

**A NATIONAL WATER INITIATIVE:
COORDINATING AND IMPROVING
FEDERAL RESEARCH ON WATER**

HEARING
BEFORE THE
SUBCOMMITTEE ON ENERGY AND
ENVIRONMENT
COMMITTEE ON SCIENCE AND
TECHNOLOGY
HOUSE OF REPRESENTATIVES
ONE HUNDRED TENTH CONGRESS

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A NATIONAL WATER INITIATIVE: COORDINATING AND IMPROVING FEDERAL RESEARCH ON WATER

WEDNESDAY, JULY 23, 2008

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:06 a.m., in Room 2318, Rayburn House Office Building, Hon. Nick Lampson [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

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Subcommittee on Energy and Environment

Hearing on

***A National Water Initiative:
Coordinating and Improving Federal Research on Water***

Wednesday, July 23, 2008
10:00a.m. – 12:00p.m.
2318 Rayburn House Office Building

Witness List

Dr. Mark A. Shannon

Director, United States Strategic Water Initiative

Mr. Tod Christenson

Director, Beverage Industry Environmental Roundtable (BIER)

Dr. Timothy T. Loftus

Water Resource Planner, Chicago Metropolitan Agency for Planning (CMAP)

Mr. Jerry Johnson

General Manager, DC Water and Sewer Authority

Mr. Bradley H. Spooner

Principal Engineer, Environmental Services at Municipal Electric Authority of Georgia

Dr. Upton Hatch

*President-elect of the National Institutes for Water Resources;
Associate Director, Water Resources Research Institute of the University of North
Carolina; and Research Professor, Department of Agricultural and Resource
Economics, North Carolina State University*

HEARING CHARTER

**SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES**

**A National Water Initiative:
Coordinating and Improving
Federal Research on Water**

WEDNESDAY, JULY 23, 2008
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

PURPOSE

On Wednesday, July 23rd the Subcommittee on Energy and Environment will hold a hearing to receive testimony on the opportunities for the Federal Government to support and better coordinate research and technological innovation to enhance water supplies and water quality and to support improved water management. The Committee will also receive testimony on a discussion draft of legislation to be introduced by Chairman Bart Gordon entitled the *National Water Research and Development Initiative Act*.

WITNESSES

- **Dr. Mark A. Shannon:** Director of the United States Strategic Water Initiative, a public-private effort to enhance American competitiveness in water purification science and technology by advancing the basic science of water purification and accelerating the implementation of innovative U.S. technologies to deliver, increase, and protect fresh water supplies around the world.
- **Mr. Tod Christenson:** Director of the Beverage Industry Environmental Roundtable (BIER), an organization created by Coca Cola and representing eleven beverage companies including Anheuser Busch, Beam, Pepsi, etc.
- **Dr. Timothy T. Loftus:** Water Resource Planner for the Chicago Metropolitan Agency for Planning (CMAP) and coordinator of the Illinois 2050 Water Demand Scenario report commission by the Governor Rod Blagojevich.
- **Mr. Jerry Johnson:** General Manager at the DC Water and Sewer Authority, a multi-jurisdictional regional utility that provides drinking water, wastewater collection and treatment to more than 500,000 residential, commercial and governmental customers in the District of Columbia.
- **Mr. Bradley H. Spooner:** Principal Engineer for Environmental Services at Municipal Electric Authority of Georgia, a public corporation providing power to 49 Georgia communities that in turn bring energy to approximately 600,000 citizens.
- **Dr. Upton Hatch:** Associate Director at the Water Resources Research Institute of the University of North Carolina, one of the fifty-four state and territorial Water Research Institutes and Centers which perform research related to regional and interstate water resources problems.

BACKGROUND

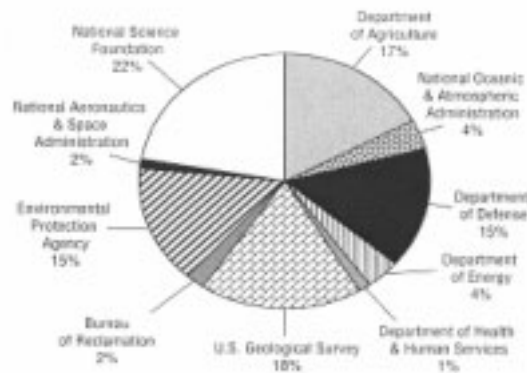
Water resource problems are growing in both number and intensity, in regions across the country. As demand for water continues to rise and as supplies dwindle, it has become increasingly apparent that there is an important role for the Federal Government to establish a comprehensive strategy for research and development of new technologies to ensure a sustainable water supply.

In 2004, the National Academies of Science published a study entitled, *Confronting the Nation's Water Problems: The Role of Federal Research*, which declared, "The United States needs to make a new commitment to water resources research

in order to confront the increasingly severe water problems faced by all parts of the country.”

Over twenty federal agencies carry out research and development on some aspect of water supply, water quality or water management. The National Academies of Science surveyed these agencies for their 2004 study and based upon the responses, estimated federal expenditures on water research to be approximately \$700 million.¹ Five of these agencies account for 87 percent of this funding: the National Science Foundation (22 percent), the U.S. Geological Survey (18 percent), the Department of Agriculture (17 percent), the Environmental Protection Agency (15 percent), and the Department of Defense (15 percent).

Figure 1: Agency contributions as a percentage of the total federal funding for water resources research in 2000.²



Despite a research budget of approximately \$700 million, the increased number of water shortages and emerging conflicts over water supplies suggest we are inadequately prepared to address the Nation’s water management issues. This same report advocates for a clear national water strategy to coordinate the 20 plus federal agencies responsible for conducting and funding research in order to avoid duplication and to tackle the looming challenges of maintaining adequate water supplies. At the May 14 hearing before the Committee on Science and Technology on challenges related to water supply and water quality several of the witnesses also recommended better coordination of federal efforts on water.

The NAS report discussed three options for better coordinating research and development programs on water: Using an existing National Science and Technology Council Subcommittee; authorization of a neutral, third party or Water Research Board; or creating an Office of Management and Budget (OMB) led interagency committee of senior agency officials formally tied to the budget process.³

The Subcommittee on Water Availability and Quality (SWAQ)

The Bush Administration had created the Subcommittee on Water Availability and Quality (SWAQ) of the National Science and Technology Council’s Committee on Environment and Natural Resources in 2003 to: identify science and technology needs to address the growing issues related to freshwater supplies, develop a coordinated a multi-year plan to improve research on water supply and water quality, and to enhance the collection and availability of data needed to ensure an adequate water supply for the Nation.⁴

¹National Academies of Science. 2004. *Confronting the Nation’s Water Problems: The Role of Research*. Executive Summary. Water Science and Technology Board. Committee on Assessment of Water Resources Research. National Research Council. Washington, DC. p. 7.

²*Confronting the Nation’s Water Problems: The Role of Research (Report in Brief)*. Water Science and Technology Board. Committee on Assessment of Water Resources Research. National Research Council. Washington, DC. p. 2.

³Chapter 6: Coordination of Water Resources Research. Pp. 199–214.

⁴National Science and Technology Council, Committee on Environment and Natural Resources, Subcommittee on Water Availability and Quality. 2007. *A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States*. Washington, DC. 35 pp.

The Academy report indicated that SWAQ is an effective forum for agencies to share information about their programs. SWAQ is already in place and the participating agencies' roles are well-defined. However, the Academy report identified several issues that needed to be addressed if SWAQ is to become an effective coordinating body. The budget function for SWAQ should be strengthened through participation of OMB on the Committee and SWAQ should engage in outreach activities to develop connections to State and local governments, to wider community of stakeholders, and to the public.

In their 2007 report, SWAQ made recommendations laying out the federal research priorities and recommendations for a federal science strategy to address water supply. Those recommendations included:

- Implementation of a National Water Census;
- Development of a new generation of water monitoring techniques;
- Development and expansion of technologies for enhancing reliable water supply;
- Development of innovative water-use technologies and tools to enhance public acceptance of them;
- Development of collaborative tools and processes for U.S. water solutions;
- Improvement in the understanding of water-related ecosystem services and ecosystem needs for water; and
- Improvement in hydrologic prediction models and their applications.

Unfortunately, these strategic goals are not reflected in the President's FY 2009 Budget request to Congress. While some of these priorities were given small allocations of funding (i.e., \$9 million requested for the United States Geologic Survey to complete a new National Water Census), agencies were not allocated funding to support work on most of the priorities identified in the report.

DRAFT LEGISLATION

There is a need for a national initiative to coordinate federal research water efforts is necessary to ensure we have the best tools and information to maintain adequate supplies of water for Americans in the coming decades. For this reason, Chairman Bart Gordon plans to introduce legislation to create a National Water Initiative. This Act seeks to improve the Federal Government's efforts in water research, development, demonstration, education, and technology transfer activities to address changes in water use, supply, and demand in the United States. The bill codifies the existing Interagency Committee, SWAQ, and strengthens the Committee by incorporating the suggestions in the National Academies' 2004 report. By strengthening the SWAQ and providing it explicit Congressional authorization, the recommendations of the 2007 SWAQ report will receive due consideration and form the start of a national strategy to ensure we have a sustainable water supply.

SECTION BY SECTION

Title: *National Water Research and Development Initiative Act*

Purpose: To improve the Federal Government's role in water research, development, demonstration, education, and technology transfer activities to address changes in water use, supply, and demand in the United States.

Section 1: Short Title

The National Water Research and Development Initiative Act of 2008

Section 2: National Water Research and Development Initiative

Section 2 directs the President to implement a National Water Research and Development Initiative to improve federal activities on water, including: research, development, demonstration, education, and technology transfer. As part of the Initiative, the President shall establish or designate an Interagency Committee with representation from all federal agencies dealing with water and the Office of Management and Budget. The Office of Science and Technology Policy will chair the Committee.

The Committee is charged with developing a National Water Availability Research and Assessment Plan, coordinating all federal activities on water, and promoting cooperation among agencies with respect to water research.

The Plan establishes priorities for federal water research and assessment and shall utilize the recommendation from a 2007 Report issued by SWAQ (Sub-

committee on Water Availability and Quality of the National Science and Technology Council). This section also identifies required elements of the Plan. The Plan is also lists a number of outcomes and directs the Committee to direct agencies to achieve the outcomes in the Plan.

The Plan will be subject to a 90 day public comment period and must be submitted to Congress within one year of enactment.

The President is also directed to create an Outreach Office to provide technical and administrative support to the Committee. The Office will disseminate information to the public and serve as a point of contact for the Initiative.

Section 3: Budget Coordination

Section 3 directs the President to provide guidance to each federal agency in the Initiative with respect to the President's annual request. The President is requires to describe and list the items in the request that are elements of the Plan of help to achieve the outcomes of the plan.

Section 4: Annual Report

Section 4 directs the President submit an annual report to Congress describing the activities and results of the initiative.

Chairman LAMPSON. The hearing will come to order. I want to welcome the Members of the Subcommittee and our distinguished panelists to today's hearing on the creation of a National Water Initiative to improve and coordinate federal research on water.

Chairman Gordon plans to introduce legislation to establish a National Water Initiative to improve and coordinate federal research and development efforts on water. I would like to thank him for his leadership and foresight in this area, and I look forward to the opportunity to consider his legislation.

In order to meet the water needs or water demands of the future, it is essential that we have the information that we need to balance the water needs for municipalities, industry, agriculture, recreation, and power. The population of the United States has increased by over 25 percent since 1973, while federal dollars for water research have remained stagnant. A new commitment is needed to ensure that we can meet the water challenges over the next 20 years and onward.

Without the right data, it is impossible to know if we are going in the right direction, and the discussion draft before us today will provide decision-makers at all levels of government with the tools they need to make the tough decisions of the future.

The 2004 National Academies Report on Federal Water Research suggests that the United States is not getting its money's worth on water resources research, because of a lack of coordination. The Chairman's discussion draft seeks to address this particular issue. The bill codifies an existing interagency committee on water availability and quality led by the Office of Science and Technology Policy, and strengthens the committee by incorporating the suggestions of a 2004 National Academies Report entitled: "*Confronting the Nation's Water Problems: The Role of Research.*"

We have a distinguished panel of witnesses before us to offer their recommendations on how federal water research programs could be better shaped, and their thoughts on the draft legislation. Our panel represents a wide range of interests, and I look forward to hearing each perspective.

At this point, I will turn to our friend, the Ranking Member, Mr. Inglis, for his opening remarks.

[The prepared statement of Chairman Lampson follows:]

PREPARED STATEMENT OF CHAIRMAN NICK LAMPSON

I want to welcome Members of the Subcommittee and our distinguished panelists to today's hearing on the creation of a National Water Initiative to improve and coordinate federal research on water.

Chairman Gordon plans to introduce legislation to establish a National Water Initiative to improve and coordinate federal research and development efforts on water. I would like to thank him for his leadership and foresight in this area, and I look forward to the opportunity to consider his legislation.

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At this point I will turn to the distinguished Ranking Member of this Subcommittee, Mr. Inglis for his opening statement.

Mr. INGLIS. Thank you, Mr. Chairman. Thank you for this hearing. Water, as we know, is one of the essential ingredients of life, and an issue this committee takes seriously. This is the second hearing we have held in the Subcommittee on water resources research. We have also held a Full Committee hearing on the water-energy nexus.

I don't think there is a Member of this committee whose district hasn't been affected by water, either too much of it or not enough. Not enough right now, in the 4th District of South Carolina.

I commend the Chairman for his draft legislation, which we will be discussing today. I believe it is the first of many steps that have been recommended to us by leading scientists, industry, academia, and State and local governments. Coordinating research is a necessary part to responding to our nation's water problems.

However, I would caution we not take, that we take care not to repeat the mistakes of the executive branch, approaching water legislation in the same ad hoc manner that agencies have approached water research. Last week, at our Full Committee markup, we passed two water research related bills out of the Committee. I would hope that the Chairman's legislation doesn't undermine what we have done in those two bills, but instead, enhances their effect.

I look forward to hearing from our distinguished witnesses, and I yield back the remainder of my time.

[The prepared statement of Mr. Inglis follows:]

PREPARED STATEMENT OF REPRESENTATIVE BOB INGLIS

Thank you for holding this hearing, Mr. Chairman.

Water is one of the ingredients of life and an issue this committee takes seriously. This is the second hearing we have held in the Subcommittee on water resources research. We have also held a Full Committee hearing on the energy-water nexus. I don't think there is a Member on this committee whose district has not been affected by water, either too much of it, or not enough.

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I look forward hearing from our distinguished witnesses, and I yield back the remainder of my time.

Chairman LAMPSON. Thank you, Mr. Inglis. If there are additional opening statements, they will be placed in the record at this point.

[The prepared statement of Chairman Gordon follows:]

PREPARED STATEMENT OF CHAIRMAN BART GORDON

Good morning and welcome to the Energy and Environment Subcommittee's hearing on my draft legislation intended to improve the Federal Government's efforts to address changes in water use, supply, and demand in the United States.

I thank our panel of witnesses for testifying. I believe your perspectives are critical to developing an effective bill. I look forward to receiving your recommendations.

The draft legislation before us today builds on the Administration's effort to coordinate federal research on water resources by establishing an interagency committee—the Subcommittee on Water Availability and Quality (SWAQ) of the National Science and Technology Council. The draft bill codifies this subcommittee and provides it explicit Congressional authorization.

The bill also incorporates recommendations from the 2004 report by the National Academies of Science entitled *Confronting the Nation's Water Problems: The Role of Federal Research* to strengthen the Committee's role in setting priorities and developing an integrated budget to support research on water resources. The Academy's report indicated that SWAQ is an effective forum for agencies to share information about their efforts on water. However, the report identified several issues that needed to be addressed to make SWAQ an effective coordinating body.

The draft bill strengthens the budget function for SWAQ through participation of OMB on the subcommittee. In addition, SWAQ is directed to engage in outreach activities to develop connections to State and local governments, to wider community of stakeholders, and to the public. These recommendations, and others, helped to form the basis of this draft legislation.

Water is essential to everything we do and there is no substitute for it. Many of our districts are experiencing problems with water supply. If we are to resolve these problems, we need an effective research and development effort that provides tools and information to manage our water resources effectively. Coordination of the programs managed across 20 federal agencies is a logical place to start.

Again, I thank the witnesses for participating in the hearing this morning, and I look forward to working with you as we go forward to ensure the Federal Government is doing all it can to promote effective water management.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Thank you, Mr. Chairman, for holding this hearing today, as this is an important opportunity to plan for the future and conserve our resources appropriately. It's a matter of common sense that we must better coordinate research and technological innovation to enhance water supplies and water quality on a national level.

As we all know from last summer's droughts and rising concern surrounding global warming that water resource problems are growing both in number and in intensity. Over twenty federal agencies carry-out research and development on some aspect of water supply, and as recent reports have indicated, we must do more to better coordinate these efforts and together work towards solutions.

I am pleased to see that the beverage industry is represented on our panel of witnesses today, as they have taken important steps to address water usage policy—an issue central to the vitality of their business. Fortune Brands, an Illinois-based company, has taken a leading role to promote smart technology and conservation practices, and with companies like Anheuser-Busch have formed a coalition to come together to share industry-wide best practices to reduce the use of water and conserve a valued natural resource.

I look forward to our testimony today, and I believe the proposed legislation is an important step in planning for our nation's future. Thank you Mr. Chairman for your leadership of this subcommittee; and I look forward to hearing from our witnesses.

Chairman LAMPSON. At this time, I am pleased to introduce our panel of witnesses.

Dr. Mark Shannon is the Director of the United States Strategic Water Initiative. Mr. Tod Christenson is the Director of the Beverage Industry Environmental Roundtable. Dr. Timothy T. Loftus is a Water Resource Planner for Chicago Metropolitan Agency for Planning. I enjoyed visiting your city for one hour last night while our plane was diverted around the United States. Mr. Jerry Johnson is the General Manager, D.C. Water and Sewer Authority. Mr. Bradley Spooner is the Principal Engineer for Environmental Services at Municipal Electric Authority of Georgia, and Dr. Upton Hatch is the President-Elect of the National Institutes for Water Resources.

