long overdue. With experience in the field of water resources, experiments could be made in other areas. A creative advance might thus be made in the technology of national policy formulation.

Senator FANNIN. The chair has a statement by H. Maurice Ahlquist, director of conservation of the State of Washington, for inclusion in the record at this point.

(The statement referred to follow:)

STATEMENT OF H. MAURICE AHLQUIST, DIRECTOR OF CONSERVATION OF THE STATE OF WASHINGTON

Mr. Chairman, my name is H. Maurice Ahlquist, of Olympia, Washington. It is my pleasure to appear before you and to present testimony on behalf of the Honorable Daniel J. Evans, Governor of the State of Washington and for the Department of Conservation, of which I am the Director.

This legislative proposal which you are considering here today offers a means of solving or at least starting toward the solution of one of our most important national, state and local problems. This is the conservation and proper use and re-use of our water supplies. Water is the key resource to our future. This has long been recognized by many of our agencies of government as well as by private citizen associations which have worked toward programs embodying beneficial uses, conservancy programs, pollution abatement and many others.

But as our population has expanded at an accelerated rate, bringing with it increased uses of water for industry, recreation and agriculture, the need for over all national, inter-region, local study of our requirements and supplies becomes paramount.

This has been brought to our attention by messages from the President of the United States which he has called for the establishment of a National Water Commission.

Congress has responded to the needs for cooperation between the many entities dealing with our water by enacting the Water Resource Planning Act of 1965, which provides for the Water Resource Council and the formation of river basin commissions. With this law, and others, we are now in a position to inventory local and area needs and resources, to prepare flood control and other programs.

However, I would like to draw your attention to the fact that in our water management programs—which are a must if we are to protect this essential asset for the future—there must be an independent board of properly qualified men, who are capable of exercising independent judgment. This Board can and will gather together the facts from our agencies of Federal and State governments along with the information from the Water Resource Council, in order to obtain enough knowledge on which to base their decisions.

I would like to draw your attention to Section 3 of the bill—Duties of the Commission. These duties, as promulgated, outline the criteria for the Commission, the guidelines by which it will formulate its reports to the President and to the Water Resource Council. I will not take your time to enumerate these excellent provisions, but will reiterate that only an independent board, free from any and all single purpose motivations, can follow these directives and produce area and nationwide water use programs which will guarantee the wisest use of our water and the greatest economic and social benefits.

On behalf of the Governor and the people of our State, I wish to thank you for your consideration of this testimony having to do with our greatest natural asset—WATER.

Senator FANNIN. The meeting will be in recess until 9:30 o'clock tomorrow morning.

(Whereupon, at 4:10 o'clock p.m., the committee adjourned, to reconvene on Tuesday, May 17, 1966, at 9:30 a.m.)

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NATIONAL WATER COMMISSION

TUESDAY, MAY 17, 1966

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The committee met, pursuant to notice, at 9:35 o'clock a.m., in room 3110, New Senate Office Building, Senator Henry M. Jackson (chairman) presiding.

Present: Senators Jackson, Moss, Burdick, Kuchel, Allott, Jordan of Idaho, and Fannin.

Also present: Jerry T. Verkler, staff director; Roy M. Whitacre, professional staff member; Frederick O. Frederickson, special counsel; Ralph Johnson, and Ellary Fosdick, consultants; and E. Lewis Reid, minority counsel.

The CHAIRMAN. The committee will come to order.

We will open our session this morning by hearing from the Secretary of Health, Education, and Welfare.

Mr. Secretary, we are delighted to welcome you to the committee and to give you the opportunity to make a statement in connection with the pending bill. I believe you have a prepared statement. You may read it or summarize it as you wish.

STATEMENT OF HON. JOHN W. GARDNER, SECRETARY OF HEALTH, EDUCATION, AND WELFARE; ACCOMPANIED BY DEAN W. COSTON, DEPUTY UNDER SECRETARY OF HEALTH, EDUCATION, AND WELFARE

Secretary GARDNER. I would like to read it if I may, sir.

The CHAIRMAN. All right, sir. Go right ahead.

Secretary GARDNER. It is quite brief.

Mr. Chairman and members of the committee, I am happy to be here today to express the support of the Department of Health, Education, and Welfare for S. 3107, a bill to provide for a comprehensive review of national water resources requirements and supplies.

We are at a point in history where interest and concern for the water resources of the Nation have reached their highest point. Last week the Federal Water Pollution Control Administration moved into the executive department, having the principal responsibility for water resource management. Also President Johnson has proposed far-reaching legislative proposals for the control of water pollution.

The bill before you represents additional evidence of the administration's concern for the preservation of this important national resource.

The 1961 Report of the Senate Select Committee on National Water Resources, developed after 2 years of study, demonstrated beyond

question the value of a comprehensive review of water resources in the United States, and out of that study came a series of laws which have immeasurably strengthened our ability to deal with the problem.

A National Water Commission, as proposed in S. 3107, would provide a means of reviewing our water resource problems outside the inevitably specialized views of the many Federal agencies now involved with various parts of the problem.

The Department of Health, Education, and Welfare is no longer managing the water pollution program. But our interest in water is no less keen, and our concern for the efficient management of water resource is closely related to our broad concern for the health and well being of the American people.

I defined the role of our Department in my recent testimony before the Senate Committee on Public Works and I would like to redefine that now:

We will conduct the research necessary to define the health effects of water pollution. This will involve various parts of the Public Health Service, including the proposed National Environmental Health Sciences Center in North Carolina, the Communicable Disease Center in Atlanta, the National Institutes of Health, as well as other laboratory resources. It also will involve the use of research grants and contracts.

We will participate in health surveillance of water supplies to determine the presence of such contaminants as disease-producing organisms, pesticides and other chemicals, and radioactive substances. This will involve cooperative arrangements among several PHS divisions and offices, as well as with Federal, State, and local health agencies.

We will carry out epidemiological investigations of specific water-borne disease outbreaks. The Epidemic Intelligence Service in our Communicable Disease Center is the primary focus for this activity.

We will provide technical assistance and training to assist State and local health agencies and the waterworks industry to continue to assure this Nation the world's safest water supplies. These activities, while centered in our Division of Environmental Engineering and Food Protection, also involve other health units.

In addition, the Public Health Service has certain traditional responsibilities, under the interstate quarantine regulations, for the Nation's drinking water supplies that will complement our responsibilities for the health aspects of water pollution. Although the Service function under the interstate quarantine regulations is to regulate water supplies furnished to interstate carriers, its leadership in this role has had significant impact on public water supplies generally. For half a century the drinking water standards promulgated by the Service have been recognized as the national standard for protection of health through the provision of safe drinking water supplies. These standards are updated from time to time with the assistance of numerous highly qualified consultants and advisers.

There are a number of other activities that we plan to continue such as consultation with the Corps of Engineers in connection with the regulation of impoundments for health purposes, and advice and consultation to other Government agencies on drinking water supplies, recreational water quality requirements, and shellfish growing water requirements.

Through participation in the Water Resource Council and the Water Pollution Advisory Board, the Department of HEW will continue our interest in this field. We are looking forward to a cooperative and constructive relationship with the Interior Department in fulfilling our national responsibilities.

In this and other appropriate ways, the Department of Health, Education, and Welfare hopes to be able to continue to make its contribution to the right for clean water. Because we may no longer be on the front lines does not mean that we are any less devoted to the cause.

As is evident from this statement, Mr. Chairman, we expect to continue very important activities in the water resources area.

A comprehensive review of the total water resource problem, conducted by a commission as proposed in S. 3107, would be of great value to our Department and its concerns for the health of the American people.

President Johnson said:

The Commission will be composed of the very best minds in the country. It will judge the quality of our present efforts. It will recommend long-range plans for the future. It will point the way to increased and more effective water resource measures by the Federal Government, working in close cooperation with States, local communities and private industry.

Mr. Chairman, the enactment of S. 3107 will be of great help to the Department of Health, Education, and Welfare in providing a base study from which we can develop more effective programs in our interest areas. We urge favorable action by your committee.

The CHAIRMAN. Mr. Secretary, I take it that while the management of the water pollution problem is no longer in your agency, you do have a continuing and deep interest in providing the necessary research facilities and advice and counsel as it relates to health—public health in particular—in order to obtain clean and pure water?

Secretary GARDNER. Mr. Chairman, that is the reason I burdened you with a rather lengthy statement of our involvement. We are still deeply in this and there is no possibility that we can get out of it. It is a public health commitment that we must continue.

As far as research is concerned, I have said frankly on a number of occasions that I don't think we have done nearly as much in the past as we ought to do in the future, and we hope to press it quite vigorously.

The CHAIRMAN. Senator Kuchel?

Senator KUCHEL. Mr. Secretary, first of all, I am delighted to have you up here before this committee. Welcome.

Mr. Secretary, just for a 30-second seminar, for my benefit anyway, the responsibility for water pollution was transferred by Executive order from your Department?

Secretary GARDNER. It was a reorganization plan, Reorganization Plan No. 2, I believe.

Senator KUCHEL. Transferred from your Department to the Department of the Interior?

Secretary GARDNER. Yes.

Senator KUCHEL. Was a new agency created in the Department of the Interior to handle that chore?

Secretary GARDNER. I can't answer that.

Mr. COSTON. I am Dean Coston, Deputy Under Secretary.

The Water Quality Act of 1965 created the Federal Water Pollution Control Administration in the Department of Health, Education, and Welfare. That agency, which was created by the 1965 act, was transferred by Reorganization Plan No. 2 to the Department of the Interior.

Senator KUCHEL. Thank you.

With respect to air pollution, where is the responsibility for administration of air pollution?

Secretary GARDNER. It is still in our Department.

Senator KUCHEL. Entirely?

Secretary GARDNER. Yes, sir.

Senator KUCHEL. Is any move contemplated to get rid of any of it?

Secretary GARDNER. No, sir.

Senator KUCHEL. Mr. Secretary, you are a member by law of the Water Resources Council?

Secretary GARDNER. Yes, sir.

Senator KUCHEL. It was created less than a year ago. Have there been any meetings of that Council?

Secretary GARDNER. Yes, sir; there have.

Senator KUCHEL. When you met, did the Council discuss its role under this proposed bill now before us?

Secretary GARDNER. I don't believe that the Council has met since the reorganization plan was submitted, has it?

Mr. COSTON. No, it hasn't.

Senator KUCHEL. What was the general tenor of the meetings of the Council which you had, Mr. Secretary?

Secretary GARDNER. Well, these referred chiefly to the Northeast water resources problems. They concern themselves with the broadest problems of water resources.

Senator KUCHEL. I remember very well our committee holding hearings on that problem involving the eastern seaboard.

Mr. Secretary, are you acquainted at all with the water problems in the area from which I come, the Pacific Southwest?

Secretary GARDNER. Yes, sir.

Senator KUCHEL. Earlier in these hearings, the Secretary of the Interior, speaking for himself and Mr. Hughes, speaking for the Budget Bureau, indicated a complete awareness of the urgent problem in the Pacific Southwest. Are you sufficiently acquainted with the question involving water to comment on that and indicate to the committee your own views?

Secretary GARDNER. No, sir; I am not. And in fact these would be of less concern to our Department in the future because they are less in the province of contamination of water and more in the province of water resources and conservation and use.

Senator KUCHEL. They would, would they not, be of great concern to the Water Resources Commission?

Secretary GARDNER. The Commission.

Senator KUCHEL. And the Water Resources Council of which you are a member?

Secretary GARDNER. Both.

Senator KUCHEL. So I take it, with respect to any particular departments of water agency of the country, it would be your statement to this committee that while you are not acquainted with them, you intend to be, because of the responsibilities you hold in that Council?

Secretary GARDNER. Yes, sir; very much so.

Senator KUCHEL. Mr. Secretary, you have read the bill before us and its provisions.

Secretary GARDNER. Yes, sir.

Senator KUCHEL. Would you say that the Commission which will be created here would, under the terms of this bill, be acting legally if it undertook, on its own responsibility, to inquire into water resources problems in any part of the country?

Secretary GARDNER. Yes, sir. As I read the bill, the terms are quite broad and the Commission, when brought together, can explore just about anything it wants in the field of water resources.

Senator KUCHEL. I think that is important, and I agree with you and I support the legislation which creates the Commission.

When a commission is established, I think that commission ought to have the authority not only to respond to your council's wishes, but on its own responsibility to inquire.

Secretary GARDNER. I firmly agree.

Senator KUCHEL. Secretary Udall testified that in his opinion, the intention of this legislation was not to create a great new vast bureaucracy under the Commission but to the contrary the Commission, as this bill implies, will be in a position to contract with other agencies for assistance. Thus, the Bureau of Reclamation, which, in my judgment, has done a superb job in the field of studying the feasibility of multipurpose reclamation projects in the West, would be available to the Commission for such studies in connection with water resource problems as the Commission might feel necessary.

Is that your view, too, Mr. Secretary?

Secretary GARDNER. Very much so, and I particularly share the view that it would not be appropriate to develop any major bureaucratic staffing here.

Senator KUCHEL. Yes, sir.

Secretary GARDNER. This is really a device for getting the best minds in the country together on this very important problem.

Senator KUCHEL. I was vice chairman of the Senate Select Committee on Water Resources under the chairmanship of the late Senator Kerr. We held hearings all across this country. This was a number of years ago. It was interesting to see in various parts of the country where there would be very few water problems, they were anxious to have guidance, Federal guidance, and in many instances Federal assistance.

So I quite agree with the comments in your statement that out of that Committee and report have come beneficial results.

Thank you, Mr. Chairman. Thank you, sir.

The CHAIRMAN. Mr. Secretary, you also understand, of course, that this Commission is to be completely free and independent in its approach to obtain the kind of answers that should be obtained in a fair, dispassionate, and impartial way, without the encumbrance of preconceived ideas of any particular Federal agency; is that not correct?

Secretary GARDNER. Yes. I would deeply regret any activity, any commission, which brought together the best minds of the country and did not give them that kind of freedom.

The CHAIRMAN. Yes.

If they should decide there is certain data or information that they want from the Corps of Engineers or the Bureau of Reclamation, for instance, they can get it. On the other hand, they are not to be put in a position where they are going to be completely dependent on other Federal agencies for decisions when the bill contemplates that they are to be the kind of commission that is made up of distinguished citizens who can reach a free and independent decision on these matters. Is that not correct?

Secretary GARDNER. Exactly.

The CHAIRMAN. Otherwise, we would have set up an interdepartmental commission to do the job.

Senator Allott?

Senator ALLOTT. Mr. Secretary, there are seven men authorized for this Commission. What sort of men—not as to name, but as to categories—do you imagine or conceive as the ideal type of people for this Commission? I am sure you have given it some thought.

Secretary GARDNER. I had assumed that they would be individuals who, among them, collectively would cover all of the major concerns of water resources, the engineering interests, the conservation interests, the health interests, all of the thing that go to make up this very complex problem.

Senator ALLOTT. When you say conservation, do you mean conservation or do you mean recreation?

Secretary GARDNER. Well, I mean both.

Senator ALLOTT. The reason I asked you that question is that there has been so little emphasis placed upon real conservation of our soil and plant life and our forest life in the last few years, and so much on recreation that you can see by the budget this year, as a matter of fact, a deemphasis upon true conservation in this country.

Do you think there is anything that this group could do that the Water Resources Council could not do if it were not for the limitation contained in Public Law 89-80?

Secretary GARDNER. The Water Resources Council Act?

Senator ALLOTT. Yes.

Secretary GARDNER. Yes, sir; I do. I think there is an inherent limitation in a council that is composed wholly of Government representatives, each inevitably rooted in the interests of his department and the program which he administers. It seems to me that there is a potentiality for considerably more free and flexible examination of all aspects of the problem by this group that is contemplated in the Commission.

Senator ALLOTT. Are you acquainted with the Public Land Law Review Commission?

Secretary GARDNER. No, sir.

Senator ALLOTT. The Public Land Law Review Commission was given the authority to inquire—and it has just been placed into operation actually, although it was authorized a year ago—and has the three members of both parties of the Interior Committees of both the House and the Senate, plus six independent appointees of the Presi-

dent, plus a Chairman and they are directed to review all of the laws relating to the public lands of the United States, which, of course, involves water.

What would you say with respect to the situation if that Committee, in its review, should come to one conclusion and the National Water Commission should come to another? It seems to me there is a great deal of overlapping in these functions here.

Secretary GARDNER. Well, as you describe the Public Land Law Review Commission, it seems to me that it has enormous scope. It has a tremendous problem laid out before it which has a great many aspects besides water.

The water resources problem is tremendous in itself. The points of overlap here are clear and yet each commission has an enormous task to do that will not possibly collide with the other, and if they disagree on points, I would just assume that it is in the nature of the process of shaping up public policy.

Senator ALLOTT. Well, the scope of the Public Land Law Review Commission, of course, is much wider than the proposed Water Commission, and yet the scope of the Public Land Law Review Commission must necessarily involve exactly the same things that you conceive of in the Water Commission. And no one else seems to be paying much attention to this fact.

Secretary GARDNER. Well, I think there is a clear possibility of overlap but I would find it difficult to believe that the Public Land Law Review Commission could step into this subject with the breadth and the depth that it deserves. This is such a tremendous problem and has so many aspects that I would think it would benefit greatly by the work of this Commission, as a matter of fact.

Senator ALLOTT. Well, if the Commission is of the nature that you describe and as the chairman of the committee has described it, and it is not supposed to be a great new bureaucracy superimposed over all of the water resource development of this country, they would almost inevitably, then, have to call upon the various departments of the Government, including your own department, for advice and more facts, or else they would have to develop parallel staffs commensurate with your own staffs, those of Interior and others.

So they will, to a great extent, be dependent, as I view it, upon information developed by the Department of Interior, the Federal Power Commission, the Corps of Engineers, your own department, and perhaps others.

Secretary GARDNER. Well, Dean Coston has just pointed out that they also have authority to hold hearings on their own. I would point out that with a relatively small staff you can do a great deal. You are not really dependent. If you have a first class staff, you have access to such sources of information, not only from the agencies but from the staffs of congressional committees, the staffs of organizations in the private sector interested in water problems, scientific organizations, and the like.

If the staff is of reasonably high quality, even though small, I don't believe it need be at all dependent, as long as it has access to the information.

Senator ALLOTT. Well, I think you would agree that they would have to call upon these agencies I mentioned and perhaps others for

information or it would take them years, and a very large staff, to develop the same information that is now available.

Secretary GARDNER. Right.

Senator ALLOTT. Section 3(a)(2) of the bill on page 3 reads as follows:

“Consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements of —” whatever that is—

“And on esthetic values affecting the quality of life of the American people.”

Do you consider that that is in any sense a directive which would authorize the Commission to go beyond the legal concepts which have been adopted and established such as, for example, the Colorado River compact, the Upper Colorado River compact, the Colorado River Projects Act, and so forth?

Secretary GARDNER. I think once you set up a commission of private citizens, they can make any kinds of suggestions they want. It would be very difficult not to allow them to make whatever kinds of suggestions they thought useful in the interest of public policy. But I don't see anything in the sentence that would necessarily go beyond that.

Senator ALLOTT. Would what?

Secretary GARDNER. I don't see anything in the sentence that would go beyond the authority you described.

Senator ALLOTT. Well, the point of it is that there are hundreds of millions of dollars invested in the West which are dependent upon these particular compacts and the distribution of water. They actually represent legal ownership of water by the people who own them, who have made these investments pursuant to that ownership, and I would like to make the point here—if you disagree, I would be happy to have you comment on it—that I don't want to see this thing get off in the direction of, “We ought to abandon the legal concepts developed from our interstate compacts as interpreted by the Supreme Court” and end up with, “There are more people here so they ought to have more water.”

Secretary GARDNER. No. I don't have any feeling that that is the direction.

Senator ALLOTT. We do have people like that in the United States, you know, and I just wanted to bring that point out.

Thank you, Mr. Chairman.

The CHAIRMAN. Mention has been made, Mr. Secretary, about the Public Land Law Review Commission. It is true that charter is rather broad but I should like to observe that I believe we have an immediate water problem in the Northeast where public lands are not involved. I am referring, of course, to the recent crisis in New York and New Jersey, so there is a vast and immediate area, including the Great Lakes area, where there has been a substantial decline in the water level, which is not within the jurisdiction of the Public Land Law Review Commission.

I think that points up the fact that the water problems occur all over the United States, and I am sure your department is deeply

concerned with these problems, not in just one region, but you are concerned, I take it, with the problems that exist in all 50 States. Is that correct?

Secretary GARDNER. That is correct.

The CHAIRMAN. So it is truly a national problem and some of the arid areas that we think of as water shortage areas, the Far West, do have a problem looking ahead a few years. But I think the paradox here is that the areas that we assume to have an abundance of water have been confronted with an immediate water shortage problem. Is that not correct?

Secretary GARDNER. Absolutely.

The CHAIRMAN. The fact is that in the New York area the mighty Hudson should take care of all the water needs of the New York and Northeast area. The trouble happens to be that you have a problem of water quality. The mighty Hudson flows with the greatest amount of pollution probably that you can find in any one area, denying that water for the many uses that would otherwise be available to the people of that area.

Secretary GARDNER. Yes.

Senator ALLOTT. Will the Chairman yield on that?

You don't have to go as far as the Hudson. All you have to do is go about a mile and a half west of this point.

The CHAIRMAN. I agree. I was merely pointing out the paradox as we have found it here in recent years with a water crisis which has been in the headlines for the last 2 or 3 years in connection with the problem in the Northeast. I agree it is all around us. I think this is all the more reason why a national commission should be looking at this problem in all 50 States.

Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Mr. Secretary, I too want to welcome you before this committee. Your testimony is constructive.

I might state that this is the first time I have seen the statement made by President Johnson as to the aims of this Commission. I am still a little concerned about the possibility of overlap between this Commission and the Water Resources Council and other agencies set up to deal with water research and water problems.

The President said: "This Commission will be composed of the very best minds in the country."

I am glad to know that. He said: "It will judge the quality of our present efforts. It will recommend long-range plans for the future. It will point the way to increased and more effective water resource measures of the Federal Government working in close cooperation with States, local communities, and private industry."

So it will judge, it will recommend, it will point the way.

In that language, do you see any possibility that this Commission will have oversight or overriding power over the Water Resources Council, for instance, of which you are a member?

Secretary GARDNER. No, sir.

Senator JORDAN. Not at all?

Secretary GARDNER. No. I think that we would wish to take their recommendations very, very seriously, give them most serious study, but this is not set up as a super-government in the water area.

Senator JORDAN. I wanted to get your statement on that. So the fact that it will point the way doesn't give you any cause for alarm that your Council should wait until they point the way?

Secretary GARDNER. No, sir.

Senator JORDAN. You expect to go right ahead in the Water Resources Council?

Secretary GARDNER. Absolutely; yes, indeed.

Senator JORDAN. Without waiting for the way to be pointed out to you?

Secretary GARDNER. Yes, indeed. This is the problem you face with any of these commissions that are set up. You simply cannot wait. You have to go on and you are dealing with a moving target and when their recommendations come, they will be equally relevant for the period beyond that.

But I think it would be a great—

Senator JORDAN. Are you saying, then, that the language of the present Council doesn't mean what it says?

Secretary GARDNER. No, sir. I think we will continue until they begin to make their recommendations. We will proceed on the basis of our present judgments, our present appraisals, of the situation which may be later illuminated and strengthened or given a different light by this group of nongovernmental—

Senator JORDAN. But you see no conflict between the proposed activities of the new Commission and other agencies in the field?

Secretary GARDNER. I see the normal amount of overlap, but it seems to me that bringing in a nongovernmental group is a very healthy thing. If they do overlap, and if at some point they disagree, I think that this may strengthen the discourse.

Senator JORDAN. Thank you, Mr. Secretary.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Mr. Chairman.

Mr. Secretary, it is a pleasure to have you with us this morning. I am sorry that I was forced to leave the room to take a call and did not hear some of the answers to the questions that were asked of you.

Time is so important in many areas of the country and you are familiar with our great problem in Arizona from the standpoint of the Public Health Service. You are quite familiar with the problems on the Indian reservations, their shortage of water, and what exists there and what should be corrected at the earliest possible time.

These men who would be appointed, you say, would be highly qualified. I don't know whether this was answered before: would they be water experts?

Secretary GARDNER. I pointed out that I think they should be drawn from all of the various areas that have a concern with water. I think that the health aspects, the engineering aspects, conservation aspects, dry land problems, all of these—

Senator FANNIN. Well, men so highly qualified would probably be in some other line of endeavor at the present time, isn't that true?

Secretary GARDNER. Very likely, yes, sir.

Senator FANNIN. So it will take time to get this organization underway and get the appointees out of the work that they are now doing and get them into this activity. Isn't that likely?

Secretary GARDNER. I think it would take some time; yes, sir.

Senator FANNIN. So we do have the great problem that time is running out, as you well understand, so far as water in some of the Pacific Southwest areas is concerned, and we are attempting to get programs through. Naturally we would not like to see delays.

Would you not think that there should be priorities established concerning which projects should come first in their activity?

Secretary GARDNER. You mean on their own agenda, once they get—

Senator FANNIN. Yes. The big problem, as I see it, is that this could delay action that is presently underway. For instance, as you know, in the House of Representatives there is a bill providing for a commission that would start work immediately, that would have an immediate study started, and naturally we are very concerned about any delays. The only way we can avert that would be to have priorities established so that this could be taken as a first step.

Secretary GARDNER. Priorities as to the problems to be tackled, yes.

Senator FANNIN. The most crucial problems, because if they must, first of all, study where the problems are, then this could also delay action. Do you not think so?

Secretary GARDNER. First, let me say that, since this Commission is not composed of full-time people, there will not be a long delay in extricating them from present obligations.

Second, I would be reluctant to set priorities for a group that were so highly competent that the first day they met they would surely sit down and agree upon—

Senator FANNIN. But then you would agree, because of the circumstances, that any particular area study would be delayed? It would just be the consequence of the setup of the Commission, is that not true?

Secretary GARDNER. Yes, but I pointed out earlier that the Water Resources Council and the agencies concerned with the program cannot, in any case, await delay of present decisions and present actions for the work of this Commission. We have to move ahead as rapidly as we can on problems as we see them.

Senator FANNIN. Would you not think that legislation which is going through Congress now and is in dire need of action should go forward under its present composure rather than to delay and await the oncome of what could happen in the formation of this Commission?

Secretary GARDNER. You mean legislation other than this?

Senator FANNIN. Yes. Just to be specific, we have legislation for the central Arizona project and this involves your Department because it concerns carrying water into the Indian reservations and that involves public health. So if the legislation is changed to comply with this legislation, then we would be delaying action on a project that should go forward immediately.

Secretary GARDNER. I think Mr. Coston is more familiar with that than I am. Would you answer that, Dean?

Mr. COSTON. Senator, I don't believe that it is the objective of this Commission to delay any kind of forward action in the whole field of water resources. Without commenting specifically on any piece of legislation now before the Congress, I doubt very much if the Congress is going to stop its legislative activities in this area pending some report of the Commission which may take several years.

As you will recall, the select committee of the Senate that explored this problem spent 2 years looking into the problem before they came out with a report.

I don't think anybody suggests that we wait 2 years before we do anything about water in the area.

For example, the President did submit to this Congress rather extensive amendments and revisions to the Federal Water Pollution Control Act. I think he submitted those with the intent that the Congress should consider them and act upon them now and not wait for the Commission to review the entire water resource problem and then take up the administration's legislation on water pollution.

I think you can extend this concept across the whole field of legislative activity in water resources.

Senator FANNIN. By what both of you said, I assume in searching how to carry this program through to the greatest advantage of the Nation that naturally it will take time to do it. So we are talking about a considerable delay.

Mr. COSTON. No, sir. We are not talking about a delay in action at all. What we are saying is that periodically this country ought to assess, in rather broad gage terms, the extent of a total resource problem such as the total water resource problem. At the same time, we know that there are many things going on which are not going to come to a stop. The Corps of Engineers will continue to develop flood control projects. The Bureau of Reclamation will continue to develop its projects. The Federal Water Pollution Control Administration will continue to initiate enforcement actions. Mayors will build waste treatment facilities. Conservation groups will continue to press for more protection of fish and wildlife. This is an ongoing, complicated process. It involves a lot of people and a lot of—

Senator FANNIN. You are speaking in generalities, but I am specific as to one project which, if we awaited the outcome of the studies by this Commission, would be delayed and that is a project that affects the Public Health Service from the standpoint of the Indians very decidedly. I don't think you would want that delayed. Isn't that right? Don't you think this project should be carried forward in the least possible time?

Mr. COSTON. All I am suggesting is that I think the Congress will continue to consider proposals.

Senator FANNIN. They should not be delayed pending the formation of this Commission and the action of this Commission?

Mr. COSTON. As you know, Senator, when Congress wants to go ahead and consider, it doesn't have to wait for us to come up and tell it what to do.

Senator FANNIN. Thank you.

The CHAIRMAN. Senator Moss?

Senator Moss. Thank you, Mr. Chairman.

I apologize for being a little late, Mr. Secretary, but I have had an opportunity to read your statement and I do appreciate your presentation before the committee.

As I understand it, from your statement here and the colloquy that has gone on with members of the committee, you view this proposal as one of long-range study of a problem that has suddenly come to

focus as one of the problems we have in this country, to wit, what are we going to do for water resources in the years ahead with two or three explosions coming, one on top of the other—our added use of water, our great industrial and population growth, and the sudden realization that we have not kept pace in keeping our waters pure and reusable, nor developing additional sources.

I want you to correct me if I misunderstood you, but I would take it that you say that the wise thing to do is to have an outside non-governmental unit of experts who are completely uncommitted and unaligned, as it were, in any of the areas of governmental water resources, take a broad overall look and come back with recommendations as to how, as a nation, we should meet this great and pressing problem, and that, in the meantime we do not slacken off or divert or delay any of the efforts that we are now making to meet the problem.

Now, does that sum it up pretty well?

Secretary GARDNER. That is exactly it, said much more briefly than I said it.

Senator MOSS. Thank you.

Senator KUCHEL. Mr. Chairman, may I ask a question?

The CHAIRMAN. Senator Kuchel.

Senator KUCHEL. So that there may be no misunderstanding on the point, the bill provides in section 3(b) the manner in which the Commission, having completed any reports, either on an interim or final basis, may transmit them to the Council and then on to the President who specifically in the language shall transmit a final report to the Congress.

I assume that final report might come toward the end of the fifth year, which is the life of the Commission.

But there is no question here that reports, once concluded and passed on to the Council and then transmitted by them to the President, should not thereafter be transmitted by the President to the Congress for action, is there, Mr. Secretary?

Secretary GARDNER. No, sir.

Senator KUCHEL. So that while the President is mandated to send the final report to the Congress, there is nothing here to imply that the President shall not send any report which he receives prior to that final report immediately to the Congress?

Secretary GARDNER. Exactly.

Senator KUCHEL. Otherwise it would be ludicrous.

Secretary GARDNER. Exactly.

Senator KUCHEL. Thank you.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. No questions. I will read the Secretary's testimony. I am sorry I was late.

The CHAIRMAN. Mr. Secretary, I wish to thank you for your very fine statement and I personally want to commend you for the fine job you are doing as Secretary of Health, Education, and Welfare.

Secretary GARDNER. Thank you, sir.

The CHAIRMAN. The next witness this morning is Congressman Ed Reinecke of California.

Congressman, we are pleased to have you with us.

STATEMENT OF HON. ED REINECKE, A U.S. REPRESENTATIVE
FROM THE 27TH DISTRICT OF CALIFORNIA

Mr. REINECKE. Thank you, Mr. Chairman.

Let me first express my appreciation for the opportunity of being here. This is my first appearance before this committee. I hope it will not be the last.

The CHAIRMAN. We are delighted to welcome you.

Mr. REINECKE. Thank you.

The CHAIRMAN. You will find the Senate not too difficult.

Mr. REINECKE. I have a statement which I would ask unanimous consent be included in the record and I believe we can save a little time.

The CHAIRMAN. Then hit the high points of your statement. Without objection, it will be included in full at the end of your oral presentation.

Mr. REINECKE. Thank you, Mr. Chairman.

Let me say that my interest in this particular bill goes back many years, primarily by virtue of the fact that I am a consulting mechanical engineer licensed to practice in California, and a manufacturer of irrigation devices as well as antipollution plumbing valves. So I have been in deep water all my life, even before I got into politics.

As such, I have a very genuine interest in this field.

I might say that last year I submitted a very similar bill to that of the chairman's and I would like to review the interest in that bill at that time, thought it did not go anywhere last year, because it comes very close to the intent as indicated in your bill.

Specifically I was interested more on the basis of conservation and utilization, once the water is in the pipeline, rather than to look at it from the natural resource point of view. This is not to minimize the requirements for natural resource development and understanding, but I feel that our quickest, our cheapest source for new water in this country is to quit wasting what we have already developed.

We have spent many hundreds of millions of dollars and unfortunately we are pouring most of that right into the ocean or some polluted river and letting it go down the drain, as it were.

This was the crux of the bill I introduced last year.

I read your bill quite carefully and I might say I sponsored an identical bill in the House and I have some points I think might offer some improvement to the bill. I would like to briefly go over these amendments at this time to bring these points to your attention.

First of all, the Commission, as set up by the bill, calls for seven people. I would suggest moving it up to nine for the simple reason that it could then be divided on a 3-3-3 basis to include the Federal Government.

As I interpret the bill as written, it does not include representatives of the Federal Government and I feel that, because of the vast amount of research and surveys that have been done, ready access to this body of information should be included, plus the fact that if the Council is to be effective, certainly Federal legislation will evolve, and by working cooperatively with the various branches of the Federal Government, I think we could do a better job in the long run.

Secondly, I have indicated also that the Council should promptly review all of the existing research data that is available. There is a

vast amount of information that has already been tabulated and done and it would be a shame to see this overlooked and not taken into consideration.

Third, I would like to suggest that the Council have the authority to publish its results.

The CHAIRMAN. So that we get our nomenclature, you are talking about the Water Council or do you mean the Commission?

Mr. REINECKE. I apologize. The Commission. It should publish its results, because again it would be a shame to find out all this information and hide it under a basket. Particularly I am referring here to research pertaining to this in-the-pipeline type of conservation. Better management practices, for instance, should be made known to all of the water purveyors and water companies throughout the country so that they can take advantage of the information gleaned.

My fourth amendment is somewhat technical but simply suggests that the Commission terminate 30 days after it submits its final report rather than to run the full course of 5 years. This is just in the name of economy.

A fifth amendment would be to allow the Commission to make grants to either individuals or nonprofit institutions that could, in turn, develop some of this research. Again, a great deal of water research information has been undertaken by universities, and I would like to make it specifically clear in the bill that this practice would be continued and would be allowed under the law.

Finally, because the question has been brought up here already this morning concerning the possibility of overlapping responsibilities and jurisdictions, that it be stated that the operational area of this particular law or Commission not overlap the existing water research type of acts and so name them, so that there would be a full understanding of its areas of responsibilities and limitations.

And, finally, that the Federal Government shall not become involved as a water purveyor in the course of doing the survey. Sometimes it seems like the Federal Government tends to get into the act with more than just its original intent.

These are the amendments, gentlemen, and I feel that they are reasonable amendments and that they would go a long way toward improving the over-all intent and the effectiveness of this Commission.

I might say that by my own experience, I have personally witnessed and done some experimentation on water conservation, particularly in irrigation, and by various moisture sensing devices have saved up to 25 percent of the water required for agricultural irrigation, and as much as 50 percent in turf irrigation.

Now, out west, this amounts to a great deal of water.

Another area of interest was a brochure put out recently by Kaiser Steel where, by simply recirculating their water, they have cut their water consumption per ton of steel by some 10,000 gallons. If this were to be extrapolated over the hundred million tons of steel manufactured a year in this country, we would be talking about approximately 3 million acre-feet of water per year just in the manufacture of this one commodity alone.

I know also for a fact that the vast new sewage disposal plant in South Chicago is completely used during the summertime for preliminary processing of water effluent from the refrigerated air condition systems in the city's large buildings. Now, this water is not truly pol-

luted but no one wants to drink it and the particular code in the city of Chicago requires that it go into the sanitary sewer and therefore they built that multimillion-dollar plant simply for handling this water that simply had passed through some cooling coils.

These are the types of things that I think need our interest and need some public attention focused on them. Needless to say, the pollution aspect comes into the water management and water uses concept. My experience has shown me that there is a great deal of water that could be saved if proper techniques were used in the use of the water to keep it from getting polluted in the first place.

Mr. Chairman, I have this statement which I will submit. I also have marked up copies that include these amendments.

The CHAIRMAN. You submit that with your statement. That will be fine.

Mr. REINECKE. Yes, I will.

The CHAIRMAN. Congressman, I want to compliment you on your constructive approach to this problem. I think, other than a statutory change as you suggested of nine members and the stipulation that there be Federal representation, the Commission has the authority to do all these things.

I do believe you run into a problem if you try to define in the statute where one Commission's responsibility begins and the other ends. In the very nature of the problem it seems to me there is bound to be some overlap. If we could avoid that, I think it would be wonderful, but I am personally fearful that that is a pretty difficult task and in the long run, I am wondering if a little overlap would hurt anyway. I mean, you can't solve a problem as difficult as this one purely on jurisdictional or efficiency grounds.

But I want to compliment you on your statement and your approach. Senator Kuchel?

Senator KUCHEL. I am delighted to welcome my California colleague here this morning and to join with the chairman, Congressman Reinecke, in complimenting you on your interest, your skill and experience in this general field, and in the testimony that you have given to us.

I would be particularly interested in the authority of this Commission, including what you have suggested, about the right to contract with public or private agencies, including universities, across the country. I do believe, however, that that is sufficiently covered in the bill so as to permit the Commission to do that. And surely, simply to make it doubly sure, that could be part of the legislative history of the bill.

I made a suggestion here the other day, and I will offer an amendment on it, and let me try it out on you.

This has to be a board, whether seven members or nine members, which reflects the national interest. What would you think about an amendment to the bill providing that the members of the Commission should be subject to Senate confirmation?

Mr. REINECKE. I would think it would be very much in order.

Senator KUCHEL. At least it is something I think we ought to talk about in this committee before the bill goes to the floor.

Thank you very much. I again congratulate you on your suggestions.

Mr. REINECKE. Thank you, Senator.

The CHAIRMAN. Senator Moss?

Senator MOSS. I, too, Mr. Chairman, would like to congratulate Mr. Reinecke for his fine testimony. Obviously, he has been thinking and working on this problem for some time, and I think he has made some very sound recommendations.

I wonder about the suggestion that the Commission should proceed to make grants to institutions.

Do you visualize the Commission as being more technical in solving problems or is this to take information that is already developed and try to devise a policy to recommend?

Mr. REINECKE. I believe part of the information is already available and it would be a matter of correcting that data. I feel certain, also, particularly in the fields of usage where my experience has been, that there is a great deal of research that can still be done, and this was the reason I was interested in trying to shed some light in that direction, so that we could encourage water management research.

Senator Moss. Well, certainly I would not see any objection to the Commission having the authority specifically, if it is not in here inherently anyway, to enter into a research agreement with a university or other institution of competence.

However, since this Commission has only a 5-year life, obviously we are not thinking in terms of long range research of a type that might take years to bring to fruition.

Mr. REINECKE. I realize that. But you see some of my interest comes clear down into the homes, domestic uses of water, and frankly there is very little information on how much water is required to take a shower. And a great deal of water can be saved.

I know a few companies that have taken a commercial interest in this area and can demonstrate that you can take a shower with less water than what most people think.

And this is just a mention of one.

There are many uses in the home or in industry or in commercial activities where water is wasted and I am concerned with the wastage of water because I think it is a crime.

The CHAIRMAN. Washing machines can be designed so they don't use too much water.

Mr. REINECKE. Clothes washers, dish washers. How much does it take to flush a toilet? This is something that has received little interest but frankly I think there is a great deal more that could be done.

I was talking to the head of the Board of Water Registry of the City of New York a few years ago. He told me there are 22 million toilets in the city of New York alone. So the potential is pretty fantastic, gentlemen.

Senator Moss. Well, thank you very much.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Congressman, I have been interested very much in your presentation. You make a good witness. You have some good ideas that I

want to explore further when I get a change to see your amendments and the statement you have made.

I am pleased that you bring up one point that has been overlooked here and that is the proper use of water that we presently have, making water do double duty by sound conservation practices.

One point you bring up, however, I want to draw your attention to, and that is when you recommend a Commission of nine people, three of whom should come from the Federal Government, as I understand you to say—

Mr. REINECKE. That was the suggestion, yes.

Senator JORDAN. One of the merits of this proposal, it seems to me, is that the Commission would be wholly independent of the Federal Government. Now you are suggesting that we tie it back into the Federal Government.

Mr. REINECKE. Well, I can assure you I am generally not one who wants to include the Federal Government anywhere that I can possibly keep it out, but I think, because the pool of information that the Federal Government holds is so vast, that the Commission would be overlooking one of its real assets if it didn't have full access to this information. I feel that having a member from the Federal Government on the Commission would be politically sound in order to obtain that information.

Senator JORDAN. The bill authorizes the Commission to draw on all agencies of the Federal Government, both in the management category and also for any borrowing of personnel, and so on, and I would rather hope that that could be accomplished without the addition of naming three men from the Federal Government.

Mr. REINECKE. Perhaps it would, and perhaps just by the legislative history that is made this morning it could clarify that message.

Senator JORDAN. Thank you.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. No questions.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Congressman Reinecke, I am impressed by the information that you have furnished us this morning and very pleased to have you with us. I think your knowledge of the water program will be very valuable in consideration of legislation in this field.

I realize that you have some thoughts regarding having the Federal Government involved in this program, but do you feel that this would expedite carrying through specific work or what is your reason behind it?

Mr. REINECKE. I felt it would expedite the work, not only in making information available but having gentlemen from the Federal Government to advise the group as to what it could do and what it could not do in terms of legislation might result in speeding up the work of the Commission.

Senator FANNIN. Well, do you feel that the Water Resources Council, and, of course, the Federal Government is represented on the Council, would suffice to work with the present program that is included in this bill?

Mr. REINECKE. If there is adequate coordination, it would probably make this amendment unnecessary; yes, sir.

Senator FANNIN. Isn't that the intent, as I understand it, to have the support—

Mr. REINECKE. Yes. I just wanted to spell it out a little more clearly.

Senator FANNIN. Thank you.

The CHAIRMAN. Thank you, Congressman. We appreciate having your statement and your comments this morning.

Mr. REINECKE. Thank you, Mr. Chairman.

(The statement referred to follows:)

STATEMENT OF HON. ED REINECKE, A U.S. REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. Chairman, I appreciate this opportunity to testify in behalf of a bill in which I am greatly interested S. 3107, and its companion bills in the House of Representatives, H.R. 13940, and H.R. 13849, fulfill the spirit and intent of a bill which I authored, and introduced on July 15, 1965, H.R. 9895.

In my work as a professional engineer licensed in the State of California I dealt for over twenty years with the problems of water conservation and engineering for private industries and other heavy water users. I also served in an advisory capacity to local government water agencies. I have long been concerned about the need for further coordination between government and industry and research institutions in the matters of conserving the water resources which this nation already has. And, now, in my work as a member of the House Interior and Insular Affairs Committee, I have been further impressed with the need to deal adequately with conservation and water engineering problems in specific areas.

The Bill now before this committee, S. 3107, is a major step in the right direction to accomplish some progress in dealing with these problems. However, there are certain items which if added would improve the bill, which I feel are of great importance. I have therefore prepared certain amendments which I would like to propose at this time:

Amendment (1) Under Section 2(b) of the bill a commission of seven members is called for. I would propose a commission of nine members. Also in Section 2(b) this bill excludes anyone from the Government from serving on the Commission. I would strike the words, beginning on line 3, page 2, which say, "No members of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States."

I would insert the following language:

"It shall consist of representatives from private industry, representatives from universities and/or laboratories engaged in studies pertaining to utilization and conservation of water, and not more than three members from other Government agencies dealing with national water research and conservation."

I have proposed that a certain number of government experts be included on the Commission in order that the Commission might benefit from their experience; and in order to provide a means of immediate coordination between the Commission and the other Federal agencies dealing with water problems. We have very qualified men in agencies like the Office of Saline Water, the Office of Water Resources Research, the Bureau of Reclamation, the Geological Survey, and the Department of Health, Education and Welfare who could contribute much of the expert experience to the Commission.

It is also important that the Commission draw upon representatives from private industry and the various research institutions. Much of the testimony and reports that will be received by the Commission will be of a very technical nature. The members of the Commission must be those who are familiar with the problems of water conservation and utilization.

Amendment (2) I propose and additional subsection on Page 3 of the bill, on line 8, after the word "Council" add a comma, and the following language:

(4) Review the surveys, applied research programs and engineering projects relating to water utilization in existence on the date of enactment of this act."

It is important, Mr. Chairman, that the proposed Commission take into account the existing programs and progress made in water engineering and research.

Amendment (3) I would amend Section 3 by adding subsection (c) immediately after line 5 and before line 6, and redesignating subsection (c) of the bill, as subsection (4). The new section (c) would read "(c) The Commission is authorized to publish the results of the investigations, studies and research conducted under authority of this act and otherwise to make such information available to the public, and other interested agencies or institutions.

The importance of disseminating the findings and recommendations of the Commission to everyone interested cannot be overemphasized. The technical information gathered should be made available to research institutions and to local government authorities dealing with water problems. By publishing its reports and findings the Commission can assist local water authorities, and encourage further research and implementations of technical advances.

Amendment (4) In the new subsection (4) beginning after the words "this Act" add the following language: "or thirty days after it has submitted its final reports, whichever occurs earlier." This will simply allow the Commission to disband as soon as its work is completed.

Amendments (5) Under Section 4, subsection (7) I recommend adding words so that the sentence will read as follows: "(7) * * * enter into contracts or agreements or make grants for studies and surveys with public and private organizations or institutions and with individuals and transfer funds to Federal agencies * * *" and continuing with the wording of the bill at line 3, page 5.

Amendment (6) Following subsection (b) of Section 4 at line 14, page 5, there should be added the following two subsections to read as follows:

"(c) The Commission shall not duplicate any investigation, study, research, or other activity being conducted under authority of the Water Resources Research Act of 1966, nor under the Water Resources Planning and Water Quality Acts of 1965.

"(d) Nothing in this act shall be construed to authorize any department, agency, or instrumentality of the United States to purvey or process water."

Mr. Chairman, much research has already been done into the areas of natural water resources, into dams and reclamation, into the problems of irrigation and flood control, and into the desalination of ocean water. But very little work has been done into the matter of saving water resources that are already developed. The quickest and least expensive source for water conservation is to stop wasting water already in the pipes; already being pumped through the water systems of our cities and countryside. For example, preliminary research has shown that by using moisture sensing devices up to a 25 percent saving of water can be accomplished in farm irrigation; with these devices up to a 50 percent saving can be accomplished in turf irrigation—used extensively in the Western States. Further research is needed in finding ways to save water used in industrial operations like steel mills. Research is needed to find more efficient means of saving water used in the air-conditioning systems of large buildings; to prevent heavy evaporation of water from reservoirs; to find better and more effective ways of purifying waste water so that it can be reused for irrigation and industrial purposes. These are some of the specific areas in which greater technical coordination is needed. This can be provided through the National Water Commission. The publication of new technical advances made by one industry or one local government agency can be shared with the entire nation.

There is a great need for advanced planning of our country's water resource needs. Population trends, potential industrial growth, national defense requirements, agricultural development—must all be considered in developing and engineering water projects for the future.

Greater coordination of the efforts of the various Federal water agencies, and the work of local water authorities, of industry, and of our nation's researchers can best be accomplished through the work of this Commission.

Of all the great natural resources of this country, water is the most valuable, the most important, and the most wasted and abused. Mother Nature has been very patient with our carelessness. But the time is fast approaching, and, indeed, is already here, when the very health of our people and the wealth of our communities is at stake. We dare not miss this opportunity to act to preserve the inheritance of future Americans.

Thank you, Mr. Chairman.

89TH CONGRESS
2D SESSION

S. 3107

WITH AMENDMENTS RECOMMENDED BY HON. ED REINECKE

[Omit the matter in brackets and insert the matter in italic]

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

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

THE NATIONAL WATER COMMISSION

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

(b) The Commission shall be composed of [seven] *nine* members, who shall be appointed by the President. Members shall serve at the pleasure of the President. [No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.] *It shall consist of representatives from private industry, representatives from universities and/or laboratories engaged in studies pertaining to utilization and conservation of water, and not more than three members from other Government agencies dealing with national water research and conservation.*

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

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

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

DUTIES OF THE COMMISSION

SEC. 3. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances such as desalting and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council. (4) *Review the surveys, applied research programs and engineering projects relating to water utilization in existence on the date of enactment of this Act.*

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

(c) *The commission is authorized to publish results of the investigations, studies and research conducted under authority of this act and otherwise to make such information available to the public, and other interested agencies or institutions.*

[c] (d) The Commission shall terminate not later than five years from the effective date of this act or *thirty (30) days after it has submitted its final reports, whichever occurs earlier.*

POWERS OF THE COMMISSION

SEC. 4. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) employ and fix the compensation of such personnel as it deems advisable, in accordance with the civil service laws and the Classification Act of 1949, as amended: *Provided*, That not to exceed five persons may be employed and their compensation fixed at salaries not in excess of GS-18, without regard to such laws; (5) procure services as authorized by section 15 of the Act of August 2, 1946 (5 U.S.C. 55a) at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements or *make grants for studies and surveys with public and private organizations or institutions and with individuals* and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner; and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

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

(c) *The Commission shall not duplicate any investigation, study, research, or other activity being conducted under authority of the Water Resources Research Act of 1966 nor under the Water Resources Planning and Water Quality Acts of 1965.*

(d) *Nothing in this act shall be construed to authorize any department, agency, or instrumentality of the United States to purvey or process water.*

POWERS AND DUTIES OF THE CHAIRMAN

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

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

OTHER FEDERAL AGENCIES

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

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

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which

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

APPROPRIATIONS

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

The CHAIRMAN. Our next witness is Dr. Donald F. Hornig, Director, Office of Science and Technology.

Dr. Hornig, I understand that your statements are en route up here and they will be available for the members and to the press later. But you go ahead and proceed in your own way, sir. Either you can submit your statement in full in the record and then just give us a résumé of the high points if you wish, or read the entire statement.

STATEMENT OF DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY; ACCOMPANIED BY DR. DEAN F. PETERSON, TECHNICAL ASSISTANT

Dr. HORNIG. Mr. Chairman, I have with me Dr. Dean Peterson of the Utah State University, who is a water expert on my staff.

The CHAIRMAN. Dr. Peterson, we are delighted to welcome you. We have a Senator from your State here.

Dr. Hornig, you may proceed in your own way.

Dr. HORNIG. Mr. Chairman, if you don't mind, I would like to simply insert the statement in the record and then go over it briefly.

The CHAIRMAN. All right. Your statement will be included in full at the end of your oral presentation.

Dr. HORNIG. I am very pleased to appear before this committee and to urge the passage of S. 3107, the administration's bill to establish a National Water Commission. I believe the passage of this bill is particularly important at this time and the principal reasons are that it is increasingly clear that water problems, while many of them are local in nature, many aspects of them are national in nature. Increasingly, the scale and scope of our water problems grow as we face problems such as interbasin transfers. The problems are getting bigger than can be coped with by the basin commissions, for example. There are more general classes of problems which have been alluded to by my statement. The problems of water aren't only the development of water supplies, but the development of technology of water use. This is so with regard to irrigation and with regard to industrial use of water, where as has been mentioned, a very wide range of practices exists.

There are spreads of 10 or 20 in water requirements for industry, depending on the kind of plants, even when water is used for the same purpose. The same is true of the household use of water. We have problems of whether we can develop alternative technological sources of water, for example, the use of brackish ground water, questions of desalting.

There is a problem, then, of developing a national approach to our water problems, of weighing the potentialities, the technological potentialities, for the future, against what we do today.

Now, my office has had constant concern with water resource problems. The Committee on Water Resources Research of the Federal Council for Science and Technology has recently published, and the President has sent to the Congress, a 10-year program of Federal water resources research, for example, which is concerned with the broad problems of water resources and water resource management. This report utilized the help and advice of panels both from within and without the Federal Government.

The use of nongovernmental committees is a workable scheme, and our experience in dealing with this and with other problems—you may recollect the report of the President's Science Advisory Committee on Pollution which among other things dealt with water problems—has led me to greatly appreciate the value of outside review and assistance by an uncommitted group in dealing with important public questions.

I don't think there is any conflict between the existence of great expertise within the Government and the need for getting an outside look, an outside evaluation by people who can reflect on these programs and who can take full account of all of the expertise and information which is available within the Federal Government.

I think one of the areas that I look to this Commission for help would be to give guidance to our own efforts on the development of water resources research, which are important to the future of the country.

We have to develop better devices to use water, better agricultural practices, better means of transporting water, wasting less, evaporating less. An enormous proportion of all of the water we have available is evaporated.

We have probably devoted insufficient attention to the use of groundwater. There is a great deal more water stored in groundwater than exists in the surface water of our streams.

I think the kinds of problem, for example, that the Commission might want to deal with, general problems which don't fit simply into any of our existing frameworks, include such questions as how to establish proper balance between, for example, structural flood control works, such as reservoirs and levees, and nonstructural, policy alternatives such as flood plain zoning, flood proofing, or flood insurance.

Should there be a national policy in regard to the development of groundwater? Is national action necessary to protect our groundwater supplies, particularly in coastal areas where if they are used unwisely, one is bothered by intrusions of salt water and occasionally permanent damage to the reservoirs? The Commission could help to evolve a national policy, or at least provide a forum for discussion of the whole difficult problem of interbasin transfers. It could be a forum for considering problems of conflicts among such national goals as recreation, power, water supply, and navigation demands on the same water.

There is, of course, considerable activity in pollution but it is impossible to discuss national water problems without considering questions of how we apply technology effectively to combat pollution.

These are only a few examples of questions. I think that we badly need a commission which would have, then, a unique role in appraising and developing overall solutions to our present problems and looking forward to the potential solutions which may change our problems in the future. These are mainly in the form of technological developments in the conservation and use of water.

In conclusion, I think the establishment of a Commission would be a wise step and I think that our own experience with other kinds of commissions and committees of this sort demonstrates that it would add greatly to our ability to cope with water resource problems.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Dr. Hornig.

I take it that the Commission also could help identify some of the more important areas for research in the future. Wouldn't this be useful?

Dr. HORNIG. This would be extremely useful and we have made very concerted efforts to identify the important areas of research, but it is important that the research be tied to the problems, and this seems to me a place where the Commission would play a particular role.

The CHAIRMAN. I take it you feel that a commission of the nature contemplated in S. 3107, on which, hopefully, most of the disciplines that are involved in dealing with this problem could be represented, provides a good opportunity to take a new and fresh look and an impartial look at this problem to try to get the facts and then make recommendations.

Dr. HORNIG. My experience in other areas has been that it is extremely helpful to have a commission of this sort, in which one would have economists, water experts, and people who represent the broad public interest, all working in common on these problems, yes.

The CHAIRMAN. Mr. Peterson, did you have any supplemental comments?

Dr. PETERSON. No, thank you.

The CHAIRMAN. I take it they are not divergent?

Dr. PETERSON. Certainly not divergent.

The CHAIRMAN. All right, sir.

Senator Jordan?

Senator JORDAN. I have no questions, Mr. Chairman. I think this is an excellent statement.

The CHAIRMAN. Senator Moss?

Senator MOSS. Thank you, Mr. Chairman. I would agree with my colleagues that this is an excellent statement and I do congratulate you, Dr. Hornig, for coming here with this sort of a presentation for the committee. Your statement, it seems to me, suggests that this Commission is to be sort of an impartial but overall and balancing sort of a review of this water problem rather than having it simply with the divisions that are already existing among the various Federal agencies in the type of water work areas that each occupies. Is that right?

Dr. HORNIG. I think you have stated this better than I possibly could. We normally face divisions, both of geography within the country and compartmentalization within the Government, and I hope that the Commission would surmount both.

Senator Moss. It would be broad enough that it could cover the whole area and yet command the expertise of various groups that it needs to draw upon in order to form these balanced judgments and then recommend?

Dr. HORNIG. I would hope it would command all the expertise necessary and that the excellence of its judgment would then commend its solutions to the Congress and to the public.

Senator Moss. Thank you, sir. I am pleased to see that Dr. Peterson is here with you. In our State he has been one of our foremost experts in the field of water resource and technological development, and so I am most pleased that he is accompanying and working with you, sir.

Dr. HORNIG. I need not say I have relied on him greatly in the past year.

The CHAIRMAN. Senator Fannin?

Senator FANNIN. Dr. Hornig, I was very impressed with your statement, especially your broad view of the potentials for the future, taking into consideration what you have said regarding the water program and other projects that will be looked at in the future. I just want to express my appreciation to you.

The CHAIRMAN. Senator Burdick?

Senator BURDICK. Mr. Chairman.

Doctor, I notice in your statement on page 3 you remind us that research is going on now under the Water Resources Research Act in the 51 land-grant colleges and in Puerto Rico.

One of the witnesses this morning suggested that perhaps this bill should embrace a research segment. What do you think about that?

Dr. HORNIG. I wouldn't think that the support of research per se, which would turn the Commission into an operating agency of sorts, would be wise. In the normal course of events, I think the Commission would find itself calling on the existing expertise both within the Government and universities and in the private sector for its judgments. There might be occasions where information had to be developed or analyzed, and I think it shouldn't be prohibited from letting a study contract here or there to assist it at key points, but I would not think it wise to establish a program of any sort.

Senator BURDICK. In other words, you think the present machinery will take care of that.

Dr. HORNIG. I think the present bill will take care of it very nicely.