You will each have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing, and when all of you complete your testimony, we will then begin with questions, and each Member will have five minutes to question the panel. Dr. Shannon, you may begin.

STATEMENT OF DR. MARK A. SHANNON, DIRECTOR, CENTER OF ADVANCED MATERIALS FOR THE PURIFICATION OF WATER WITH SYSTEMS, UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN

Dr. SHANNON. Thank you very much. I am really happy to be here. Thank you, Chairman Lampson and Ranking Member Inglis, and others distinguished Members of the panel.

I am really excited to be here, because I think this bill is vitally needed for this country, and it is the right thing at the right time, and I really think it is actually visionary in its approach. So, I am going to talk about a number of different things as quickly as I can, because there are so many points to be made, but I really appreciate the fact that there is a real idea to focus in on trying to increase water supplies, and if I can have the next slide.

This is just a snapshot when I go around the world talking about water issues, my record tends to focus on the arid Southwest. They say we have real problems there, but this map shows issues related to water, and depletions that are occurring over the country. And the Southeast has serious issues, and the Midwest, near one of the greatest bodies of freshwater in the world, has also major issues in Illinois, as well as along the Ogallala Aquifer.

In order to increase supplies, we are seeing a real depletion of groundwaters, and we need to look at new ways of doing this. While the water sector invests about approximately \$700 million in research foundations, such as the American Water Works, and the Water Environment Research Foundation, WateReuse, collectively invests another \$24 million, their efforts are really at applied research. I think a really important thing to do is to improve and advance the basic science and technologies, such that we can get new technologies to fuse into the sector.

And so, as a representative of the U.S. Strategic Water Initiative, one of the co-founders, what we are really wanting to do is take the basic science that the United States is so good at developing. We are really fantastic at that. But we really have a disconnect with getting this diffused into practice, and so that we can have solutions. When the water supplies begin to drop, and we see a tremendous drop in the level of aquifers, that we can do something

about it. And I have a lot of hope that we can do this, and from a science point of view there is lots of room to move. We are a water planet. We have lots of water around it. It is just how we use it, and how we incorporate it.

We are really looking at developing new technologies that can then get diffused into practice, so that water managers around the country can utilize this. One of these issues is sourcewater protection, and there is lots of critical issues there. There is a lot of water in both saline and fresh aquifers, and that is where it is really down. What we are seeing is that the water is getting saltier and saltier and needing more and more treatment. So, we need to be able to figure out how to do this effectively and affordably.

We need to understand what the withdrawal rates are for both the freshwater aquifers and the saltwater aquifers that underlie them. In addition, we need to understand what we can do about the 800 billion gallons of water that we get from produced water. That could be a fantastic source of water that currently is not. There are a lot of sources of water that are available that we just don't use today. And with some more science and technology, we can very effectively use these, and alleviate a lot of the problems with source protection.

We have got to be able to prevent cross contamination because as we start to pump down, cross contamination begins to require more treatment. Can I have the next slide?

This is a projection of possible increases that are going to occur by 2030, due to population growth. We are using more and more water because of our economics. If you look at this, we are seeing significant factors all over this country, and we are going to need to see major investments by local areas. If you are looking over at California, it doesn't look like a large increase but they already use so much that that is actually a huge value. We need to be able to figure out, there is a lot of critical issues, I think, for the U.S., and you know, I would like to go to the next slide.

To do sourcewater protection we need to be able to couple the contamination in the sources. Finally, population growth is really driving everything, and this one basically shows that if we are going to increase our water supplies for this country by 62 percent we need to start conservation. Then we would only need to increase it by 30 percent.

That sort of gives you an overview of why I think we need science and technology here. Thank you.

[The prepared statement of Dr. Shannon follows:]

PREPARED STATEMENT OF MARK A. SHANNON

Good morning Chairman Lampson, Ranking Member Inglis, and distinguished Members of the Subcommittee on Energy and Environment. I want to thank you for the opportunity to testify before the Subcommittee today. I especially want to thank Chairman Gordon for his leadership on this issue and for producing the legislation that we are providing testimony on today. I am Mark Shannon, Director of the Center of Advanced Materials for the Purification of Water with Systems, a National Science Foundation Science and Technology Center headquartered at the University of Illinois at Urbana-Champaign. This Center focuses on finding solutions to the coming water crisis through revolutionary advances in science and technology. We also have partnerships with major stakeholders in the water sector with an active Industrial Affiliates program of companies across the U.S. with interests

in solutions to water problems.¹ I am also the Co-Founder of the United States Strategic Water Initiative, which is a consortium of companies, academic researchers, and water associations acting together to advance the science of water purification and to accelerate delivery of new U.S. technologies necessary to increase and protect fresh water supply.² The premise of these activities and partnerships is that significant and technological advances are a critical component to meeting the future water needs of our country and world. Our objectives are to develop new water purification technologies that can reduce the amount of energy and chemicals currently used to treat water, and to create new methods to desalinate, reuse, decontaminate, and disinfect waters so that we can gain new waters for human use from different types of sourcewaters, including those that are not now considered usable. By doing so, we will be able to expand the U.S. water supplies, without needing to transport fresh waters over long distances at huge costs in capital and energy usage.

The different water using sectors (agriculture/livestock, energy, industry and mining, and domestic use) have different needs and requirements, for withdrawal, consumption, and discharge of waters. Importantly, what will work for one water use sector may not work for another. However, as supplies become more constrained, the impact of one sector on another becomes more important, and they are coupled to each other. Moreover, due to the extent of river systems and aquifers, along with the interdependencies of use, the effect on water supplies is no longer just a local issue. For the Federal Government to adequately address all these issues across sectors, it is imperative that coordination and cooperation occur across the different agencies working to find solutions to the water supply and availability issues.

I appreciate this opportunity to provide input to the Committee on the National Water Research and Development Initiative. In my view, this visionary initiative is the right effort at the right time to ensure that we stimulate water-related research and development (R&D) that simultaneously lead to new opportunities for U.S. companies, not those of foreign countries, while solving current and future problems in water supply and quality. This can be accomplished by improving and enhancing federal research, development, demonstration, education, and technology transfer in water use, supply, and demand, as well as conservation and management.

As the Committee is aware, water R&D in the United States is well more than a century old, and is carried out by a wide range of research organizations at all levels of government (Federal, State, and municipalities), by technology developers and vendors, water associations, and the academic community. While the water technology sector invests approximately \$7 million and research foundations such as the American Water Works Association Research Foundation, Water Environment Research Foundation, and the WaterReuse Foundation collectively invest another \$24 million annually, their efforts are directed at applied research focused on specific issues of interest to their subscribers. A great deal of additional research is done at U.S. universities, water associations and State and local units of government. Beyond their work, there are a number of key areas in which direct and sponsored research at the federal level is essential. I would like to speak to what I believe those key areas in Science and Technology are that the proposed Bill can address.

Water Availability and Sourcewater Protection

The United States lacks sufficient knowledge regarding the actual amount of water stored and recharged in currently utilized fresh water aquifers. Current data indicate that levels in some monitored aquifers are dropping rapidly. For instance, regions of the High Plains Aquifer south of the Canadian River in New Mexico and Texas experienced water level declines of more than 60 feet between 1980 and 1999.

¹ Industrial Affiliates and Partners: Archer Daniels Midland (ADM), Applied Membrane Technologies (AMT), Biolabs/Chemtura, Clorox-Brita, Cargill, Culligan, Damon S. Williams Associates (DSWA), ITT, Metropolitan Water Reclamation District of Greater Chicago, Pentair, Porex Porous Products, PPG, Praxair, Siemens, UOP/Honeywell, Water and Wastewater Equipment Manufacturers Association (WWEMA).

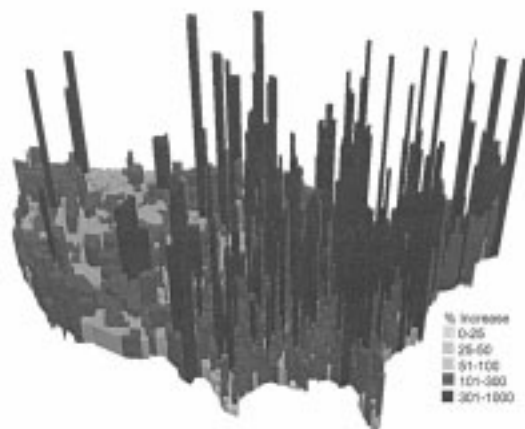
² List of signers: Ken Kirk—National Association of Clean Water Agencies; Mark Shannon, Jian-Ku Shang, Michael Plewa, Eberhard Morgenroth, Timm Strathmann, Richard Sustich—WaterCAMPWS/University of Illinois at Urbana-Champaign; Kofi Bota, Eric Mintz—WaterCAMPWS/Clark Atlanta University; Rishi Shukla—Archer Daniels Midland; Greg Pepping—University of Wisconsin; David Henderson—XPV Capital Corporation; Richard White—Lawrence Livermore National Laboratory; Shaurya Prakash—Rutgers University; Lutgarde Raskin—University of Michigan; Slav Hermanowicz—University of California at Berkeley; Tanna Borrell—University of Michigan; Scott Husson—Clemson University; Eva Steinle-Darling—Stanford University; Wen-Tso Liu—National University of Singapore; Daniel Brunelle—GE Global Research; Mark Rigali—Sandia National Laboratories; Darren Sun—Nanyang Technical University; Franz Hoffman—Procorp Enterprises, Milwaukee.

While there are regional efforts to look at these issues, a nationwide effort to inventory and quantify the existing fixed and recharging supplies of fresh, brackish and saline water is critical not only for projecting water availability and sustainable withdrawal capacities, but also for helping scientists, engineers, and planners choose water supply and community development solutions that will be viable. The effects of withdrawal and consequent salting on lands and lakes, as well as contamination rates of aquifers also need to be quantified. Critical issues for federal R&D include assessment of (i) the waters contained in both freshwater and saline/brackish aquifers, (ii) the withdrawal and recharge rates of both, (iii) the amount of communication between surface and both types of groundwaters and adjacent watersheds, and (iv) the degree of cross-contamination occurring between sourcewaters.



Research Needs for Development of New Water Supplies

Local water demands from population and economic growth will vary throughout the United States, with many areas likely to experience very high growth rates over the next 30 years. Conventional sources of water may not be available or too expensive to develop, and conservation and efficiency may not be enough to ease demand. New water supplies will be needed for these areas.



Predictions of increase in local water use by 2030, as a percentage increase over year 2000. Note that percentage increase does not reflect the total local increase, as increases in southern California are greater at 101 to 300% than Denver at 301 to 1000%. However, percentage increases do reflect the need of local systems to increase water supplies.

Population data and projections from U.S. Census Bureau (<http://www.census.gov/population/www/projections/interj.html>, <http://www.census.gov/popest/totals.html>)
 Water Use Data from USGS (<http://webdl.cr.usgs.gov/NAWQA/AMapTheme/index.jsp>)
 Projections for water use based on Texas Water Use 90 yr projections (http://www.tdweb.state.tx.us/publications/reports/State_Water_Plan20012017/StateWaterPlan2007/StateWaterPlan.html)

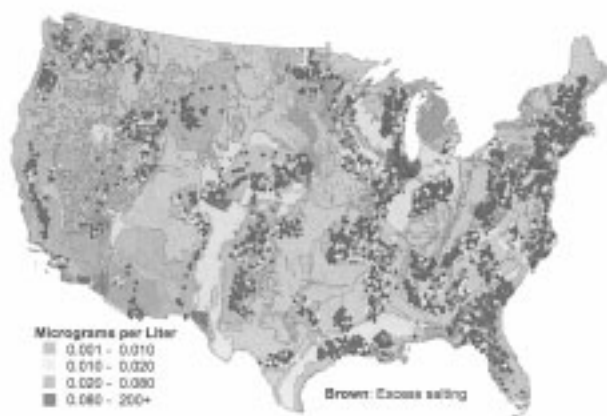
Meaningful increases in potable water supplies can only be achieved through reuse of existing wastewater and development of brackish and saline sources—to gain new supplies everywhere from the “sea to sink to the sea again.” This effort will need to focus on augmenting water supplies via desalination of seawater and brackish aquifers, as well as through direct reuse of municipal, agricultural, and produced wastewaters from energy and industrial operations. From a purification standpoint, brackish aquifers and wastewaters present even greater challenges than seawater desalination. Crucial issues to utilizing inland brackish lakes and aquifers include developing methods and materials that can separate hard water dissolved solids with minimal fouling, and minimizing residuals created during desalination and reclamation of contaminated and brackish sourcewaters. Critical issues for federal R&D include (i) establishment of standards for potable and non-potable waters derived from these sources, (ii) education of the public of the need and safety of potable waters derived from sources that meet the standards to gain widespread acceptance, and (iii) development of resource recovery methodologies for concentrate residuals and brine from brackish and saline sources, and energy and chemicals from wastewater.

Contaminant Detection, Decontamination and Removal

An emerging trend impacting water supplies is that contamination of sourcewaters, in particular groundwater aquifers that were previously clean, is either reducing supplies or is requiring costly cleanup or extensive treatment of the waters to be used by humans. To maintain the viability of these and new sourcewaters, efficient removal of contaminants from all types of water sources is needed, to get the “drop of poison out of an ocean of water.”

Current treatment technologies are typically not contaminant-specific, resulting in excessive use of energy and chemicals during treatment, as well as necessitating the removal of benign constituents and excessive generation of residuals requiring further processing and disposal. Efforts to develop more marginal water sources, due to increasing demand and depletion of existing sources, will likely become prohibitively expensive using conventional approaches. A major cost factor in removing trace amounts of critical contaminants from sourcewaters is that large quantities of benign, potable constituents are also removed. Using treated low-cost materials such as naturally derived Chitosan from crustaceans, or new and reusable swellable glass sorbents that can selectively and affordably remove contaminants such as heavy

metals and petroleum distillates, freeing up waters for human use. Additionally, real-time, in situ detection, adsorption, and/or catalytic destruction of potential warfare/terrorism agents are major challenges for the water industry. If we can know in near real time what contaminants are present in sourcewaters, and mitigate potential dangers from contaminants, we can prevent major losses in water supplies to large number of our people in times of crisis. Critical issues for federal research include (i) establishment of what classes of contaminants need to be removed together, (ii) determination of necessary contaminant detection levels and reliability of in-situ monitoring, and (iii) standards for disposal of contaminants recovered from reused and reclaimed waters.



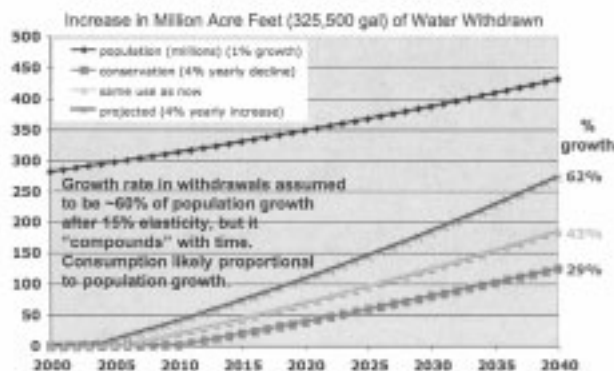
Map of the aquifers of the United States, with the EPA's Critical Drinking Water Pollutants and excess salting regions (surface and intrusion into aquifers) superimposed on top. Note the close correlation of the pollutants and salting with stressed and impacted aquifers. Over pumping increases cross-contamination, reducing availability of clean water supplies or needing intensive cleanup and treatment where little to none was required before.

Pathogen Detection and Removal

Similar to chemical contamination, waterborne pathogens can sicken significant numbers of people, and if introduced to water systems naturally or deliberately, or via cross-contamination with waste systems, can render even major water supplies unusable. Moreover, treatment for pathogens can also inadvertently introduce toxic compounds to water supplies. Disinfection technologies that effectively deactivate known and emerging pathogens without producing toxic substances are needed to "beat chlorination." New and affordable materials, methods, and systems are necessary to provide drinking water free of harmful viral, bacterial and protozoan pathogens, while avoiding the formation of toxic by-products or impairing the treatment of other contaminants. Low cost materials such as proteins from harvested Moringa seeds can remove pathogens such as viruses from water, and new sunlight activated catalysts can potentially disinfect waters from a host of pathogens without using additional chemicals or energy. A key unsolved problem is the detection and removal of new and/or evolving infective viruses, and resistant pathogens to standard chemical treatment. Critical issues for federal R&D include (i) development of standards and accepted modalities for determining infectivity of pathogens in water for near real time detection, and (ii) establishment of risk assessment and mitigation for disinfection by-products from current and new treatment methods.

Water Conservation and Reuse

Population growth projections show that conservation alone will not be enough to meet future water demand in many parts of the United States. Projected population growth of 100 to 130 million people over the next 32 years in the U.S. will put further stress on water demand.



The average overall increase in population of the United States is shown in blue, assuming a 1% (between the low and high estimates). Three estimates for the growth in water supplies needed to sustain the population growth, assuming a projected increase in per capita consumption to account for higher use of energy and economic expansion (in green) of 62% by 2040 (using current technologies), use at current levels (in orange) of 43%, and a drop in per capita use of 4% per annum from increased conservation and efficiency (in red) of 29%. The conservation projection requires by 2040 60% less in domestic use, 30% less for energy production, and 20% for agriculture and livestock, which requires new technologies.

Population Data from US Census Bureau: Lowest estimate at 0.9% per annum through to 2030
The Blueprint 2030 forecast of the revised United States population growth from 2000 to 2030 was 1.14%

With current growth in consumption patterns with respect to domestic, industrial, agricultural, and energy usage, the U.S. will need to increase total water supplies by up to 60 percent using current technologies. Moreover, combined with changing demographics, this population growth will cause increases of over 100 percent for many cities and large metropolitan areas across the U.S., likely causing critical water shortages. Even if we are able to maintain per capita consumption at 2000 levels, we will need more than a 40% increase in water supply capacity by 2040. Reduction in per capita water consumption must therefore be an essential part of our national strategy to extend the service capabilities of current and future water supplies and associated infrastructure. A key issue is that leakage of drinking water from the distribution network, and water main breaks is the same as loss in supply. Reducing leakage in the infrastructure will not only effectively increase water supplies, but it will reduce the amount of energy and chemicals used to create and transport potable water, and the overall operation and maintenance costs. Conservation via improved efficiencies and reduction in waste can dramatically reduce overall costs of providing clean water. Research efforts that focus on minimizing the withdrawal of water and on the conversion of direct draw applications to reuse systems have the potential to substantially reduce projected water needs, particularly for specific watersheds and aquifers. Critical issues for federal R&D include (i) assessment of interactions between different water use sectors (agriculture, livestock, mining, energy, domestic, and industry) on water use, conservation, and reuse, and (ii) understanding the environmental impact of changing withdrawal, consumption, and discharge patterns on overall water systems.