Senator BURDICK. I was interested in your comments about underground waters. Are you familiar with the project at Minot, N. Dak., where they artificially recharged an aquifer?

Dr. HORNIG. I am not familiar with that particular one but in a number of areas in this country, for example, Peoria, Ill., this has been done. There have been experiments at Penn State and other places that I am familiar with. I think this is one of the aspects of water reuse that is very important, the idea of not spilling all our water off into streams and off into the ocean.

Senator BURDICK. This is a very fascinating case. This is a case where they sank some tubes into the ground and took some waters from nearby streams and started to refill this aquifer. It began an action like a priming action and restored this aquifer and took care

of the needs of this city for at least the time being. And I think this is a very fascinating phase of water development and water programs.

Dr. HORNIG. I think in the long run that good water management is going to require a very large scale discharge of waters back into aquifers, along just the lines you mentioned.

Senator BURDICK. Thank you.

Senator KUCHEL. Off the record.

(Discussion off the record.)

The CHAIRMAN. Dr. Hornig, Dr. Peterson, we want to express our appreciation to you for your assistance and help and we compliment you on your fine presentation.

Dr. HORNIG. Thank you, Mr. Chairman.

(The statement referred to follows:)

STATEMENT OF DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY

Mr. Chairman, members of the committee, I am very pleased to appear before you today and to urge passage of S. 3107, the Administration's bill to establish a National Water Commission. I believe passage of this bill is particularly important at this time.

It is now very clear that our water resource development has become a matter of paramount national interest. No region has escaped the problems of short or polluted water supplies at one time or another, and actions taken in one part of the country have their effects in remote regions whether these actions involve the physical diversion of water, the development of recreational facilities, the preservation of wild lands, or the establishment of pricing policy. The wild rivers of California interest the New England conservationist, and the diversion of water for irrigation in Wyoming affects the electrical power output at Hoover Dam.

We now have the capability to make physical changes in our water resource which involve large areas of the country. Changes in the management of the Great Lakes would be of concern to all of the states contiguous to the Lakes, to part of Canada, and quite possibly to part of the Mississippi Basin as well. The proposed Central Arizona project now contemplates importation into the Colorado Basin but implicitly to the four Northwest states also—all of the states west of the Continental Divide. These large projects are truly of national concern in a real physical sense. They clearly extend beyond the purview of even the river-basin commissions to be established under the recent Water Resources Research Planning Act. At some future time we may consider the great North American Water and Power Alliance scheme which would involve a large part of Canada, much of Mexico, and two-thirds of our states.

One important result of the study and discussion which has taken place throughout the nation in the last two or three years is that we now have a better understanding of our water resource, its nature and the problems of our society in developing and managing it than we have ever had before. The importance of these problems requires that we seek every possible means to attack them on all fronts. The proposed Presidential Commission will provide an important national capability—an over-view of our national effort in water by some of the best thinkers and most experienced experts in the field. It will provide for an independent evaluation of pressing problems beyond any commitment to state, local, or regional interests or to any particular agency mission.

The progress made by this Congress and the last one in setting the stage for a truly national effort to preserve and effectively utilize our water resources certainly needs no review before this Committee. The 89th Congress has an enviable record in its dedication to conservation and to water resource development. The concept of a National Water Commission is eminently consistent with the spirit and foresight of these actions.

Under the Water Resources Research Act, the research and educational resources of all 51 land-grant universities and associated institutions in all of the states and Puerto Rico have been mobilized. Title II of the Act amended and signed by the President last month permits the Office of Water Resources Re-

search to call on research capabilities wherever they may be found to provide additional scientific and technological support as needed for water resources development.

Other legislation insures that wilderness areas, wild rivers, and recreational areas will be included as important and necessary parts of our resource development effort. The Water Pollution Control Administration is being developed into an integrated agency with the explicit mission of cleaning up our polluted streams. Under the Water Resources Planning Act, comprehensive river basin planning in full partnership with the states and all of the Federal agencies may now go forward officially for the first time. A Commission such as the one proposed would be a significant addition to this list of accomplishments.

Quite frequently, the Office of Science and Technology has been asked by the President to consider important water resource problems. The Committee on Water Resources Research of the Federal Council for Science and Technology was established in 1964 and has the standing assignment of coordinating water resources research. Recently the Committee prepared the report, "A Ten-Year Program of Federal Water Resources Research," which was forwarded to the Congress by President Johnson in March. In preparing this and other reports, the help and advice of panels and consultants drawn from universities and other agencies outside the Federal Government was freely utilized. These panels and consultants made many stimulating suggestions. Experience has led me to greatly appreciate the value of outside review and assistance by knowledgeable private citizens. Such consultants and panels are regularly used by my office.

The work of the Commission will have an important relationship to that of the Committee on Water Resources Research. The Committee seeks to develop the most useful research program possible, based on its concept of present and future water resource problems. Recommendations of the Commission will help the Committee to assign priorities and identify areas of needed research which might otherwise be overlooked. Conversely, the efforts of the Federal agencies and others engaged in research will continue to open up many new opportunities. American science and technology has amply demonstrated its capability to develop new and ingenious ways to cope with physical problems, including water problems. Given encouragement, it can develop even better devices and techniques to help conserve our water, regenerate it when polluted, or manage it more effectively. Science has developed techniques of analysis, using computers, which are capable of handling extremely complex systems, previously completely intractable. These powerful tools can be used to decide on the best way to develop multiple-objective water plans. A national technology, which is well on the way to placing a man on the moon, can certainly contribute with increasing effectiveness to our national water program. The Commission will need to appreciate fully the opportunities for scientific and technological advance in the water field, be able to make the best possible technical judgments as new opportunities unfold, and assess the relative merits of new technological alternatives for solving our water resource problems.

The task of the Commission in assessing our water supply needs against our potential physical water supply has already been discussed by others. The Commission is directed to review and advise on the entire range of water resource problems. It can do a great deal to identify those areas of inquiry where solutions to water problems are most urgently needed and to bring into focus the more important considerations involved in each case. These questions need frank and open discussion. I believe the following are typical questions which might be considered by the Commission:

How can a proper balance be established between structural flood control works, such as reservoirs and levees, and non-structural alternatives such as flood plain zoning, flood proofing, and flood insurance?

What should be the national policy in regard to development of ground water? Is national action necessary to protect our ground water supplies, especially in our coastal plains?

What shall be the basis for discussion of interbasin transfers of water?

How can the conflicts among recreation, power, water supply and navigation demands in the same river basin be resolved?

How should we apply our knowledge of technology and economics to combat pollution in our lakes and river systems?

How can a proper balance between the conservation values of wild rivers and national parks and monuments and the values for irrigation, hydro-power and industrial and municipal water supply be determined?

These represent only a few important examples of questions which need to be carefully considered by a detached group without commitment to any special mission or particular institution.

There are many other opportunities for study which would be open to the Commission. For example, we do not know how to make allowances in our water resources planning for technological advances which may be available in the future. Conversely, our developing society may impose new demands on our water resource which have not yet been anticipated. More effective institutions than are now available could possibly be developed to cope with our water resources problems. For example, the Delaware River Commission provided very important capability in dealing with the Northeast drought. It could take important emergency steps which otherwise probably would not have been possible and which were highly effective in mitigating the consequences of the drought.

The Commission should be in an excellent position to make suggestions about the desirable course which research and technological development might take. It could advise on programs of public information and manpower development.

I visualize the National Water Commission as having a unique role in appraising and developing solutions to the water problems of our nation. I see it not as a mere compendium of regional viewpoints, but as a truly national commission. The Commission will complement the work of the Water Resources Council by providing an assessment of our water problems and their solutions from an outside vantage point.

The bill before the Committee appropriately provides for desirable coordination between the Commission and the Council, but at the same time preserves the independent role of the Commission.

In conclusion, creation of a National Water Commission at this time would be a wise step. The Commission will provide an important complement to the efforts of the Federal Government and the states and communities. Efforts have recently been stimulated by new Federal legislation as well as by a growing public awareness about our national water problems.

The CHAIRMAN. Our next witness is Mr. Alfred B. Fitt, General Counsel and Special Assistant for Civil Functions, Department of the Army.

Mr. Fitt, you may submit your statement for the record if you wish. You have a short one.

STATEMENT OF ALFRED B. FITT, GENERAL COUNSEL AND SPECIAL ASSISTANT FOR CIVIL FUNCTIONS, DEPARTMENT OF THE ARMY

Mr. FITT. I have a very short statement, Mr. Chairman, and I propose to read it.

The CHAIRMAN. All right, sir.

Mr. FITT. If that is agreeable.

Mr. Chairman and members, I am Alfred B. Fitt, Special Assistant to the Secretary of the Army for Civil Functions. I am also General Counsel for the Department of the Army and the Secretary's alternate on the Water Resources Council.

As a member of the Water Resources Council, the Department of the Army would welcome the creation of the National Water Commission contemplated by S. 3107. It is our view that such an ad hoc commission would be of great value in exploring the expanding frontiers of water resource development. The National Water Commission, as we understand it, would be concerned not with the day-to-day problems of implementing national water resource development policies, but rather with the larger questions concerning policies which are as yet unformulated. It would not concern itself with the planning and coordination functions assigned the Water Resources Council under the Water Resources Planning Act of 1965. We think the

two bodies would complement each other, that they could work together in full harmony, and that when the Commission finishes its labors the Council will be able to proceed with much greater confidence that its program will meet the Nation's long-range needs.

A body of distinguished private citizens can undoubtedly deal more effectively with certain broad and long-range aspects of national policy than can the experts responsible for carrying out the action programs through which the resources are developed. A Commission of this nature is especially qualified to offer recommendations on the need for interchange of water between major river basins and on the policies which should govern such interchange. A National Water Commission is needed also to propose criteria for choosing between development and preservation, to design a Federal policy on priorities of water use, to make recommendations on Federal subsidies, and to deal with other problems in the solution of which judgment of a high order is a more important factor than technical competence.

The great issues confronting the Nation in the field of water resource development, utilization, and conservation should, we believe, be weighed objectively and from the national standpoint, by just such a body as the one contemplated by S. 3107. The Department of the Army recommends, therefore, that the Congress enact this bill.

Your courtesy in affording the Department of the Army an opportunity to present its views is greatly appreciated.

Thank you.

The CHAIRMAN. Any questions of Mr. Fitt?

Senator KUCHEL. Let me ask a couple.

Mr. Fitt, what do you mean on page 2 when you talk about this Commission designing a Federal policy on priorities of water use? What do you have in mind?

Mr. FITT. Well, of course, the Commission's role is that of a recommending body, and it would not itself design Federal policy on water use priority. It would make its recommendations through the Water Resources Council to the President and then, of course, ultimately to the Congress.

Senator KUCHEL. What you are saying, then, is that you have in mind that the Commission might make comment on the problem of the priorities of water use.

Mr. FITT. Yes, sir.

Senator KUCHEL. And when you use that phrase, priority of water use, do you mean priority based on State law where the water is located?

Mr. FITT. Well, no. I think the kind of priority I was referring to had to do with the situation where there will be competing needs in many places, each of which has substantial justification. Selection between water quality control storage or water supply on one hand, and the use of water for power development on the other; this and similar problems present many difficult choices throughout the Nation.

Senator KUCHEL. Priorities based on the Commission's recommendations or feeling with respect to what use or uses best serve the public interest?

Mr. FITT. Well, the Commission, of course, would only recommend a framework for application in a broad regional context.

Senator KUCHEL. They could not establish priorities.

Mr. FITT. That is right.

Senator KUCHEL. And to make recommendations on Federal subsidies, what do you mean by that, Mr. Fitt?

Mr. FITT. I think this is the kind of problem that Dr. Hornig touched on.

For example, in choosing between the use of Federal flood control structures to reduce flood damage as compared to flood plain zoning. Another example is in the field of irrigation. I am sure there are similar examples.

Senator KUCHEL. No further questions. Thank you very much, sir.

The CHAIRMAN. Any further questions?

Senator JORDAN. No questions.

The CHAIRMAN. Thank you, Mr. Fitt. We appreciate having your statement.

Our next witness is Dr. James Crutchfield, Professor of Economics at the University of Washington. He has also taught at the University of California at Berkeley. He is a widely known expert in the field of water resource economics and has published extensively in this field. He has served as a regional economist for the Office of Price Stabilization and has served in Uganda, Kenya, and as an FAO economist. He has also served as a consultant to the Canadian Government.

Dr. Crutchfield is currently a consultant to the California Resources Agency.

Dr. Crutchfield, it is a real pleasure to welcome you to the committee this morning.

STATEMENT OF DR. JAMES CRUTCHFIELD, PROFESSOR OF ECONOMICS, UNIVERSITY OF WASHINGTON

Mr. CRUTCHFIELD. Thank you, Mr. Chairman, members of the committee. I have prepared a statement, Mr. Chairman, which apparently was lost in the Pony Express somewhere coming from our more primitive part of the country, but I would like, if I may, simply to summarize.

The CHAIRMAN. All right. We will include the statement in full at the end of your oral testimony and you proceed to summarize and give the high points of your paper.

Mr. CRUTCHFIELD. Thank you, Mr. Chairman.

I appreciate very much the opportunity to appear before the committee as a proponent of the National Water Commission. I believe the objectives set forth in S. 3107 are an excellent statement of need in this area of vital concern.

My particular interest in the situation can be summed up by pointing out that the role of the Federal Government in water resource development is a vitally important one. While I do not feel that the existing water situation is critical, nevertheless it is going to become more and more expensive to meet our problems of water supply and water quality in the near future, and the need for efficiency in that process seems to me an extremely important item. For that reason I would like to concentrate on some of the areas in which the efficiency of that process could be enhanced by the provisions that are contained in this bill.

As a number of other witnesses have pointed out, there is no single answer to the water problem and probably within no single region

could we find permanent solutions except as part of a national water policy or program. I was particularly gratified to hear the distinguished Representative from California, for example, point out as explicitly and efficiently as he did the possibility of adding significantly to the effective supply of water through greater efficiency in its use. We have tended so often to think of the water problem in terms only of developing new supplies and too little in terms of the greater efficiency of the use of our existing supplies, including reclamation of water that has been degraded in various ways.

I think every economist who is concerned with water has expressed some very serious concern about the persistent tendency to price water below its full economic value and the impact of that on available supplies of water. As long as water is underpriced for any user, whether it be in agriculture, municipal use, or industrial use, he will use too much of it and he has too little incentive to find ways to search actively for ways of economizing on the amount of water required. And in the process, every time he uses more water than technically is actually required, he creates that much more of a water quality problem in the process.

I think that in many areas of the country the failure to price water in a more realistic way has tended to create an illusion of water shortage well in advance of the actual need for that situation.

I think perhaps the most serious of the policies that have led to this that might be a matter of careful consideration by a National Water Commission are the longstanding policies of subsidizing agricultural production by providing water at considerably less than the actual cost of delivery. I do not think anyone in my profession would doubt the important part that has been played by large-scale water development projects in the development of commercial agriculture, and the associated development of the regions involved. I feel that the conditions that justified that policy in the past may well have changed significantly as the country has developed, and that there is an urgent need to determine whether or not the most efficient use of water in fact is promoted by continuing to use the price of water as a technique for providing agricultural subsidies.

If indeed agriculture does require subsidy assistance, there may well be far more efficient ways of doing it than providing the wrong quantities of water and water projects in the wrong places.

I would like to stress very strongly that a more realistic pricing policy for water in agricultural use will not turn the West into a desert or anything approaching that. Agriculture, like all other efficient technical users of water, is strongly influenced by the price it has to pay, and if it pays a higher price, it has both the incentive and the demonstrated capability of using water more efficiently, of finding more efficient crop allocations that will use less water, of making it become more effective.

The argument that we must provide more and more water for more and more irrigated acreage because of pending food shortages, nationally and in the world situation, I think, is highly suspect on the part of most professional economists. As far as the United States itself is concerned, the record seems quite clear that technological progress in agriculture has been greater than almost any other sector of our economy. We have had continuing surplus problems largely

because of the tremendous rate of technical improvement that has taken place. I believe there is no indication at all, then, that the amount of acreage required to meet our expanding economy's food and fiber needs for quite a long time to come will actually be—and even if additional acreage may be required, additional food production be required—it is not at all clear that an expansion of irrigated acreage in the relatively arid West is the most efficient way of accomplishing that.

To the extent that the United States does undertake major commitments to assist in food production to relieve shortages abroad, it is very likely that the major U.S. contribution could be made in technical and capital assistance in areas closer to the actual area of need and that supplemental irrigation in this country could also be a more efficient way of dealing with the problem.

I also would like to stress the fact that, while the Congress has taken a tremendous stride forward in the field of water quality management in the recent legislation passed, there is a long gap between a statement of purpose and an excellent analytical framework for improving the Nation's water quality nationally and actually getting down and getting the job done in particular regions and particular areas.

The nature of the water quality problem as an economist's problem, I think, is pointed up by the fact that it is extremely easy to yield to the temptation to shift the costs of water pollution onto someone else's shoulders and that business firms, agriculture, municipalities, and even some Federal agencies, are always strongly tempted by the possibility of letting someone else pay the bill in terms of correcting water quality that has been degraded or actually forgoing some uses of the water.

It is quite possible again that a much more realistic policy with regard to water quality standards and for charges for the use of water sources for waste disposal would lead to the engineering away of a considerable amount of the waste that is presently being generated that has to be disposed of through water.

Again, a national approach to water quality standards has been taken. It calls for an equally broad approach to the implementation of water quality.

I would support strongly the position expressed very well by Dr. Hornig with respect to alternatives.

National water policy calls for a consideration in many cases of non-water alternatives to some of our more expensive water structure problems. In flood control, for example, the policy of building to the last possible ounce of protection that may be needed fails to consider a number of major alternatives such as flood plain zoning or other emergency measures that might reduce significantly the overall cost of the program.

The same is true with regard to water quality.

Economists share, I think, a concern of a great many other people with the influence of water on the quality of our environment. And one of our most pressing problems is the difficulty of incorporating in standard agency procedures the real economic importance of outdoor recreation, of wildlife, of the preservation of national beauty.

There are now procedures available—they are being developed fairly rapidly—for more accurate decisionmaking with respect to

these intangible aspects of life. A National Water Commission could do very well to assist in incorporation of these procedures into actual agency operations.

I would like also, if I may, Mr. Chairman, to point out that a mere listing of problem areas of this sort testifies to the fact that our water agency procedures at the present time are something less than adequate in the opinion of many economists. This is not a matter of the integrity or the competence of personnel in such agencies as the U.S. Corps of Engineers or the Bureau of Reclamation. But it is true that the responsibility over the Nation's water supply is divided among agencies that have different objectives, different legislative constraints, that sometimes do not have control over all of the alternatives that should be considered in projects with which they are concerned.

There is also some doubt about the actual evaluation procedures that are followed as a matter of policy by our national agencies. For example, the Bureau of Reclamation follows policies with regard to the discount rate used on projects, the failure to charge interest on capital costs assignable to irrigation, the long deferral of payments after water deliveries have actually been undertaken. The fact that the Bureau of Reclamation follows water evaluation policies that are different than those of the Corps of Engineers and of major State agencies such as the Department of Water Resources of California implies that everybody cannot be right at the same time. I believe that some updating of procedures for water evaluation to bring the agency procedures more in line with current professional thinking is very much a matter of concern to the new Commission if it is created.

Finally, I would like to suggest that there is urgent need for an independent audit of Federal project evaluation in the field of water resources. There is no such full audit possible at the present time. By the time the Bureau of the Budget gets the projects they are relatively fully developed and the auditing process needs to be undertaken by an agency independent of that planning the project, and it needs to be undertaken as a part of the planning process itself so that the adequacy of the factual basis can be considered at the time.

It does not seem to me, then, that the Commission proposed in this legislation would be a duplication of efforts in the existing action agencies or of the Water Resources Council. Rather, it represents a necessary step, in my opinion, for a thoroughly independent review of a set of national principles, the application of which could produce much better answers to the diverse regional problems that we face.

For these reasons, Mr. Chairman, I would support the bill.

The CHAIRMAN. Thank you, Dr. Crutchfield, for a very excellent résumé of your paper.

I was interested in your comments with reference to the differential that exists in the price structure between the Federal agencies, such as the Bureau of Reclamation, and I think you mentioned the State of California. Could you comment on that?

Mr. CRUTCHFIELD. Yes.

The CHAIRMAN. How wide a discrepancy and what is their approach as distinguished from the approach made by the Federal agencies?

Mr. CRUTCHFIELD. The Department of Water Resources of the State of California, Senator, has a pricing policy much more closely in

line with that of which most water economists would like to see. In general it is a policy that those who use water must provide for full repayment of the costs of producing and delivering that water. It is a policy that requires all users of water to pay essentially the same price at point of delivery. This contrasts very sharply with the water-pricing policy in the Federal agencies, the Bureau of Reclamation, for example, in which water for irrigation use is priced far below the level that has to be paid by other users.

There are areas, for example, in California where \$4 water is available for irrigation at the same time that it is necessary to provide \$28 water for municipal and industrial use. In that respect I think that the discrepancy suggests very strongly what could be gained by reallocating water to obtain the largest net benefit from it.

The CHAIRMAN. That is a very interesting observation.

Senator KUCHEL?

Senator KUCHEL. Well, on that point, Doctor, and I must say I am delighted to listen to you, it is a fact, is it not, that the multipurpose character of Federal projects is different from the character of those projects in California which conceivably could have a bearing on the price structure of delivered water for irrigation?

Mr. CRUTCHFIELD. Not entirely, Senator. I believe the California water projects are themselves multipurpose and they are planned essentially as an integrated water system. They have power generation, they have potential irrigation, municipal and industrial use in mind.

Senator KUCHEL. I think that opens up a subject that ought to be part of the inquiry which this Commission would make.

You mentioned the problem of efficiency, too. I am simply intrigued by those areas in my State which now, with Federal help, are fighting salt water intrusion by pumping sewage into the ground to act as a barrier. This has to be done because the sinking water tables require it, absent some scheme of importation. And here again the economics of efficiency are most important.

Well, all I can say is that your testimony is excellent and I am delighted to have a chance to listen to it.

Mr. CRUTCHFIELD. Thank you, Senator.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Thank you very much. You make a good point, Doctor, I believe, when you talk about pricing water, that those people who use water should be charged enough for it to restore its potability, in a sense to restore it to as good a state as they receive it. Is this what you are saying?

Mr. CRUTCHFIELD. Not in all cases, Senator, although I think the principle is the one I stated, that there are lots of cases in which some degradation of water quality is simply inevitable. Civilization generates a tremendous amount of waste. But I think the basic principle is as you have indicated. If someone is required to pay the full cost of dumping waste in water or anywhere else, then we harness the ingenuity of the individual businessman, the individual farmer, the individual municipality manager, to reducing the amount of waste to be disposed of.

It is not a given quantity and by more appropriate placing of the costs on the proper shoulders we get the maximum possible progress toward waste reduction, which is at the heart of the problem.

Senator JORDAN. That is a constructive suggestion. I appreciate your testimony.

The CHAIRMAN. Senator Fannin.

Senator FANNIN. Doctor, I agree with you in many respects, although I think that you have posed a theoretical problem rather than the practicalities of what we are involved with in many instances. I think if we were starting a project, an original project, that may work out. But you agree we must cope with the economics of the situation that we face in any particular area.

Mr. CRUTCHFIELD. Yes, sir. The unscrambling of eggs is never a very profitable proposition. We have water problems and policies ongoing that must continue and must carry through.

Senator FANNIN. We have long-range programs that already have been placed into effect and have a goal to attain, but I just question in many respects whether or not we can apply those recommendations that you are making. So this is why you say we should go forward with this Commission.

Mr. CRUTCHFIELD. That is right, sir. I believe there are some long-standing, deeply rooted Federal policies with regard to water that could stand a very careful review, but because they do cut across a great many ongoing programs, it is not something that can be undertaken immediately or lightly. And for that reason, I believe a national review of the situation by the most competent independent group that could be assembled is the proper first step.

Senator FANNIN. Thank you.

The CHAIRMAN. Once again, Dr. Crutchfield, we want to express to you our appreciation for an outstanding statement, and I want to thank you for coming this distance, too, to present your views to the committee. Your entire statement will be included, as I previously stated.

Mr. CRUTCHFIELD. Thank you, Senator. I appreciate the opportunity.

(The statement referred to follows:)

STATEMENT OF DR. JAMES A. CRUTCHFIELD, PROFESSOR OF ECONOMICS, UNIVERSITY OF WASHINGTON

I appreciate the opportunity to appear before this committee as a proponent of a national water commission. The objectives set forth in S. 3107 are an excellent statement of need in an area of vital concern to every segment of the American economy.

There is no need to elaborate the need for efficiency in the use of existing water supplies in the United States and in the development of new sources. Engineers and economists concerned with the national water situation are in general agreement that the supply of good quality water is not in a critical state but the necessary increases will be forthcoming only at steadily higher costs. The uneven rate of economic development in various regions of the United States and the unequal distribution of natural supplies of surface and groundwater accentuate the problem.

Water is a peculiar commodity in many respects, not the least of which is the fact that it can render multiple services, all of which involve some alteration in both the quality and quantity of water available for others. As a result, the "supply" of water is a slippery concept to define. On the broader national scene we have tended to think largely in terms of development of new sources—essentially improved usage of existing surface flows—when we talk of adding to our water supplies. Yet an increase of major proportions in the total net economic benefits from water can be obtained by reallocating existing supplies among present users and by taking full advantage of technical progress in reducing water losses. In addition, reclamation of brackish and waste waters and

preventive measures to reduce pollution can be regarded as net additions to the supply of economically useful water.

Partly because the supply of water is flexible in these respects, there is no single answer to "the water problem." National water policy must deal with a complex bundle of regional problems, each with its characteristic local elements, but all linked in a national pattern by overlapping supply and demand interdependencies. There are no simple, final answers to the problems of water supply and quality in any one region; and no one region's problems can be resolved in the long run except as part of a consistent national program designed to assure continued technological improvement in the use of current water supplies and proper scale, location and timing of projects necessary to meet future needs.

Virtually every economist concerned with water has expressed unhappiness about the persistent tendency to price water below its full economic value. Quite apart from the random effects of this policy on income distribution, it results, inevitably, in reducing the net economic contribution of water in its many uses. As long as water is underpriced for any user he will naturally tend to substitute it for other productive services wherever possible, whether the use in question involves irrigation, industrial cooling, waste disposal, or street washing. There will be little incentive to look actively for ways to reduce water inputs or to make use of water-saving techniques developed by others. And every step away from economy in water use is a step in the direction of more serious pollution. A new national policy with respect to the pricing of water from federal projects is long overdue.

Failure to price water on a sound economic basis has tended to create the illusion of shortage far in advance of actual need. The most serious situation in this respect is the impact of a long-standing policy of subsidizing agricultural development by providing water at less than the actual cost of delivering it, and—in many cases—far less than the price that other users would be willing to pay. In the western half of the United States a major part of the consumptive use of water is for irrigation purposes. No one would contest the important part played by large scale water development projects in the development of commercial agriculture in the western states. But the conditions that may have justified the extension of handsome subsidies to agriculture in the form of underpriced water no longer prevail. Even if the desirability of subsidizing agricultural output is accepted, there are far more efficient ways to do it than by inducing farmers to use more water than they should, to grow the wrong pattern of crops, and to force federal and state water agencies into premature and unbalanced projects for development and transfer of new water supplies.

The situation is compounded by the fact that more and more irrigation water has been drawn from underground sources, much of it on a "water-mining" basis. Because there are wide areas in which irrigation simply cannot continue at present levels because of declining water tables, the pressure for further water development projects to provide surface supplies for irrigation or to recharge groundwater sources is intensified. Even in the east of crops that are sold at market prices, the subsidy to irrigated agriculture involves a transfer of income to farmers from other water users and the general public of a random nature, serving no particular economic goal for the nation as a whole. In the east of crops whose prices are supported, the transfer effect is obviously even greater.

It should be stressed that a more realistic pricing of water for agriculture purposes will not turn the west into a desert. Many crops could well afford to pay prices reflecting the full cost of water delivery. American agriculture can and would seek out many ways of adjusting to higher water prices: by shifting crop patterns, by using water more efficiently, and by changing to production methods that require less water.

What of the argument that expansion or irrigated acreage in the United States is imperative to meet impending food shortages? In the opinion of most economists, this involves a mixture of unsupported assumptions and outright errors. It is by no means clear, for example, that the food and fiber requirements of a growing American economy will require cultivation of larger total acreages, though the types of land used and the areas of cultivation may well change. The continuous agricultural surplus problem that has plagued the United States for decades is ample testimony to the incredibly rapid technological pace in agriculture and the consequent stabilization or even reduction of the total acreage and labor services required to meet expanding demands.

If we look instead at the world situation, and assume, for the moment, that the United States has undertaken a commitment to meet massive increases in world demands for food, it is still highly questionable that the most efficient

way of achieving this objective is by expansion of irrigated acreage in the west, with its heavy demands on already scarce water resources. One of the most efficient methods would involve expansion of output through American technical and capital assistance abroad, in countries closer to the areas of most insistent demand. Even in cases where American agriculture is to meet international demands, it is likely that supplemental irrigation and concentration on the more highly productive agricultural areas would produce larger amounts of food per dollar of inputs than would expansion of irrigated acreage in the west.

I have dealt with this subject at some length because it points to the pressing need for a major investigation of the role of water in American agriculture, national in scope and free of regional partisanship or of biases inherent in the approach of those whose agency missions are intimately bound up with present water pricing policies.

A review of agricultural water policy would automatically carry with it the presumption that a study be made of regional economic objectives, particularly as they relate to water usage. The issues involved are far too complex to be discussed in detail in this statement, but one illustration might be offered. Present water policies in some of the water-deficient regions imply a commitment to provide water at constant prices to any number of people who choose to settle or establish any kind of business or farming operation wherever they choose. But clearly, this flies in the face of the principle that most efficient economic development of a region be based on intensive use of the productive factors which are most abundant in the area. In practice, it means that regional economic development in the areas concerned can only be sustained by imposing increasingly severe costs on water users in adjacent regions and on general taxpayers as the cost of interregional diversion projects mounts. It does not seem unreasonable to question whether the mountain must, in all cases, come to Mohammed.

In recent years, much progress has been made in defining the essential nature of the water quality management problem—a better term, incidentally, than pollution control. There is increasing recognition of the fact that many of the more serious cases of pollution arise from the fact that it is both possible and profitable to shift the cost of waste disposal from the municipality or business firm developing the waste to others who must use water of degraded quality, incur heavy costs to rectify it, or simply forego valuable economic usages because water quality cannot be made adequate at any cost. Similarly, it has become clear that the amount of water used and therefore the amount of pollution generated is by no means a fixed magnitude for any given household, industrial, or agricultural operation. If water charges and charges for the use of water courses as a vehicle for waste disposal are made sufficiently realistic, the amount of waste actually generated can be engineered to much lower levels. In effect, there is urgent need for region-wide analysis of our water supply systems, and for investigation of all alternative means of reducing the aggregate amount of waste to be handled.

Although recent federal legislation to establish water quality standards represents a giant stride forward, a tremendous amount of research and experimentation in system-wide water quality programs remains to be done before its full benefits can be realized. It is one thing to define analytically a cost-minimizing waste disposal system, fully integrated with its related water supply system, and quite another to develop data accurate and extensive enough to make it operational. A national approach to water standards calls for an equally broad approach to their implementation.

The development of plans for larger, longer-lived, and more expensive water development and transfer projects raises some pressing economic problems to which an impartial national authority could well turn its hand. It must be remembered that capital-intensive multiple purpose water projects effectively lock us into a system of water, power, irrigation, and flood-control over long periods of time, with only limited flexibility to meet the inevitable uncertainties of a dynamic, rapidly growing economy.

They frequently make it difficult, if not impossible, to take advantage of technological developments in alternative methods of providing many of these services. With respect to hydroelectric power, for example, calculation of economic benefits as the difference between the cost of producing hydroelectric power and that of the best alternative overstates benefits seriously over longer periods of time by ignoring the consistent record of technological improvement in thermal power. Similarly, steady progress in the field of

nuclear power generation should make us wary of firm commitments to extremely large, multiple purpose water development projects in which power provides the major economic justification for the investment. As indicated below, the use of excessively low discount rates in the evaluation of water projects tends toward just this type of distortion and inflexibility in public investment.

All of these comments point up the economist's insistence on looking at alternatives wherever large scale public investment, in water or anything else, is concerned. Construction of a water project that does not cover its full costs, or the deliberate underpricing of water to an agricultural or industrial user, is undesirable not only from an equity standpoint, but because it ties up valuable resources, human as well as physical, that could make a larger contribution to the national welfare in other uses. By the same token, the authors of a national water policy should take a long, careful look at the way in which present values are related to future values. Virtually every economist concerned with public investment in water facilities agrees that the discount rates used by the water agencies do not reflect current professional opinion. While there is much disagreement as to the actual rate to be used, there is a general consensus that the rates now used by the federal agencies are so low as to result in serious errors in estimation of costs and benefits, and a resulting tendency to favor excessively large, and excessively long-lived projects at the expense of other approaches that are more flexible and more efficient.

The same kind of reasoning underlies the need for a systematic study of emergency procedures to deal with unexpected developments in water demand and supply. The recent water shortage in New England is simply a dramatic illustration of a general problem affecting water supplies and water quality throughout the nation. Variations in water flows around average figures are so great and may persist over such long periods of time that serious deficiencies in both quantity and quality of water can and will arise if we "sail too close to the wind." At the same time, a large amount of unnecessary economic waste can be inflicted on the public by insisting that all water projects should have an average capacity equal to peak requirements under the worst possible set of circumstances. Thus, if water structures are built to insure protection against the worst conceivable flood, or the most persistent possible drought, the cost in terms of underutilized capacity over long periods of time may far exceed the costs of the rare contingencies they are designed to meet. More practical ways of meeting many of our emergency situations with respect to water supply, flooding, and water pollution, may be available if we consider alternative temporary measures to meet emergency conditions, with our major investment geared to meet only normal loads. Research along these lines is urgently needed, since they suggest the possibility of a major revision of present concepts of structural control and transfer of water used by federal agencies.

Economists share the concern of many other groups with the impact of economic growth and urbanization on the quality of the environment, both rural and urban, in which we live. Water is at the very heart of the problem, since continued access to wildlife, outdoor recreation, scenic beauty, and wilderness areas—essential elements in the American heritage—involves competing uses of water. Unfortunately, there is no generally applicable method of putting dollar values on many of these non-marketed services, yet no one can deny that they play a vital role in the long run welfare of the American people. The record of the past demonstrates that we have consistently underinvested in the quantity, quality, and diversity of outdoor recreation and the amenities of life. It is a matter of national concern that promising developments in the valuation of outdoor recreation be followed up with detailed studies of particular areas in which major decisions must be made as to competing water usage. This type of study is particularly pressing, since decisions adverse to recreational or scenic use of water are, for all practical purposes, irreversible. A national authority, drawing on the accumulated skills of economists, geographers, ecologists and other specialists could provide a much better balance for these types of uses in the overall scheme of water development and allocation than we have been able to achieve in the past.

The mere listing of these problem areas that affect the national water scene, together with those cited by other witnesses before this committee, are testimony to the fact that agency procedures are less than adequate at the present time. This is not a matter of the integrity or competence of the personnel involved. The basic weakness lies in the fact that responsibility for management of the nation's water supplies is divided among federal, state, and local agencies which

are subject to different legislative constraints, and charged with different objectives. Even at the national level, major decisions involving regional and interregional water projects are divided among several agencies which, despite both external and internal efforts, are anything but uniform in their handling of evaluation procedures required for efficient planning and development of water projects.

As an example, it might be noted that the Bureau of Reclamation follows a number of policies that clearly violate sound economic practice in computing benefit-cost ratios for irrigation components of water projects. No interest is charged on capital costs assignable to irrigation; a substantial time lag is permitted between the first delivery of water and the first contractual payments from irrigators; revenues from other water uses are frequently used to reduce agricultural repayment obligations; and some secondary benefits are added to primary benefits in evaluating agricultural usage. Quite apart from their effects on proper planning and scale of projects, these dubious Bureau of Reclamation procedures differ from those used by the Corps of Engineers and some major state water agencies. Clearly, someone is wrong. The literature on water economics and proper methods of valuing benefits and costs has run so far ahead of the procedures of the major federal water agencies that a major effort to bring the requirements of S. 97 up to date is clearly necessary.

Economic evaluation of water projects inevitably involves the necessity of looking far into an uncertain future. At very best, the estimates for both benefits and costs are subject to wide margins of error. On the other hand, there appears to be clear evidence that the federal agencies consistently err on the high side with respect to benefits and on the low side with respect to costs. Again, there is no implication of dishonesty or incompetence on the part of the analyst; but the very fact that he is typically dedicated to the missions of his agency tends to push in this direction. At present, there is no provision for a thorough, independent audit of planning activities in the water field. Such audits should not be limited to the adequacy of project evaluation with respect to accuracy of estimates and reliability of the data on which they are based. It is equally important to make sure that the size of the project is optimal, and that all alternative ways of satisfying water demands have received adequate consideration. Such an audit cannot be made effective if conducted by the planning group itself, nor would it realize its full potential if it is limited to an "after the fact" appraisal of completed project reports. Rather, it must be undertaken as an integral part of the planning process itself.

The importance of these changes in procedure and techniques of water planning cannot be overemphasized, nor can it be stressed too strongly that they must be national in scope. The realities of economic and political life are such that federal water projects always involve the possibility of shifting substantially the allocation of benefits and costs among different geographic and political units and among different groups of individuals. The temptation to muster the full force of the local communities that would benefit from a project behind the efforts of the planning agency that wants to build it is apparent. The cost to the public, even if the pressure results in no more than a persistent tendency to go to the high side of the benefit estimates and the low side of the cost estimates, is not trivial. Moreover, the competitive nature of the relations among the various federal and state water agencies, each of which is sure of the virtues of pushing its particular program for the resource area in question, is not calculated to increase efficiency or accuracy in planning and executing projects.

Finally, a national review of water policy would permit us to investigate much more fully the complex nature of the overall decision-making processes involved. It must not be forgotten that water resources are used in an environment in which a multitude of decisions by state and local governments and by private enterprise must somehow be meshed with those of the federal agencies in assessing the full impact of alternative programs on regional and national economic welfare. Fractionalization of the process, by political unit or by agency at any level of government, is bound to result in failure to consider all alternatives and to evaluate them on as objective a basis as possible.

For these reasons I would strongly endorse the creation of a national water commission and the initiation of a broad-gauged analysis of all major aspects of the nation's water problems.

University of Washington.
Department of Economics.

The CHAIRMAN. Our next witness is Irving Fox, vice president, Resources for the Future.

Mr. Fox has served as a representative of the Department of the Interior on comprehensive interagency surveys of the Arkansas, White, and Red River Basins. He has also been a staff member of the Southwest Fuel Committee for the Department of the Interior in Albuquerque and a staff member of the U.S. Commission on Organization of the Executive Branch of the Government, the first Hoover commission. At one time he was Assistant Director of the Administrative Division of NLRB. Mr. Fox is a distinguished author, having published numerous articles on the subject of water resource development.

We welcome you, sir, and look forward to hearing your testimony.

STATEMENT OF IRVING K. FOX, VICE PRESIDENT, RESOURCES FOR THE FUTURE, INC.

Mr. Fox. You have, sir, a copy of the statement that I prepared, and I believe it has been distributed to members of the committee, and with your permission I will just highlight what is in that statement, Senator.

The CHAIRMAN. Right. The statement will be included in full at the end of your summary so if you will proceed to give a résumé of the high points, it would be very helpful.

Mr. Fox. It certainly is an honor and a pleasure to appear before this committee in connection with consideration of the legislation. My remarks will be directed to the nature and significance of the water problems we face and the issues confronting us today which merit consideration by a proposed commission.

I felt, as an official of Resources for the Future, that I could best serve the committee's need by trying to define these problems and issues as I see them rather than trying to assess the specific merits of the legislation that is being proposed here.

In the first part of my statement I have tried to summarize rather briefly the water situation in the United States and I think one point that does merit emphasis here is that we do have a generous endowment of water in this country, and in particular I point out here that as of 1960 the net depletion of water in the United States by man's activities amounted to about 8 percent of the runoff. In the West the situation is, of course, considerably different, but even here I think it is still impressive that we do have a very substantial amount of water available if it is efficiently used and that by and large the quantitative outlook in the country as a whole is a very reassuring one.

We do have some serious problems which I will come to in a moment but they do not really stem, in my judgment, from a quantitative shortage.

We do have some water quality problems and here I mention these in the statement that I have presented, but we do have also some reason for optimism even in this area. In rivers like the Ohio River Basin and even our Potomac River here we have had major improvement in water quality over the past decade. But possibly of even greater significance, the scientific and technological advances we have made in water quality management promise to achieve a relatively high standard of quality throughout the Nation at costs we can well afford.

This is not to deny that pollution continues to pose some very difficult scientific and technical problems. I think in the field of flood control we still face some major difficulties. It is of particular interest that in spite of the enormous investments made in flood control works over the past 30 years, average annual flood damage measured in constant dollars appear to be rising. It is evident that we have not yet evolved a set of policies which result in the best use of flood plain lands.

In this brief, and very brief, review of the water situation, the point I wish to emphasize is that we have both the endowment of water resources and an emerging science and technology of water management to fulfill foreseeable future needs for water services at reasonable cost, to provide clean water for drinking, for recreation and for a pleasant environment, to manage floods and to realize other important values.

Now, in spite of this, we do have some serious situations, as illustrated by the drought in the Northeast, the recent flood in Dallas, declining water tables in some areas, serious pollution problems in lakes like Lake Erie, and a number of our rivers.

My thesis is that we have both the resources and the technical capability for solving these problems but to do so will require some major advances in public policies and programs. And in the statement that you have before you, I have identified five, you might say, problem areas to which I wish to draw your attention and that might conceivably be considered by a commission such as the one proposed in the legislation.

The first of these I refer to as the task or the problem of achieving a much better understanding of water problems and opportunities in the United States on the part of policymakers and the general public. I think there is widespread evidence that the nature of the problems and opportunities we face in the water field in various regions are quite inaccurately perceived and understood by a large portion of the public affected as well as by many public officials.

The nature of this difficulty is well illustrated by the experience we have had here in the Potomac River Basin. Studies of the Potomac have been underway for more than a decade. Many millions of dollars have been spent. And yet we find that many people in the region have not had a clear understanding of the nature of the problems that we face in the Potomac and the opportunities for dealing with them.

Now, there are very sound and you might say good reasons why we have had such difficulty in gaining a clear understanding of the problems and opportunities in the Potomac Basin. And the first of these and the one that I would like to emphasize most is that the science and technology of water management has become so complex that a large number of alternative possibilities exist for meeting a given situation.

We got into this in some research that we were doing at Resources for the Future. Dr. Davis of our staff, through studies that he made, developed data on nearly 300 alternative ways of dealing with one aspect of the pollution problem. This serves to illustrate the point, that we have not yet found the best way of assessing the many alternatives which almost always exist and of providing the public and

policy officials with simple, accurate information about the relevant choices.

The water field has become a highly technical and complex field in which the public has a great deal of interest and we have not yet, you might say, found the machinery or developed the machinery for, you might say, providing this information to policy officials and the public generally in a reasonable, simple, and accurate way.

The second reason we have this problem is that we just do not have the agencies or at least a group of agencies that provide authoritative sources for the information we need. Any single public agency has a responsibility for only a portion of the problem. Private groups generally have a specialized interest which narrows their view of the problem.

Solving this particular problem of providing policymakers and the public with accurate, authoritative and understandable information on water situations and opportunities is, in my judgment, the most important issue that could be addressed by a special group such as the Commission proposed in S. 3107.

The second problem area to which I would like to draw your attention is the effect of existing law and public policy on the way private institutions use water and water-related services. This bears on the number of things that Dr. Crutchfield said a few moments ago. There is a mounting body of evidence that law and public policy often do not foster the best use of our water resources by private institutions. Here I would like to draw your attention to four aspects of this particular issue.

One of these is the adequacy of our water allocation law. This is State law, but I would assume that a commission such as this could advise and recommend to the Nation what might be appropriate, you might say the direction in change and improvement in State allocation law as well as Federal law.

I think there is increasing evidence that water law in the West as well as possibly in other parts of the country does not encourage efficient use of water within agriculture or the efficient transfer of water from less profitable or less valuable agricultural uses to more valuable municipal and industrial uses.

A second aspect to this problem of encouraging best use of water resources by private institutions is found in the area of flood management. As I mentioned a moment ago, flood damages appear to be rising in this country. An important reason for this appears to be that individuals grossly underestimate the seriousness of the flood hazard in their use of the flood plains. In other words, many people move into the flood plains without recognizing the dangers that they encounter. One of the important challenges that we face in the field of water policy lies in finding ways and means of providing the private sector with a much more precise understanding than it now has of the consequences of its decisions in the face of both flood and drought hazards.

A third aspect of this problem of achieving best use of water resources by private institutions is found in the area of water pollution. How can industries and individuals be motivated to use waterways for waste discharge purposes only to that extent which is consistent with the public interest?

This issue is being debated a great deal lately, both in the Congress and in State legislatures. We are talking about such matters as effluent charges and for stiffer penalties and types of regulation, economic incentives of various types, but I do not believe that the answer to this is entirely clear. I think we do need to find some way of motivating our private institutions not to use our waterways for waste discharge purposes any more than you might say is consistent with the overall public interest.

And a fourth aspect of this problem is found in the policies governing the provision of water services from public developed water projects. There we encounter a complex and difficult issue. It involves this question of pricing and subsidies which have been referred to earlier. For sound business reasons, individuals use a commodity in accord with its price. If it is priced at zero, it will be used in a profligate way. I feel it is time that we ask what is the effect of existing policies governing the provision of water services by public agencies upon the efficiency of water use by private individuals, and if it is found that these policies do not foster efficient use, as I believe it will, measures for remedying this situation should be sought.

A third problem area involves the development of institutions capable of integrated management of water resources systems. In a number of regions—and this is not all regions, but in a number of them—water resources are intensively used. This particularly is true in the industrialized areas in the vicinity of large cities. We have learned through research over the last decade or so that effective management of the water resources in these situations requires the operation of a highly integrated system of measures. Under these circumstances there are frequently opportunities for fitting together in a co-ordinated fashion large-scale treatment facilities for handling waste from a number of smaller communities and industries, the storage of water in reservoirs for a variety of purposes including the augmentation of flows for water quality improvement, the storage of waste during low flow period so as to maintain water quality under these circumstances, the collection and marketing of byproducts from waste disposal on a large-scale basis when it would be uneconomical to do so at individual facilities, the management of the flood flows, and the regulation of use of flood plain lands in a manner consistent with other uses of the waterway.

To operate such a combination of facilities in an efficient manner and in coordination with natural stream flow conditions requires a unique type of institutional arrangement, and I do not believe we have any in this country today actually operating on this sort of basis.

I would like to emphasize that the task not only includes planning and construction of facilities but also the operation on a day-to-day basis of a complex system which requires the application of the most advanced techniques of systems analysis. Arrangements for planning and construction will not do the job unless operating capability is also provided. And this is a matter that I think deserves top level attention in this country.

A fourth problem area deserving attention is an examination of the role of water resources in regional economic development. Much of our interest in water, investment in water resources, has stemmed historically from the promise that water development offered to regional economic growth. I think the country has changed a great deal over

the last few years, and it is time to reexamine the kinds of circumstances under which water development does promise to foster economic development and when it is of less significance, more precisely, exactly what its impact is.

The point I wish to emphasize is that we really do not have a clear understanding of the significance of water development for regional advancement and the relationship to national economic growth. In view of the importance attached to this factor by many of us, it seems timely if not urgent that we achieve a deeper understanding of the effect of water development investment upon regional economies under varying conditions.

My final and fifth point, which I suggest as deserving attention of such a commission as the one proposed, is the role of water resources in meeting future targets for agriculture production. Agriculture continues to be a key industry in the water field. According to our estimates, in 1960 more than six times as much water was depleted through agricultural uses as was depleted through municipal and industrial uses. Agriculture not only figures prominently in water use for irrigation but it is an important justification for many flood control projects as well.

Now, in the west, of course, this lies at the center of the water issue. The question we must ask ourselves as a Nation is, how we can best meet future targets of agricultural output on the basis of alternative assumptions about the extent to which we will be exporting food abroad, and in light of the opportunities we have in this country, to what extent is it best to fulfill future needs through an expansion of irrigated agriculture and flood control, and to what extent should we resort to other measures for increasing agricultural productivity.

I would like to conclude by saying that we do have considerable information bearing on these items being developed at universities and colleges and within the Federal Establishment. I should think that a commission such as the one proposed might be able to draw upon such information as well as develop new information and analyses of its own and provide some authoritative understandings and analyses of how we might deal with the kinds of issues that I have described.

The Congress and the executive branch and many States and local governments are to be commended for the energetic attack they have made on water problems in the last several years. There are some important issues that remain to be resolved. Others could be identified than those I suggested. I would hope that these problems I mentioned, Senator, would be useful in understanding the kinds of issues such a commission might pursue.

The CHAIRMAN. Well, Dr. Fox, I want to commend you most highly for the tremendous amount of effort that you put into your paper and your excellent résumé of that paper here this morning.

I have a lot of questions, but I am just going to ask a few at this time.

I noted in your statement you said that in spite of the enormous investment made in flood control works over the past 30 years, average annual flood damages, measured in constant dollars, appear to be increasing. Why is this so? What alternatives do you see?

Mr. Fox. Well the evidence seems to indicate—and data is rather difficult to develop on this subject, but some very good work has been done by Professor White at the University of Chicago—

that we have had continuing encroachments on the flood plain. People are moving into the flood plains. They really are misconstruing or misunderstanding the seriousness of the flood hazard that they face. With the growth in population and the growth of cities we have this pressure to move into these areas, and many people really do not know what they are getting into until the flood strikes.

Also directly we provide a certain amount of flood protection, put up a levee, provide a dam, and this will maybe control, let us say, the 10-year flood or the 25-year flood, and then the 50-year flood strikes and we have a lot of flood damage. Here is a case where, as I suggested in the paper, private industries and private agencies really are not well-advised, you might say, or informed, to make wise investments relating to water resources.

The CHAIRMAN. Another statement that I wanted to mention of yours, you say "for a variety of reasons many of the services from public water projects are provided to the users at much less than cost. For sound business reasons individuals use a commodity in accord with its price. If it is priced at zero, it will be used in a profligate way because it would appear to cost nothing."

Now, in view of the long-standing practice of underpricing water from public water projects, is there, in your judgment, any real possibility of changing this policy?

Mr. Fox. Well, I think this is a question that is beyond me. It is basically a political question. The reason I raise it is this: It seems to me that we might change this policy. I think my own personal view is that a considerable modification in what we call reimbursement policy is merited today when it may not have been merited in the past when these policies were established. But I think we should face this issue in any event, or a group should, and should ask itself if this policy cannot be changed. What are the alternatives for inducing private institutions to use water efficiently? Do we set up some sort of regulatory mechanism to bring this about? How else might we approach this if it is politically impracticable to develop, you might say, differing reimbursement policies?

The CHAIRMAN. There is another reference in your statement that I want to mention. It is a matter I know Senator Kuchel has taken a keen interest in. He has already asked some questions on this point.

You state there is increasing evidence that in Western States water law does not encourage efficient use of water in irrigation as well as evidence that water law inhibits the transfer of water from less valuable irrigation uses to more valuable municipal, industrial and recreation uses.

I wonder, are there any studies underway now on how the law might be changed to encourage more efficient use?

Mr. Fox. Yes. There are studies underway in this connection. I would suggest that you pose this point to Dr. Stephen Smith when you have him up here, because one of these studies is being undertaken at Colorado State University, and he is closely associated with it. But I think there are a number of studies that have, you might say, sought to identify this problem and also sought to suggest how these laws might be improved. This is difficult.

The CHAIRMAN. Much more work needs to be done?

Mr. Fox. Much more needs to be done. I think the work that has been done ought to be drawn together and in addition I think this needs to be pursued further.

The CHAIRMAN. Thank you very much.

Senator Kuchel?

Senator KUCHEL. Your paper is splendid, and I intend to study it and read it with very great care. Questions do occur to me, but I shall not ask them at this time.

On the point which the Chairman raised with respect to the law of water, the changes that have been made in the West, particularly those changes even in the State constitution which the people I represent effected many, many years ago, all point up, I suppose, a need for the law of water to be explored with the possibility in mind of improving the law itself, as you suggest, utilizing water in areas which are not as economically important as those in which they are being spread at the moment. And in that connection, I think it is regrettable that we have had a Federal-State jurisdictional controversy. There are many areas in which the Federal Government must be supreme, and there are other areas where State law, with respect to some types of situations, must prevail, but the jurisdictional dispute over water ought to be solved by people of good will on both sides of the controversy.

Thank you again. I must say to the Chairman I think these papers have been excellent. I think yours, Dr. Fox, is an outstanding one. Thank you.

Senator JORDAN. Thank you, Dr. Fox, for a very stimulating paper. I intend to go through it very carefully myself.

Senator FANNIN. Dr. Fox, I have been very impressed with some of the information you have furnished to us. I was just wondering, the Water Resources Council, with such widespread membership, would it not be the organization that could best carry through your recommendations?

Mr. Fox. I have not sought to address this question of whether you might say the Commission of some other organization could best pursue the questions that I have raised here. However, it would appear to me that there may be some of these issues that could be attacked by the Water Resources Council. But I think that the merit of having a special commission is that it offers the opportunity of bringing people that are, you might say, independent of any of the ties and operating programs into the picture to take a fresh look at the situation. These are the complicated issues that we are facing here and such an outside view might be worthwhile at this time.

Senator FANNIN. Why do you think they would be more independent than members of the Water Resources Council?

Mr. Fox. The Water Resources Council?

Senator FANNIN. Yes.

Mr. Fox. Well, the Water Resources Council is composed of the members of the Cabinet with the—who have operating programs at the present time and who are concerned with those. They rely on the staff of their agencies that are concerned with the conduct of these programs. And it seemed to me that possibly by bringing people out that do not have these obligations and responsibilities, we might get a somewhat different look at the situation.

Senator FANNIN. The knowledgeable people that will be selected as members of the Commission would naturally have a field of endeavor, in which they are most vitally interested. Do you think they would foster programs in their field just the same as would the members of the Water Research Council foster programs that they have the most interest in?

Mr. Fox. The question you raise, sir, is this: Is it possible to find people who are knowledgeable and still have a kind of an independent and disinterested view of this whole subject? I believe it would be, but I may be wrong. I have not tried to examine that question here.

Senator FANNIN. I have asked this question previously but I will also ask you. Do you think men of stature would be involved in other endeavors of importance and so it would take time to obtain seven members to serve on this Commission?

Mr. Fox. I would not minimize the difficulty of finding good men. I would assume that they can be found in a country of this size and with the amount of talent that we have today available in this field.

Senator FANNIN. But you agree it will probably take some time.

Mr. Fox. It will be a task, I think, to really find these people because there are so many demands.

Senator FANNIN. Thank you very much.

The CHAIRMAN. Thank you very much, Dr. Fox. We appreciate having your statement.

Mr. Fox. Senator, I am not a doctor.

The CHAIRMAN. All right. We thought we got into the "doctor road" here.

Mr. Fox. Thank you.

The CHAIRMAN. We will give you an honorary degree for your performance here this morning. And as previously stated your full statement will be printed.

(The statement referred to follows:)

STATEMENT OF IRVING K. FOX, RESOURCES FOR THE FUTURE, INC.

It is an honor and a pleasure to appeal before this Committee in connection with its consideration of proposed legislation for the establishment of a National Water Commission. My remarks will be directed to the nature and significance of the water problems we face in the United States and the issues confronting us today which might merit the consideration by the proposed Commission. As an official of a non-profit research institution, Resources for the Future, I feel that I can best serve the Committee's needs by defining these problems and issues as I see them rather than by trying to assess the utility of an agency of the type recommended.

Although water resources programs constitute but a small fraction of the national economic activity, the way we manage these resources will have a special significance for the economic and social well being of the American people. The investments in water-related activities will be large, they will influence the pattern of urban and regional growth and they will help determine the quality of the physical environment in the United States in the years ahead. It has been estimated that between 1960 and 2000 the population of the United States could nearly double and the gross national product could more than quadruple. Implicit in these projections is an enormous investment in such facilities as municipal water projects, storm water drainage, municipal sewage treatment works, industrial waste treatment, water-based recreation facilities, flood management works, irrigation facilities, and so on. These investments will mount into the hundreds of billions of dollars by the end of the century and the efficiency with which they are made will affect our rate of economic progress.

The nature and location of water investments to serve urban people may profoundly affect the character of the cities served. The pattern of storm water drainage, the location of water and sewage facilities, the amount of flood pro-

tection provided, the kind and extent of water-based recreation activities will influence the pattern of urban growth, the cost of urban living, and the quality of urban life.

The nature of large-scale regional water resources programs may have a major impact on the size and nature of regional economic activities and the quality of both the rural and urban environment. If abundant supplies of water at low prices are provided to the Southwest, the agricultural component of the economy there could increase substantially which would, of course, influence the demand on service industries and in turn slow up agricultural development in other regions of the country. Similarly, the provision of water-based recreation opportunities and the preservation and enhancement of water quality can influence significantly the pattern of growth of the tourist industry in the United States. And certainly the way our lakes, rivers and associated lands are managed will determine whether they will offer pleasant vistas and opportunities for relaxation and recreation. Possibly as important as all of these, some of the decisions we will be making will be irreversible. Once a valley is inundated by a reservoir it is, as a practical matter, impossible to return it to its original state, if we should later decide that we have made a mistake. Similarly once a large lake or estuary has been degraded by pollution, it may be next to impossible to restore the quality of the water. The decisions we are making are solemn and weighty ones.