Scalability, Ramp-Up and Technology Diffusion

We have the scientific and engineering capabilities in our universities and government and national laboratories to make great discoveries and find sustainable solutions to our problems, but unless a means to move these advances from the laboratory to full production is possible, these innovations will, unfortunately, remain in the laboratory. Further, many novel approaches to problems, while scientifically intriguing, may not take into consideration the costs of mass production or implementation. Scalability focuses on capacity for researchers to incorporate benchmarking and manufacturing scale-up considerations as well as facilitating the testing and movement of new materials and procedures to industry. For a technology to be successful the total life cycle costs must be favorable and it must win in the marketplace. Moreover, with respect to potable water systems, a history of performance ef-

ficacy and costs of installation and operation must be available for water managers to select with confidence one technology over another. Because of its oversight role with respect to drinking water, wastewater and environmental quality, research into, and development of low-cost, highly-adaptable technology verification methods is appropriate at the federal level to encourage diffusion and adoption of innovative water technologies under various State and local programs.

Perhaps just as importantly, developing new innovative and cost effective technologies in water purification can help position U.S. companies to compete in the rapidly expanding worldwide markets for water technology. Many nations around the world (China, India, Singapore, Switzerland, and within the EU) are pouring money and resources into developing new science and technologies for increasing water supplies and for new purification methods. While the U.S. still leads in basic science, we are falling behind in technology diffusion into the marketplace. The *WaterCAMPWS* Industrial Affiliates and the signers of the U.S. Strategic Water Initiative are anxious to develop new products to solve the critical problems facing the U.S. and world and to actively compete in this growing market for water products and systems.

Comments on the draft National Water Research and Development Initiative legislation

Now I would like to shift my comments to the draft National Water Research and Development Initiative legislation before the Committee.

We certainly concur with the Committee that our nation will benefit substantively from the establishment of a National Water Research and Development Initiative, and the creation and execution of a National Water Availability Research and Development Plan. There are many water-related research and management activities across the federal agencies, from Agriculture, to Energy and the Defense Departments, to EPA, to NASA and to NOAA, just to name a few. Not only will lateral coordination across agency activities enhance the return on current water investments across the agencies, but it will also facilitate the identification and evaluation of further research opportunities for future investment.

Recommendation for National Water Research and Development Advisory Committee

We have initiated a similar effort, known as the United States Strategic Water Initiative (USSWI), including stakeholders from federal, State and municipal research programs, academia, water technology developers, and major water users such as the agriculture and energy sectors. The goals of USSWI are to:

- Increase basic science and technology research of water purification in academic and government research laboratories to enhance innovation and American competitiveness;
- Provide feedback from water associations, suppliers, users, practitioners, government officials, and the public on water purification needs, technologies, and product performance to S&T researchers;
- Provide a direct path for new ideas and technologies created in research laboratories to be evaluated, demonstrated, verified, and certified;
- Foster public and private investment in water purification research, and accelerate the diffusion of technologies (implementation, commercialization, and adoption) that emerge from such research;
- Establish a cooperative research agenda including a prioritized list of gaps, needs, and opportunities in water science and technology.

Because a substantial water research and development effort already exists outside the federal agencies, we believe that input from this external community is essential to the successful development and implementation of the Plan envisioned in the Act. We therefore recommend that the Act include establishment of a standing National Water Research and Development Advisory Committee under the *Federal Advisory Committee Act*, to provide advice and counsel to the Interagency Committee and information on extra-mural water research and development activities to the National Water Initiative Outreach Office.

We strongly support the creation of national interdisciplinary research Centers with participation from U.S. universities, water associations and research foundations, and the private sector including technology companies, innovators, and finance, to accelerate the diffusion of new science and technologies from federal, State, and local research laboratories, as well as university and foundation funded research, into the marketplace. The Centers should likely be independently man-

aged with governing boards that include the participating stakeholders along with relevant agencies.

National Water Availability Research and Assessment Plan Outcomes

We are very pleased with the desired outcomes of the Plan, and would like to offer several minor revisions aimed at enhancing the practical value of the Plan for improving water management:

- a) implementation of a National Water Census, which shall include the collection of water data to create a comprehensive water database that includes *information on available quantity, quality, consumption, recharge capacity and threats to groundwater and surface water resources*;
- b) development of a new generation of water monitoring techniques *in support of the other outcomes of this subsection*;
- c) development and expansion of technologies for enhancing reliable water supply, *management and reclamation*;
- d) development of innovative, *maximally-efficient* water-use technologies and tools to enhance public acceptance;
- e) development of collaborative tools and processes for U.S. water solutions;
- f) advancement of understanding of the water-related ecosystem services, ecosystem needs for water, *and opportunities for ecosystem management through beneficial water reclamation*;
- g) improvement of hydrologic prediction models and their applications;
- h) enhancement of technology transfer to, and technology adoption by the water management community;
- i) analyses of the energy needs *and identification of energy conservation opportunities in providing water supplies across the country*;
- j) *assessment of, and mitigation strategies to address, the impacts of economic, demographic, climatic, and technological changes that have contributed to changes in our nation's water availability and quality*;
- k) *creation of national research and technology Centers for accelerating the diffusion of science and technology from Federal and other government funded research to practice.*

Minimum Funding for Act-Related Activities—Section 2(b)(4)(B)

We are concerned that the Act does not authorize the appropriation of funds to carry out the objectives of the Act, but relies on contributions from the agencies represented on the Interagency Committee. To the extent practicable, we recommend that an aggregated contribution sufficient to carry out the objectives of the Act be included in this section. To fully accomplish the research objectives under the Plan, we anticipate that substantial increases in appropriations to participating federal agencies will be necessary. To create new national research Centers additional funding will be needed. Other nations establishing such Centers, such as two in Singapore, are funding them at \$30 million per year per Center for periods of five to ten years, with similar investments by the private sector. A greater amount is being expended in Switzerland (~\$100 million/year) to develop new technologies to reduce water usage in the domestic and particularly the energy sectors. It is likely that a greater level of funding will be needed in the U.S. to solve the larger problems the U.S. faces over several sectors and over disparate geographic regions. The basic research in water science and technology for increasing water supplies, efficiency, and conservation that I am aware of is funded at about \$12 million/year between the NSF, EPA, and DOE. To rapidly increase water R&D, we recommend that this Act authorize a federal funding level of \$100 million per annum beginning in FY 2010 with annual increases of five percent through 2019.

In closing, on behalf of the academic research community and the water technology sector commend the Committee for recognizing the need for coordination across the breadth of federal agencies conducting water-related research. The proposed National Water Research and Development Initiative is vital for the United States. The Initiative is visionary and will ensure the U.S. will be the leader in creating solutions for the pending crisis in water availability that has already impacted the quality of life of many U.S. citizens, and this is only the beginning of the coming problems. For our part, we stand committed to assisting the proposed Interagency Committee in the development of a National Water Availability Research and Assessment Plan and in coordinating our own work in furtherance of

such a Plan. It is our fervent belief that this coordination is essential to the Nation's success in addressing water management issues, both now and in the future.

Thank you, Mr. Chairman and Members of the Committee for this opportunity to provide this testimony. I would be happy to answer any questions you may have.

BIOGRAPHY FOR MARK A. SHANNON

Mark A. Shannon is the Director of the National Science Foundation Science and Technology Center for Advanced Materials for the Purification of Water with Systems, the *WaterCAMPWS*, which is a multiple university and government laboratory center for advancing the science and engineering of materials and systems for revolutionary improvements in water purification for human use, with participation from companies across the water sector spectrum from utilities to vendors to consultants. He is also the Co-Founder of the United States Strategic Water Initiative, which is a consortium of companies, individuals, and water associations acting together to advance the science of water purification and to accelerate delivery of new U.S. technologies necessary to increase and protect fresh water supply. He is the James W. Bayne Professor of Mechanical Engineering at the University of Illinois at Urbana-Champaign, and received his B.S. (1989) M.S. (1991) and Ph.D. (1993) degrees in Mechanical Engineering from the University of California at Berkeley. He received the NSF Career Award in 1997 to advance microfabrication technologies, the Xerox Award for Excellence in Research (2004), the Kritzer Scholar (2003–2006), the Willet Faculty Scholar (2004–2007), and received the BP Innovation in Education Award in 2006.

Chairman LAMPSON. Thank you very much. Mr. Christenson, you are recognized for five minutes.

STATEMENT OF MR. TOD D. CHRISTENSON, CHAIRPERSON, BEVERAGE INDUSTRY ENVIRONMENTAL ROUNDTABLE (BIER)

Mr. CHRISTENSON. Thank you, Chairman Lampson and Ranking Member Inglis, distinguished Members of the Subcommittee. My name is Tod Christenson. I am the Director and Chair for the Beverage Industry Environmental Roundtable, not so coincidentally named BIER, B-I-E-R.

BIER is a unique, creative, voluntary collaboration of 12 global beverage companies from across four beverage sectors, beer, wine, distilled spirits, and nonalcoholic beverages. Our member companies operate nearly 200 production and packaging facilities spread across 35 states, with many, many auxiliary operations.

BIER is unique in that it is an independent, proactive convenience of private industry working together to drive water conservation, resource protection, energy efficiency, and climate change mitigation. We do this through benchmarking and data collection, best practice sharing, as well as working on various venues like this to inform public policy.

We are here today to applaud the Subcommittee and Chairman Bart Gordon for their focus and commitment to look at policy changes that will allow us to succeed in meeting our country's water challenges today and into the future. We applaud the opportunity of this act under consideration, to provide for the Federal Government to demonstrate leadership, employing its role in inventorying and coordinating collaboration on water initiatives from across the federal agencies, facilitating commitment to allocation of resources to support the research and development, creating space for stakeholders to come together and share and input to this process, and the ensuing agenda that is implied. And as well, in building awareness, both across industry and government, and within the public domain itself.

The September 2007 Strategy Report, which we have been provided a copy with, produced by the National Science and Technology Council Committee on Environment and Natural Resources, which we understand is a founding work leading to today's policy discussion, we believe is an excellent work product. It is one that provides both a comprehensive look at water challenges we face today, and expect in the future, as well as outlines what we believe are some implied research and development activities and needs going forward. We support the current policy considerations, and those that will lead to streamlining, increased efficiency, and collaborative efforts across federal agencies. We believe that is a very important factor for us. It provides a much stronger working environment for our industries.

A few of the research priorities that we would note include a comprehensive water resource inventory, but not only of today, but looking at future needs and possibly doing some scenario planning. We believe there is a need in research to assess our country's water infrastructure, which includes both supply, delivery, as well as treatment capabilities.

As many of us know, we have an aging infrastructure. There is a lot of opportunity for conservation within that structure, and we believe that a thorough assessment needs and opportunities assessment of the system is warranted. We also believe in the priorities innovative technology and practice development. As Dr. Shannon has implied here, I believe that is an important piece.

Public awareness and education is the fourth piece that we see that needs development. We need to improve the practices of our public, of our industry, and create a greater level of focus to water stewardship.

We would like to leave you with a couple thoughts for consideration as you move forward in the policy development efforts. To highlight a few points of my written testimony that has been submitted, we would ask you to consider establishing a long-term vision, and empower the developing interagency committee with clear goals and milestones aligned with the developed vision. We see an opportunity, given the current roles, that State and tribal entities play in water management today, for incorporation of that role into the work of the interagency committee, and/or future policy development.

We hope you consider the experience, knowledge, and technology that resides in American industry groups and NGOs, and those that they will be developing into the future. There is quite a bit of energy and money being put towards water consumption and efficiency technologies, to drive water use efficiency within our industry. There is a lot of valuable technology out there to be mined, distributed and shared. We see that as a role of the Federal Government to help facilitate.

Lastly, Chairman Lampson, Ranking Member Inglis, water issues are a serious and growing concern with all Americans. We will need new technologies, changes in water use practices, and new collaborations across all industry, public, and governmental concerns to meet our future challenges.

To these efforts, you have our full support. On behalf of the BIER member companies and myself, thank you for the opportunity to address you today.

[The prepared statement of Mr. Christenson follows:]

PREPARED STATEMENT OF TOD D. CHRISTENSON

Chairman Lampson and Ranking Member Hall. My name is Tod Christenson; I am a senior consultant with Delta Consultants and Director of the Beverage Industry Environmental Roundtable (BIER). I have a Masters in Geology and Organic Chemistry with over 20 years of experience in working with private industry on strategically important environmental issues. My office is in St. Paul, Minnesota. On behalf of BIER, I would like to thank you for the opportunity to present this written testimony.

BIER Background

First, I would like to introduce the organization I am representing with this testimony; BIER. BIER is a voluntary convenience of twelve global, leading beverage companies and two leading beverage industry suppliers. BIER is facilitated by myself and additionally supported by colleagues of mine from Delta Consultants (HQ in St. Paul, Minnesota).

Founded in August 2006, BIER member companies build on the technical knowledge and skill, brand power and strength in aggregate to make meaningful impact to *water conservation and resource management, energy efficiency and climate change mitigation through reduction in carbon emissions*. The group strives to be industry leading and serve as a role model in industry sector collaboration within the space of environmental stewardship.

The current members of BIER are:

- Anheuser-Busch.
- Bacardi
- Beam Global Spirits & Wine
- Brown Forman Corporation
- Coca-Cola Enterprises
- Diageo
- Danone
- Miller Coors (previously Coors Brewing Company)
- Nestle Waters North America
- PepsiCo
- Pepsi Bottling Group
- The Coca-Cola Company
- Ecolab
- JohnsonDiversey

BIER's current agenda involves the following key initiatives:

- Developing common frameworks to guide our working agendas in water conservation and resource management, energy efficiency and climate change mitigation.
- Qualitative benchmarking of Water Conservation Practices (2007) and Watershed Management Practices (2008)—the benchmarking results are used in developing the best practice sharing agenda, defining current best practices and identifying individual company opportunities for improvement.
- Water Use and Efficiency Benchmarking (2007 & 2008)—a quantitative measurement of water use and efficiency across the varied beverage industry sectors.
- Best Practice Guidance Tool Development—recent topics included drought preparedness and management, rainwater harvesting, clean-in-place (CIP) and water use, re-use, and recycle practices.
- Beverage Industry Sector Guidance for Greenhouse Gas (GHG) Emissions Reporting—a sector specific guidance to support calculation of GHG emissions against the World Resource Institute (enterprise basis) and British Standards Institute (PAS-2050; Life Cycle Assessment or Product) GHG protocols.

- Stakeholder Engagement—taking a variety of forms, BIER is actively engaging with external stakeholders to build awareness, collaborate and inform public policy development as it relates to water conservation and resource protection, energy efficiency and climate change mitigation.

Water is Common Thread between Diverse Beverage Companies

The beverage companies that constitute BIER membership represent four unique sectors of the beverage industry: beer, distilled spirits, wine, and non-alcoholic beverages.

In the United States alone, member companies operate nearly 200 production and packaging locations spread across 35 states, with many other auxiliary locations. Member operations also extend into agriculture, manufacturing, transportation, and even tourism sectors. BIER membership constitutes a majority of beer, carbonated soft drink, non-carbonated beverages, and bottled water sales in the United States.

The congregation of these companies is rather unique, given the significant difference in their operations. However, *all of the companies are tied together by a common thread: each of their products share water as the primary ingredient.*

Members of the beverage industry have identified that access to clean water is not only an essential concern to business continuity, but a basic human need.

To this end, beverage companies have donated many millions of servings of clean drinking water in response to domestic emergency situations, such as hurricane relief and recent floods in the Mississippi River Basin. In other communities, beverage companies contribute to resource management by receiving municipal wastewater to their treatment systems and sharing technical experts with community planning agencies.

However, BIER members truly stand out in the realm of resource management and water conservation technologies. Member companies are continually challenging themselves to be more efficient with their resources, and to ensure that operations are conducted in a manner that will sustain business and quality water access for generations to come. The simple fact that these companies have been convening for the past two years on a quarterly basis to discuss matters of environmental conservation demonstrates their awareness to these issues and willingness to allocate resources to pursue environmental solutions.

Among the most notable achievements of BIER membership in water conservation and resource management are:

- Universal improvements in water efficiency from 2005 to 2006, through which the industry avoided the use of over nine billion liters of water. This is enough water to support the annual home water use of 65,000 Americans.
- Development of internal environmental management systems and water management systems which promote and communicate best practices and drive continuous improvement through data measurement and goal setting.
- Implemented water reuse for non-product uses and beneficial reuse of wastewater for energy recovery and agricultural uses.
- Collaborative effort through benchmarking studies and practice sharing sessions to advance drought management planning efforts and watershed management through third-party communication efforts.
- Community engagement efforts through educational initiatives, community awareness fairs and organized habitat cleanups.

General Comments

BIER applauds the efforts embodied in the proposed “*National Water Research and Development Initiative Act of 2008*,” and we thank this subcommittee and Committee Chairman Bart Gordon for your focus and commitment. Combined, these efforts will provide a framework that will allow all of us to succeed in meeting the water conservation challenges of the future.

As an industry that relies on water as a core ingredient to the very products we produce and given the challenges we envision going forward in maintaining adequate supply and water quality to meet all the needs of our country and society, we believe your efforts will be very useful and help assure availability and access of this precious natural resource well into the future.

We have separated our input into three basic categories for your consideration and offer an end-user perspective in the interest of helping shape policies that will benefit all consumers and users of our water resources.

Role of Federal Government in Water Supply, Water Conservation, and Water Management

We applaud the opportunity this Act provides for the Federal Government to demonstrate leadership on many key aspects of water supply, water conservation and water management in an active and well coordinated way.