Therefore, water resources policies and programs merit our thoughtful study and concern. My consideration of them is divided into two parts. First I wish to characterize the water situation in the United States today as I see it. Second, I will describe and examine several major problem areas in the water field which I believe are of critical importance to the implementation of sound water resources programs in the years immediately ahead.

THE WATER SITUATION IN THE UNITED STATES

I feel that the water situation in this country has been widely misunderstood. Briefly stated, my view is that we are well endowed with water resources and that through the wise application of what we know and what we are learning about the management of water we can realize the services we seek from our water resources during the foreseeable future at a reasonable cost.

In considering the reason for this general conclusion, let us begin with a comparison of the quantity of water we have available in the 48 states with the quantity we actually use. The supply of water available to this area averages 11 hundred billion gallons per day. Our estimates at Resources for the Future indicate that in 1960 man's activities resulted in the net depletion of about 85 billion gallons per day. This is the quantity of water that was evaporated, transpired, incorporated in products or discharged into the ocean so it could not be reused. In other words, about 8 per cent of our natural fresh water supply was being used in 1960 in a way that it was not available for reuse. Even when we grant that a large portion of the remainder ran off in floods was badly polluted, or uneconomically located, it is evident that the nation has a large quantity of water to work with in meeting future needs.

The regional picture varies greatly. East of about the 98th meridian water is relatively abundant and substantial quantities of water can be provided for municipal, industrial, and agricultural purposes at relatively modest costs. There are other problems in this region to which I will refer later, but the quantitative outlook is a favorable one. West of the 98th meridian, except for portions of the Pacific Northwest, natural supplies of fresh water are relatively scarce. In much of this region more water could be used, especially in agriculture, than is readily available at reasonable cost. In this region future demands can be met in a variety of ways including increased efficiency of water use, providing new supplies by transport from water abundant areas, by desalination, or by reducing the quantity of water used in agriculture and applying it to municipal, industrial and recreation uses. We have estimated that as of 1960 in the arid and semi-arid West (exclusive of the Pacific Northwest) nearly 20 times as much water was depleted as a consequence of irrigation as was depleted through municipal and industrial uses. In other words, a little more than a five percent reduction in agricultural use in this region would have permitted a doubling of municipal and industrial use. The extent to which future demands should be met through increased efficiency of water use, the development of new supplies, and transfer of water from agriculture to municipal and industrial use will depend upon the results of much more careful study than we have given it.

However, in considering the water situation in that region, we should not lose sight of two points, namely (1) that a high rate of municipal and industrial growth can be supported without the development of new supplies and (2) should use of water in agriculture be reduced, the nation's ability to meet its food and fiber needs in the foreseeable future would not be impaired because of the large agricultural potential which continues to exist in the United States.

In brief, the quantitative water outlook for the nation is a favorable one. However, in much of the country pollution poses our most vexing water management problem. The waterways of the nation have been and continue to be valuable outlets for effluent from cities, industries and agriculture. And their value for this purpose continues to increase. For example, it is estimated that potential organic waste loads could more than double between 1960 and 2000. The cost of not using waterways for effluent discharge would be enormous. But the use of waterways for this purpose conflicts sharply with other important considerations. In particular, it conflicts with the growing demand for outdoor recreation and the increasing value being placed upon the aesthetic character of waterways. Preserving and enhancing water quality in response to these interests and in the face of such a large potential increase in effluent discharge poses unusually complex scientific, administrative and political problems. It is difficult to provide a simple measure of the seriousness of water pollution but the attention this subject has received from the public generally, the Congress, and other public officials is ample evidence of the gravity with which it is viewed. But even here there is reason for a cautious optimism. The quality of some of our major rivers such as the Ohio and the Potomac have been greatly improved over the last decade. Possibly of even greater significance, the scientific and technological advances we have made in water quality management promise to achieve a relatively high standard of water quality throughout the nation at costs we can well afford. This is not to deny that pollution continues to pose some very difficult scientific and technical problems.

Floods are another important aspect of the water situation. It is of particular interest that in spite of the enormous investments made in flood control works over the past 30 years, average annual flood damages measured in constant dollars appear to be increasing. It is evident that we have not yet evolved a set of policies which results in the best use of flood plain lands in spite of the flood hazard potential.

In this brief review of the water situation in the United States, the point I wish to emphasize is that we have both the endowment of water resources and a science and technology of water management to fulfill foreseeable future needs for water services at reasonable costs, to provide clean water for drinking, for recreation and for a pleasant environment, to manage floods, and to realize other important values. However, the realization of these results will depend in large measure upon the development of policies by public and private agencies which take into account an unusually complex interrelationship among the technical, economic and political factors which bear upon the development and use of water resources.

PROBLEMS AND ISSUES IN THE WATER RESOURCES FIELD

In spite of the relatively optimistic water situation I have portrayed, the simple fact remains that we do have some quite serious water problems. The drought in the Northeast caused shortages in many cities including New York. Dallas recently suffered from a damaging flood. Declining water tables are causing farmers in the Southwest to reduce or eliminate production. The pollution of Lake Erie and some of our other lakes and rivers is justifiable cause for widespread concern. My thesis is that we have both the resources and the technical capability for solving these problems but to do so will require major advances in public policies and programs. I assume that a major purpose of the proposed Commission would be to study and illuminate the factors which inhibit our ability to deal with these problems effectively. With this in mind, I'd like to suggest five policy problem areas where advances are needed if we are to deal effectively with the water situations which trouble us today.

ACHIEVING A BETTER UNDERSTANDING OF WATER PROBLEMS AND OPPORTUNITIES

There is widespread evidence that the nature of the problems and opportunities we face in the water field in various regions are quite inaccurately perceived and understood by a large portion of the public affected as well as by

many officials. In a society such as ours the way problems, such as those in the water field, are attacked is determined by the view held by a large number of people including public officials, private managers, and the public generally. I am convinced that one of the truly fundamental problems we face in making wise decisions about the use of water resources stems from the difficulty we have had in gaining an accurate understanding region by region of the water situation and the opportunities that exist for using these resources to good advantage.

The nature of this difficulty can be illustrated by our experience with the Potomac River basin. For about a decade there has been an intense debate about how best to manage and use the water resources of this region. Several million dollars have been spent by public agencies in studying the resources of the area, the demand for water services, and possibilities for supplying this demand. Currently a major planning effort is under way at the specific request of President Johnson to make the Potomac a model of conservation. Hopefully this will result in an imaginative program which the people of the region will support.

But during this decade of debate thoughtful people interested in the future of the Potomac found it difficult indeed to gain a clear understanding of the nature of the problems and the opportunities for dealing with them. We knew the river was polluted and we knew that in dry periods Washington could eventually experience water shortages. But it has been and continues to be somewhat of a mystery as to the precise nature of the pollution problem, how it might be approached, how future municipal and industrial demands might be met, how best advantage might be taken of the recreation potentials of the area, and how the beauty of the region might be preserved and enhanced. This mystery did not exist because of a lack of plans because a number of them were proposed during this period.

The reason why we have had such difficulty in gaining a clear understanding of the problems and opportunities in the Potomac basin is reasonably evident. The difficulty exists for two reasons: First, the science and technology of water management has become so complex that a large number of alternative possibilities exist for meeting a given situation. For example, in a study of water quality in the Potomac Estuary, Dr. Robert K. Davis of Resources for the Future, through the use of an electronic computer, developed data on nearly 300 alternative ways of dealing with one aspect of the pollution problem. This serves to illustrate the point that we have not yet found the best way of assessing the many alternatives which almost always exist and of providing the public and policy officials with simple, accurate information about the relevant choices. The second reason the problem exists is that we do not seem to have authoritative sources for the information we need. Any single public agency has a responsibility for only a portion of the problem. Private groups generally have a specialized interest which narrows their view of the problems. Furthermore, they seldom have the staff and resources required to undertake the highly technical studies required to gain a deep understanding of the kinds of problems posed by water management.

Solving this problem of providing policy makers and the public with accurate, authoritative, and understandable information on water situations and opportunities is in my judgment the most important issue that could be addressed by a special group such as the Commission proposed in S-3107. It is a reflection of the difficulty faced by a democratic society in using effectively and in accord with the will of the people the know-how science and technology have placed at our command. I doubt that there is any simple solution. National policy officials have certain needs with regard to the national picture. State and regional officials require more specific information. Some way must be found to convey relevant, unbiased information to the general public. If we can make substantial advances toward the solution of this problem, many of our other difficulties will evaporate.

FOSTERING BEST USE OF WATER RESOURCES BY PRIVATE INSTITUTIONS

A second problem area that would merit the attention of a national study group is the effect of existing law and public policy on the way private institutions use water and water-related services. Government is so deeply involved in the management of water resources that we sometimes fail to recognize that many if not most of the final decisions with regard to the use of water are made by private individuals and organizations. **The farmer who irrigates a crop may**

determine how much water to use for this purpose. The manufacturer has a large voice in deciding the nature of the effluent which will be discharged into a stream. The private company or individual may decide what use to make of lands subject to flood hazard. Hydroelectric power, navigation channels, and recreation facilities are used to the extent decided upon by private individuals and organizations. There is a mounting body of evidence that law and public policy often do not foster the best use of our water resources by private institutions. Four aspects of this broad problem merit examination.

One is the adequacy of existing water allocation law. I'm well aware that water law poses delicate and complex questions. Yet, there is increasing evidence that in the Western states water law does not encourage efficient use of water in irrigation as well as evidence that water law inhibits the transfer of water from less valuable irrigation uses to more valuable municipal, industrial and recreation uses. In the East, there is a growing concern that riparian law may not be well suited to the situation that is evolving where water is much more intensively used than it has been in the past. Where water is a scarce commodity we cannot afford a framework of law that permits inefficient use of the resource.

A second aspect of this problem of encouraging best use of water resources by private institutions is found in the area of flood management. A few years ago many of us were surprised to learn from studies by Gilbert White and his associates that average annual flood damages, measured in constant dollars, have increased over the past 30 years in spite of an enormous investment in flood control facilities. An important reason for this appears to be that individuals grossly underestimate the seriousness of the flood hazard in their use of flood plain lands. I believe it is fair to say that existing flood management policies do not foster efficient use of flood plain lands and related investment in water resources facilities. One of the important challenges that we face in the field of water policy lies in finding ways and means of providing the private sector with a much more precise understanding than it now has of the consequences of its decisions in the face of both flood and drought hazards.

A third aspect of this problem of achieving best use of water resources by private institutions is found in the area of water pollution. How can industries and individuals be motivated to use waterways for waste discharge purposes only to that extent which is consistent with the public interest? So far we have sought to deal with this problem primarily through a system of regulation and appeal to the civic conscience of individuals. We are not satisfied with the results and different measures are now being considered. I do not think that the best course to follow with regard to pollution is self-evident. Further study of this problem and consideration based upon a careful analysis of the consequences of alternative possibilities appear desirable.

A fourth aspect of the problem is found in the policies governing the provision of water services from publicly developed water projects. Here we encounter a complex and difficult issue. For a variety of reasons many of the services from public water projects are provided to the users at much less than cost. For sound business reasons individuals use a commodity in accord with its price. If it is priced at zero it will be used in a profligate way because it would appear to cost nothing. If water is a valuable resource, society has a strong interest in seeing that it is used in accord with its value. I feel that it is timely to ask what is the effect of existing policies governing the provision of water services by public agencies upon the efficiency of water use by private individuals. If it is found that these policies do not foster efficient use of the resource, as I believe it will, measures for remedying this situation should be sought.

THE DEVELOPMENT OF INSTITUTIONS CAPABLE OF INTEGRATED MANAGEMENT OF WATER RESOURCES SYSTEMS

Let me now turn to a third problem area. In a number of regions of the country water resources are intensively used. This is particularly true in the industrialized areas and in the river basins closely associated with major cities. We have learned over the last decade or so that effective management of water resources in these situations requires the operation of a highly integrated system of measures. This is especially true where water quality management is an important consideration. Under these circumstances there are frequently opportunities for fitting together in a coordinated fashion large-scale treatment facilities for handling the wastes from a number of smaller communities and industries; the storage of water in reservoirs for a variety of purposes including the augmentation of flows for water quality improvement; the storage of wastes

during low flow periods so as to maintain water quality under these circumstances; the collection and marketing of byproducts from waste disposal on a large-scale basis when it would be uneconomical to do so at individual facilities; the management of flood flows and the regulation of the use of flood plain lands in a manner consistent with other uses of the waterway. To operate such a combination of facilities in an efficient manner and in coordination with natural streamflow conditions requires a unique type of institution arrangement.

In the United States today probably only one organization, namely the Delaware River Basin Commission, has the kind of authority required to undertake integrated programs of this kind. Here I wish to emphasize that the task not only includes planning and the construction of facilities but also the operation on a day-to-day basis of a complex system which requires the application of the most advanced techniques of systems management. Arrangements for planning and construction will not do the job unless an operating capability also is provided. I believe that most students of water resources management are agreed that some way must be found to provide such operating capability if we are in fact to manage our water resources effectively and, in particular, to deal with the pollution problem.

There are a variety of ways such capability can be provided. A careful examination of these possibilities to guide policy makers on how to go about fulfilling this need would be eminently worthwhile.

ACHIEVING A BETTER UNDERSTANDING OF THE ROLE OF WATER RESOURCES IN REGIONAL ECONOMIC DEVELOPMENT

A fourth problem area deserving attention is an examination of the role of water resources in regional economic development. Historically water resources development has received widespread support because of the view that such development will promote regional economic growth. In fact, much of the support that water resources projects undertaken by the Federal government have received has been based on the assumption that the water project would have a significant influence upon the economic development of the region in which the project was located.

I find a good many economists seriously question the validity of this assumption. They will agree that water projects may be important and in some cases necessary for growth to take place. But there is considerable feeling that the significance of water investments for regional development has been greatly overestimated.

No doubt circumstances vary considerably with the kind of project and the nature of the regional economy. For example, in an area where the economy is largely supported by agriculture and the agricultural sector is declining because of the depletion of water supplies, the provision of a new supply of water to maintain the agriculture may be of crucial importance to the regional economy. In other instances where heavy-water-using industries are of negligible importance, water development may have a relatively insignificant effect upon the regional economy. The point I wish to make is that we really do not have a clear understanding of the significance of water development for regional advancement and the relationship to national economic growth. In view of the importance attached to this factor by those who support water resources projects, it seems timely if not urgent that we achieve a much deeper understanding of the effect of water development investments upon regional economies under varying conditions.

ACHIEVING A BETTER UNDERSTANDING OF THE ROLE OF WATER RESOURCES IN MEETING FUTURE TARGETS FOR AGRICULTURAL PRODUCTION

A fifth problem area that I would suggest as deserving attention is that of the role of water resources in meeting future targets for agricultural production. Agriculture continues to be a key industry in the water field. According to our estimates in 1960 more than six times as much water was depleted through agricultural uses as was depleted through municipal and industrial uses. Agriculture not only figures prominently in water use for irrigation but an important justification for many flood control projects is an increase in agricultural production.

Over the years we have been hearing a running argument over the question of whether we should continue to build irrigation facilities at public expense when there are agricultural surpluses. Today there is increasing evidence that the world food situation will deteriorate and that pressure will mount for the United

States to export larger quantities of food to meet the needs of increasing populations elsewhere. If I understand correctly the present outlook, there is a likelihood that these demands will soon utilize our surpluses and raise the question of whether agricultural production in the United States should actually be stimulated to help meet the needs of the rest of the world.

In the West agriculture lies at the center of the water issue. No large-scale water development projects can be justified in the West except on the assumption that the maintenance of agriculture output is worth the cost of water development. In other words there is plenty of water to meet the growing demands for municipal and industrial purposes in the West providing we are willing to see a modest decline in irrigated agriculture. This fact makes it of critical importance for us to understand the value of preserving or expanding the level of agricultural output, if we are to make intelligent judgments with regard to such large projects as are now being considered in the West.

The question we must ask ourselves as a nation is how we can best meet future targets of agricultural output on the basis of alternative assumptions about the extent to which we will be exporting food abroad and in light of the opportunities we have in this country. To what extent is it best to fulfill future needs through an expansion of irrigated agriculture and flood control and to what extent should we resort to other measures for increasing agricultural productivity?

CONCLUSION

The Congress, the Executive Branch, and many state and local governments are to be commended for the energetic attack they have made on water problems the last several years. However, there are some important issues which remain to be resolved. Others could be identified in addition to those I have suggested, but I hope that the five problems described in this presentation will indicate to the Committee some of the areas which would merit priority attention by a Commission of the type proposed in S-3107.

The CHAIRMAN. Our next witness is Dr. Stephen C. Smith, a professor and chairman of the Department of Economics and director of the Natural Resources Center for Colorado State University, who specializes in natural resources economics.

He has taught at several universities and has served as an agricultural economist for the Tennessee Valley Authority. He has published many articles and has developed considerable expertise in the field of water institutions. He is one of the organizers and is current chairman of the executive board of the Universities' council on Water Resources, a newly formed national organization designed to coordinate water research among the country's universities, and on the executive board of the U.S. Commission on Irrigation, Drainage, and Flood Control.

Dr. Smith, it is indeed a privilege to welcome you to the committee this morning.

STATEMENT OF DR. STEPHEN C. SMITH, PROFESSOR AND CHAIRMAN, DEPARTMENT OF ECONOMICS, COLORADO STATE UNIVERSITY

Dr. SMITH. Thank you. I appreciate the opportunity to meet with you and comment on a few aspects of this bill. I did not have an opportunity to have my statement typed and presented to you in advance. There is a copy here that you may have.

The CHAIRMAN. Your statement will be included in full in the record if you would care to highlight it.

Dr. SMITH. Yes.

First, if I may, Mr. Chairman, before I get into the statement itself, I would like to make a very brief comment with respect to what Mr. Fox mentioned with respect to the water transfer question.

We do have a study that is nearing completion—it is not quite done—at Colorado State University which is specifically looking at the economics and legal aspects of transferring water between different kinds of uses and between different locations and use. It is using the legal backgrounds of several States as a base upon which to make the evaluation. So this study is going on and there have been some articles published in this area, and others will be coming out very shortly.

The CHAIRMAN. Very good.

Dr. SMITH. I think there are only two points that I would like to comment on briefly at this time. The first deals more with the approach that such a commission might take in viewing its problem. The first point would be to have an overall point of view which would look at the Nation's water resources systems and develop a frame of reference which would analyze the water problems within a system's context.

The necessity to maintain as its central mission a concept of the whole of water resources services while dealing with alternative means for handling problems is important. Our past history of water resources decisionmaking has suffered at times from the fragmentation which comes from a problem-by-problem or project-by-project approach. Unless guarded against, it can blur important problems from view.

This observation is not critical of past action. It merely emphasizes the point of history that our water resources problems have grown bigger and more complex, our concepts for approaching them have grown bigger and more complex. Thus, there is utility in asking the overall question at this time, Where we are going and why? In this respect I think the Commission would be very useful in highlighting the direction. And it would be, in my complementary to the other agencies currently active in this field.

The term "management." in terms of management systems, has been used advisedly. The major river systems within the United States are currently under some level of management control. The realization that water management through our existing water agencies has been progressing at a steady pace frequently comes as a surprise because it is the crisis which makes the headlines.

This fact raises a series of management problems we have not had to face before and which will become increasingly complex in the next half century. For the first time we are in the position of managing major aspects of large river systems. As we progress further, with our capability, the possibility of effecting major environmental changes multiplies. Since many unknowns lie ahead, we, as managers, are placed in the position of needing the best information possible so that the decisions will yield desired result and minimize unwarranted irreversible situations.

Thus it would be useful if the problems inherent in the management of large-scale water resources systems were identified and clearly appraised.

This is a many-sided issue, but the provision of water services through the management of large-scale systems can no longer take second place to the project by project type of development. The elements of system management and growth need clearer definition. By this process, the interaction between systems comes into sharper focus.

Thus interbasin transfers can receive explicit attention in terms of both quantity and quality and, of course, a part of the system management would be various points that have been brought out earlier by previous witnesses.

It may not appear as a big step, moving to a concept of integrating the management of a water system rather than looking at flood control, irrigation, recreation, power, navigation, et cetera. But the step may be both large and significant because the solution of how to provide a service is not prejudged. This approach tends to force a careful examination of a wider range of alternative ways of supplying the water service. The point I want to convey is the importance of this concept as well as developing organizational structure for implementing this type of integration.

The existing water agencies have already made significant progress down this road as have State and local units. Hopefully the regional commissions will see an opportunity to define a significant role in this area. But the overall concept could usefully be further specified within the context of being free from immediate action. This point, I think, is significant because it does bring together the many elements of whether you are considering the wide range of alternatives, such as flood control, questions of pricing, or water pollution.

The second major point I want to comment on flows from the first. If the suggested concept will result in furthering the development and implementation of possible new approaches, why has it been so long in coming?

First, we are just reaching the stage of water management where the problems are truly spread across the Nation. This fact will change the water policy in the future, the broadened base may change the character of the ideas coming to the fore.

Second, problems quite naturally have given birth to programs of action. With the less pressure of an earlier day, the need to fit into an integrated system was less. But today, in technical terms, the externalities are significant and call for attention. But on some problems, agency missions and authorizing legislation make interagency negotiation difficult. I am not referring to a lack of desire or willingness on the part of agency personnel, but I do suggest that water resource legislation and policy be examined to identify those points of policy inconsistency in conflict which inhibit the development of integrated management.

In a sense the task might be, I think, analogous to what was mentioned earlier with respect to the Public Land Law Review Commission. I am fully aware that these problems are difficult and fraught with economic and political complexities, but at times it is useful to face these editions directly to decide whether to continue on an old path or chart a new course. I believe this study commission could aid in looking at those types of policy and legal questions that do confront the existing organizational structure for managing our water resources.

Very briefly these are the two major points I would like to make.

The CHAIRMAN. Dr. Smith, I think you have made a very fine contribution to the testimony that has been offered here yesterday and today. Together with the other witnesses we are getting a pretty good background of some of the problems that we face when we talk about

water, and I want to compliment you both on your statement and on coming here from Colorado to make this presentation.

Senator Jordan?

Senator JORDAN. I just want to join you, Mr. Chairman, in expressing our thanks to Dr. Smith. These hearings have brought expert testimony from all over the country, which shows the widespread interest in this matter. We are pleased to have the statement of Dr. Smith.

The CHAIRMAN. Thank you very much, and your statement will be included in full.

(The statement referred to follows:)

STATEMENT OF STEPHEN C. SMITH, PROFESSOR AND CHAIRMAN, DEPARTMENT OF ECONOMICS, AND DIRECTOR, NATURAL RESOURCES CENTER, COLORADO STATE UNIVERSITY, FORT COLLINS, COLO.

Mr. Chairman, and Members of the Committee, it is a pleasure to be here. My name is Stephen C. Smith, Professor and Chairman, Department of Economics, and Director, Natural Resources Center, Colorado State University, Fort Collins, Colorado. My comments relevant to the National Water Commission Act are made as an individual who has devoted most of his professional life to studying water resources development and management along with other aspects of the field known as natural resource economics. Since receiving my Ph. D. degree from the University of Wisconsin, issues in water development and management have been my particular concern at the University of California, Berkeley, and at Colorado State University. This academic experience has been supplemented by having been on the staff of the Tennessee Valley Authority for five years, as a consultant to the Office of the Secretary of the Army, and as an adviser to numerous Federal and State agencies. Further, I am chairman of the Executive Board of the Universities Council on Water Resources and a member of the Executive Board of the U.S. Commission on Irrigation, Drainage, and Flood Control.

The proposal to create a new group to take a fresh overall look at the Nation's water resources is a decision for the Congress and the Executive Branch. This suggestion comes at a time of organizational adjustment under the Water Resources Planning Act and within the water agencies. With proper liaison, the results from such a new examination could contribute to the maturing of the new arrangements. The work of such a group would not need to impede the flow of decision already in process, except as you specify.

In my comments two interrelated points will be emphasized with a very brief elaboration. My intent is to provide a broad base for reference from which specific problems for study may be defined. First, such an independent group could take a fresh look at the overall system for providing the Nation with the services of water or of avoiding its destructive force. This could be done through developing a concept of integrated management of water resources systems within the frame of reference of our pluralistic economy. Second, those problems which are difficult to approach because of existing legislative restraints of mission or that would require new legislative authorization need identification, analysis, and recommendation for action.

With respect to the first point, the necessity to maintain as its central mission a concept of "the whole water resources services" while dealing with alternative means for handling problems is important. Our past history of water resources decision-making has suffered at times from the fragmentation which comes from a problem by problem or project by project approach. Unless guarded against, it can blur important problems from view. This observation is not critical of past actions; it merely emphasizes a point of history, that as our water resources problems have grown bigger and more complex, our concepts for approaching them have grown bigger and more complex. Thus, there is utility in asking the overall question of where are we going and why, with respect to water resources management. In fact, this question should be continually asked within the existing structure. The existing water agencies have already made significant progress down this road as have state and local units of government. Hopefully the regional commissions will see an opportunity to define a significant role for themselves. But, the overall concept could usefully be further specified within a context which is free of immediate action.

The second point flows from the first. If the suggested concept will result in furthering the development and implementation of possible new approaches, why has it been so long in coming. First we are just reaching the stage of water management when the problems are truly spread across the nation. This fact will change the water policy of the future; the broadened base may change the character of the ideas coming to the fore. Second, problems, quite naturally, have given birth to programs of action. With the less pressure of an earlier day, the need to fit into integrated management system was less. But today—in technical terms—the externalities are significant and call for attention. But on some problems, agency mission and authorizing legislation makes interagency negotiation difficult. I am not referring to a lack of desire or willingness on the part of agency personnel. But I do suggest that water resource legislation and policy be examined to identify those points of policy inconsistency and conflict which inhibits the development of integrated management. In a sense, the task would be analogous to part of the function of the Public Land Law Review Commission. I am fully aware that these problems are difficult and fraught with economic and political complexities. But at times it is useful to face these issues directly to decide whether to continue on an old path or chart a new course. A study group could assist in making such a decision.

The term management has been used advisedly. The major river systems within the United States are currently under some level of management control. The realization that water management, through our existing water agencies, has been progressing at a steady pace frequently comes as a surprise because it is the crisis which makes the headlines. This fact raises a series of management problems we have not had to face before and which will become increasingly complex during the next half century. For the first time, we are in the position of managing major aspects of large river systems. As we progress further with our capability, the possibility of effecting major environmental changes multiplies. Since many unknowns lie ahead, we, as managers, are placed in the position of needing the best information possible so that decisions will yield desired results and minimize unwanted irreversible situations. Thus, it would be useful if the problems inherent in the management of large scale water resources systems were identified and clearly appraised. This is a many sided issue, but the provision of water services through the management of large scale systems can no longer take second place to project by project development. The elements of system management and growth need clearer definition. By this process, the interaction between systems can come into sharper focus; thus, interbasin transfers can receive explicit attention in terms of quantity and quality of water service.

It may not appear as a big step, that is, moving to a concept of integrating the management of a water system rather than looking at flood control, irrigation, recreation, power, navigation, etc. But the step may be both large and significant because the solution of how to provide a service is not prejudged. This approach tends to force a careful examination of a wider range of alternative ways of supplying a water service. The point I want to convey is the importance of the concept as well as the organization for providing water services.

The CHAIRMAN. The Chair wishes to announce that we have three more witnesses, Dr. Hufschmidt, Mr. Eugene B. Waggoner, and Dr. Nathaniel Wollman, and possibly Congressman Robert Duncan of Oregon. The committee will stand in recess until 2:30, at which time we would hope to complete our hearings on the pending measure.

(Whereupon, at 12 noon, the committee recessed, to reconvene at 2:30 p.m. the same day.)

AFTERNOON SESSION

The CHAIRMAN. The committee will come to order.

Our first witness this afternoon is Dr. Maynard M. Hufschmidt, professor of city and regional planning and environmental sciences

and engineering at the University of North Carolina, where he recently moved from the graduate school of public administration at Harvard University. Dr. Hufschmidt brings to this hearing a tremendously broad range of experience. Prior to his work on water resources research at Harvard, he served with the Bureau of the Budget and the Department of the Interior in the Secretary's Office. He and colleagues at Harvard recently completed design of a major computer model of the Delaware River Basin which will be the first of its kind in the world.

Dr. Hufschmidt, we are pleased to have you here before us, and we are looking forward with great interest to your testimony.

STATEMENT OF DR. MAYNARD M. HUFSCHMIDT, PROFESSOR OF CITY AND REGIONAL PLANNING AND ENVIRONMENTAL SCIENCES AND ENGINEERING, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Dr. HUFSCHMIDT. Thank you, Mr. Chairman.

Mr. Chairman and members of the committee, I am grateful for the opportunity to appear before you today to present these remarks on the very important topic of national water resources management.