We view the principal role of Federal Government as it relates to water supply, water conservation and water management, to include the following functions:

1. Inventory, coordinate and communicate the existing work being performed across all federal agencies. In doing so, ensure improved coordination, inter-agency collaboration and development of priority projects that have clear deliverables.
2. Commit and allocate resources to support and drive the needed research and development on water-related issues.
3. Create the space for stakeholders to come together and share technology and innovations.
4. Support innovative water projects and promote water conservation practices across both public and private industry.
5. Create tools to promote and enact water efficiency practices and technologies.
6. Build public, industry and state/local/tribal awareness on water issues and solutions that our country is facing today and will be facing tomorrow.
7. Drive responsible “water stewardship” behavior and practice across all aspects of our society (public and private) without favor (RE: in an unbiased and non-partisan fashion).
8. Drive efficient water consumption and use across the Federal Government enterprise, instilling in our Federal Government a culture of water stewardship; in essence lead by example when it comes to water supply, conservation and water management practices and performance improvement.
9. Execute its’ strategic water agenda against a long-term vision for achievement and in a manner that makes very clear the role of the Federal Government and States.

Priority Needs for Federal Research and Development

The work completed by the National Science and Technology Council Committee on Environment and Natural Resources entitled “*A Strategy for Federal Science and Technology To support Water Availability and Quality In The United States* (September, 2007) was a very comprehensive look at the challenges facing this country and thus the implied research and development work that would benefit sound stewardship of our country’s water resources. It is a thorough summary of the challenges in meeting our future water demands and facing the challenges. We recognize that much work is currently being done or has been initiated on meeting these challenges. We also recognize that the current policies under development will lead to a more streamlined, efficient and collaborative effort as the various federal agencies work to address the variety of these challenges and we applaud the efforts of all federal and State agencies involved. Rather than add to the list of challenges and needs, we instead, offer what we see as a few of the priorities of focus for federal research support.

1. Water resources inventory (mapping) and needs forecasting and/or scenario planning.
2. U.S. water supply, delivery and treatment infrastructure assessment.
3. Innovative technology development in how we use supply, treat, re-use water and direct water to beneficial re-use.
4. Public awareness and education on re-use technologies and advanced water treatment technology.
5. Water conservation behavior modification practices and tools; i.e., methods to shift our attitude and culture to be more sensitive to water stewardship needs and continue to drive improvement and public and industry water management performance.

Regardless, of the specific projects taken forth, we feel it is important that priorities for research and development be established in alignment with the desired end-state vision and strategic plan set forth by the Interagency Committee. Further, any research taken on needs to include clear delineation of expectations or outcomes, be appropriately resourced and aggressively driven to completion.

Considerations Moving Forward

As your Subcommittee moves forward from this hearing, Mr. Chairman, we offer some thoughts for your consideration.

1. The consideration of goals and/or milestones might help enhance the important work you envision for the Interagency Committee in increasing the efficiency and use of federal funds, streamlining the efforts on the all critical issues related to water management, and setting the foundation for some very collaborative and creative solutions.
2. We see an opportunity, given the current roles that State and tribal entities play in water management, for an incorporation of that role in the work of the Interagency Committee in managing our country's water resources.
3. We applaud the purpose to drive greater interagency collaboration, and hope that you will consider the experience, technology and knowledge of water management that likewise resides in American industry groups and non-governmental organizations (NGOs).
4. Much work has and is currently being developed to assess existing water resource availability, access and quality across many states and tribal lands. In addition agencies like the U.S. Geological Survey have numerous on-going research projects that involve inventorying/mapping/monitoring of our water supplies and quality. We hope you will consider leveraging the work being done in assessing water supply, quality, forecasting future needs, etc. and would encourage you to provide additional clarification on Water Research Outcome number one (Under Section 2 (d) (1)).
5. Given the general age and current state of our country's water delivery and treatment infrastructure(s), we suggest a Water Research Outcome be considered to provide for an assessment of our current water supply, delivery and treatment infrastructure, with an eye toward allowing us to improve the reliability, conservation and efficiency along the complete water supply chain.
6. As it relates to long-term water resources planning and needs assessment, we would suggest adding a Water Research Outcome that involves future use forecasting or scenario planning for future water supply, availability and quality as may be impacted by evolving demographics, public and industry needs and/or climate change.

Closing

Chairman Lampson, Ranking Member Hall and Members of the Subcommittee, water issues are a serious issue for our country. We are facing increased water shortages and distribution challenges. We have an aging infrastructure and in general, a society that has not yet fully embraced the need for improved water stewardship. Technologies exist today that will help us meet some of the challenges, but additional innovation in technology, practices and new collaborations will be needed to meet future challenges. As one end-user and as an industry that relies on reliable supply and quality water, the beverage industry takes water conservation and resource protection very seriously. It is an area that will continue to receive our attention and represents an area we will work to provide leading effort.

We are thankful for the opportunity to provide testimony and hope we have the opportunity to continue to work with this subcommittee and any resulting policy developments.

As you examine the policy considerations before you today, and consider taking a bold new step in helping the management of our country's limited water resources, we hope that our input has been helpful. We look forward to working with all of you in the future.

On behalf of all BIER Member Companies, thank you!

BIOGRAPHY FOR TOD D. CHRISTENSON

Experience Summary

Tod D. Christenson has more than 20 years of professional experience as an environmental strategic thinking partner to private industry. He is a management consultant with unique skills and expertise in the following areas.

- strategic thinking and planning,
- business meeting facilitation,
- benchmarking,

- environmental organizational diagnosis and coaching,
- goal setting and performance management
- corporate social responsibility
- environmental sustainability

Tod utilizes his technical knowledge and management skills in leading for Delta Consultants its' delivery of Corporate Responsibility and Benchmarking practices. Tod is fluent in all aspects of Corporate Social Responsibility (CSR), helping customers develop, and implement affirmative CSR disciplines across their enterprises.

Education

M.S. Masters of Geology and Organic Chemistry, Idaho State University, Pocatello, Idaho

B.A. Bachelor of Arts in Geology, St. Thomas University, St. Paul, Minnesota

Advanced Professional Training Course Work in Contract Management, Facilitation, Organizational Diagnosis.

Current/Recent Speaking Engagements

Water Stewardship in the Beverage Industry—Wal-Mart Supplier Water Stewardship Forum, Bentonville, AR, March 2008.

Water Sustainability and Stewardship—Keynote Speaker, 20th Annual Canadian Bottled Water Convention, Niagara Falls, Ontario, April 2008.

Sustainability Metrics Development and Measurement—Grocery Manufacturers Association 1st Annual Sustainability Summit, Washington, DC, February 2008.

EHS and Sustainability Metrics Management Systems—Air & Waste Management Association, Atlanta, GA, December 2006.

Water Conservation in the Beverage Industry—International Society of Beverage Technologists, May 2006.

Representative Project Experience

Affirmative Environmental Sustainability Discipline Consultation—2007 to current

Senior consultant supporting the development and implementation of an affirmative environmental sustainability discipline for a global, diversified consumer products company. The consulting assignments involve participation in setting strategic direction, designing governance structures and facilitating working groups in the areas of product stewardship, eco-efficiency and communications and training.

Metrics development and baseline measurement represent additional area of consultative support and comprises the aspect of internal benchmarking to drive continuous improvement and external reporting.

Beverage Industry Environmental Roundtable (BEIR)—2006 to current

Director of BIER whose mission is to drive continuous improvement and inform public policy as it relates to Water Stewardship, Energy Efficiency and Climate Change Mitigation.

As Director, Tod is applying his leadership skills to coalesce this voluntary industry collaboration to develop a common framework for environmental stewardship, share best practices and use the collective knowledge, expertise and shared learnings to affect public policy.

Under Tod's leadership, BIER is currently:

- developing a GHG Protocol for the beverage sector following World Resource Institute (Enterprise) and British Standards Institute (Life cycle) protocols,
- developing industry best practice guidance tools,
- facilitating cross industry collaboration and networking, and
- is helping the global, brand leading beverage companies achieve new standards of performance.

BIER participants include global environmental affairs, marketing communications and public affairs leaders from the following beverage companies: Anheuser-Busch, Bacardi, Beam Global Spirits & Wines, Brown Forman, Coca-Cola Enterprises, Danone, Diageo, Miller Coors, Nestle Waters North America, PepsiCo Inter-

national, The Coca-Cola Company, and Pepsi Bottling Group. Additionally, Ecolab and JohnsonDiversey participate as key suppliers to the beverage industry.

Water Use and Efficiency Benchmarking to the Food and Beverage Industry—2005

Project Manager and lead consultant on the benchmarking of water use and efficiency across a diverse group of companies in the food and beverage industries. Participants include world-wide organizations as Coca-Cola, Cadbury Schweppes, Heineken, SAB Miller, Molson Coors, and others. The focus of this environmental sustainability-related benchmarking study focused on the aspects of Total Water Use, Water Use Ratios, Efficiency Initiatives, and company Watershed Protection Programs.

Environmental Liability Management Benchmarking—1999–Present

Lead consultant and project manager for the Annual Petroleum Industry Environmental Liability Management Benchmarking Study. The participants for these annual studies and practice exchange summits have included, ConocoPhillips, Chevron, BP, Sunoco, Ashland, Marathon Oil Company, Amerada Hess, Getty Realty, Shell Oil Products and ExxonMobil. Responsibilities include: participant interview (data collection), data analysis and presentation of findings on the ELM business practices and processes component of the benchmarking study. The annual benchmarking studies covers liability management business processes/practices and performance metrics for Downstream Petroleum operations that relate to refining, bulk storage, pipeline and retail distribution.

The work is conducted annually and culminates in a Summit where participants engage with their peers in best practice sharing and common environmental issue problem-solving.

Portfolio Analysis and Organizational Design—2002

Project Manager and lead consultant for a major oil company's liability management organization portfolio analysis and organizational design. Responsibilities included: providing coaching to the responsible manager, developing a process plan for developing the optimum organizational management scheme, and facilitation of the organization through the process of designing and implementation of the new organization.

Personal

Tod is married (27 years) and with his wife Kim has three children; Jenni (21), Jack (20) and Jacy (16). Tod enjoys all forms of outdoor activities, is an avid reader for entertainment and enjoys the abundant water resources of his native and home State of Minnesota.

Chairman LAMPSON. Thank you, Mr. Christenson. I will get that out in a minute. And Dr. Loftus, you are recognized for five minutes.

STATEMENT OF DR. TIMOTHY T. LOFTUS, PROJECT DIRECTOR, NORTHEASTERN ILLINOIS REGIONAL WATER SUPPLY PLANNING, CHICAGO METROPOLITAN AGENCY FOR PLANNING

Dr. LOFTUS. Chairman Lampson, Members of the Illinois delegation, and fellow Members of the Energy and Environment Subcommittee, thank you for the opportunity to comment this morning.

I come before you to speak of implementing a new National Water Research and Development Initiative. On behalf of the Chicago Metropolitan Agency for Planning and with funding from the Illinois Department of Natural Resources, I have had the privilege for the past two years of leading a new regional water supply planning initiative in an 11 county Greater Chicago region. This regional planning effort was initiated following Illinois Governor Rod Blagojevich's Executive Order 20061.

The National Water Initiative could provide states, local partners, and the private sector with the guidance and information necessary to meet the challenges similar to what we have encountered during this initial phase of planning in Illinois. For example, earlier this month, CMAP issued a water demand study for our region that reveals gaps in data due to inadequate water use reporting. It has been said that you can't manage what you don't measure. Thus, the current status of water use reporting must be addressed if we are to fully grasp how future water demand will reconcile with our water supplies.

The National Water Initiative should enable states and their local planning partners to address the need for comprehensive reporting across all water use sectors as part of a new National Water Census that has been recommended by the Subcommittee on Water Availability and Quality.

The population in the Chicago metropolitan region is projected to grow by over three million people, or 38 percent by the year 2050. Water demand scenarios for our region indicate that water use could increase as much as 64 percent during that time, absent any policy intervention, and without specific strategies for actively managing both demand and supply. Factoring in climate change scenarios reveals that demand for our water in our region could grow even further.

On the supply side, our region's water sources are generous, but finite. Illinois access to Lake Michigan water is constrained by U.S. Supreme Court consent decree. The deep bedrock aquifer underlying Northeastern Illinois is being de-watered. The system of shallow aquifers shows evidence of increasing contamination from chlorides. Our two inland river sources are threatened by non-point source pollution, and required to maintain minimum in-stream flows. Overall, as elsewhere in the United States, our challenge in the Chicago region is not so much scarcity, but water waste, and an institutional structure for water management that leaves plenty of room for improvement.

As part of our charge from the State, CMAP created a 35-member Northeastern Illinois Regional Water Supply Planning Group composed of elected officials, private sector representatives, and other stakeholders. The Regional Water Group has already adopted several water use conservation and efficiency measures as the centerpiece of the nascent Regional Water Supply Plan that is expected next year.

Regrettably, our regional studies funding is currently jeopardized by State of Illinois budget issues. While our planning effort in Northeastern Illinois is proactive rather than a response to a crisis situation, I can tell you from experience that it is difficult to get people to take a long-term view. That can be one important function of the National Water Research and Development Initiative, to define and help implement a water conservation and efficiency agenda that encourages long-range planning by giving clear guidance to states and the private sector alike.

The National Water Initiative's promise of improved horizontal cooperation among federal agencies should be coupled with improved vertical coordination with those of us at State, regional, and local levels who are working to increase stewardship of our most

vital resource. Among other considerations, a new federal effort should also recognize the five following points.

Issues of water quality are inseparable from our need for water availability. Improved water monitoring is prerequisite to informed decision-making. Achieving water conservation and efficiency goals will help our nation achieve energy efficiency goals. It is our nation's best interest to improve our understanding of water-related ecosystem services, and ecosystem needs for water, as well. Finally, federal support can provide key incentives for effective planning, especially when local pressures tend to promote short-term rather than long-term thinking.

Thank you very much for your time this morning.
[The prepared statement of Dr. Loftus follows:]

PREPARED STATEMENT OF TIMOTHY T. LOFTUS

Chairman Lampson, Members of the Illinois delegation, and fellow Members of the Energy and Environment Subcommittee, thank you for the opportunity to comment today. I come before you to speak of implementing a new National Water Research and Development Initiative. Never before has the need for a fresh and more coordinated federal role in addressing our nation's water use, demand, and supply been so urgent.

On behalf of the Chicago Metropolitan Agency for Planning (CMAP) and with funding from the Illinois Department of Natural Resources (IDNR), I have had the privilege for the past two years of leading a new regional water supply planning initiative in the 11-county, greater Chicago region. This regional planning effort was initiated following Illinois Governor Rod Blagojevich's Executive Order 2006-1, which called on the Illinois Department of Natural Resources, in coordination with the State Water Survey, to define a comprehensive program for state and regional water supply planning and management. CMAP has been charged by IDNR to lead the planning process in northeastern Illinois.

Water supply planning in the Chicago region, an iterative process that is expected to evolve over the years ahead, could be greatly strengthened by the promise of the National Water Research and Development Initiative. The National Initiative could provide states, local partners, and the private sector with the guidance and information necessary to meet the challenges similar to what we have encountered during this initial phase of planning in Illinois.

For example, earlier this month CMAP issued a water-demand study¹ for our region that reveals gaps in data due to inadequate water-use reporting. It has been said that you can't manage what you don't measure. Thus, the current status of water-use reporting must be addressed if we are to fully grasp how future water demand will reconcile with our water supplies. The National Initiative should enable states and their local planning partners to address the need for comprehensive reporting across all water-use sectors as part of a new National Water Census that has been recommended by the Subcommittee on Water Availability and Quality.²

The population in the Chicago metropolitan region is projected to grow by over three million people or 38 percent by 2050. Water-demand scenarios for northeastern Illinois indicate that water use could increase as much as 64 percent during that time absent any policy intervention and without specific strategies for actively managing both demand and supply. Factoring in climate change scenarios reveals that demand for water in our region could grow even further.

While our regional analysis of demand and supply is not complete, there is ample reason for concern. On the supply side, our region's water sources are generous, but finite. Illinois access to Lake Michigan water is constrained by U.S. Supreme Court Consent Decree. The deep-bedrock aquifer underlying northeastern Illinois is being de-watered. The system of shallow aquifers shows evidence of increasing contamina-

¹ *Regional Water Demand Scenarios for Northeastern Illinois: 2005-2050. Project Completion Report, June 15, 2008.* Prepared by Benedykt Dziegielewski and Farhat Jahan Chowdhury, Southern Illinois University Carbondale, Department of Geography and Environmental Resources.

² *A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States.* Report of the National Science and Technology Council, Committee on Environment and Natural Resources. Subcommittee on Water Availability and Quality. September 2007.

tion from chlorides (i.e., road salts). Our two inland river sources are threatened by non-point source pollution and required to maintain minimum in-stream flows. Overall, as elsewhere in the United States, our challenge in the Chicago region is not so much water scarcity, but water waste.

As part of our charge from the State, CMAP created a 35-member Northeastern Illinois Regional Water Supply Planning Group (RWSPG) composed of elected officials, private sector representatives, and other stakeholders. The RWSPG has already adopted several water-use conservation and efficiency measures as the centerpiece of the nascent regional water supply plan that is expected next year. In July 2009, this diverse group is scheduled to issue its plan with recommendations for managing water supply through 2050. While our regional study's funding is currently jeopardized by State of Illinois budget issues, CMAP is committed to moving forward with our partners to complete this important effort.

I can tell you from experience that it is difficult to get people to take a long-term view. That can be one important function of the National Water Research and Development Initiative: To define and help implement a water conservation and efficiency agenda that encourages long-range planning by giving clear guidance to states and the private sector alike.

The inherent complexity and uncertainty associated with planning for our nation's water resources, water availability and quality, make for a formidable challenge that needs to be met now. Those of us working on this front should benefit from the National Initiative achieving its purpose of improving the Federal Government's efforts with research, development, and outreach as it pertains to water use, supply, and demand.

The National Initiative's promise of improved horizontal cooperation among federal agencies should be coupled with improved vertical coordination with those of us at State, regional, and local levels who are working to increase stewardship of our most vital resource. Among other considerations, the effort should also recognize that:

- 1) Water quality is a prime attribute of water availability.
- 2) Improved water monitoring is prerequisite to informed decision-making.
- 3) Achieving water conservation and efficiency goals will help achieve energy efficiency goals.
- 4) It is in our nation's best interest to improve our understanding of water related ecosystem services and ecosystem needs for water.