In searching for a theme for these remarks, I discovered that the term dynamic typifies our situation in water resources today. We are in a period of very rapid change—in technology, in intensity and nature of water use, and in relationship of planning, development, and management in the field of water resources to other fields, including urban and metropolitan development, for example. Some important changes have already occurred in problem, policy, and situation since the Kerr committee reported in early 1961. More striking, however, is the contrast on the water resources scene between the present and 16 years ago when the President's Water Resource Policy Commission (the Cooke Commission) reported. Then the account was still primarily on quantity of water; also, major emphasis was placed on the four principal purposes of Federal water-resource development—navigation, irrigation, flood control, and power—which had been recognized as important ever since the Inland Waterways Commission report of 1908.

This emphasis was dominant in 1950, in spite of the fact that the Cooke Commission report took a broad view of water resource planning and included many purposes other than the big four.

There was also a rural emphasis implicit in the Cooke Commission report; the importance of urban-metropolitan pressures on water resources was not stressed greatly.

Today the situation is quite different. We have shifted—though I hasten to say water quantity problems are still with us, as many of you are keenly aware—but we have shifted to an emphasis upon water quality. It has become clear that many of our worst problems are concerned more with deterioration of water quality at critical points and in critical low-flow periods, than in absolute water shortages. Certainly this is true of most areas in this country, except in some very arid sections.

This change in emphasis has been accompanied by shifts in purposes of development; outdoor recreation, esthetics, natural beauty have become important considerations in planning. We are much more concerned than formerly with the demands of urban-metropolitan areas—with water supply, water quality management, outdoor recreation, open spaces, flood plain management. And we have shifted emphasis somewhat from development of water resources to the management of water resource systems, often very complex ones such as the TVA system.

These shifts in content and emphasis in the water resources field are well known to you, and to this point I have mentioned only the obvious changes. Less well understood, however, are two important changes which I shall now discuss.

1. We have evolved a clearer understanding of the objectives of water resources development. I mean by this, for example, that we are now willing to state explicitly that regional economic development is a primary objective of water resource development, along with increase in national income. This has been stated clearly, for example, in the legislation establishing the Appalachian development program. Also, the revised standards and criteria for Federal water resources projects, contained in Senate Document 157, 87th Congress, includes regional development as a primary objective. Of course, regional and local considerations have been present in most Federal water resource programs since navigation projects were first proposed in President Jefferson's administration. But we have been loath to stress this fact and have preferred historically to rely on justifications in terms of national well-being. Our entire apparatus for benefit-cost analysis emphasized gains to national income—so-called primary benefits—and only grudgingly admitted gains to regions or special classes of people—so-called secondary benefits. It is clear, however, since passage of the Appalachian Development Act and the Economic Development Act, that Congress has determined that regional income growth is itself a worthwhile objective, even at some expense to growth in national income. Also, we have begun to recognize that an objective such as preserving or enhancing esthetic values—natural beauty—is a proper subject for national concern.

This discussion of shift in objectives may seem beside the point of today's subject, S. 3107. Yet, it relates directly to section 3(a)(2) of the bill, which states that "The Commission shall consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people." This section is directed toward coping with the trends I have been discussing.

My second point is that, thanks to the rapid developments since 1950 in computer technology and in theories and methods for planning and decisionmaking—loosely termed systems analysis and operations research—we have developed new and improved techniques of analysis for planning and operating water resource systems. By means of these techniques it is now possible (1) to analyze the performance of water resource projects in a systems context; (2) to formulate and study a large number of discrete plans which embody many alternative means and measures for controlling water flow and managing

water resources; and (3) to select from these plans the one or the few alternative plans which best meet the set or sets of objectives established by the policymakers (Congress and the President).

These methods have been studied, first, at the basic research level starting in the mid 1950's—and this is what I was involved in in the Harvard water program in the Littauer School—but now moving increasingly into the application stage in both planning and management, in agencies such as the Army Corps of Engineers, TVA, Bureau of Reclamation, and the Federal Water Pollution Control Administration. In fact, we are now moving into a period where water management is becoming the important focus, displacing in part the emphasis on water resources planning which has been with us since the late 1920's when the Army Corps of Engineers first began preparation of the "308" reports.

As a specific example of a new technique which has been developed and is finding increasing application, I want to talk about simulation. Simulation is just a fancy word for reproducing the behavior of a water resource system artificially—in this case in order to observe its performance in both physical and economic terms. By means of simulation it is possible to test the performance of a system of structures operated for a set of purposes by running through the system the data on water flows obtained either from the historic record or derived from a statistical model which uses the historic record.

With such a simulation model constructed for a water resource system which is under study it is possible to examine many alternative system designs or plans. Thus, for example, one can run a basic design, test its physical and economic performance; change the design by adding a reservoir, revising the output mix, or altering the operating policy, for example, and observe the change in performance. With the great speed and capacity of today's computers, it is possible to simulate the performance of complex systems in an amazingly short time. A simulation over 250 years of the performance of the Lehigh River system—with five reservoirs operated for four purposes—used about 7½ minutes of time on the IBM 7094 computer. A test simulation run of the much larger Delaware system, with as many as 42 possible dams and reservoirs and four purposes, required about 20 minutes on the same computer. With such computer speeds, it is possible realistically to examine many alternative designs by means of this technique.

My basic point is that we are only at the threshold of application of such techniques to the planning, design, construction, and management of water resource systems. Application often takes place in ways not anticipated in early stages of research. It now appears that the new systems analysis techniques will advance the art and science of water resource planning in two important ways:

(1) The areal scope of planning can be extended to cover entire States, multi-State regions and groups of river basins. For example, it should be possible significantly to improve the analysis of water storage and transmission networks covering the whole of the urbanizing Northeast, entire States such as California, transbasin diversions in the Western States, and even such large scale proposals such as the North American Water and Power Alliance scheme. Such analyses are now underway or are being proposed, and I believe that the new techniques will be useful in improving planning here.

(2) More important, the new techniques allow the depth and intensity of planning to be greatly extended. For example, a greater number of structural and nonstructural alternatives can be evaluated in system context than formerly. The effect on system design of alternative pricing, regulatory, and management policies can be examined. Here the work of Professor Gilbert White and his colleague at the University of Chicago on alternative methods of flood plain management is an outstanding example of extension of intensity of planning; so is the work of Dr. Allan Kneese of resources for the future on alternative means of water-quality management in a regional context. We can find many examples today of intensification of planning by the water resource agencies—more alternatives being considered, more purposes being analyzed, new administrative, regulatory, and financial policies being considered. There is a growing propensity to experiment with new approaches; for example, the Delaware River Basin Commission is examining the utility of various administrative and regulatory measures in planning and management of the Delaware basin water resources. And the new techniques will contribute, I believe, to the success of these and related efforts.

Systems analysis techniques will also make significant contributions to the management of large and complex water resource systems. As I pointed out earlier, we are now rapidly moving into the management phase of water resources. Most major river basins of this country now have extensive storage and control works—the TVA, Columbia, Missouri, Colorado, Arkansas, and Central Valley of California immediately come to mind. And most of this development has taken place over the last 35 years. I think the Hoover Dam was probably the only one major structure of that group, if we exclude the earlier sort of reclamation structures, that was not done in the last 35 years. Truly these years have been years of development. In our preoccupation with development we have not given adequate attention to problems of water resource management. Particularly in irrigation but also in municipal water supplies, water has been wanted, or put to low value uses. As development of new sources becomes increasingly costly, we are turning to more effective management of existing developed supplies. Systems analysis techniques, including simulation of operations of existing systems, will be of great assistance in accomplishing this much needed work.

In summary, I believe that we now have the knowledge in terms of theory and technique, to do a much more effective job of planning and managing our water resources than we have done thus far. The major question is whether we shall apply this knowledge to the job at hand. Here we face the problem of lag. Established agencies have well-developed procedures, techniques and routines; and these are not lightly discarded for new and largely untested methods, no matter how promising these seem to be. In time, education and training can overcome these handicaps to innovation; but the lag is there, nonetheless. One approach to reduce lag is to encourage experimentation in planning and management, both in existing agencies and in new organizations. Another approach is to encourage applied research on new techniques through the newly-established structures of 50 water resources research institutes. I believe it is 51 if we include Puerto Rico in it. Elsewhere I have suggested that research on comprehen-

sive planning of water resource systems be carried on in the following broad fields. Here I list nine items as follows:¹

1. Establishing objectives of water resource planning.
2. Establishing standards and criteria in relation to the political process.
3. Defining the planning region and scope and intensity of water resource planning.
4. Techniques for regional economic projections.
5. Deriving water resource benefit functions.
6. Deriving water resource input-output relationships.
7. Preliminary screening techniques for planning systems.
8. Techniques of detailed systems analysis.
9. Studying the system planning process as a whole.

Further basic and applied research on these and related topics would contribute greatly to early and effective application of new techniques by the operating agencies.

If a National Water Commission were established as provided in S. 3107, it could contribute to the improvement of water resource planning and management by conducting studies and analysis in at least four fields.

1. Application of Research Results: How can research on new techniques of analysis be translated more effectively into application on water resources planning and management?

2. Relationship of Water Resources Planning to Other Planning Fields: How can water resources planning and development be fitted effectively into (1) planning and development for growing urban-metropolitan complexes; and (2) planning for economic and social development of distressed areas such as Appalachia and the other discussed regions which are now being considered?

3. Performance of Existing Water Resource Projects: How have the Federal water resource projects built since World War II, performed both in terms of the extent to which they have served both the originally intended purposes and the nature and degree of changes in use, purpose, scope and effectiveness which have occurred in response to changing conditions? Such an audit would be extremely useful as a guide to future planning and policy formation. By its very nature, this task must be performed by a group or groups outside the responsible agencies. Much of this auditing task could be carried on in the Water Resources Research Institutes, but the Commission could provide leadership and a forum for analysis of results.

4. Objectives of Development: As a background to the making of executive and legislative decisions on objectives, studies could be undertaken of existing law and policy on objectives in relation to the present-day realities of our economic and social system. Such study could, for example, place into perspective existing policies on "development of the West," and relate these to an overall national policy on regional development, including development of distressed and lagging areas.

In conclusion, I point out that my comments have dealt largely with the environment in which a National Water Commission would operate, if established. I have not discussed either the desirability

¹ Maynard M. Hufschmidt: "Research on Comprehensive Planning of Water Resource Systems," *Natural Resources Journal*, vol. 5, p. 223 (October 1965).

of establishing the Commission or the details of its composition or duties, other than to suggest some topics for it to consider. As a close observer of the national water resources scene, I had thought that the Water Resources Research Act, the Water Resources Planning Act, and the Reorganization Plan shifting water pollution control function to the Department of the Interior, provided a heavy meal of innovation for the Executive branch to digest; thus the need for a National Water Commission did not seem obvious to me when the notion was first broached by the Bureau of the Budget last fall.

Its justification, it seems to me, for its establishment, is in its ability, is in its capacity to unleash new approaches, new ideas and new concepts, and its ability to provide incisive analysis to the President and Congress on strengths and weaknesses of past performance in water resources planning and development and on new paths to follow in the future. In this it can perform a valuable role in shaping our water resources management to meet the needs of the future. I thank you.

The CHAIRMAN. Thank you, Dr. Hufschmidt.

I must say that I have been tremendously impressed with your testimony. I think that you have opened a whole new area of exploration in order to get the kind of information that can be useful in our endeavor to get answers to some very troublesome problems in the water area.

I do want to compliment you. As a matter of fact, I think the people who have come from the "egg head" world have made some most realistic and practical suggestions that can be extremely helpful in connection with the proposed work of the Commission. I just want to say how much I was impressed with the area that you have opened.

I have about three or four questions I wanted to ask. Have the Government agencies adopted the computer techniques to which you have referred?

Dr. HUFSCHMIDT. To some extent, yes. I might say that, as would be expected, when the computer first became available the Government agencies, including both the Corps of Engineers and the Bureau of Reclamation, as well as the TVA, used the computer to do more effectively the kind of analysis they had been doing. To give you a specific example, on the Columbia revision of the 308 report, you will find, I believe it is the 1958 report, that when the report that was finished in the late 1940's was developed, it was possible only for them to examine in detail about two or three systems because there are so many dams and there are so many interrelationships, and the job of running the water through the system is a very tedious one, and at that time all they had was sort of hand computers almost.

The CHAIRMAN. This was confined more or less to the engineering aspects of the problem.

Dr. HUFSCHMIDT. Yes.

But even by 1958, with the small sized computers used on that 308 report on the Columbia revision, they were able to examine, instead of 2 or 3, some 20 or 30 different designs so that they extended existing ways of doing things; they expanded their ability to look at the alternatives and alternative designs tremendously.

Now, more recently computer studies have been made in the Potomac study that was done several years ago apparently. Currently much more elaborate studies, including the use of some of our work that we did at Harvard, are being done on the Susquehanna River by the Army Corps of Engineers. I am less familiar with the current applications in the Bureau of Reclamation, but they have begun to apply them, although not to the extent and the degree as indicated on our more refined models.

The CHAIRMAN. Let me take you to the next step on that. Can a computer model consider economic factors as well as engineering factors in its operation?

Dr. HUFSCHMIDT. Yes. This was one of the prime considerations in the computer models that we developed. It was to build in economic factors from the outset; in other words, to build in cost functions and benefit functions and what we call economic loss functions, so that as the computer program operates it evaluates the results both in physical and economic terms.

The CHAIRMAN. Have the Government agencies moved this far?

Dr. HUFSCHMIDT. They are experimenting with the application of these techniques.

The CHAIRMAN. But they are just starting as far you know?

Dr. HUFSCHMIDT. Yes.

The CHAIRMAN. It seems to me that in this economic area you do really move into a section that has been rather dark in the past, and it has been an adjustable situation in that certain assumptions are made and then certain conclusions follow. I do not think there has been the kind of searching inquiry into the economic area in connection with our resource development that we really should have in order to know the options that are available to us. Do you not feel this way?

Dr. HUFSCHMIDT. Yes, I would agree with that.

The CHAIRMAN. You can pretty well work out all the cost factors on a given project and you can look at the dam, and the flow of the water, and all the other aspects. But what is lost sight of in so many instances, it seems to me, are the economic factors that go into the consideration and decision of whether the project is the right kind of project, and we have rationalized in the past. We build a project and then, to justify it, we sort of come to the economic conclusions that we want to come to.

Dr. HUFSCHMIDT. I would say this, if you would take a historic look, and I used to be one of those reviewers in the Bureau of the Budget in the mid-1940's who had the unhappy task of having these projects come across my desk to look at—

The CHAIRMAN. Without the benefit of the computer.

Dr. HUFSCHMIDT. That is correct. And the economic analysis at that time, including the degree of the sort of economic projection analysis was very weak, let us say, certainly much less in evidence than in studies and plans made today.

There is an increasing emphasis on this, but we need to do better, and we need to do more refined analyses than we have been doing in this field. But there has been an increasing recognition on the part of everyone involved that this is necessary. Sometimes we have had the recognition but have not been able to get the expertise applied in quite the right sequence, as you suggest.

The CHAIRMAN. Right.

Turning to page 9, you raise the question, and I thought I might ask you for an answer by way of illustration of the first point, "Application of research results: How can research on new techniques of analysis be translated more effectively into application on water-resources planning and management?" Would you like to enlarge on that a little?

Dr. HUFSCHMIDT. Well, yes. This is the problem of lag that I mentioned. I think that we now have an opportunity with these many water resources research institutions to, perhaps, work with the water resource agencies on taking new techniques and actually seeing how they apply to trial situations. This is one aspect.

Another possibility is that we can do much more in terms of in-service training, and here the universities could collaborate with the agencies, for instance, just on computer technology and on the application on systems analysis techniques. There could be much more done in terms of educating and training the existing staffs.

And I think we need, in our engineering and planning schools, to train many more water resources engineers of the modern breed, which is a computer-oriented systems analyses interdisciplinary type, and there are hopeful signs here.

A number of institutions are doing this sort of training. If one were to look into the engineering economics program at Stanford, for example—and Professor Linsley testified yesterday that their program would, incidentally, be financed by the Ford Foundation—here is an example of trying to do this in the engineering field, training engineers who have a knowledge of economics and are able to apply it. We are trying to do some of this in a modest way in North Carolina.

The CHAIRMAN. In certain capacities to be generalists in this area, to deal with more than one discipline.

Dr. HUFSCHMIDT. Yes. You must, of course, start out with a certain basic knowledge of engineering and technology and then develop the social science aspect, as it were.

The CHAIRMAN. Right.

Dr. HUFSCHMIDT. Similarly, I think economists quite often could benefit by getting more involved in technology.

The CHAIRMAN. And vice versa.

Dr. HUFSCHMIDT. Dr. Kneese is an example of one who is not afraid to learn about technology so that he can communicate with the engineers and scientists—and too often it may be that economists are speaking in one corner and the technologists in the other, and are not able to communicate. This, I think, has been part of the problem in our planning field, not only in water resources but planning in investments generally.

The CHAIRMAN. You might extend it to national security, too.

One last question, Dr. Hufschmidt. As we move from the development period into the management period, what changes in institutions or policies do you believe will be necessary? In other words, can the commission help make those changes, as you see it?

Dr. HUFSCHMIDT. Well, I think that we have to solve this problem, which has been endemic, and that is of finding workable means within our Federal system of having regional or basin management groups.

Now, the Delaware River Basin Commission is an example of one of these which was tailor-made to suit the States of this area and the Federal interests.

As an indication of an earlier regime, the TVA is obviously a regional agency which is equipped to manage its particular problems. I am not telling you anything when I say that the history of the Columbia Basin has been a search for some sort of management vehicle.

This gets beyond the planning now and it gets into the question of how do you manage the power and water on a day-to-day basis so that the benefits are maximized for the region as a whole and for the Nation, and we have not solved this problem yet.

The CHAIRMAN. Try to harmonize what are at the times conflicting interests?

Dr. HUFSCHMIDT. That is correct, yes.

The CHAIRMAN. Which occur in most of the river basins.

Dr. HUFSCHMIDT. That is correct, yes.

I think that the commission could contribute to this by exploring alternatives in the field within the context of today.

As we all know, there is much ideological baggage of the past associated with this sort of thing which, I think, is not relevant today and we can get on with the job of setting up management institutions.

They probably are not going to be the same nationwide pattern of anything. They may be tailored to the particular situation. I have come to this conclusion in recent years. As I believe Irvin Fox may have mentioned to you, his view on this is that some sort of solution particularly peculiar to the area involved is probably what we need. But the dimensions of the management problem and the political and institutional factors that are associated with that need to be developed. Here, of course, as we know, we no longer are only considering individual river basins, but there are problems of transbasin diversions. In the Northeast, for example, we already have this with New York and Pennsylvania and New Jersey taking from the Delaware River, for example, and so management—

The CHAIRMAN. Which has not been the most harmonious operation at times.

Dr. HUFSCHMIDT. No.

The CHAIRMAN. With threatened lawsuits and a few other things.

Dr. HUFSCHMIDT. In this case the Supreme Court has been involved in this particular issue; that is correct, yes.

The CHAIRMAN. Well, very fine, Dr. Hufschmidt.

Senator Jordan.

Senator JORDAN. Thank you, Mr. Chairman.

Dr. Hufschmidt, you have introduced a very interesting concept into this colloquy we have had here today, and you talk about the possibilities of using computers and systems design and also for testing the economic performance as well. You may get a pretty good test here for economic performances. But do you believe that computers will ever completely replace the use of scale models in systems?

Dr. HUFSCHMIDT. You mean an analog model?

Senator JORDAN. Yes.

Dr. HUFSCHMIDT. No.

Senator JORDAN. To supplement.

Dr. HUFSCHMIDT. That is correct, yes. The electronic computer is useful for what we call digital simulation, simulation of numbers, discrete numbers, now, and analog computers can be in the form of a scale model such as the scale of an estuary or a harbor.

Senator JORDAN. Yes; I have seen many models.

Dr. HUFSCHMIDT. That is correct.

Senator JORDAN. They are expensive to build.

Dr. HUFSCHMIDT. That is correct.

Senator JORDAN. They do give a pretty good idea of what the effect will be of a certain design of a dam.

Dr. HUFSCHMIDT. That is correct.

To give you an example of where these things do overlap, and you may have a choice, on the Delaware River Estuary the Federal Water Pollution Control Administration has installed a digital computer model which reproduces the behavior of the tides. Now one could also build a scale model of this, and I believe the Vicksburg Lab of the Corps of Engineers has done so.

Senator JORDAN. Yes.

Dr. HUFSCHMIDT. And the question of which of these is more useful depends upon the nature of the problem. They are both relevant and sometimes this is a question which—

Senator JORDAN. They can complement each other.

Dr. HUFSCHMIDT. They certainly can complement each other, and in some cases one can be substituted for the other. It is a matter of your choice as to which one is more appropriate, but they do complement each other rather than compete.

Senator JORDAN. Yes. I thank you for an interesting and constructive paper on this subject. Thank you.

Senator FANNIN. Dr. Hufschmidt, I, too, want to commend you for what seems to me almost a new horizon as far as the search for information is concerned.

I am very interested in your remark about the newly established structure of the 51 water resource research institutes. To what groups do you refer?

Dr. HUFSCHMIDT. Well, under the Federal Water Resources Research Act there was a pattern of water resources research institutes which was established one for each State associated generally with land grant colleges, and these, as you may know, are financed by Federal appropriations.

There is now—I believe the Department of the Interior manages this—there is now \$100,000 a year, I believe, in funds for each institute which is provided annually, and then there are possibilities for additional matching grant funds to the institutes for research projects.

Senator FANNIN. I am just wondering if this will give the Commission the opportunity to be the central repository of information that can be utilized by the different organizations that are delving into these problems?

Dr. HUFSCHMIDT. Yes, sir. As I understand it, there are plans for all research results to be centralized in terms of an international information system in Washington, so that if one were working on a particular research problem, by a very simple inquiry into the information system one can get data on all research which has been done on

the problem. These sort of research data banks are now being developed in the Federal Government.

Senator FANNIN. Do we have any machines in any business organization or in any school into which could be fed information of the history, say, of the flow of rivers, information in each year, on the flow of one river specifically, that could bring about a projection for the future?

Dr. HUFSCHMIDT. Yes.

First of all, let me say that the Geological Survey is now in the midst of a full-scale program of putting all of the past hydrologic records, streamflow, on magnetic tape to be generally available rather than in the old water supply papers which you may remember was the previous method.

Now this information will be on tape and the techniques have been developed for taking this existing record of streams, and if there is enough information to make it worthwhile statistically, it is possible, by creating a statistical model, to develop what we call synthetic records of flows so that you can test the performance of a river system's structures over, say, 1,000 years of synthetic records.

When these records are analyzed statistically by the usual sense of getting averages, and what we call standard deviations, which are measures of a spread, the synthetic records cannot be distinguished from the actual records, which means that you have pretty good models.

So models of this kind have been developed, and in a sense this is what makes these simulation programs worthwhile, because you can only run through 20 or 30 years of historic records in one of these programs. It is not very exciting. What you want to do is to run through as many possible droughts and floodflows as possible so that you can get a picture of what will happen under a diversity of conditions. This is now possible by these techniques that have been developed.

Senator FANNIN. If the information is available how long will it take for some electronic machine to compile it, say, for a region? Naturally I know it depends on the size of the region. If all information were available, could it be done, say, in a week or a month or what would be the time?

Dr. HUFSCHMIDT. The big problem, of course, in constructing these simulation programs is the building of the model, and this may take quite some time. But in the context of a planning process, this is reasonable.

If you are going to plan over, say, 2 or 3 or 4 years, as many of these regional plans are, you can do this in a year or so, let us say. Much of the time is taken in building and correcting, as we call it debugging, the model. Once the model is developed then things go fast. You can run through a particular system in an amazingly short time. That is, in a half hour you can get a tremendous amount of information. Of course, a half hour on some of these machines is still quite expensive. But if your problem is important enough so that you can spend the effort and time to build this computer simulation program, then you can afford to operate it as much as you need to.

Senator FANNIN. Is the equipment available at this time to carry this program through?

Dr. HUFSCHMIDT. The advances in the computer have been tremendous. I have been talking about the IBM 7094 computer, and the other computing companies, Univac and Minneapolis-Honeywell, all have comparable equipment. Under the new generation of computers they have effectively removed any limitations of computer size because they have been able to hook units one to the other, so that this now just becomes a matter of how many of these you need. The limitations on the storage of information in computers is pretty effectively removed in the sense that you can construct a problem that, if it is worth constructing that big, there are computers now that can run it.

This is a generalization. I am not an expert in this field, but our horizons in this area have expanded tremendously, and no longer do you have to worry too much about computer size as being a limiting factor.

Senator FANNIN. Firms or schools are available that contract to do this work?

Mr. HUFSCHMIDT. Yes. Typically the Federal Government owns and is making many of these installations. The Defense Department, of course, is a leader in this field. But if you take our complex of universities—Duke, North Carolina, and North Carolina State—we have one of the new generation computing systems put in for these three universities which will handle any problems that we will be able to develop.

In other words, the computer size limitation is pretty effectively off there, and this type of installation is what you have at schools such as at MIT, Harvard, California, Stanford, Cal Tech. Most large universities now have major computers installment of this size.

Senator FANNIN. Is it common practice for this work to be contracted to a school?

Mr. HUFSCHMIDT. You mean by—

Senator FANNIN. Studies to be assimilated through a machine?

Mr. HUFSCHMIDT. You mean the Federal agencies? No. What has been—leaving aside now the problems in space and the Defense Department with which I am not very familiar—in the water resources field such computer work that has been done on actual operations has been generally done with Federal Government facilities. For instance, TVA has its own computer system; Bonneville Power and the Army Corps of Engineers in the Northwest have their own systems.

But research, including applied research, attempting to develop new techniques have been contracted out to institutions.

Senator FANNIN. That is what I was wondering. Projections could be made through a school such as you mentioned, Harvard or Stanford or the University of California?

Mr. HUFSCHMIDT. Yes, that is right.

There is a pattern of applied research at institutions of this kind which has been developed over the years for the testing of new techniques. Much of it has been more in the engineering side and mechanical, hydraulic engineering than it has been on the economic side. There is no reason why it could not be done on the economic side.

Senator FANNIN. Thank you, Doctor.

The CHAIRMAN. Once again, Dr. Hufschmidt, we want to compliment you and express our appreciation for your fine presentation.

Mr. HUFSCHMIDT. Thank you very much. It is certainly a pleasure to appear.

The CHAIRMAN. It has been very helpful.

Our next witness is Mr. Eugene B. Waggoner, president of the Consulting Engineers Council.

Mr. Waggoner comes to us with a background of more than 20 years' experience in the field of water resources. He is a geological engineer who served as a staff geologist for the U.S. Bureau of Reclamation for 10 years. Mr. Waggoner also served as a consultant to the Royal Irrigation Department of Thailand, the Water Power Development Authority of West Pakistan, to AID in the Yemen and to the United Nations in Cambodia. He was also a member of the Board of Consultants to the International Water and Boundary Commission between the United States and Mexico. Mr. Waggoner also serves as a member of the International Commission on Irrigation and Drainage, and the International Committee on Large Dams.

We are delighted to have you, and you may proceed in your own way, sir.

STATEMENT OF EUGENE B. WAGGONER, PRESIDENT, CONSULTANT ENGINEERS COUNCIL OF THE UNITED STATES

Mr. WAGGONER. Thank you. I am delighted to be here to have an opportunity to listen to all of this interesting testimony and to present briefly the viewpoints of our organization, the Consulting Engineers Council, and also my own views.

I will read this. It is short, and perhaps, it will stimulate some questions which can be answered.

The CHAIRMAN. All right, sir.

Mr. WAGGONER. My name is Eugene B. Waggoner. I am Executive Vice President in charge of the Denver, Colo., office of the consulting engineering firm of Woodward-Clyde-Sherard and Associates. I appear here today as the President of Consulting Engineers Council of the United States, which is composed of nearly 1,800 independent consulting engineering firms throughout the country. Our membership is restricted to individuals and organizations engaged solely in the private practice of engineering. The unique feature of the private practice of engineering is that the consulting engineer has no commercial sales or contracting affiliations which can bias or conflict with his independent judgment and engineering integrity. He serves only the best interests of his clients who may be the public or private organizations, and he builds his professional reputation on the providing of sound and up-to-date engineering knowledge, in direct technically stimulating and productive competition with others of his profession.

Consulting Engineers Council is extremely pleased to appear here today on what I trust will be the final phase of an idea which this organization has been supporting, in and out of Government, for many years. Specifically, I refer to S. 3107, the creation of the National Water Commission.

All professional engineers share the concern with the water supply problem now current in every corner of every State in the country. It is a national problem which is bound to affect the health, industry,

and welfare of all of our citizens. Our concern leads to a desire to apply our knowledge and expertise in some effective and concerted manner to the planning and development of adequate water supply.

In this connection, we are delighted to note in the statement of Mr. Elmer B. Staats, Deputy Director of the Bureau of the Budget—I believe he has since changed his title—before this Committee on September 8, 1965, when he said,

A National Water Commission, drawing on the expertise available outside the Federal Government would compliment and enhance the effectiveness of existing sources of information and advice available within the Executive Branch, including the Water Resources Council.