At CMAP, we believe our region is at a turning point, and that could apply equally to other urban areas and the U.S. as a whole. Pressures in the economy—particularly housing and fuel costs—are increasing public support for compact growth patterns and other policies that planners have long promoted. Sensible growth will be an important component of our regional water strategy, to discourage development in locations that will strain supplies. Water-supply planning can benefit from the heightened public awareness of how quality of life can be preserved and improved through effective stewardship of regional resources. Again, federal support can provide key incentives for effective planning, especially when local pressures tend to promote short-term rather than long-term thinking.

Thank you for considering my testimony, and I look forward to the National Water Research and Development Initiative becoming law and fulfilling its promise to ensure adequate water supplies for the Nation.

Chairman LAMPSON. Thank you, Dr. Loftus. Mr. Johnson, you are recognized.

**STATEMENT OF MR. JERRY N. JOHNSON, GENERAL MANAGER,
DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY**

Mr. JOHNSON. Thank you, Chairman Lampson, Members of the Committee. I am Jerry Johnson, General Manager of the District of Columbia Water and Sewer Authority, otherwise known as DCWASA. I appreciate your interest in the federal role in research, development, and research coordination in the areas of water supply, water conservation, and water management.

I also appreciate the opportunity to testify before the House Committee on Science and Technology's Subcommittee on Energy

and the Environment, and to comment on the national water research and development effort.

DCWASA has a broad mission of providing reliable, cost-effective water and wastewater services. We are an independent authority of the District of Columbia, and serve a multi-jurisdictional area here in the region. We distribute drinking water and collect wastewater for more than 500,000 residential, commercial, and government customers here in the District of Columbia, including this U.S. Capitol complex. We treat wastewater for another 1.6 million residents in Maryland and Virginia.

Mr. Chairman, from my perspective, there are a number of factors that complicate efforts to better coordinate and manage water resources, including geography, State and local jurisdiction and political boundaries, the site-specific nature of statutory and regulatory framework, the structure of local and regional water and land use agencies, as well as a strong history that includes the evolution of development around waterways that serve as both sources of drinking water, support for industrial and other economic activities, and receiving waters for discharges of effluent from wastewater treatment plants, and overland runoff. However, all of these can be overcome.

A broad framework to establish supporting water resources research and development is a pathway for identifying important national priorities, while also helping to disseminate information on a range of issues we confront in improving our management of water resources. However, the opportunity to establish a framework that better coordinates ongoing research will certainly strengthen our efforts in, with the research and our research agendas. Providing a stronger brand of national leadership that promotes a consensus and identifies priorities will encourage even greater initiative on the part of academic institutions, professional organizations and associations, research foundations, local agencies, and industry.

As you know, water rarely is a localized resource. It rises and crosses jurisdictional boundaries, and cities, counties, and states, which makes the federal role extremely critical as we address these issues. A number of federal agencies, ranging from the U.S. EPA, the U.S. State Department, Agriculture, and others are making a number of national professional and industry associations work together, and have established over the years a very important research effort that is based on collaboration across these professional lines.

Another example, a couple of examples of those are the American Water Works Association, which has sponsored over 635 completed research projects, with another 300 that are underway, with in excess of 500 researchers that have been involved.

Another example is the Water Environment Research Federation, a leading independent scientific research organization, and I am proud to be a member of the board of that organization, and we have, in fact, done over 400 research projects, totaling some \$89 million in value. Similarly, academic institutions participate in important research that constitutes, that contributes to the understanding of our interactions with the environment. These efforts

also enhance our ability to manage water resources and reduce potentially negative effects on human activity.

Scientists who are employed in our wastewater plant and our Water Quality Division are participating in a fair amount of this research in areas of bio-solids management, and providing a good bit of information on corrosion control as it relates to the drinking water distribution system. We also work with a number of universities, to include Virginia Tech and Howard University, on a number of research initiatives.

But there are a number of initiatives that really need to be examined, and I think a few examples of those are understanding when water is safe to drink, understanding the phenomena of pharmaceuticals and nanotechnology as it relates to water, bio-solids management, point source control, just to name a few.

Mr. Chairman, once again, I wish to express my appreciation to you and the Committee for your interest in these critical issues. We most often come to Capitol Hill seeking support for massive infrastructure improvements, and to undertake, to ensure protection of our resources and the environment. There are, however, initiatives that the Federal Government can undertake that are at least as important as appropriation bills. A national initiative to build better coordination and stronger foundation for developing priorities, enhancing overall national research agenda, and providing the information we need to improve our management of our water resources, is just that initiative.

I believe that you can be confident that the successful effort will result in not only a more cost-effective research initiative, but also a positive impact on water resource development and management through better planning, lower costs, and improved efficiency.

In closing, Mr. Chairman, many of the issues that I have discussed in this testimony, and particularly, the written testimony, are not new to the research community. Climate change, however, is a substantially different kind of challenge. Although the debate regarding global warming continues in some quarters, there is no doubt that water resources can and are dramatically affected by local and regional climate change.

Strengthening the national research agenda through better coordination could help to develop an important new role, and provide a critical advantage for the successful addressing of many of these new challenges that we face.

Also, I would just point out to the Committee that a couple of things in the legislation, one relates to funding, that I think probably could be addressed and strengthened, and the other is consideration of the difficulty in uncoupling water resources from wastewater management and the whole notion of things related to that particular industry.

Thank you very much. I would be pleased to answer any questions you have and I apologize for going over my time.

[The prepared statement of Mr. Johnson follows:]

PREPARED STATEMENT OF JERRY N. JOHNSON

Mr. Chairman and Members of the Committee, my name is Jerry N. Johnson, and I am the General Manager of the District of Columbia Water and Sewer Authority, otherwise known as DCWASA. I appreciate your interest in the federal role in re-

search, development and research coordination in the areas of water supply, water conservation and water management.

I also appreciate this opportunity to testify before the House Committee on Science and Technology Subcommittee on Energy and the Environment, and to comment on a national water research and development effort.

DCWASA's broad mission includes providing reliable and cost-effective water and wastewater services. We are an independent authority of the District of Columbia that serves a multi-jurisdictional service area.

Specifically, we distribute drinking water and collect and treat wastewater for more than 500,000 residential, commercial and governmental customers in the District of Columbia, including this U.S. Capitol complex. We also treat wastewater for 1.6 million customers in Montgomery and Prince George's counties in Maryland and Fairfax and Loudoun counties in Virginia.

In many ways we are unique:

- Unlike almost every other municipal water utility in the country, we were established in both local and federal law.
- We are directly regulated by the Federal Government, through the U.S. Environmental Protection Agency's (EPA) Region 3.
- The source of our drinking water is the Potomac River—a river that is bounded by several states and the District of Columbia, and although we distribute drinking water, our supplier is the Baltimore District of the United States Army Corps of Engineers Washington Aqueduct.
- Although we treat wastewater for both wholesale and retail customers at a District of Columbia facility that is regulated by the EPA, our wholesale customers operate under separate permits and different pollution limits, and also have different regulatory regimes established under state governments.

These factors do not necessarily impact all of DCWASA's operations on a daily basis, but they do impact how we plan, develop and manage water resources. Even though we are unique we share many of the challenges that confront other municipal and regional water and wastewater agencies. For example:

- The fact that DCWASA is responsible under its NPDES permit for addressing the District's estimated three billion gallons of annual combined sewer overflows that reach the Anacostia and Potomac rivers and Rock Creek, while at the same time the District of Columbia Department of the Environment is responsible for managing the District's stormwater flows into these waterways under a separate MS4 permit issued by EPA;
- The fact that the Federal Government provides drinking water treatment means that the periodic disagreements between jurisdictions that border the Potomac River (and which are mirrored in other regions of the country) have important implications for many area residents, but not for customers whose water is treated by the *federal* U.S. Army Corps of Engineers;
- When local drought conditions require Maryland or Virginia to impose voluntary or even mandatory water restrictions in communities that border the District, we usually escape these limits because we rely on the Potomac which has substantial natural and manmade reserve capacity far upstream;
- Although the Blue Plains Advanced Wastewater Treatment Plant was the first to meet the EPA's Chesapeake Bay Program voluntary limits on nitrogen discharges, and even though we will expend about \$1 billion dollars to meet more stringent requirements, EPA and states in the Chesapeake Bay watershed have yet to establish effective means to limit the most serious source of pollutants entering the Chesapeake Bay—run-off from non-point sources;
- The District of Columbia is required to expend approximately \$2 billion to address the combined sewer overflows, while most of the pollution in the Anacostia River is caused by legacy pollutants in river bed sediments and other pollutants from upstream beyond the District's borders—another example of the essential need to develop more effective watershed-based approaches to water, wastewater and storm water management.

Mr. Chairman, from our perspective there are a number of factors that complicate efforts to better coordinate the management of water resources, including:

- Geography
- State and local jurisdictional and political boundaries
- The site-specific nature the statutory and regulatory framework within which we ail work

- The structure of local and regional water and land use agencies, and
- History—the evolution of development around major waterways that serve as both sources of drinking water and as receiving waters for the discharge of effluent from treatment plants and overland run-off.

A broad framework established for supporting water resources research and development is a pathway to identifying important national priorities while also helping to disseminate information on the range of issues we confront in improving our management of water resources.

However, the opportunity to establish a framework that better coordinates ongoing research will certainly strengthen our research agenda. Providing a stronger brand of national leadership that promotes consensus and identifies priorities will encourage even greater initiative on the part of academic institutions, professional associations and research foundations, local agencies and industry.

As you know, water is rarely a localized resource; it raises inter-jurisdictional challenges across cities, counties and states. The federal role in coordination is crucial. A number of federal agencies ranging from the EPA, to the U.S. Department of Agriculture and the Centers for Disease Control, just to name a few, are making important contributions to research, and many national professional and industry associations have established over the years very important research efforts that are based on collaboration across professions, academia, government and water agencies.

For example, the mission of American Water Works Association Research Foundation (AwwaRF) is to advance the science of water to improve the quality of life by focusing on drinking water research. To date, AwwaRF has sponsored 635 completed research projects, and more than 300 studies are currently underway. In excess of 500 researchers and 30 partner research organizations have been involved in research efforts, which are guided by stakeholders in the water industry and supported by nearly 1,000 member organizations in nine countries worldwide.

Another example is the Water Environment Research Foundation (WERF), formed in 1989, is a leading independent scientific research organization dedicated to wastewater and stormwater issues. As a member of the WERF Board of Directors, I am proud of the fact that we have managed nearly 400 research projects, valued at more than \$85 million.

This nonprofit organization operates with funding from subscribers (wastewater treatment plants, stormwater utilities, and regulatory agencies and the Federal Government, industry and equipment companies, engineers and environmental consultants. And the approach to research stresses collaboration among teams of subscribers.

Similarly, academic institutions participate in important research that contributes to our understanding of our interactions with the environment. These efforts also enhance our ability to manage water resources and reduce potentially negative effects of human activity. Less well known are the research efforts of local agencies like DCWASA.

Scientists who are employed in our wastewater treatment and our drinking water quality units are participating, and some instances leading, important research efforts in, for example, the use of biosolids, a byproduct of wastewater treatment. We are also conducting research and providing important data to EPA and other agencies in the area of corrosion control in the treatment and distribution of drinking water.

This work is being undertaken in many instances in collaboration with academic institutions like Virginia Tech, Howard University, the University of Washington and Cincinnati University, as well as with organizations like AWWARF.

Yes, this work is important. Yes, we are establishing important and valuable affiliations. Yes, this applied research will improve our ability to operate more efficiently and at lower cost, or alternatively to improve our ability to comply with increasingly stringent regulatory standards.

However, given the nature of our mission, our research agenda can sometimes be driven by relatively shorter-term objectives. I genuinely believe that the Nation will benefit from a stronger, better coordinated approach to research that supports better management of this increasingly scarce resource.

We are strongly supportive of an initiative that creates a more centralized opportunity to review, discuss and build a consensus on how we should approach some of these many challenges. DCWASA has been an advocate for strengthening the national research effort on a range of issues that relate to both wastewater treatment and drinking water treatment and distribution. For example:

Simultaneous Compliance

More research and coordination should be encouraged in the area of simultaneous compliance with all federal regulations under the federal *Safe Drinking Water Act*. Changes in one regulation may require a drinking water treatment change that has a negative impact on compliance with another regulation.

As current research is showing, for example, the pipe scales that form on the interior of pipes and which protect the pipes from the corrosive effects of water are very sensitive to chemical changes. These chemical changes may cause extensive metal release (including lead) into the water. Drinking water distribution systems are dynamic and sensitive systems and treatment changes required by regulations can have unforeseen and far reaching consequences. Research in the area of simultaneous compliance requires a much more aggressive and coordinated response.

When is Water Safe to Drink?

Almost every day, a water utility is faced with demonstrating that the water it delivers is, in fact, clean and safe to drink. A recent example is the water main break in Montgomery County Maryland where there was a potential microbial contamination after a major water main break. When a system loses complete water pressure in a large area, the distribution system becomes vulnerable to contamination. Current practice is to issue a boil advisory for at least 48 hours because it takes 24 hours to analyze bacteria samples that are collected immediately after the outage occurs.

Another set of samples is analyzed 24 hours later, placing a burden on local businesses, hospitals, and the entire community. Improving the speed of bacteriological analysis from days to hours or minutes in a manner that meets nationally accepted standards to ensure can help ensure the integrity of our water systems as well as consumer confidence.

I believe that this ought to be a higher priority. That is of course only an opinion, but this initiative may provide a better opportunity for all interested parties to create a consensus on this and many other issues.

Pharmaceuticals and Nanotechnology

Better coordination between federal agencies like the National Institute of Health, USDA and EPA, on pollutants that are discharged to our waterways, especially in the emerging areas of pharmaceuticals and nanotechnology is critical.

Water and wastewater utilities end up holding the bag because we are a regulated point source, but we must do a vastly better job assessing the environmental impact in the product development phase of many of these current and future potential contaminants. There have been concerns about pollutants such as estrogens in the Potomac, but there has been too little effort to evaluate source reduction strategies to regulate these chemicals, leaving the onus on end-of-pipe technologies that are very difficult and/or expensive to implement.

The variety of pollutants are also expanding to include nanotechnology constituents that may potentially harm the environment or human health, but there is, again, too little work evaluating the fate of these constituents once they reach the environment.

Biosolids

Better federal stewardship of biosolids management is another example of the need for greater attention in the area of wastewater and wastewater treatment by-product re-use. DCWASA staff members are involved in WERF and self-funded projects that are intended to ensure that the application of biosolids to land as a fertilizer is practiced in a safe and sustainable manner and in accordance with EPA guidelines.

- We are involved in WERE work to produce a protocol for rapid response to biosolids safety related issues.
- We are also evaluating sustainability measures for biosolids reuse. Our determination is that biosolids recycling can significantly reduce our greenhouse gas footprint through carbon sequestration and by off-setting the energy needs and greenhouse gases produced from manufacturing commercial fertilizer.
- DCWASA is also involved in a WERF project verifying reliable destruction of pathogens in digested biosolids.

Even better efforts to coordinate biosolids research could help address local concerns around the Nation regarding perceived risks associated with biosolids, while

also assessing the current and potential future value of biosolids as a safe and sustainable resource.

Non-Point Source Controls

Better coordination on non-point source control may be one of the most critical challenges in improving water quality in the nations receiving waters. Point sources are subject to regulation, but often non-point sources are major sources of pollution and the clean-up of water bodies will not be realized until non-point sources are addressed.

An example is the mitigation of nutrient related pollution in the Chesapeake Bay, where the Bay clean-up will not be realized without participation of non-point sources. Non-point source pollution is the main cause of nutrient pollution in the Bay. Point sources make up less than a quarter of nutrient related pollution. Yet DCWASA rate payers are being asked to spend \$1 billion to build facilities under stringent standards and deadlines with absolutely no guarantee to these rate payers that the Chesapeake Bay will be remediated, because much of the non-point source related nutrient pollution remains unabated. It is critically important that we work more diligently to develop watershed-wide and non-point source strategies for managing and improving water quality in receiving waters.

Mr. Chairman, I once again wish to express my appreciation to you and the Committee for your interest in these critical issues. We most often come to Capitol Hill seeking support for massive infrastructure improvements that water agencies must undertake to both ensure reliable service and to protect the environment.

There are, however, initiatives that the Federal Government can undertake that are at least as important as appropriations bills. A national initiative to build a better coordinated and stronger foundation for developing priorities, enhancing the overall national research agenda and providing the information we need to improve our management of our water resources is just such an initiative.

I believe that you can be confident that a successful effort will result in not only more cost-effective research initiatives, but also a positive impact on water resource development and management through better planning, lower costs, and improved efficiency.

In closing, Mr. Chairman, many of the issues I've noted in my testimony are not new to the research community, or the industry. Climate change, however, is a substantially different kind of challenge. Although the debate regarding global warming continues in some quarters, there is no doubt that water resources can and are dramatically affected by local and regional changes in climate.

Strengthening the national research agenda through better coordination could help develop important new tools that provide a crucial advantage in successfully addressing this new challenge.

I would be pleased to respond to any questions.

BIOGRAPHY FOR JERRY N. JOHNSON

Jerry Johnson currently serves as General Manager of the District of Columbia Water and Sewer Authority. The Authority provides retail and wholesale water and wastewater treatment services to the District of Columbia and parts of Virginia and Maryland with a customer base of approximately two million. The Water and Sewer Authority operates Blue Plains Wastewater Treatment Plant, which is the largest advanced Wastewater Treatment Plant in the world.

Johnson is nationally known as a turnaround specialist. As the first General Manager of the newly created Authority, he guided it from an unrated agency with a projected \$8 million deficit to one with an A+ credit rating and \$170 million reserve in two years, (currently double A rating). He has developed long-term capital and financial plans, a comprehensive rate strategy in addition to resolving major operating and regulatory agency issues. Public/private partnerships, infrastructure planning, and organizational development are also among Johnson's areas of expertise.

Prior to joining the Water and Sewer Authority, Johnson served as Deputy City Manager for Operations in the City of Richmond, Virginia. During his tenure in Richmond, he also served as Director of Public Utilities, responsible for four separate utility operations including gas, electric, water and wastewater providing service to the metropolitan Richmond area. He has also been the General Manager for the Metropolitan Richmond Convention and Visitors Bureau, responsible for marketing the metropolitan area for tourism and conventions. Jerry began his service in Richmond as the Director of Community Facilities for the City.

Before moving to Richmond, he was Assistant to the City Manager for the City of Alexandria, Virginia and was a Senior Planner for the City of Charlottesville, Virginia.

He graduated with a Business Degree from Ferrum College; a Degree in Urban Affairs and Economics from Virginia Tech and completed the Program for Senior Executives in State and Local Government at the JFK School of Government, Harvard University.

He serves on a number of boards and commissions, holds leadership positions in several national organizations and has numerous honors and awards resulting from his professional accomplishments and community involvement. He also has a number of publications to his credit.

Chairman LAMPSON. Thank you, Mr. Johnson. Mr. Spooner, you are recognized for five minutes.

STATEMENT OF MR. BRADLEY H. SPOONER, PRINCIPAL ENGINEER, ENVIRONMENTAL SERVICES OF THE MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA (MEAG POWER)

Mr. SPOONER. Thank you, Mr. Chairman and Members of the Committee. I am here today on behalf of the American Public Power Association (APPA), which represents the interests of more than 2,000 publicly owned electric utility systems serving approximately 45 million Americans. APPA members serve some of the Nation's largest cities, along with many small and medium-sized communities in 49 states.

Water availability is crucial to many types of electricity generation. For hydroelectric power, it is the energy source. For fossil and nuclear steam generation, water is needed for many in plant process uses. Water is, therefore, crucial for APPA's members to deliver electricity to support a healthy environment and a vibrant economy.

Today, APPA would like to highlight three of its recommendations for the Committee to consider. The first recommendation is that the legislation should include measures to ensure high quality data. Developing a research and assessment plan, and conducting the research called for the plan, will involve the production, analysis, and use of a significant amount of technical data. APPA recommends that the bill consider available resources and guidelines intended to ensure data of high quality. An example would be the resources and guidelines developed under the *Federal Data Quality Act of 2001*, also known as the *Information Quality Act*.

Of particular importance is that data used for implementing the bill be objective, transparent, peer-reviewed, unbiased, and reproducible. Because many departments and agencies will participate in developing the plan and conducting the research, coordination of high quality data among the parties by the interagency committee will be especially important.

The second recommendation is that the legislation should include research related to projected significant water consumption increases with carbon capture and sequestration technology. Various global climate bills introduced in Congress have contemplated the future use of a technology called carbon capture and sequestration, or CCS. The intent of CCS is to capture carbon dioxide resulting from the combustion of fossil fuels at power plants before the carbon dioxide is emitted. Several studies done by the Department of Energy's National Energy Technology Laboratory indicate that capturing the carbon dioxide at a power plant would require a dou-

bling of the plant's consumptive water use. This significant increase in water consumption appears to run contrary to the goals of the bill, and therefore, appears to be an issue ripe for research under the bill.

The third recommendation is that the legislation should ensure participation by states, local communities, and stakeholders. Early in 2008, the State of Georgia adopted a Georgia Comprehensive Statewide Water Management Plan. The Plan came about following an extensive stakeholder process involving agriculture and business interests, local governments, nonprofit agencies, trade associations, and others. Under the guidance of Governor Perdue and the Georgia Environmental Protection Division Director Dr. Carol Couch, the Georgia Plan was approved by the State Water Council and the State General Assembly.

Of particular note is that the Georgia Plan was successfully developed in a state experiencing both drought conditions and strong economic growth. The success of the Georgia Plan process suggests some similar processes that may be beneficial to the proposed plan called for in the draft bill. For example, the bill should consider extending the duties of the outreach office to specifically bring states and local communities into the federal plan development process earlier and more extensively. Likewise, consideration should be given to extending the duties of the outreach office to establishing a stakeholder group to provide input during development of the plan. These entities and groups should be able to provide valuable information to make the final federal plan more effective.

In wrapping up, I would like to mention that in April of 2007, APPA sent a letter to Full Committee Chairman Gordon in support of legislation designed to develop a methodology for, and a complete national assessment of geologic storage capacity for carbon dioxide. This legislation was ultimately included in the Energy Bill enacted into law in December of 2007, and APPA thanks the full Committee Chairman and the Committee as a whole for their hard work on this important matter, and we look forward to the results being made available.

Thank you for the opportunity to provide input today. We hope that you will consider the American Public Power Association and MEAG Power as resources for questions that may arise as the process moves forward.

Thank you.

[The prepared statement of Mr. Spooner follows:]

PREPARED STATEMENT OF BRADLEY H. SPOONER

APPA represents the interests of more than 2,000 publicly owned electric utility systems across the country, serving approximately 45 million Americans. APPA member utilities include State public power agencies and municipal electric utilities that serve some of the Nation's largest cities. However, the vast majority of these publicly-owned electric utilities serve small and medium-sized communities in 49 states, all but Hawaii. In fact, 70 percent of our members are located in cities with populations of 10,000 people or less. Public power systems own approximately 10.1 percent of the total installed electric utility generating capacity in the United States. Hydroelectric projects comprise nearly 19 percent of public power's total generating capacity. There are 132 municipally-owned utilities with hydroelectric capacity, of which 94 are APPA members. The remaining mix of public power's generating capacity is comprised of approximately 27 percent coal, 36 percent gas, eight percent nuclear and eight percent oil.

Public power systems' primary purpose is to provide reliable, efficient service to their local customers at the lowest possible cost. Like hospitals, public schools, police and fire departments, and publicly owned water and waste water utilities, public power systems are locally created governmental institutions that address a basic community need: they operate to provide an essential public service, reliably and efficiently, at a reasonable, not-for-profit price.

The Municipal Electric Authority of Georgia (MEAG Power) is a public corporation whose primary purpose is to generate and transmit reliable and economical electric power to 49 Georgia communities that are Participants of MEAG Power. MEAG Power is Georgia's third-largest electric power supplier. Power is provided through co-ownership of two nuclear and two coal-fired generating plants, sole ownership of a natural gas-fired combined cycle facility, and ownership of over 1,300 miles of high voltage transmission lines and nearly 200 substations.

APPA and MEAG appreciate the opportunity to testify at this important hearing on "A National Water Initiative: Coordinating and Improving Federal Research on Water." In addition, APPA appreciates the opportunity to comment on the draft "National Water Research and Development Initiative Act of 2008" and to provide additional comments about the water/electric generation nexus. Water availability is crucial to many types of electricity generation. For hydroelectric power, water *is* the energy source. For fossil and nuclear steam generation, water is needed for many in-plant process uses including for condensing steam. Water is therefore crucial for APPA's members to be able to deliver a reliable and reasonably priced electricity supply to residences and businesses in our communities in order to support a healthy environment and a vibrant economy.

The U.S. Department of Energy (DOE) released a report entitled: *Energy Demands on Water Resources: Report to Congress on the Interdependency of Energy and Water*. DOE found that: "Water is an integral element of energy resource development and utilization. It is used in energy-resource extraction, refining and processing, and transportation. Water is also an integral part of electric-power generation. It is used directly in hydroelectric generation and is also used extensively for cooling and emissions scrubbing in thermoelectric generation. For example, in calendar year 2000, thermoelectric power generation accounted for 39 percent of all freshwater withdrawals in the U.S., roughly equivalent to water withdrawals for irrigated agriculture (withdrawals are water diverted or withdrawn from a surface-water or groundwater source) (Hutson et al., 2004). Water withdrawal statistics for thermoelectric power are dominated by power plants that return virtually all the withdrawn water to the source. While this water is returned at a higher temperature and with other changes in quality, it becomes available for further use.

Comments on Draft National Water Research and Development Initiative Act of 2008

Today, APPA would like to offer several recommendations for the Committee to consider as it further develops the bill. The comments include: encouraging high quality data in developing the National Water Availability Research and Assessment Plan established in the draft legislation; discussing concerns with projected water usage increases with carbon capture and sequestration technology; and relating some positive experiences associated with a statewide water management plan adopted by Georgia earlier this year.

For some APPA members, there is an intrinsic relationship between serving water utility customers and electric utility customers. Many APPA members anticipate significant load growth in water and electricity as populations increase. End-user energy efficiency, water use efficiency, and renewable energy, although important, will not be sufficient to meet these increased electricity and water demands.

One of the common misconceptions is that surface and groundwater challenges are only in the arid Southwest. The challenges are not limited to that area of the country alone. For example, according to the Michigan Land Use Institute, nearly the entire western shoreline of Lake Michigan has water demand above available precipitation, and aquifers in that region have declined as much as 900 feet, and are declining as much as 17 feet per year in some cases. For these reasons, we need additional research on how to reduce water consumption from many industrial users (including power plants) which do not take away energy capacity. APPA, therefore, appreciates the draft legislation's national scope and acknowledgement of the challenges facing water use in the future.

The Legislation Should Include Measures to Insure High Quality Data.

Developing a National Water Availability Research and Assessment Plan, and conducting the research called for by the Plan to achieve the Water Research Out-

comes, as proposed in the draft bill, will involve the production, analysis, and use of a significant amount of technical data. The data would include information on water quantity, water quality, technologies, consumption, and other criteria. A well-constructed Plan and the associated research will necessarily rely on accurate and reliable data.

APPA recommends that the bill consider available resources and guidelines intended to ensure that federal activities such as contemplated by the bill use data of high quality. An example of resources and guidelines can be found in the principles for the federal *Data Quality Act of 2001* (also known as the *Information Quality Act*), which called for the Office of Management and Budget to “provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information.” In the February 22, 2002 *Federal Register*, OMB published *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies*. Since that time, many federal departments and agencies have developed data quality guidelines.¹

Of particular importance is that, as appropriate, data used for implementing the bill be objective, transparent, peer-reviewed, unbiased, and reproducible. These criteria will especially help to insure that the data are credible and therefore useful for the intended purpose. Because many Departments and Agencies will participate in developing the Plan and conducting the research, coordination of high quality data among the parties by the Interagency Committee will be especially important.

The Legislation Should Include Research Related to Projected Water Consumption Impacts with Carbon Capture and Sequestration Technology.

Various global climate and greenhouse gas emission reduction bills in Congress have contemplated the future use of a technological process called Carbon Capture and Sequestration (CCS) or what EPA calls “geosequestration,” sometimes also referred to as carbon capture and storage. The intent of CCS is to “capture” carbon dioxide (CO₂) resulting from the combustion of fossil fuels at power plants before the CO₂ is emitted, direct the captured CO₂ into an underground pipeline system, and store the piped CO₂ safely underground such as in a saline geologic formation.

According to studies done by the U.S. Department of Energy’s National Energy Technology Laboratory (NETL) and others, “capturing” the CO₂ at a power plant would require significant amounts of additional consumptive water use at the plant. For example, data from two NETL reports² on CCS indicate that there would be approximately a doubling of water consumption, when comparing new pulverized coal plants of similar net capacity, with and without post-combustion CCS technology. The table below summarizes the DOE/NETL water data; the range for supercritical units shown represents the data in the two DOE/NETL reports. The same doubling of water consumption would likely occur with retrofitted coal generation. This significant increase of water consumption appears to run contrary to the goals of the draft “*National Water Research and Development Initiative Act of 2008*”—and therefore appears to be an issue ripe for research pursuant to the bill. Attached to this testimony are *APPA Comments to NERC on Reliability Impacts of Climate Change Initiatives*. Comment No. 7, Competition for Scarce Water Supplies, provides additional insight, information, and referenced materials that are relevant to this issue.

¹ See <http://www.ombwatch.org/article/archive/231?TopicID=13> for a list of Department and Agency guidelines and links to the guidelines.

² See *Cost and Performance Baseline for Fossil Energy Plants*, DOE/NETL–2007/1281, May 2007, Revised Aug 2007; and *Pulverized Coal Oxycombustion Plants*, DOE/NETL–2007/1291, Aug. 2007, Revised Oct. 2007 and associated Nov. 2007 presentation slides.

CCS Water Use Impacts	
550MW Nominal Net Output Coal Unit	
Post-Combustion CCS Technology	
Subcritical Unit	
Without CCS	6,212 gpm
With CCS	12,187 gpm
% Increase with CCS	96.2%
Supercritical Unit	
Without CCS	5,441-5,443 gpm
With CCS	10,444-12,130 gpm
% Increase with CCS	92.0%-122.9%
Supercritical Unit	
Without CCS	4,720 gpm
With CCS	9,640 gpm
% Increase with CCS	104.2%

Data Are Needed on Geologic Formations Before Large Commercial Power Plants With CCS Can Be Realistic.

While APPA has not yet performed an exhaustive study of the impact of carbon sequestration on current or future water supplies, we are concerned that neither the state of the science nor the existing regulations are sufficiently developed to where carbon sequestration can seriously be considered as a greenhouse gas mitigation technique. It would be very difficult to do site characterization assessment properly in many locations because not enough is known about the subsurface geology and hydrology.

In April of 2007, APPA sent a letter to Full Committee Chairman Gordon in support of legislation designed to develop a methodology for, and complete a national assessment of, geological storage capacity for carbon dioxide. This legislation was ultimately included in the energy bill enacted into law in December of 2007 and we thank the Full Committee Chairman and the Committee as a whole for their hard work on this important matter and we look forward to the results being made available.

Water Use, Energy and Discharge Temperatures

APPA encourages DOE or other agency funding of ways to reduce thermal impacts from power plants (and industrial facilities) through less expensive cooling tower technologies. Today cooling towers have parasitic energy impacts which are very high. Parasitic power is the amount of the power used to run pollution controls, cooling towers, chemical processes to reduce pollutants, and to run booster compressors. This parasitic power takes away from the net energy output from the power plant. Additionally, it is very difficult to retrofit the current fleet with cooling towers due to both parasitic power capacity losses and due to physical space. Localized drought conditions and multiple dischargers of water can threaten to exceed the temperature limit of a receiving stream. In 2007 a major utility in the U.S. had to shut down its utility operation because the receiving waterbody's temperature could not tolerate the incoming water from the power plant. The confluence of population changes, density of population and location of manufacturing facilities will make this concern even more difficult in future years. New technologies or operational practices to reduce the effluent temperature from thermal power plants without causing parasitic power losses would be very helpful.

For municipal power plants associated with APPA communities that have both electric and water utilities, it would also be helpful to find additional ways to reduce the costs of desalination plants (whether simple distillation or reverse osmosis)

using waste heat from the power plant. This research could include the use of grey water, re-usable water, and even water that could be sufficiently cleaned for drinking water. Research in this area could provide communities with additional surface water which would be enormously beneficial.

The Legislation Should Insure Participation by States, Local Communities, and Stakeholders.

Early in 2008, the State of Georgia adopted a *Georgia Comprehensive Statewide Water Management Plan*. The Georgia plan came about following an extensive stakeholder process involving agricultural and business interests, local governments, non-profit agencies, trade associations, and others. Under the guidance of Governor Purdue and Georgia Environmental Protection Division Director Dr. Carol Couch, the Georgia plan was approved by the State Water Council and the State General Assembly.³ Of particular note is that the Georgia plan was successfully developed in a state experiencing both drought conditions and strong economic growth.

The success of the Georgia plan process suggests some similar processes that may be beneficial to the proposed National Water Availability Research and Assessment Plan called for in the draft bill. For example, the bill should consider extending the duties of the National Water Initiative Outreach Office to specifically bring states and local communities into the federal Plan development process, earlier and more extensively. Likewise, consideration should be given to extending the duties of the Outreach Office to establishing a stakeholder group (those who may be affected by the research or its results) to provide input during the development of the federal Plan. These entities and groups should be able to provide valuable information (e.g., State and local plans already in place, ongoing research) to make the final federal Plan more efficient and effective.

New Energy-Related Water Use Issues: Biofuels

Due to the recent influx of investments in ethanol to provide alternatives to fossil fuel based gasoline (and other fuels), it is expected that there will be enormous water use impacts of this increase in the use of biofuels. While APPA does not have an official position on the use of ethanol, the impact that adding corn harvesting and ethanol processing will have on water use and the energy nexus is important. As referred to earlier in my testimony, the DOE Energy-Water Roadmap stated:

“The **potentially massive water demand posed by ethanol production** is a significant concern for those in the Central region. New directions in national biofuels supply and demand suggest that new research into techniques that do not require crops grown with fresh water are needed.”

Hydropower Challenges

According to Energy Information Administration (EIA) data from 2006, hydropower accounts for almost 80 percent of renewable capacity in the United States. Hydropower has long been a vital piece of the United States electric utility industry and a driving force in the development of the economies in certain regions. Not only is hydropower a clean, efficient and renewable source of electric power, the dams themselves are multi-purpose in nature—providing flood control, irrigation, industrial and municipal water, and fish and wildlife habitat improvements. Finally, the dams also provide transportation and recreational benefits.

Over 500 of the 2010 public power systems nationwide receive all or a portion of their power supply from the four federal Power Marketing Administrations (PMAs). The PMAs market federally generated hydropower from federal dams, and sell this hydropower to APPA members at cost-based rates plus interest (to be used to repay the cost of building the dams). The purchase price for this hydropower also factors in O&M for the hydropower facilities on these multi-purpose dams. However, because the rates paid by APPA members to the PMAs must go back to the Treasury and be appropriated back out by Congress annually, the funds for O&M at these facilities have often been used for other purposes thereby leaving a need for significant rehabilitation at these facilities.

The Bureau of Reclamation and the U.S. Army Corps of Engineers manage the dams and are responsible for the O&M for hydropower facilities at the dams. While we recognize that this committee does not manage the appropriations process, it is important to understand that by rehabilitating these hydropower facilities, a significant amount of zero-emissions, low-cost hydropower could be added to our genera-

³ See <http://www.georgiawatercouncil.org/index.html> for the Georgia Comprehensive Statewide Water Management Plan and associated documents.

tion mix without building another dam. Therefore, we hope that the Committee would support increases in the federal appropriations for O&M at the Bureau of Reclamation and Corps of Engineers to undertake these rehabilitations.