And we have been further encouraged by Chairman Jackson's speech on the floor of the Senate on March 21st of this year when he said in part:

More imaginative solutions and better plans are needed if we are to meet the critical water needs of the future. We can take a bold step in this direction by establishing a National Water Commission with broad vision and capable of exercising independent judgment.

The establishment of a National Water Commission has strong support from throughout the country, not only from the engineering profession, but from other areas where individuals are concerned with our water development and resource planning.

We are rapidly approaching the day when our water supplies and resources will no longer be sufficient to meet the needs of our growing economy and our continued waste of water is perhaps the most serious problem facing our country today.

Clearly, then, much more can and must be done to better conserve and more efficiently plan and use our existing water supplies. The day will come, however, when our best efforts will not be enough and the development of new water sources is a necessity. Increasing consideration must be given to development of new techniques and planning to solve this problem.

Before this country further plunges itself helter-skelter into a variety of often uncoordinated programs initiated for a particular short-range need, we should attempt to review, on a national basis, how these immediate answers to particular problems will affect the country and its resources in years to come.

A national commission, such as proposed, should have the ability to review all of the plans and programs for water development. It should draw upon existing facilities in the Federal and State Government to help it determine the best course to follow.

Realizing this need, the Consulting Engineers Council has established a National Water Resources Advisory Committee to review, study, and make recommendations on our current water activity. This committee stands ready to be of service to this congressional committee and to the country as a whole, and we would be proud to offer one or more of our members to serve on the National Water Commission, support him by an available pool of professional experts who would serve voluntarily, bringing new ideas and concepts to the Commission.

Many consulting engineering firms, such as my own, are well experienced and qualified in the broad area of water, including ground water. Private consulting engineering firms represent a reservoir of

talent available to provide the needed highly skilled engineering talents. We have only to be asked.

The essential ingredient contained in the proposed establishment of a National Water Commission is that it shall be composed of individuals outside the Federal Government. We view this type of prerequisite as an essential step for a meaningful committee to exercise its judgments above ingrained governmental pressures or political judgments. We would, however, suggest that perhaps two additional steps might be taken to insure that members of the committee would be free to act in the interests of the country as a whole.

First, that the provisions as found on page 2, line 6, of S. 3107, allowing retired governmental employees to serve on the committee be stricken. While we do not question the capability of retired civil servants or retired military personnel to make independent judgments, it is inconceivable that their decisions and judgments would not be based on their long governmental service, thus creating a possibility of Commission decisions not truly reflecting the talents and capabilities found outside of the governmental sphere.

Additionally, we would suggest, in keeping with the expressed purpose of the committee, that State governmental employees also be barred from serving as members of the Commission. We want to make it clear here that our reasons are not based on a contention of inept ability or lack of a conscientious desire to be independent in their thinking. However, if the Commission is to reflect and advise on the planning and programs of water development in the most unbiased manner possible, then it must be truly free in its composition to arrive at these decisions.

I can assure you that professional engineers and the Consulting Engineers Council of the United States of America stand ready to provide both the time and talent necessary to make this Commission a truly meaningful and working partner with existing State and Federal bureaus, river basins, and councils to achieve a partnership that will adequately provide for the water needs of our country.

I appreciate being given the chance to read this formally.

The CHAIRMAN. I appreciate, Mr. Waggoner, having your statement and the offer of assistance from the Consulting Engineers Council. We are certainly dealing with problems that are of such magnitude that we will need all the assistance that we can possibly obtain.

You mention that a national Commission such as proposed should have the ability to review all of the plans and programs for water development. It should draw upon existing facilities in the Federal and State Governments to help it to determine the best cause to follow.

I think the latter sentence is quite clear, but I wondered if you would comment further on that?

Mr. WAGGONER. Well, our thought was that you have here a Commission or an organization which could be completely of one mission, and that one mission be for the entire United States and for its welfare in the matter of water resources, and in order for one organization to have one mission they should have the opportunity to review what all of the various organizations are doing in their individual missions.

For instance, various governmental agencies and our State agencies and basin organizations all have their own missions, and in order to serve the administration properly, one organization must

draw these projects together and consider them in the light of national well-being.

The CHAIRMAN. Very good.

Thank you, Mr. Waggoner. I appreciate having your statement. In this committee we welcome all the suggestions, because we are trying to find some answers to a difficult problem.

Senator FANNIN.

Senator FANNIN. Yes, Mr. Chairman.

Mr. Waggoner, I want to thank you for your expressions of public interest, and certainly the public-spirited statement that you have made and the offers that you have covered in your presentation, certainly, as I say, are commendable.

On page 2 of your statement, to go back to what the chairman covered about the Commission having the ability to review all of the plans and programs for water development, inasmuch as it will take some time to get the Commission underway, do you think it would be proper to hold back the present programs, present legislation, carrying through where there have been extensive studies over the years? In other words, hold those projects until they can be reviewed, realizing the time element involved and the critical situation of some of the programs?

Mr. WAGGONER. No, I definitely do not think they should be held up at all. We must have on-going missions, and this committee could, of course, be directed to apply its most intensive efforts and studies of certain specific projects that are current and needful immediately. But, at the same time, they could be constantly working on the overall study to bring cohesion to these projects so that we are not looking in 50 places for the various essentials for our water resources problem.

Senator FANNIN. Senator Gordon Allott regrets he cannot be here at this time, but he did have some questions that he would like for me to ask you, Mr. Waggoner. Some of the questions will be a little repetitious of what your statement covers, but I will ask them, inasmuch as he has requested me to do so.

What fields of knowledge and experience do you think should be included on this Commission?

Mr. WAGGONER. Well, actually there are many, many of them, and we have the problem of putting all of these fields into the brains of seven men, so to speak, even knowing that there will be a staff, and this sounds like an almost impossible task.

The thing that we know is that it represents many fields, that it must be based on a platform of engineering background because this is where these water resources problems—and I say problems—are all going to start.

I would have thought that the proper makeup of this commission would be possibly two engineers, one of whom would be a civil engineer capable of the vast range of interests which civil engineering includes, everything from hydrology to hydropower to flood control. It is an extremely wide branch of interests or field of interest. I would say the other one should be a sanitary engineer of broad interest in water treatment to cover the various fields of pollution.

I would think that one should be a person who is an expert in ground water. I think few people recognize that our ground water

reservoirs and resources are still one of the major sources of water for industry and for much domestic water throughout the country. There is a special problem about them in that many of them are depletable, permanently depletable. We are in many cases mining water whereas in other places we are using rechargeable ground water, and when we are depleting water which will never be recharged or replenished, then we must be thinking of the water heritage for people of the future, and this takes a special understanding.

I would say there should definitely be an accomplished water law attorney on this commission. I do not see how it could possibly operate without someone thoroughly informed on everything from State, Federal, local water law and the many pacts, covenants, et cetera, that are involved. I think that a water attorney ought to be there.

I think there should be an agriculturist, one whose field is wide enough to cover not only crop propagation and the food products but all types of vegetation such as forests and agricultural types of approaches.

There should also be an economist on the commission, because the economic impact on all parts of our Nation's business and living standards and everything are based on economy, and there should be an economist there of very high capability.

I would say, perhaps, that the last one, the seventh one, should be a conservationist, because we must not forget in our direct approach by engineering and our dollars approach by economists, and our legal and agricultural approach, that we still have to live, and we have to have an enjoyable living environment and conserve things for people of the future. So I would think that this sort of a make-up would make—

Senator FANNIN. Thank you very much, Mr. Waggoner. That is a very comprehensive report as to the make-up of the commission, as to what you think would be necessary.

There are some other questions that Senator Allott requested that I ask of you, and some, too, have been answered in your previous testimony to some extent, but I will read them as you may want to comment further.

As you know, it is somewhat difficult to insure any specific representation on such a commission. Do you have any suggestions as to how we might insure an experienced group of qualified people to broad knowledge as included in the commission's make-up?

Mr. WAGGONER. Well, to answer that briefly, I think that just direct appointment opens this up to the possibility that people of not the very best qualifications could be put on this commission. If, for instance, you had, perhaps, a system of Senate ratification for this, then you would have committees that could thoroughly investigate these people and look into them. I think then the chance of getting the very best would be improved.

Senator FANNIN. I was just going to ask you if you thought there should be Senate confirmation. You have answered that.

Mr. WAGGONER. This is my personal opinion, but I feel strongly that they should be confirmed by the Senate.

Senator FANNIN. Would you think the recommendations for the appointments should come from the organizations that would be involved in the specific work?

Mr. WAGGONER. Yes.

Senator FANNIN. The next question is, What do you think about the 5-year length of life provisions?

Mr. WAGGONER. I personally thought that that was pretty good. In the first place, it prevents us from being saddled with something if it does not work, it prevents us from being saddled with it permanently; whereas, if it does work it can be extended. It also puts the onus of getting down to work and getting the work done on the assignments given to this commission if they know that at the most they have 5 years to do it.

I think that along with this there ought to be certain tasks assigned to them with a definite deadline of less time than that, some of our major problems, specific problems.

Senator FANNIN. Thank you.

The last question is, What is your opinion as to the compensation of the commission? You know it is set in this bill at \$100 per day.

Mr. WAGGONER. Well, I think it should either be nothing or several times that. I think that one of the mistakes that the Government has made many times when they are talking to men of high caliber and great ability, asking them to conserve their Nation, and then offering them a sum of money which falls back in the same old \$100 a day they were talking about 20 years ago, which was an insult to them.

I would be prouder to serve my nation for a dollar a day than for \$100 a day by far, and I think that most of the people who are of the quality that should be on this Commission will be people making many, many times that amount. They are not going to come for the money, but the money you set aside appears to be a measure of their ability, and if you say they are \$100 men, I think it is an insult to them.

Senator FANNIN. Thank you very much, Mr. Waggoner.

The CHAIRMAN. Thank you, Mr. Waggoner. I wish we could break that \$100 barrier, but we get stuck with precedents up here. The problem, in large part, is how to differentiate between a per diem for one commission which may not have the responsibility and the tough assignment that this particular one would be confronted with. I think you have made a very good point, however. I want to compliment you and thank you for your presentation.

Mr. WAGGONER. Thank you again for the privilege of appearing here.

Senator FANNIN. Thank you again.

Dr. Nathaniel Wollman.

Doctor, I would like to make a few comments about you. Our witness is Dr. Nathaniel Wollman, professor and chairman of the Economics Department of the University of New Mexico. Dr. Wollman is one of the Nation's leading experts on water resource development. He is a distinguished author and has written extensively on the subject of water. He is also an active participant in the work of the 1961 Senate Select Committee on National Water Resources.

Dr. Wollman, we are very pleased to have you here and we look forward to your testimony.

The CHAIRMAN. Dr. Wollman, I also want to welcome you. I had a certain personal interest in New Mexico.

Mr. WOLLMAN. I know. I was sorry to hear of your recent tragic accident.

The CHAIRMAN. Thank you.

STATEMENT OF NATHANIEL WOLLMAN, CHAIRMAN, DEPARTMENT OF ECONOMICS, UNIVERSITY OF NEW MEXICO

Mr. WOLLMAN. Thank you, Senator Fannin, and thank you, Mr. Chairman.

I will depart a little bit from my prepared statement in light of what has gone before.

I support the proposed National Water Commission, its objectives, duties, and composition. The proposed Commission fills a gap in our administrative machinery and is a logical complement to the Water Resources Council.

Among the several purposes to be served by such a commission, one of the most important is to allay the fears and the suspicions that national interests are not always served by the Federal water resource programs. These fears arise out of several circumstances. One is the fear that sectional interests override national interests, largely as a result of the geographic basis of congressional representation.

A national water commission whose focus is the national welfare can provide Congress not only with useful analysis but also with an instrument with which to minimize the grounds of such accusation.

A second circumstance is the fact that the complexities of water use are so great that Congress is not able to formulate reasonably concrete guidelines for action by administrative agencies. It has been impossible to specify what pattern of water use would be in the best interests of the Nation. Even if we knew, there would be debate over the means to be used. For these reasons congressional mandates to operating agencies tend to be broad, sometimes rather vague, and occasionally the source of conflicting and overlapping responsibilities. While this state of affairs may be improved by some degree as we learn more about water resource development, it is likely that suspicion over the adequacy of choices made will grow rather than diminish as the intensity of competition for scarce resources increases. The proposed Commission should help to keep this suspicion within the bounds of healthy scepticism, rather than having it grow to the point where rational discussion becomes difficult.

The most impressive criticism of the existing organizational structure that I have seen, encompassing both Congress and the executive departments, has been the fact that policy tends to be made on the initiative of relatively strong, well-organized, and vocal minority interests. These growths are not evil. Many authorities have pointed out our system would function more poorly in their absence. Nevertheless, what has been missing up to now has been a suitable vehicle close to the seat of power for an equally vigorous presentation of interests allied neither to an activity or to a particular section of the country. This deficiency would be remedied by the proposed Commission.

It is commonly held that present administrative arrangements produce undesirable biases. Other witnesses have already pointed out a number, structural rather than nonstructural solutions, overinvestment in water resources relative to other activities because of sectional logrolling. A third I have already mentioned: namely, the threat that well-organized vocal minorities can override the mute, uninformed interests of majorities, or, the opposite: That majorities can effectively freeze out all minority preference and leave the minority

with no place to go. These biases are organizational in their origin and are not eliminated by the Water Resources Planning Act and the new entities which that act authorized. The Water Resources Council will reduce, perhaps eliminate, inconsistency among various agency programs within a region and even within the Nation. But it is one thing to have inconsistency among agency programs eliminated; it is another to be assured of the fact that consistency is directed toward maximum national welfare. Neither the Water Resources Council nor the river basin commissions constitute such radically different organizations from what we have had in the past to escape the criticisms that have been directed toward the interagency form of organization.

I came across this comment by an anonymous author, Mr. Z, who obviously was someone with an inside view. He pointed out that:

"Lacking any central authority short of the President, the member Bureau and Department representatives * * * are unable to resolve basic conflicts of interest." He concluded by saying:

"This proposition holds when the coordinating committee is composed of cabinet level officials."*

I do not mean to imply that the water resources planning act is not an important step forward, but only that there is still room for further innovation.

A truly national point of view is easily formulated in the abstract, but is likely to be difficult to identify in the concrete. Some of the alternatives to be considered are not likely to have an advocate by a water resource agency because they may represent options of not doing rather than doing. Imminence of water shortage in a region should prompt a search for the best answer among alternatives that not only includes all possibilities of making more water available, but also all possibilities of reducing the input of water per unit of product, all possibilities of varying the regional product mix within the context of a given national product mix, and all possibilities of varying the national product mix among water-related and non-water-related goods and services. This suggests a very wide range of possible adaptations for a given region and for the economy as a whole.

I might point out that it is because of the computer techniques that Dr. Hufschmidt recently described that these possible types of studies can now be made.

In the private economy these decisions emerge from the action of buyers, sellers, producers, and consumers in the market. In the administrative world of water resources many, perhaps most, of these decisions are made by governmental action. Alternatives must be examined not only in relation to the costs of water but also in the light of preference for domicile, the effects of different densities of population in the different parts of the country; the effects on the dynamics of regional and international economic growth; the costs and availabilities of urban infrastructure, and the problems of military and civil protection in event of an attack.

A national water commission would lend assurance that all alternatives were appraised in the cool light of dispassionate reason.

Advances in technology are likely to contribute to a blurring of jurisdictional boundaries among agencies, to growing conflict as well as complementary among regions, and to a more rapid expansion in

*National Resources Journal, November 1961, p. 200.

the possible range of solutions than in the institutional apparatus that exists to deal with such solutions.

I would like to point out a very small example. We have been hearing talk recently of a diversion of water from Columbia to the Colorado. I would like to call the committee's attention to a proposal that was made about 10 years ago to divert water from the Mississippi, somewhere around Shreveport, and bring it to San Antonio. This proposal was made in a paper by Harold Busey, a Los Alamos scientist, and he concluded that the project increased in economic feasibility as the scale of the diversion increased up to the size of a small navigational canal. He did not make the next step, but by doubling the distance and the lift the water could be brought to New Mexico, a lift of about 5,000 feet, comparable to what is involved in bringing the water from the Columbia to the Colorado.

The proposed commission not only would be insurance that advances in technology were not matched with an institutional vacuum, but would also be the agency upon which we could rely for advice on institutional change. This, then, is a final advantage of the proposed Commission. It is neutral with respect to additions, subtractions, and other changes that might be made among the line agencies. Its creation imposes no irreversible commitments or rigidities that we could conceivably regret a few years from now.

Creation of the proposed commission will not solve all problems surrounding Federal participation on water resource programs. A number of unanswered questions then will still remain. For example, how will the deficiencies in certain kinds of data be remedied?

A notable gap is our knowledge of industrial waste discharge. To remedy this deficiency would require, I gather, additional legislation.

Another question is the choice of machinery whereby conclusions and recommendations of the Commission are translated into action, especially in those instances where sectional or activity interests are adversely affected.

If the Water Resources Council functioned effectively, it would provide valuable support. I am assuming that it will, but it yet remains to be seen how it will operate.

I would like to emphasize a point made by Maynard Hufschmidt, and in a somewhat different context made by Professor Crutchfield.

The National Water Commission will have to be cognizant of and will greatly affect regional economic plans. This puts great responsibility on the Commission and emphasizes the importance of its composition. Its decisions regarding water can affect many aspects of the economy. For example, in its consideration of a wide range of alternatives, it might find out that a cash subsidy to be disposed of by the region might be superior to subsidized water, or that subsidization of the freight rates might also be preferable. Because of the range of the possibilities, the Commission should represent a wide range of the disciplines in addition to being endowed with imagination, dedication, and time to devote to their office.

If the National Water Commission is successful it may turn up more problems than can be solved in 5 years, and I would hope that the Congress position would be flexible enough to consider prolonging the Commission's life.

Most of the arguments that support creation of the Commission today are likely to justify its continuation in the future.

I would like to conclude by pointing out that we are in an interesting period of transition. One of the most famous economic text books, a text book by Professor Samuelson, in his first three editions included a sentence that indicated two examples of a free good, air and water. In the fourth edition water was deleted from the example.

The CHAIRMAN. That is economic growth.

Mr. WOLLMAN. The question is when does air go out. Thank you.

The CHAIRMAN. We certainly want to express to you our appreciation for this fine statement. I believe you made a study not too long ago showing what an acre-foot of water used in irrigation would bring, I think, some \$50?

Mr. WOLLMAN. Yes.

The CHAIRMAN. And wildlife and recreation \$200 to \$300?

Mr. WOLLMAN. Yes.

The CHAIRMAN. And municipal and industrial use \$3,000 to \$4,000—

Mr. WOLLMAN. This was—

The CHAIRMAN [Continuing]. Per acre foot.

Mr. WOLLMAN. Yes, per acre foot. This was a study that was based upon conceivable patterns of water uses in the Rio Grande Basin, using San Juan-Chama diversion water, and bringing it into the Rio Grande, and making the computation on the water that would be brought into the Rio Grande and the water that would remain in the San Juan Basin.

The CHAIRMAN. Of course, this dramatically points up the need to ask the critical question in each and every instance when you have a limited amount of what we discussing here, and what we are proposing that the Commission take a look at, and that is what is the wisest and the best use of that limited commodity. I think that question is not asked often enough, and it has not been critically examined in many areas of the country.

Mr. WOLLMAN. I agree. I think there are any number of instances where if that question had been critically asked a different kind of project would have been proposed. These are the kinds of questions that should be taken into account in plans prepared by the River Basin Commissions and by the examination of those plans by the Water Resources Council. The National Water Commission would have as one of its responsibilities making sure they were.

The CHAIRMAN. And the local community would be better off and the country might well be better off.

Mr. WOLLMAN. I think in some cases the local community might be better off, but in some cases the country would be better off, but perhaps at the expense of hardships imposed on the local community—

The CHAIRMAN. With reference to page 2 of your formal statement, you make several points in the second paragraph. You say it is commonly held that the present administrative arrangements produce undesirable biases. One is toward structural rather than nonstructural solutions of water resource problems. Another is toward over investment in water resources relative to other activities because of sectional logrolling.

I wonder if you could just be a little more illustrative of those points.

Mr. WOLLMAN. I can illustrate the first. In fact, one of your earlier witnesses gave you an excellent illustration, the use of structures to try

to protect people against floods versus, say, flood plain zoning or local or flood protection around a small structure.

The problem of zoning also could be illustrated in another way. Because of the construction of certain flood plain protective devices people then assume that they have a kind of protection that they do not have. Irvin Fox pointed that out this morning. Then, as a consequence, there is an increased use of the flood plain. The possible damage that then results is then enhanced by virtue of the increased use. The damage would be less if there had been no protection, paradoxically, because there would not have been then the same degree of encroachment into the flood plain subject to the damage that then takes place on occasion.

Another example is the problem of dilution of the wastes, which is a structural solution, versus in-plant treatment, which is a nonstructural solution.

The example of overinvestment is, I think, illustrated by the studies that have been made of various irrigation projects when converted to a cost per acre, and they indicate a larger investment per acre than the land could conceivably have been worth under any circumstances. This, of course, is not true of all irrigation projects, but it is true of certain ones.

The CHAIRMAN. Thank you very much. I appreciate having your comments.

Sentor FANNIN.

Senator FANNIN. Thank you, Mr. Chairman.

Dr. Wollman, I want to commend you for the thought you have put into your statement, and for the knowledge that you have in this field of endeavor. It is not all connected with economics, and I am very impressed with what you have said, and I feel your optimism as to what can be projected for the future. You are a neighbor of mine in the State of Arizona, where we know that our schools have worked together, the University of Arizona and your school. We do have some great problems, but we cannot push back the clock. I think that is one of the greatest of our problems.

Mr. WOLLMAN. That is right.

Senator FANNIN. We must work with the conditions that have developed. I think we recognize that this is one of the very serious problems that faces most of the communities in this country. So I do appreciate what you have had to say regarding the potentialities and possibilities that can be developed.

Mr. WOLLMAN. Thank you.

Senator FANNIN. Thank you.

The CHAIRMAN. Thank you, Professor Wollman, for coming this great distance, as well as for your fine statement.

Mr. WOLLMAN. Thank you very much.

The CHAIRMAN. I think it has been very enlightening for all of us to have the benefit of these well-thought-out statements and comments.

The committee will stand adjourned with the stipulation that the record will remain open until Friday of this week for any additional statements or comments. Thank you very much.

(Whereupon, the committee adjourned at 4:20 p.m.)

APPENDIX

(Under authority previously given, the following statements and communications were ordered printed:)

STATEMENT OF THE LEAGUE OF WOMEN VOTERS OF THE UNITED STATES

The League of Women Voters of the United States, an organization of 146,000 women who are members of local and state Leagues in the 50 states, Puerto Rico, and the District of Columbia, wishes to express its support of S. 3107—to provide for a comprehensive review of national water resource problems and programs through establishment of a National Water Commission.

Since 1956, when the League of Women Voters of the United States began its study of water resources, we have supported a number of bills before this Committee for creation of a highly-placed central body that would take an over-all view of our natural resources problems. In 1960, a member of the Board of Directors, testifying before this Committee in support of the proposed Resources and Conservation Act of 1960 said:

"The League has also found that meeting the nation's water needs requires not only regional planning, but planning for the country as a whole. The demands of one region must be weighed against those of another; the demands of one type of water use against conflicting ones. At present we find no governmental machinery suited to gathering the needed data, interpreting that data, and making recommendations on the basis of which the Executive can carry out long-range comprehensive planning and Congress can consider and enact legislation to implement such planning. . . . The many decisions which will be made in the water resources field will come more and more to involve choices between its use for various purposes. Those decisions are political ones, and will be made at the local, state, regional, and federal levels. The League believes that much more information must be available at all levels if the country is to make wise decisions."

The League supported the continuing, country-wide survey by experts which was part of the proposal for the Resources and Conservation Act of 1960. And in 1961, we were back before this Committee in support of that year's version of the proposed Resources and Conservation Act. The national Director testifying for the League said:

"Our study * * * during the last three years * * * has revealed a number of roadblocks to optimum development of water resources throughout the country. Important among these are:

Lack of continuing coordinated study of water resource needs and comprehensive recommendations for meeting such needs.

Lack of any agency in the Executive branch which has responsibility for developing a clear, up-to-date picture of water needs and making a comprehensive long-range plan to meet these needs together with recommendations for achieving the goal."

When proposals for a Council of Resources and Conservation Advisers to the President fared no better in 1961-62 than in the preceding Congress, the League continued to press for better over-all planning, better coordination between federal programs assigned to various agencies, and integrated planning and programs for river basins. In 1961, 1964, and 1965, the League supported the Water Resources Planning Act in testimony presented before this Committee. In interviews with and letters to their Representatives in Congress, League members urged passage of the bill. This time we had occasion to applaud when representatives of the League witnessed the signing of the Water Resources Planning Act by President Johnson, officially creating the Water Resources Council and authorizing river basin planning commissions.

And now the League is interested in rounding out the forward thrust in inter-departmental coordination and coordinated planning for total river basins or

regions set in motion by the Planning Act. We think there has been improvement since 1961 when we spoke of the need for coordination of federal programs. We think coordination of federal and state activities has become better. But we are convinced that there still is need to have specialists in water resources from outside the government present their views on present and future water problems, water requirements, and alternative ways to solve problems and meet requirements. We want to know what experts with no long indoctrination in or allegiance to the programs or practices of any federal agency think of the potential of water quality management, interbasin transfer, desalination, advanced treatment and reuse.

We believe that there will be value in adding the conclusions reached by leading thinkers chosen from outside the government circle to the information released by the federal agency involved. Far-reaching decisions lie ahead. Before these irrevocable steps are taken at the urging of some sections, national discussion and decision is needed. But citizens are uncertain about the facts. Our members, like many others, admire and have confidence in the technical skill of the federal construction agencies. But we doubt the prudence of relying solely on construction agencies to decide on the advisability of entering into large physical projects. We think it reasonable to seek an opinion from a group of equally respected stature and impeccable reputation but of different orientation. Since the nation has no such body at present, we support creation of one by this proposed legislation.

The reasons given above for creation of the National Water Commission are reasons why the League would prefer that Section 2(b) "No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States" be changed to strike out the exception in the case of retirees. We would prefer to see retired officers and civil servants ineligible for appointment to the Commission. There are many places and capacities in which these experienced, valuable people can continue to serve in the water field after retirement, but this National Water Commission should not be one. The very purpose of the Commission is to obtain the conclusions of men chosen from a different background, free from involvement in federal or state agencies. If the Commission is to be staffed by ex-agency personnel, there is no reason to establish it. What we are seeking is analysis from another viewpoint. Will it agree with the conclusion of the agency assigned by law to develop a certain program? Will it differ? How much? In what particulars?

Information, skills, and experience from the federal agencies will be available to the Commission members under the provisions of Section 6 for utilization of services of federal water resource agencies. Because we agree that federal personnel and federal agency studies should be utilized in the interest of economy and efficiency, the League thinks it all the more important that the Commission members themselves should not be persons retired from military or civil service.

The League of Women Voters recognizes, and is pleased to see mentioned in the bill, the promise of productive relationship between the Water Resources Council and the proposed National Water Commission.

We hope to see the proposed National Water Commission give particular consideration to economic and social aspects of water resource development in contrast to emphasis on the engineering side. The Council of Economic Advisors and the Joint Economic Committee in Congress, established by the Employment Act of 1946, have been successful in developing public awareness of economic tools available to stimulate the economy and in encouraging steps to achieve economic growth. The League thinks that far-reaching effects of the same seminal character can come from discussion of interim and final reports made by the National Water Commission. We foresee the National Water Commission educating the public and officials as the Senate Select Committee did. We foresee reports of this Committee focusing attention of interested citizens and of competing agencies on common problems as the economic reports have done.

The League of Women Voters of the United States views the proposed National Water Commission, not as a panacea nor as a competitor with the Water Resources Council or with regional planning entities, but as another vehicle toward League goals of improved coordination and sounder planning in water resource development. Since 1960 the League has held the position that

"Over-all long-range planning and development of water resources require federal procedures which provide the Executive and Congress with adequate

data and a framework within which alternatives may be weighed and intelligent decisions made."

and that

"Procedures should be established which provide information and an opportunity for citizen participation in policy decisions affecting the directions which water resource development will take."

In hope that it will help to accomplish both these ends, we ask the Senate Committee on Interior and Insular Affairs to recommend enactment of S. 3107 to establish for five years this National Water Commission of distinguished, non-government water specialists.

STATEMENT OF DONEL J. LANE, EXECUTIVE SECRETARY, STATE WATER RESOURCES BOARD OF OREGON

Mr. Chairman and members of the committee. My name is Donel J. Lane of Salem, Oregon. I am Executive Secretary of the State Water Resources Board and appear before you on behalf of the Honorable Mark O. Hatfield, Governor of Oregon and that Board in support of S. 3107. Governor Hatfield and our Board have supported the principle of a National Water Commission since it first came to our attention in the report of the Bureau of the Budget pertaining to S. 1019 and S. 75 submitted to the chairman of this committee under date of May 10, 1965.