Thank you for the opportunity to provide input into the bill development process. We hope that you will consider us as a resource for questions that may arise as the process moves forward.

Attachment**APPA Comments to NERC on Reliability Impacts of Climate Change Initiatives**

JULY 16, 2008

APPA is the national association for the 2,000 State, municipal and other publicly owned electric utilities in the United States. APPA's membership also includes numerous multi-service utilities including irrigation districts. Approximately one-third of all public power utilities own and operate electric generation, including coal, oil and gas-fired, nuclear, hydro-electric and a variety of renewable energy facilities such as wind, geothermal and municipal solid-waste.

APPA is concerned about the convergence of the numerous public power issues raised by climate change that create pressures to pick certain technology options and discard others prematurely before their operational and cost consequences are fully characterized. APPA anticipates increased physical, economic and political supply pressures in the competition for (relatively) cleaner energy sources and for access to related infrastructures such as local water supplies, gas pipeline capacity and rail transportation that are needed for electric generation. These tensions could create increased risks to electric system supply adequacy and operational reliability in the following seven areas:

1. The Dash for Gas and International Energy Demand Pressures. The most immediate risk to reliability has been called the "dash for gas." Public policy decisions and market forces will likely cause many companies to choose the "quick fix" of fuel switching. These market forces include pressure on company stock prices and bond prices if they do not mitigate carbon risk in anticipation of public policy decisions by "going green" now. The United States has adopted such coal/gas/coal/gas fuel switching policies several times before—and each such switch has had unintended consequences. The dash for gas in electric generation could create conflict with basic manufacturing industries that need reliable natural gas supplies as feed stocks and with widespread use of gas for space heating. Further, increased domestic reliance on imported liquefied natural gas (LNG) implies that U.S. natural gas demand will increasingly be driven by international oil and gas markets. See discussion below.

2. Replacement of Generation Retired Due to Climate Change. The second risk to reliability arises from the need to rapidly replace the base load power supplied from generating capacity that is likely to be retired in the near future due to the combined effects of equipment age and regulatory requirements to reduce CO₂ emissions. Continued reliance on coal for power generation implies that the utility industry will need to install over 100 GW of new capacity to replace existing conventional steam-electric capacity (with no additional capacity to meet forecast demand growth).

3. Parasitic Losses from CO₂ Capture and Compression. The third reliability risk identified by APPA results from the enormous parasitic energy demands associated with CO₂ capture and compression. Research sponsored by APPA indicates that the Nation will need to install as much as 320 GW of additional generating capacity to meet the parasitic losses associated with CO₂ capture and compression systems at existing coal-fired power plants. While the loss factors for some new technologies may be as low as 30 percent, the parasitic losses associated with retrofitting existing conventional coal-fired plants are as much as 50 percent of total gross output. By way of comparison, roughly 100 GW of capacity might be needed to meet the parasitic losses associated with SO₂ scrubbers and NO_x selective catalytic reduction systems under the Clean Air Interstate Rule (CAIR), which was vacated by the D.C. Circuit Court. See discussion of CCS issues below.

4. Generation Outages from Rapid Deployment of New CO₂ Control Technologies. The fourth risk to reliability associated with climate change is the move to CO₂ control technologies that have not been fully developed beyond small scale demonstration projects. Commercial scale projects will undoubtedly raise numerous logistical, technical and cost factors that are as yet not well understood. Until shown otherwise, it is unreasonable to assume that planned and forced outage frequencies and durations for new generation and carbon control technologies are in any way similar to the much lower outage rates for mature conventional generation technologies. Particularly for coal-fired generation in conjunction with CO₂ capture, compression and permanent storage, the critical skill sets and technology requirements

to permit, build, own, operate and maintain such a facility are more similar to those required for a major chemical plant than a conventional steam-electric power station. See discussion of CCS issues below.

5. Non-Electric Infrastructure Required for Large-Scale Carbon Capture and Sequestration. All new technologies for controlling CO₂ for climate change purposes rely heavily upon new non-electric infrastructure that must be built in order to complete the process of safely injecting and storing CO₂ in geologic formations. An extensive network of new pipelines and rail for transportation of chemicals required for carbon capture, pressurization and storage will be required. Nearly all existing coal-fired plants and most new plants that intend to capture, pressurize and inject CO₂ into geologic formations will be forced to transport such pressurized CO₂ by pipeline to remote locations. See discussion of CCS issues below.

6. Heavy Reliance on Remote and Intermittent Renewable Energy Sources. Heavy increased reliance in many regions of the United States on renewable energy sources that are remote from load centers and/or intermittent or variable in their output characteristics may pose reliability risks. A major build-out of EHV transmission is required to ensure the deliverability of wind and other generation to major regional load centers. The alternative, which entails very, very heavy reliance on renewable generation in the subregions where it is produced, is likely to introduce new operational problems for the interconnected grid. System operators and renewable energy operators may be forced to curtail significant amounts of otherwise economic and environmentally beneficial generation in source regions. Particularly where wind output is counter to the daily and seasonal patterns in customer load, NERC's analyses should take into account the potential operational risks of high penetration levels of wind generation in particular subregions. APPA anticipates that the report of the NERC Operating Committee's task force on variable resource integration will fully describe many of these issues; however, the combined effects of all five of the risks to reliability associated with climate change mitigation will be very difficult to foresee.

7. Competition for Scarce Water Supplies. Population and economic growth in more arid regions of the United States, depletion of ground water supplies, and increased risk of drought due to climate change all increase the general scarcity of water. Further, new generation technologies may compound these factors, by significantly increasing the per MWh water requirements for power generation. These factors increase the difficulties encountered in siting of new plants and meeting operating restrictions for existing plants. See discussion below.

APPA has developed a series of white papers to address some of the technology, legal and public policy issues associated with carbon capture and storage. These APPA white papers, which are offered for NERC's use in its assessment of the Reliability Impacts of Climate Change Initiatives, are publicly posted at: <http://www.appanet.org/files/HTM/ccs.html>

L.D. Carter, "Carbon Capture and Storage From Coal-based Power Plants: A White Paper on Technology for the American Public Power Association (APPA)," May 2007 [pdf]

L.D. Carter, White Paper, "Retrofitting Carbon Capture Systems on Existing Coal-fired Power Plants," November 2007. [pdf]

Jonathan Gledhill, Policy Navigation Group; James Rollins, Policy Navigation Group; Theresa Pugh, APPA, White Paper, "Will Water Issues/Regulatory Capacity Allow or Prevent Geologic Sequestration for New Power Plants? A Review of the Underground Injection Control Program and Carbon Capture and Storage," November 2007. [pdf]

- Marianne Horinko, White Paper, "Carbon Capture and Sequestration: Legal and Environmental Challenges Ahead," August 2007 [pdf]

Issue 1—The Dash for Gas and International Energy Demand Pressures

In an April 2008 white paper entitled, "Natural Gas and Electricity Costs and Impacts on Industry," the U.S. Department of Energy's National Energy Technology Laboratory (NETL) reported that opposition to new coal-based power plants is leading to generation capacity shortages in many areas of the country and endangering U.S. energy security. The opposition is also inducing a "dash to gas" and quickly causing a rise in natural gas prices at a time when federal climate change legislation could immediately lead to a doubling of natural gas consumption for power generation. This legislation would increase the country's dependence on foreign energy

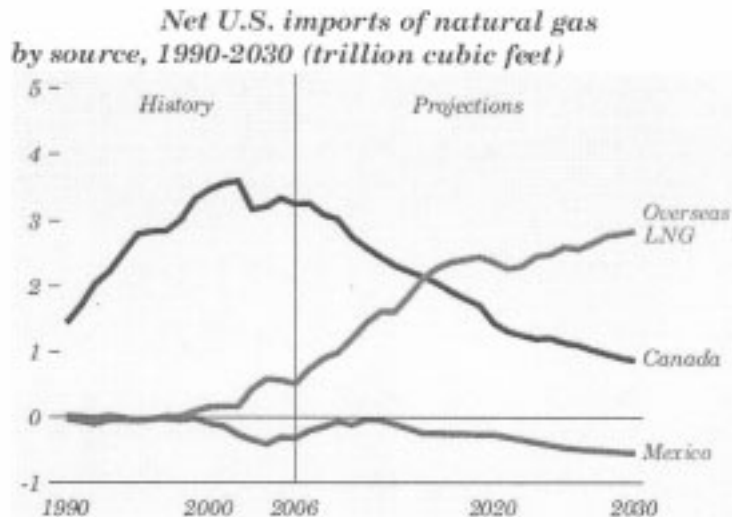
sources in the form of liquefied natural gas (LNG) causing both natural gas and electricity prices to increase dramatically.

NETL also describes how coal has protected consumers from even higher natural gas prices. Unfortunately, the current opposition to continued reliance on coal will help ensure that U.S. natural gas prices continue to rise toward parity with the price of oil. Such increases in natural gas prices could cause trade-exposed sectors of U.S. industry to shut in production, particularly when faced with coal-powered competitors in China or regions like the Middle East, where cheap natural gas reserves supply power needs. NETL estimates that by 2016, the absence of 18 GW of currently forecasted new coal-based power plants would mean additional natural gas demand of 1.4 Tcf/year, equivalent to almost all of the Nation's presently forecasted LNG supply growth.

If actual electricity growth is higher, as forecasted in U.S. Energy Information Administration's latest Annual Energy Outlook (AEO), up to an additional 2.3 Tcf of natural gas for generation will be needed.

Foreign Uses of Natural Gas

The recent trend of increasing reliance of imports of LNG from overseas is expected to continue. Recently, there has been major expansion of LNG terminals in the United States, and the capacity to import LNG is expected to double in the near future. As can be seen by the figure (below) from EIA, the amount of natural gas imported from Canada and Mexico is decreasing, and the amount imported from overseas as LNG has been increasing and is predicted to continue that rise. The United States will be competing with other countries for this LNG on the open market. As the energy needs of developing countries continue to increase, the demand for this LNG will increase as well, potentially leading to less LNG imports into the U.S. and higher prices.



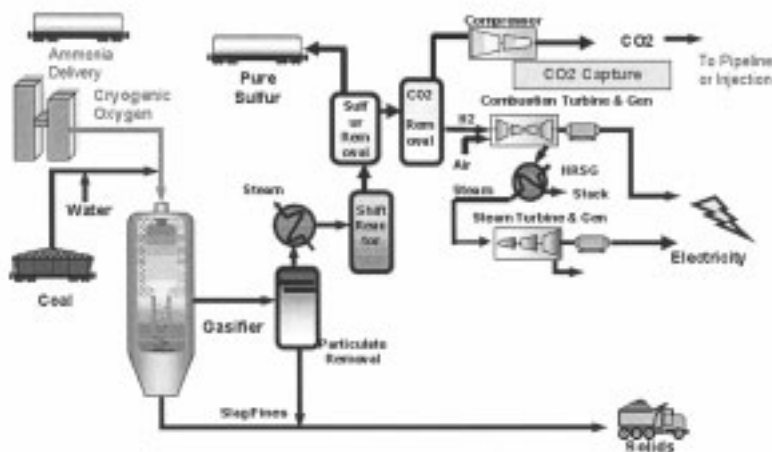
Issues 3, 4 and 5—The Complex Configurations of New Power Plants with Carbon Capture and Storage Will Pose New Risks for Infrastructure Reliability

All of the new technologies discussed at major technical conferences for injecting CO₂ into geologic formations for climate change mitigation purposes rely heavily upon new industrial and transportation infrastructure that must be built in order to complete the process of safely injecting and storing CO₂ in geologic formations.

These include product pipelines to get enormous volumes of ammonia, H_2S , and other chemical solvents to the new power plants for carbon separation. These are chemicals that have either never been used at power plants or never at this scale. These additional infrastructure demands on rail lines, given current “captive rail” concerns, may well create electric reliability risks if the entire infrastructure does not work seamlessly. Like the creation of a national highway system for surface transportation of commodities and people, the new CCS technology at power plants will require a very sophisticated infrastructure of chemical products delivered by surface shipping, barges and trains to CCS-equipped power plants. Some CCS plants may even require construction of chemical delivery pipelines that have traditionally only been constructed to serve refineries, natural gas production plants or other industrial facilities. Assuming that CCS is the technology chosen at new power plants, water treatment of produced waters (the byproduct of produced water from geologic formations) as well as salt and ammonia disposal must be undertaken on a scale never seen before in the U.S.

Most power plants with CCS will operate as though they are refineries with extractive businesses on-site alongside product movement through pipelines and rail cars. The electric power industry will be required to address and develop new “just in time” manufacturing techniques and relationships with suppliers and pipelines. Any failure of ammonia transport or CO_2 movement through pipelines to geological storage facilities could easily cause power plant shutdowns—a new class of reliability risks not yet seen in the power sector.

Power plants with carbon separation and geologic storage of CO_2 raise a host of new technology issues with as yet unknown reliability impacts. Future power plants with CCS will be dependent upon the chemical and chemical transportation industries. CCS reliability and economics depend on the ability to continually inject CO_2 into geologic formations throughout the lifetime of the power plant. This critical assumption has not yet been tested in the gas volumes likely to be produced by major power plants. The presumption that CO_2 can be injected in situ at a new power plant with two 500 MW units for the next 60 years is a huge leap of faith. Since none of these new power plants has yet been permitted, it is not clear if there will be provisions for “start up, shut down and maintenance” or for times when the CO_2 must be vented to allow for the power plant to run fully if there is a problem with the carbon separation technology or carbon injection technologies. New carbon dioxide control technologies will create highly complex power plants that function with chemical processes at very high temperatures and under intense pressures. Similar batch chemical plants often prove to have complex maintenance issues. The figure below illustrates some of the complexity associated with an IGCC plant, with carbon capture and storage technologies.

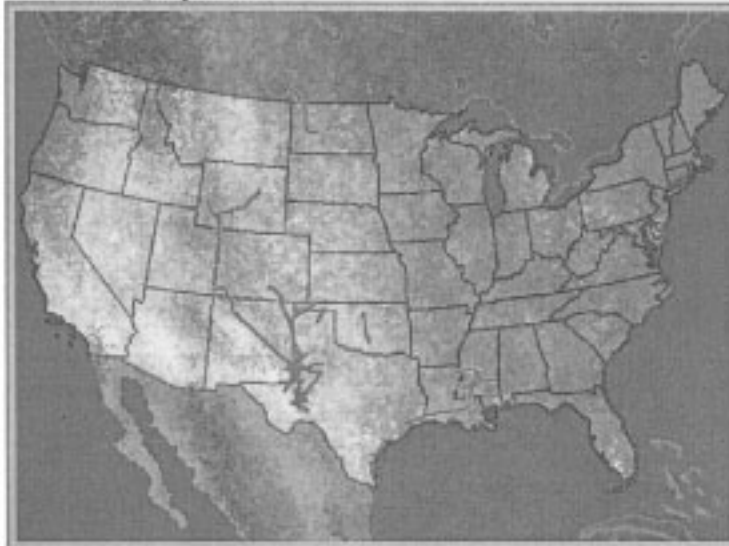


Although the illustration shows one ammonia delivery system, some power plants might require ammonia product pipelines or other ammonia delivery methods. The size and proximity to a chemical plant may dictate delivery method and cost. If all

of the necessary product deliveries do not take place as scheduled, the plant might not be able to operate reliably without recurring unplanned outages.

The map shown below illustrates how few pipelines exist today to transport the CO₂ to locations for currently permitted injection (oil and gas recovery locations). In contrast to the substantial networks for rail delivery for coal and transmission of natural gas and electricity, most of the U.S. has no existing transportation system to deliver CO₂ to locations suitable for geological injection. This infrastructure must be built and provide a highly reliable and predictable delivery system.

Current CO₂ Pipelines



Scheduled and Unscheduled Outages:

Reliability across the U.S. grid is inextricably linked to the frequency and duration of generating unit outages—whether planned or unplanned. Current IGCC technology has evidenced considerably longer planned outages than conventional power plants, which in retrospect seems unsurprising since IGCC coal gasification plants look and function much more like refineries than power stations. Anecdotal conversations about maintenance issues for IGCC technology for manufacturing and power production currently indicates an annual planned outage rate of up to 60 days per year. While future coal gasification plants (IGCC) may well improve on this scheduled down time, these scheduled outages remain a concern for APPA if gasification technology becomes the dominant form of coal based generation.

Since no commercially demonstrated carbon separation and geosequestration company exists anywhere in the world, it is impossible to predict outage rates for these new technologies or whether the planned and unplanned maintenance of CCS systems within the power plant would lead to a significantly greater number of scheduled and unscheduled outages and a reduction in total plant availability and capacity factors. But since few new technologies are as reliable during their early years of operation as proven existing technologies for which we have extensive operation and maintenance experience, caution and conservatism is advised.

Issue 7—Energy and Water Interdependencies

In December, 2006, the U.S. Department of Energy released a report titled: *Energy Demands on Water Resources: Report to Congress on the Interdependency of Energy and Water*. DOE found that: “Water is an integral element of energy resource development and utilization. It is used in energy-resource extraction, refining and processing, and transportation. Water is also an integral part of electric-power gen-

eration. It is used directly in hydroelectric generation and is also used extensively for cooling and emissions scrubbing in thermoelectric generation. For example, in calendar year 2000, thermoelectric power generation accounted for 39 percent of all freshwater withdrawals in the U.S., roughly equivalent to water withdrawals for irrigated agriculture (withdrawals are water diverted or withdrawn from a surface-water or groundwater source) (Hutson et al., 2004). Water withdrawal statistics for thermoelectric power are dominated by power plants that return virtually all the withdrawn water to the source. While this water is returned at a higher temperature and with other changes in quality, it becomes available for further use. Many power plants, including most of those built since 1980, withdraw much less water but consume most of what they withdraw by evaporative cooling. In 1995, agriculture accounted for 84 percent of total freshwater consumption. Thermoelectric power accounted for 3.3 percent of total freshwater consumption (3.3 billion gallons per day) and represented over 20 percent of non-agricultural water consumption” (Solley et al., 1998).