The Oregon Water Resources Board is our states water policy and planning agency. Its functions include, in part, classification and allocation of unappropriated water including establishment of minimum flows, rendering decisions on conflicts over water and acting as the state's representative in comprehensive water resource planning carried out in cooperation with federal agencies. When the Board was created in 1955 it undertook to develop a concept of water planning that was without precedent at either federal or state level. Even though legislative standards had been provided it was necessary to develop methods of establishing values before it could implement its responsibilities.

In its attempts to work out acceptable criteria for the formulation of a state water policy, the board became very cognizant of the deficiencies of present standards for the determination of values between uses of water, particularly those that involve socio-economic aspects such as recreation, water quality and sports and commercial fisheries. To meet this and other types of deficiencies, federal agencies developed what is known as Senate Document 97 to provide a basis for assigning benefits for federal projects. To date these concepts have not been completely accepted by the Congress.

The basis for assigning costs is even more obscure. It is our understanding that efforts are underway to develop a counterpart to Senate Document 97 pertaining to cost analysis but to our knowledge it has not yet been released. This type of information is needed before equitable solutions can be found to resolve our water problems. We question whether current concepts of project economic feasibility are applicable when we consider the magnitude, the complexity and the far reaching consequences of inter-regional and international water development proposals now being discussed.

What will be the impact of such proposals on areas which have not yet fully committed their water resources? Would transfer of water be a retardment to future growth in such an area? What would be the cost of such an inability to develop? In areas with limited storage capability such as the Columbia River Basin, who pays the incremental cost of future water development that would result from using the more feasible sites to meet current demands of another region and how are these costs determined?

What are the alternates to inter-regional transfers of water? Have they been fully explored?

What are the costs to the recipient region if inter-regional transfers are not undertaken and how are they determined?

What is the legal mechanism to insure and maintain whatever equitable decisions that are agreed upon to meet regional and national water requirements?

These are some of the types of problems that the nation faces today in the development and utilization of water resources.

We believe that a National Water Commission, composed of distinguished citizens from the various disciplines and representative of the major geographical

regions, with duties as prescribed in Section 3 of S. 3107 could perform a great service to the nation in developing the criteria for the type of water planning that is a necessary prerequisite to decisions on feasibility of physical structures required to meet inter-regional and national water requirements.

STATEMENT OF ALEX RADIN, GENERAL MANAGER, AMERICAN PUBLIC POWER
ASSOCIATION

The American Public Power Association supports the enactment of S. 3107 as an important step toward full utilization of our nation's water resources.

Our Association represents more than 1,400 local publicly owned electric utilities, including municipal systems, public utility districts, irrigation and power organizations, State power agencies, and other public power groups in 45 States.

During the 23rd Annual American Public Power Association Conference, which was held this month in Boston, APPA delegates endorsed S. 3107 and passed the following resolution May 12, 1966:

NATIONAL WATER STUDY

Whereas, the problems of water supply to many areas of this Nation are becoming increasingly serious, and

Whereas, many proposals involving water supply, including the diversion of water from one river basin to another, also affect the construction, operation and maintenance of hydroelectric projects;

Now, therefore, be it resolved: That the American Public Power Association endorses S. 3107, which establishes a National Water Commission comprised of citizens outside of Federal government service for the purpose of conducting a national water study covering the availability, demand, proper use, and conservation of our entire Nation's water resources.

During the Boston Conference, APPA delegates also considered the further development of the Colorado River and passed this resolution in support of studies by a National Water Commission relating to the authorization of Bridge Canyon and Marble Canyon Dams:

COLORADO RIVER

Whereas, the further development of the Colorado River is in accordance with the proper conservation of our Nation's water and land resources.

Now, therefore, be it resolved: That the American Public Power Association reaffirms its support of authorization and construction of Bridge Canyon and Marble Canyon Dams and appurtenant power facilities as proposed in H.R. 4671, provided that the water resource studies proposed in Section 201 be conducted, as expeditiously as feasible, under the direction and control of a National Water Commission composed of citizens outside of Federal government service as proposed in Senator Jackson's bill, S. 3107.

The American Public Power Association recommends and urges that the National Water Commission study the development and redevelopment of hydroelectric projects. In 1964, the Federal Power Commission, in the National Power Survey, recommended that redevelopment of existing projects "should be extensively studied for selected projects of apparent economic feasibility and for areas where hydro peaking facilities would be desirable and needed." The Survey also estimated that by 1980 the hydroelectric capacity available for power system supply will increase to about 78 million kilowatts, which will be about 15 percent of total generating capacity needs.

The National Power Survey also recognized that hydroelectric development is closely related to water resource planning:

In many cases the development of hydroelectric power provides such associated benefits as recreation, water supply, fish and wildlife enhancement, flood control, and cooling water for thermal-electric and industrial plants. Many multiple-purpose projects would not be economically justified without the inclusion of power as one of the project purposes. The favorable characteristics of hydroelectric power and the frequent multiple use benefits associated with its development provide strong incentives for utilizing the remaining potential of our water power resources that can be developed economically.

APPA urges that a comprehensive survey of water resources take into account the findings and recommendations of the National Power Survey. Further development of present hydroelectric projects, and construction of new projects will help insure the availability of abundant low-cost power in the future.

AMERICAN WATER WORKS ASSOCIATION, INC.,
New York, N.Y., May 23, 1966.

HON. HENRY M. JACKSON,
Chairman, Senate Interior and Insular Affairs Committee,
Senate Office Building,
Washington, D.C.

DEAR SENATOR JACKSON: At your request, I am, on behalf of the American Water Works Association, submitting our views on Bill S. 3107 now under consideration by your Committee.

Our Association, composed of men in all fields who are engaged in the design, construction, operation and management of water utilities, and related activities, has long had an interest in the overall problem of providing water service adequate to meet the nation's growing domestic, commercial, and industrial needs.

We are well aware that the problems are becoming more difficult as the growing needs approach the more or less fixed amounts of water available. Although much has been done by those in the industry, as well as by the various departments of state and federal government, there does appear to be a need for an overall look at the problems of water supply on a national basis.

Senate Bill S. 3107, which calls for the appointment of a seven-member National Water Commission, would seem to provide a practical means for making the type of study that is needed at this time.

We have had excellent relations with many of the federal and state agencies. Nevertheless, we strongly support the requirement in the bill which calls for the appointment of the commission members from outside federal service. This should help assure a broad and objective outlook.

We recognize the need for the commission and the various duties and responsibilities assigned to it and urge passage and implementation of the bill.

Sincerely,

SAMUEL S. BAXTER, *President.*

COLUMBIA PLATEAU RESOURCES COUNCIL,
Plummer, Idaho, May 16, 1966.

The Honorable HENRY M. JACKSON,
U. S. Senate Office Building,
Washington, D.C.

DEAR SENATOR JACKSON: In a regular meeting of the Board of Directors of the Columbia Plateau Resources Council in Lewiston, Idaho, Monday, May 9, the directors voted unanimously in favor of your Bill S3107 to establish a National Water Commission.

The resolution they adopted read:

Be it resolved that the Columbia Plateau Resources Council Board of Directors encourage the passage of Senator Henry M. Jackson's S3107 Bill to establish a National Water Commission.

The directors also voted unanimously to support the formation of the River Basin Commission in the Columbia River watershed as proposed by the Governors of the Northwest states at the recent Las Vegas conference: to assure optimum development of water resources in the Pacific Northwest. They also resolved that studies presently under way by state and federal agencies to determine the growing and long-range demands of Northwest needs and water uses be expedited.

We know you will be interested in these action of the Columbia Plateau Resources Council.

Sincerely,

EARL McCLELLAN, *President.*

NEW MEXICO INTERSTATE STREAM COMMISSION,
Santa Fe, N. Mex., May 4, 1966.

The Honorable HENRY M. JACKSON,
Chairman, Senate Interior and Insular Affairs Committee,
Washington, D.C.

DEAR SENATOR JACKSON: By letter dated April 18, 1966 Mr. Jerry Verkler has advised me that your Committee would be happy to receive my comments on S. 3107, the National Water Commission bill.

It is my view that the National Water Commission would be able to furnish what will be generally accepted as unbiased recommendations on the nature and extent of investigations and reports needed for the complex of water problems facing the United States. Such unbiased recommendations would give invaluable guidance in the studies so urgently needed to meet the imminent water supply problems of the western states. A unity of purpose among the western states that could develop from the Commission's recommendations would improve and accelerate the necessary studies.

I concur with your view that we can look to the National Water Commission for broad vision, independent judgment and imaginative solutions in meeting the critical water needs of the future. I support early enactment of S. 3107.

The invitation to present my views on S. 3107 is greatly appreciated and I hope that you will be able to make this letter a part of the record of the hearings on the bill.

Yours truly,

S. E. REYNOLDS,
Secretary.

NATIONAL WILDLIFE FEDERATION,
Washington, D.C., May 23, 1966.

The Honorable HENRY M. JACKSON,
Chairman, Senate Committee on Interior and Insular Affairs, New Senate Office Building, Washington, D.C.

DEAR MR. CHAIRMAN: The National Wildlife Federation appreciates the invitation and opportunity to comment briefly upon S. 3107, a proposal to create a National Water Commission, currently under consideration by your Committee, and would appreciate having this letter made a part of the record.

It is our opinion that a National Water Commission, which could conduct impartial studies of controversial water problems, would be of significant importance to the Federal Water Resources Council and to the Congress. We believe the principle of impartial group envisioned by this proposal could perform a valuable function in making an independent evaluation of plans relating to water resources. The need for such a group has been highlighted by the recent drought in the Northeast and critical water problems in the Great Lakes as well as the need for water in the arid Pacific Southwest. Undoubtedly there are other areas where such a Commission could function with great service to the country.

It is our understanding that such a Commission would use data collected by Federal and state agencies, and from other sources, in arriving at decisions rather than developing a staff of its own.

In endorsing the principle outlined in S. 3107, we would not want to cause any significant delay in the resolution of any major water problems. It would be our hope that this Commission could function with a minimum of delay.

Sincerely,

THOMAS KIMBALL,
Executive Director.

TACOMA, WASH., May 8, 1966.

Senator HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C.

DEAR SENATOR JACKSON: Your kind invitation of April 18 to submit any comments I might care to make on S. 3107, the National Water Commission bill, is sincerely appreciated.

Perhaps no other time of the year would be actually less crowded for me with miscellaneous large and small commitments, but it has seemed that lately the time to think out and organize some of the concepts of the bill has been matched

in its scarcity only by the time to sit down and get thoughts on paper and on the way to you.

Pollution and its perplexity of problems are popping up like our spring flowers, all over the place, as these observations may indicate:

On May 6 the Winter School Building of the WSU Experiment Station in Puyallup was the scene of a spirited well-based address to the Sigma Xi Club on "People, Pollution and Politics" by Dr. Charles H. Drake of the WSU Department of Bacteriology and Public Health. In my mind there's no question of his competence in research, in application of that research to practical problems, and in compelling attention to presentation of his knowledge.

The April 23 issue of the Saturday Evening Post has "Our Dying Waters" as the lead article; it's by John Bird and the foreword indicates that it begins a series of reports on a national problem and an angry new public determination. Mr. Bird mentions Lake Tahoe and Chesapeake Bay, along with the Potomac, the Cuyahoga, the Hudson, the Mississippi and the Detroit Rivers, and the scandalous way in which they have virtually been destroyed for use by the general public. Lake Tahoe comes to my mind quickly in that Dr. Drake, who is also a reserve officer of the U.S. Public Health Service, was ordered to a period of active duty in connection with the pollution problem in that area, and came up with a solution. (The Passaic River also comes to mind—as far back as 1923 its noisome stench would almost have gagged a buzzard. I wonder if a generation and a half have been conditioned already in that area to filthy water and filthy air and are being reconciled to living with it. I hope not.)

In today's News Tribune (Tacoma), Page D-16 refers to "thousands of tons of soil which would now be polluting the river below (i.e., the White River) now remain in place on the Green farm." The article was directed to the value of the soil erosion control job necessitated because water poured from an 8-inch tile drain off farm land. Pollution was an evil equally principal with the erosion; from the tile laid only in 1957 a hole 175 feet long, 75 feet wide and 110 feet deep had already been gouged out of an embankment on a farm just northeast of Lake Tapps.

(Do I correctly recall that there was great bitterness in claims and counterclaims and court actions in the Shelton area where oyster growers strongly maintained that waste sulfite liquor from the Rayonier pulp plant was poisoning the waters in which great quantities of oysters had formerly been raised, and that the oysters have been staging a steady comeback since the closure of Rayonier?)

Last Monday night or early Tuesday morning a fire in a warehouse in Yakima placed many lives in jeopardy: the lives of human beings from toxic fumes spewed out into the night and from burning "farm chemicals and insecticides"; possibly the lives of human beings and certainly the lives of countless fish. Air pollution from the fire is certainly classed as accidental; the use for which the farm chemicals and insecticides was planned wasn't accidental. The terrific danger from their use was dramatized in the Tacoma News Tribune's story on May 6 regarding the enormous effort required to dispose of 500,000 gallons of contaminated water remaining in the basement of the storage company warehouse after the fire was out. Part of the newspaper account reads that "the insecticide-polluted water couldn't be pumped into nearby streams because it would harm fish, and it couldn't be diverted into the city sewage system because it would destroy needed bacteria in the system". One TV news report had it that all the fish downstream from Yakima to Astoria would have been killed if the polluted water were dumped into the river. What was done? A deep trench was dug in a desolate sagebrush area far outside the city, and a fleet of tank trucks was used to haul the stuff there and dump it in; lime was then to be used to neutralize the acids, and the whole area was to be covered with from four to six feet of earth. It would seem that commendation is in order for the well-informed people who realized the potential danger and quickly saw to it that authority was exercised to avoid what could have been a multi-million dollar disaster piled on top of a loss already estimated at a half-million dollars. But what if the "farm chemicals and insecticides" had been used in agriculture in the "normal" course of events? Pesticide pollution of ground water would have inevitably resulted, as it will continue to occur so long as certain chemicals are permitted to be ingredients of these

agricultural poisons. The only difference in the two circumstances of pollution would be in the rate of occurrence of the pollution.

Pollution of another kind is related in an article in the Audubon Magazine, by Richard C. Bradley. This is pollution of the public mind and reactions, according to Mr. Bradley, in order to accomplish exploitation of natural resources under guise of public benefit. The Bureau of Reclamation speciously cites authority of the Secretary of the Interior under a 1919 Act which is absolutely absent from a 1932 Act specifically establishing the Grand Canyon National Monument; the whole purpose of this and other attempted justification is to make the construction of power dams look economically feasible to Congress although the premise and assumption that the price of power can be counted on to remain at 6 mills per KWH for the *next 75 years*, is one of the most ridiculous to be found in a national publication. Here the error is in the absolutely unjustifiable attempt to finance a half-billion dollar water-diversion network by building unnecessary dams costing half as much again and ruining geological and historical and esthetic value forever, in the bargain.

These are local or regional incidents. How many times are they multiplied, up and down across the country?

There is this about pollution: how important is its prevention? A conservative estimate of water requirements of the population of this country as projected for the year 2000 indicates that *every* drop of natural water that falls on *every* bit of this country, as rain, as snow or as sleet, will have to be used at least *twice* to satisfy ordinary needs; a harsher estimate is that every such drop will have to be used *four* times, and that by the year 1985. Waste water purification is a positive *must* for the reuse of water, and so the prevention of pollution is rated high on the list of *musts* in the direction of purification and reuse.

New water resources may be developed. In desalinization, for instance, technical methods may be improved, with consequent better quality and larger yield at lower cost. Ways may be developed to increase precipitation and preservation of the increase in reservoirs for later distribution, so that seasonal imbalance may be partially compensated for. Controlled melting of glacial or other frozen areas may ultimately occur, most likely as a cooperative effort between this and other nations. Transfers of water in large quantities, between regions, will doubtlessly become necessary, for agricultural and industrial as well as for personal uses.

Tremendous implications are involved in the consideration of water resource development, reuse of water, and transfer of water between regions. The greatest joint effort of the highest talent in science, in engineering, in public health, in economics, in tax expertise, in public relations to effect proper education, acceptance and cooperation, in compromise, in governmental supervision and control, in legislation, and above all in *common sense*—these and other, many other, considerations appear to be justified in the name of national survival. In the matter of opposition to further intrusion of government in what should be private affairs, I yield to a degree, principally because of two things: we have been too placid in not protecting our natural heritage from wanton greed and recklessness; and the federal government's power to tax or to establish tax incentives to promote a more ready and effective compliance with the needed legislation.

For nearly a hundred years scientists have been amassing vast and valuable knowledge as to the physical, chemical and biological nature of water, and its abuses and its uses, both objective and subjective. The problem encountered has been, in common with all other scientific advance in knowledge, that as the bonfire of knowledge grows larger in the night and brightens an ever-increasing area adjacent to it, the perimeter of darkness just beyond that lighted area is also increasing. We are well supplied with information. We must now acquire courage and wisdom, to apply that information for the greatest good of the greatest number. The duty to discover all the necessary facts must have as its essential and inescapably necessary complement the duty to use and apply that knowledge in a just and righteous and truly moral manner.

The National Water Commission to be established by S. 3107 will be confronted by tremendous variations and complications—those that exist between needs and desires; between people "in" government and people outside of government; between water and its sources, and water and its waste; between waste by chemical, by biological, by radioactive, and by other action; between the practical and necessary side, and the esthetic side, of water reuse; between public apathy and private (or even public) greed; between what *can* be done,

what *should* be done, and what *must* be done; between criminal waste and careful, justifiable, profitable conservation; between the man with the eyesight of a hawk and the man with the vision of a clam.

The responsibilities of the Commission will be awesomely weighted, either for public good or for public disaster. Its conscience must be impeccably established, sturdily constituted and unwaveringly obeyed. Upon it, in the last analysis, there does rest the survival of this country, in saving it from its people. It will be a challenge to strong men of highest motives to expend liberally of their diligence, their energy, and above all of their good will toward their fellow men. The law entrusted to their enforcement should be a good law, one with teeth in it, that they may pledge to one another and to the rest of us American citizens, in the words of the immortal Declaration: "our lives, our fortunes, and our sacred honor". This, also in immortal words, those of the martyred Lincoln: "that this nation . . . of the people, by the people, and *for* the people, shall not perish from the earth."

Appealing to the Supreme Judge of the world, as did our founding fathers, may He bless the deliberations of your committee to the end that good and proper legislation may be enacted, which in its application will bring about honest and united effort on the part of all, to the end and the enjoyment of a solution which will have early, appropriate, happy and permanently-lasting consequence.

With every good wish, I am

Yours very sincerely,

CHARLES M. TOYNEBEE.

STATEMENT OF NORTHCUTT ELY, SPECIAL COUNSEL TO THE COLORADO RIVER BOARD OF CALIFORNIA, AND SPECIAL ASSISTANT ATTORNEY GENERAL

(An explanation of Title II, H.R. 4671, 89th Congress, House Committee Print No. 19, A bill to authorize the construction, operation, and maintenance of the Colorado River Basin Project.)

TITLE II

Title II directs the Secretary, in Section 201, p. 28, line 16, to prepare estimates of water supply and requirements to at least the year 2030, for both basins. At page 28, line 24, he is directed "to investigate sources and means of supplying these requirements, in both basins, including reductions in losses, importations from sources outside the natural drainage basin of the Colorado River System, desalination, weather modifications, and other means." At page 29, line 17, this instruction is expanded, "to investigate current and anticipated water requirements of areas outside the natural drainage area of the Colorado River system which feasibly can be served from importation facilities en route to the Colorado River system." This instruction is to be read in connection with the important new language in Sec. 201 (b) and (c), which begins at p. 29, line 22.

The Secretary, in Section 201(b), is directed to prepare planning and feasibility reports of a staged plan for projects adequate, in his judgment, to meet the requirements reported under Section 201(a).

This staged plan is to be based upon comprehensive analysis of water resources and requirements, not only in the entire Colorado River Basin, but also in the potential areas of origin of water to be imported into that basin.

IMPORTATIONS FOR USE IN THE LOWER BASIN: THE FIRST 2.5 MILLION

Section 201(c), beginning at p. 30, line 3, tells the Secretary that "the plan for the first stage of works to import water into the Colorado River system from outside the natural drainage area of that system shall include facilities to provide two million five hundred thousand acre-feet annually for use from the main stream of the Colorado River below Lee Ferry, including satisfaction of the obligations of the Mexican Water Treaty and losses of water associated with the performance of that treaty."

The plan for the first stage may include, in addition to this mandatory minimum component, three discretionary increments of capacity. But before discussing them, the quantity of 2.5 million deserves explanation, as it occurs several times in the bill.

Two million five hundred thousand acre-feet annually is the quantity which must be added to the mainstream to make possible the use of the Lower Basin on a permanent basis of the 7.5 million acre-feet apportioned by the Supreme Court, when the flow at Lee Ferry is reduced to the Compact minimum by Upper Basin depletions and the Upper Basin is released from the Treaty burden. The derivation of the 2.5 million acre-foot figure was explained in detail in the August hearings (p. 289).

DISCRETIONARY INCREMENTS OF CAPACITY

The three discretionary increments in capacity of the first stage of importation works begin at page 30, line 13.

First, in Sec. 201(c)(1) the Secretary may include facilities to divert into the Colorado River up to two million acre-feet annually of additional water for use in the Lower Colorado River Basin, bringing the Lower Basin total up to a maximum of 4.5 million acre-feet of imports. This recognizes that the water requirements of Arizona, California, and Nevada are much greater than the 7.5 million acre-feet which would be "firmed up" by the importation of 2.5 million. For example, seven million five hundred thousand acre-feet, under the terms of the decree, and of this bill, would provide only 2.8 million acre-feet for Arizona, 4.4 million for California, and 300,000 for Nevada. Arizona's stated requirements are at least 3.8 million acre-feet. California's existing projects were constructed to use 5.4 million, not 4.4 million acre-feet. Nevada, in the Supreme Court suit, offered proof of requirements greatly in excess of the 300,000 acre-feet which the decree would give her out of the first 7.5 million.

The second discretionary increment in the capacity of the importation works appears in Sec. 201(c)(2) at page 30, line 16. It authorizes inclusion of up to 2 million acre-feet for use in the Upper Colorado River Basin. If this were brought in below Lee Ferry, the two million acre-feet so imported would in fact be used in the Lower Basin, and the obligation of the Upper Division under Article III(d) of the Compact would be reduced from 75 million to 55 million acre-feet in each period of 10 consecutive years. Thus the first stage of the Secretary's plan may provide a maximum importation into the Colorado River system of up to 6.5 million acre-feet annually.

The third discretionary increment of capacity (Sec. 201(c)(3), p. 30, line 19) in the importation works is up to 2 million acre-feet annually for use in the areas which can be served by these importation facilities en route from the areas of origin to the Colorado River system. Thus, if the import aqueduct brings water from the rivers of Northern California to the Colorado, it may be feasible to deliver water from it, en route, to areas in Northern and Central California, and Nevada. If the aqueduct brings water from the Columbia, similar opportunities for service may be found in Northern California, Oregon, Idaho, and Nevada.

MEXICAN TREATY BURDEN

Section 201(d), at p. 30, line 24, deals with the Mexican Treaty burden. This paragraph makes three points: First, the Treaty constitutes a national obligation. Second, and in consequence of the first point, the Upper Division and the Lower Division are both to be relieved of the obligation imposed by Article III(c) of the Compact to curtail their uses to supply water for Mexico, but only if and when the third point is met. This states that the obligation shall end when the President issues the proclamation specified in Section 304(b) (p. 36, line 23). The President must be able to proclaim that works have been completed and are in operation, capable in his judgment of delivering annually not less than 2.5 million acre-feet into the mainstream below Lee Ferry from outside the natural drainage area of the Colorado River system, and that such sources are adequate, in the President's judgment, to supply such quantities without adverse effect upon the foreseeable water requirements of any state from which such water is imported. The 2.5 million here referred to is identical with the 2.5 million capacity which Section 201(c) directs the Secretary to provide as the mandatory element in the first stage of his importation plan. This proclamation has other important effects, which we will come to later.

PROTECTION OF STATES AND AREAS OF ORIGIN

Section 202 contains important new provisions for the protection of areas and states of origin. This subject is of concern to California as a potential area of origin, just as it is to the Columbia Basin states for the same reason.

Section 202(a), at p. 31, line 12, gives the Secretary a general mandate to make provision for adequate and equitable protection of the interests of the states and areas of origin, including assistance from the development fund established by Title IV of the bill, so that water supplies will be available for use in those states and areas at prices to the users of water which are not adversely affected by the exportation of water to the Colorado River system. This means, in California's case, that if the cheapest potential projects for development of our northern rivers are first used as sources from which to export water to the Colorado, with the result that potential users of water in California must instead look to more expensive sources, then the development fund is to pay that increment of cost.

Section 202(b), at p. 31, line 22, provides a priority for the states and areas of origin in about as sweeping terms as could be devised. It says, in so many words, "all requirements, present or future, for water within any State lying wholly or in part within the drainage area of any river basin from which water is exported by works planned pursuant to this Act shall have a priority of right in perpetuity to the use of the waters of that river basin, for all purposes, as against the uses of the water delivered by means of such exportation works, unless otherwise provided by interstate agreement." Thus, if the exported waters are diverted from any point in the Columbia River basin, any state which has any portion of its area in that basin has a perpetual priority, to be initiated at any time in the future, to the use of Columbia system water for all purposes as against any user of water exported from the Columbia River system by any project which may result from the planning proposed by this bill. This is so even though the water so exported is being devoted to consumptive use in the Colorado River basin by projects whose initiation is prior in time to the future projects in the Columbia Basin on whose behalf the priority is asserted. It is so even though the use thus protected in the Columbia basin is not a consumptive use, but is a use for power or navigation or fish preservation or disposal of pollution to the ocean. No Columbia Basin state may be deprived of this protection except by its own consent, given in an interstate compact. By the same token, if California rivers, instead of the Columbia, are the source of the exported waters, California receives the same protection.

If California is the area of origin for even as much as 2.5 million acre-feet, California will contribute a quantity of water from our northern rivers to the Colorado which is several times the quantity that this bill would give us out of the Colorado. We have accordingly exercised great care in writing this language and the other safeguards for areas of origin which this bill contains, and are satisfied with it. We hope that our sister states in the Columbia Basin are similarly reassured.

TIMING

Section 203(b), at p. 32, line 11, directs the Secretary to submit his proposed report and findings on the importation plan to the affected states and federal agencies, as required by existing law, and to do so by December 31, 1970. This date, which is later than some of us would prefer, is adopted in deference to the five-year period of investigation adopted for current water planning studies by certain of the Columbia Basin states in 1965.

Section 203(c), p. 32, line 15, requires that within one year after the affected states and federal agencies have submitted their findings, the Secretary must submit his plan and report to the President and to the Congress, accompanied by the comments of these states and agencies.

NO AUTHORIZATION FOR CONSTRUCTION OF IMPORTATION WORKS

The bill does not authorize construction of any importation works. Such authorization must await another act of Congress, after it has reviewed the Secretary's plan and the comments of all affected States and interested federal agencies.



The first part of the book is devoted to a general history of the United States from its discovery by Columbus in 1492 to the present time. It covers the early years of settlement, the struggle for independence, the formation of the Constitution, and the growth of the nation to its present boundaries. The author discusses the political, social, and economic changes that have shaped the country over the centuries.

The second part of the book is a detailed account of the American Revolution, from the outbreak of hostilities in 1775 to the signing of the Treaty of Paris in 1783. It describes the military campaigns, the political maneuvering, and the ultimate triumph of the revolutionary forces over the British.

The third part of the book deals with the early years of the new nation, from the signing of the Constitution in 1787 to the end of the War of 1812. It examines the challenges faced by the young republic, the development of its institutions, and the expansion of its territory.

The fourth part of the book covers the period from the War of 1812 to the outbreak of the Civil War in 1861. It discusses the growth of the industrial revolution, the expansion of slavery, and the tensions that led to the conflict.

The fifth part of the book is a history of the Civil War, from its beginning in 1861 to its end in 1865. It details the military and political events, the role of Abraham Lincoln, and the ultimate victory of the Union.

The sixth part of the book is a history of Reconstruction and the late 19th century, from the end of the Civil War to the beginning of the 20th century. It discusses the challenges of rebuilding the South, the rise of the Gilded Age, and the emergence of the Progressive Movement.

The seventh part of the book is a history of the 20th century, from the beginning of the century to the present. It covers the rise of the United States as a world power, the two world wars, the Cold War, and the social and economic changes of the modern era.

The book is written in a clear and concise style, making it accessible to a wide range of readers. It provides a comprehensive overview of the history of the United States, from its early years to the present. The author's use of primary sources and his detailed analysis of the events of the past make this a valuable work for anyone interested in the history of the United States.

The book is divided into seven parts, each covering a different period of American history. The first part is a general history of the United States, the second part is a detailed account of the American Revolution, the third part deals with the early years of the new nation, the fourth part covers the period from the War of 1812 to the outbreak of the Civil War, the fifth part is a history of the Civil War, the sixth part is a history of Reconstruction and the late 19th century, and the seventh part is a history of the 20th century.

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