As the figure below suggests, there are many counties in the U.S. (shown in red in the figure below) where the annual groundwater withdrawals exceed the amount of precipitation, implying that local and regional aquifers will not be able to be recharged. Population growth, agriculture and electric power generation will likely be viewed by the public as competing users of scarce water supplies, particularly during the permitting process for new generation.

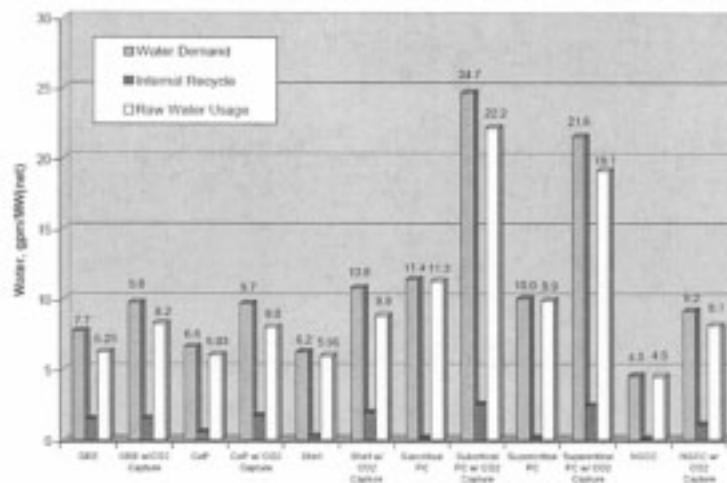




As shown in the map shown above, the U.S. Census Bureau predicts dramatic increases in population over the next 20 years, particularly in parts of the mountain west, the west coast, Texas, and the southeast. These increases in population will likely mean considerable increases in electricity usage and summer peak demands. Many of these areas also face severe pressures on water supplies.

Further complicating the limited availability of water is the fact that that new fossil electric generation technologies require a minimum of twice the water that existing plants use, as shown in the figure shown below.

Water Demand with and without CCS: Water Use Increases 33-100%



Source: Cost and Performance Baseline for Fossil Energy Plants (DOE/NETL-2007/1281)

How is Water Availability Connected to Reliability?

If we have a lack of water, that will create a reliability concern as it will be difficult to build new plants, and existing plants may be required to reduce their operations/shed load if there is insufficient water in the river for thermal cooling. For example, a large baseload plant in the Southeast U.S. had to cease operations for five days due to the high temperature of the receiving water body. Power plant water releases would have violated their discharge permit requirements. Similarly, several years ago, a severe drought in the upper great plains (coupled with directives to maintain water flows to support barge traffic) forced numerous fossil-fired plants located on the Missouri River to shut down or operate at reduced output levels.

BIOGRAPHY FOR BRADLEY H. SPOONER

Brad serves as Principal Engineer, Environmental Services for MEAG Power in Georgia. He manages environmental permitting and compliance for MEAG's fossil fuel units, develops strategies for MEAG to meet future environmental requirements, and works with regulatory and legislative bodies to insure that future requirements reflect sound science and public policy.

Brad chairs the American Public Power Association's Energy and Air Quality Task Force and Air Regulatory Committee and represents MEAG on the Large Public Power Council's Environmental Task Force.

Brad is a registered professional engineer and a member of the bar. He has a B.S. in Electrical Engineering with high honors from the University of Rhode Island, an M.S. in Engineering Management from Northeastern University, and J.D. cum laude from Suffolk University Law School.

Chairman LAMPSON. I think we will. Thank you very much. And recognizing, via teleconference, we have Dr. Hatch. You are recognized for five minutes.

STATEMENT OF DR. UPTON HATCH, PRESIDENT-ELECT, NATIONAL INSTITUTES FOR WATER RESOURCES; ASSOCIATE DIRECTOR, WATER RESOURCES RESEARCH INSTITUTE, UNIVERSITY OF NORTH CAROLINA; RESEARCH PROFESSOR, DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS, NORTH CAROLINA STATE UNIVERSITY

Dr. HATCH. Chairman Lampson, Representative Inglis, I hope the AV is working sufficiently. I am Upton Hatch, the Interim Director of the North Carolina Water Resources Research Institute, located in North Carolina State. I am also President-Elect of the National Institute of Water Resources, or NIWR. I appreciate this opportunity, and I apologize. We are hosting an annual conference of the University Council Water Resources here in Durham.

As an academic, my degrees are from Dartmouth, Georgia, and Minnesota, all in economics, particularly water resource economics, and my research currently is focusing on the effectiveness of water conservation measures and efficiency.

I am testifying on the part of NIWR, which is an organization of 54 institutes, 50 states, and four territories. It was created by the Water Resources Act of 1964. It has been continuously funded since then, but inflation adjusted dollars have actually declined quite dramatically. In authorizing these institutes, Congress' intent was to increase the amount of research conducted in the water area, aiding the entry of new scientists, also to train new scientists, and distribute the results of the sponsored research to the water managers and the general public. It was recently, in 2006, reauthorized.

The Water Resources Institute received core funding from the U.S. Geological Survey, and this core funding is a dependable source of funding that is leveraged on the order of five or ten to one, with other federal agencies, State, and also some local groups. And we strongly support this idea of better coordination.

As has been suggested by others, there have been three well known reports that we support strongly, the so-called SWAQ Report, and the 2001 and 2004 NRC studies. Just without going through all the results there, of course, several major points jump out. The condition of the water resources in many parts of the United States and the world are deteriorating. Our institutions that can balance the ecological, environmental types of needs for water, and also, human needs are not sufficient. Obviously, population growth and competing uses for the water are a major problem.

In the Southeast, where I grew up, most of the infrastructure was built in the '60s, and obviously, the population has increased dramatically in that area. And also, there is the climate issue. So, I guess you might say the major issues in my mind would be the competing uses, the population growth, the age of the infrastructure, and the lack of coordination, and stagnant financial support at the federal level.

It is interesting that the NRC report did say that we need to make a new commitment to research on water resources, and we need a new mechanism is needed to coordinate water research, currently fragmented among approximately 20 federal agencies. In the NRC report, there were several research areas that were focused,

although there were 43 in total. Just a couple of those would be water supply enhancing technologies, understanding land use change, doing a better job of measurement and monitoring, understanding the frequency and cause of severe weather and climate, global climate change, economic returns to these competing uses, our legal regimes, adaptive management, the role of the private sector, and also, doing a better job of getting stakeholder input.

Federal involvement in water resources is particularly important, because watersheds, or water drainage areas, if you will, don't conform to State boundaries, and so, we inevitably end up with contentious situations among the various states that share a watershed. Also, research from one state is obviously applicable to research or to solutions in another state. So, we have a classic public goods situation.

In North Carolina, our recent droughts have made it clear that it is rainfall, to some extent, that causes our problems, but it is not just rainfall. Our technologies and our management of these competing uses is crucial, and the coordination among federal and State groups that represent these competing uses is a very important area that I believe this legislation targets.

It is also, I think, interesting to pull forth from the NRC report, and actually, read a quote here: "The World Resource Research Institute system," which is NIWR, "provides an existing, well organized mechanism for articulating State-based research needs, and for bringing together water managers, stakeholders across a wide cross section of the public, and academic researchers and academic institutions throughout each state. . .the institute system can provide an effective means for communication between, for example, a national level research coordination body," which is similar to what we are proposing, or is being proposed today, "and State and regional water resource agencies."

I would like to conclude by saying that WRRI or NIWR is uniquely positioned to address this initiative, or to assist because, as mentioned by several of our earlier speakers, high quality, unbiased research results are crucial. And also, long-term and multidisciplinary work is also useful. And the flexibility and adaptability to local conditions is another aspect that WRRI can help provide.

It can also go from institutional to technical solutions, and the full spectrum there. It has an established network that has been working over 40 years now, and is good at addressing regional issues. The education, the students who have graduated and developed their expertise through this program. I don't have an exact number, but we have about 50 right now in North Carolina that are currently being supported in some fashion by the Institute, and we can then multiply by the 50 states, and get some kind of notion as to the level of support that this is providing to students.

Also, I think the Institutes have experience in assessing priorities, assisting in increasing the efficiency of water resource investments. And as mentioned earlier, high quality data is very much the hallmark of the Water Resources Institutes.

So, I would like to, first, I would like to express my appreciation for being involved in this, and I apologize for this AV situation we have here, but we strongly support this initiative, and we agree

that something over than an ad hoc process that has been mostly done in the past is needed.

Thank you very much.

[The prepared statement of Dr. Hatch follows:]

PREPARED STATEMENT OF UPTON HATCH

Mr. Chairman and Representative Inglis,

My name is Upton Hatch. I am the Interim Director of the North Carolina Water Resources Research Institute (NC WRRRI), located at North Carolina State University. In addition, I am President-Elect of the National Institutes for Water Resources (NIWR).

I appreciate this opportunity to participate in this hearing on proposed legislation, “*National Water Research and Development Act*,” today by video conference. I am unable to provide this testimony in person because we are co-sponsors of the annual meeting of the Universities Council on Water Resources (UCOWR) today here in Durham, NC.

My academic degrees are from Dartmouth College (B.A.), University of Georgia (M.S.), and University of Minnesota (Ph.D.), all in economics, particularly resource economics with a specialty in water resource economics. I am currently involved in research on the effectiveness of water conservation measures, particularly drinking water, and have established water conservation as a major focus of NC WRRRI’s program.

I am testifying today on behalf of the National Institutes for Water Resources (NIWR), an organization composed of the fifty-four State water resources research institutes established under legislation enacted by Congress. The *Water Resources Research Act of 1964* (42 USC Sec. 10301 et seq.) authorized the establishment of water resources research and technology institutes at land-grant universities throughout the Nation. There are institutes or centers in each of the 50 states, plus four territories.

In authorizing the water institutes, Congress intended that they:

- arrange for competent research that addresses water problems or expands understanding of water and water-related phenomena;
- aid the entry of new research scientists into water resource fields;
- train future water scientists and engineers; and
- distribute the results of sponsored research to water managers and the public.

Congress reauthorized the Act in 2006 in Public Law 109–471.

While the State WRRIs receive core funding through and partner with the U.S. Geological Survey (USGS), they also collaborate and undertake research with a diverse set of federal agencies, e.g., Environmental Protection Agency, Agriculture Department, Forest Service, Army Corps of Engineers, NASA, and the Energy Department.

Copies of the 2008 Executive Summary of the activities institutes established under provisions of the *Water Resources Research Act* has been provided to the Subcommittee with my prepared statement.

I understand this hearing is to develop legislation to better coordinate the Federal Government’s role in “designing and implementing federal water research, development, demonstration, education, and technology transfer activities to address changes in water use, supply, and demand in the United States.”

As you know, the National Science and Technology Council issued a report in September 2007 entitled “*A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States*.” The interagency report was prepared by the Subcommittee on Water Availability and Quality (SWAQ). We strongly support the findings of this report.

In 2001 and 2004, two seminal National Research Council (NRC) reports (“*Envisioning the Agenda for Water Resources Research in the Twenty-First Century*” and “*Confronting the Nation’s Water Problems: The Role of Research*”) thoroughly examined the urgency and complexity of water resources issues facing the U.S. Among others, the following water resources challenges were cited as motivation for these studies:

- There is abundant evidence that the condition of water resources in many parts of the U.S. and the world is deteriorating;

- Our institutions appear to have limited capacity to manage water-based habitats to maintain and improve species diversity and provide ecosystem services while concurrently supplying human needs;
- In some regions of the country, the availability of sufficient water to service growing domestic uses is in doubt, as is the future sufficiency of water to support agriculture in an increasingly competitive and globalizing agricultural economy;
- Demands for water resources to support population and economic growth continue to increase, although water supplies to support this growth are fixed and already fully allocated in most areas;
- Renewal and repair of the aging water supply infrastructure will require time and hundreds of billions of dollars;
- Frequency and magnitude of damages attributable to droughts and floods are increasing, providing evidence of increasing vulnerability to extreme climate and weather events;
- Threat of water-borne disease is constantly present, as exemplified by recent outbreaks of cryptosporidium.

This NRC report highlighted the Nation's need "to make a new commitment to research on water resources in order to confront the increasingly severe water problems faced by all parts of the country" and that "a new mechanism is needed to coordinate water research currently fragmented among nearly 20 federal agencies."

There are many critical areas where knowledge and information need improvement for better water resources management. The cited NRC reports developed a comprehensive list of 43 areas needing further scientific inquiry. Selected (unranked) examples are:

- Improve existing supply enhancing technologies such as wastewater treatment, desalinization, and groundwater banking;
- Understand the impact of land use changes and best management practices on pollutant loading to waters, ecosystem services, and biodiversity;
- Understand regional and national hydrologic measurement needs and develop a program that will provide these measurements;
- Understand and predict the frequency and cause of severe weather (floods and droughts);
- Understand global change and the associated hydrologic impacts;
- In all sectors develop more efficient water use strategies and optimize the economic return for the water used;
- Develop legal regimes that promote groundwater management and conjunctive use of surface water and groundwater;
- Develop adaptive management as a better approach to water resources management;
- Understand the role of the private sector in achieving efficient water and wastewater services; and
- Develop different processes for obtaining stakeholder input in forming water policies and plans.

These areas are examples of the need to improve our current understanding on the interdependence of water quantity and quality; the balance between human and ecological water uses; and the legal, institutional, and social factors that contribute to sustainable water resources management.

Why should the Federal Government lay the funding cornerstone for water research? In the first place, water resources are defined by physical geography and not by State boundaries. The vast majority of water problems are of regional or national character. Even those of limited scope are usually very similar between states. Hence, research funding at the federal level, with results transferred nationwide, is the only truly comprehensive and efficient approach. In the second place, water research epitomizes the economic concept of a *public good*. As such, State and local governments and private entities will not produce as much of it as is justified by the overall value of the results.

cultural water demands rise steadily. North Carolina, as well as most U.S. regions, is not well prepared to effectively manage these unprecedented water stresses. The main reasons for the lack of preparedness are symptomatic across the U.S. and include:

- Lack of comprehensive knowledge and information on the interdependencies of natural processes and water uses;
- Narrow perspective on the part of water user groups acting to protect their short-term interests with total disregard of long-term risks; Lack of a shared and system-wide management vision and strategy;
- Lack of federal and State agency coordination and cooperation; Inflexible legal and institutional bureaucracies;
- Insufficient federal and State research investments for the development and implementation of innovative, adaptive, and integrated management technologies, systems, and processes; and
- Weakening of water resources research and education programs which are naturally suited to integrate knowledge across disciplines and create human resources qualified to develop sustainable solutions for our complex water resources challenges.

I would like to briefly comment on each of these areas.

Knowledge and information: There are many critical areas where knowledge and information need improvement for better water resources management. The above cited NRC reports developed a comprehensive list of 43 areas (listed above) needing further scientific inquiry. These areas exemplify the need to improve our current understanding on the interdependence of water quantity and quality; the balance between human and ecological water uses; and the legal, institutional, and social factors that contribute to sustainable water resources management.

While there is a lot to learn, a lot is already known and can significantly benefit water resources planning and management. However, making this knowledge and information meaningful for and accessible to those involved in decision-making processes has proved to be another very serious challenge. Paradoxically, in spite of our information age, water resources policy-makers, managers, and stakeholder groups are becoming ever more removed from current scientific and technological advances. There is thus a compelling need to establish and invest in effective information and technology transfer mechanisms.

Local vs. system-wide perspectives: Water stresses are often compounded by the efforts of individual stakeholders acting to safeguard their own local interests without regard for the long-term risks of such actions. A local and short-term perspective by each water user group sharing the resource cannot be sustainable and only serves to hasten the depletion of water reserves and the onset of disastrous impacts for *all*. The same “tragedy of the commons” scenario is likely to occur when water uses and impacts are planned and managed individually, without regard for their multiple temporal and spatial linkages. It is thus imperative that the proposed Initiative take a holistic perspective in the development of a comprehensive national water strategy.

Federal and State agency coordination and cooperation: Water resources management falls within the mandates of several federal agencies including EPA, NASA, and NSF and various Departments such as Agriculture, Commerce, Defense, Energy, Health and Human Services, Homeland Security, and Interior. Further complicating water management, monitoring and oversight responsibilities are found within different groups of these departments, for example, ARS, NOAA, CORPS, USGS, ATSDR, NIEHS, and USBR. In reviewing the existing federal coordination mechanisms, the 2004 NRC report concluded that “coordination among agencies has occurred only sporadically over the last several decades, despite repeated calls for more coordination.” As a result, the national water resources agenda among the federal agencies is fragmented and has a disciplinary rather than a broad and holistic scope. Furthermore, although the states adjudicate, administer, and regulate water rights and uses, federal and State agencies must work together to ensure harmonization of and compliance with federal and State laws in the management of transboundary water resources. However, the existing coordination and cooperation mechanisms, if any, have been ineffective, and more often than not turn water conflicts and disputes into costly litigious battles.

Lack of investments in integrated and adaptive management: A striking finding of the 2004 NRC report was that over the last 30 years total funding in the areas of (1) water supply augmentation and conservation, (2) water quality management and protection, (3) water resources planning and institutional issues, and (4) water resources data collection have severely declined. As a result, long-term basic re-

search and technology transfer in integrated and adaptive water resources planning and management have been neglected, and the majority of our water resources are managed by reactive, disciplinary, and inefficient methods and procedures. The main impediments in the use of modern management methods are: (1) inflexible bureaucracies that have evolved around the use of old management procedures and (2) inadequate training of agency personnel. Thus, a promising and largely unexplored strategy to address water scarcity is the modernization of the current management procedures through recent but proven scientific advances, transferred to professional practice through education and training.

Water resources research and educational programs: The other casualty of declining funding has been the weakening of our water resources research and educational programs. At a time when universities increasingly depend on “soft” funding, faculty positions and student support have migrated to other higher priority areas. In sharp contrast to the 60’s, 70’s, and early 80’s, very few academic programs can now claim significant expertise in water resources. This is not to imply that academic programs are shrinking. On the contrary, they are expanding, as they should, to cover much finer and very exciting frontiers of geophysical, environmental, and life sciences. In doing so, however, universities have lost their commitment to interdisciplinary education and are becoming over-specialized. An important role that water resources programs can play is to provide a scientific and policy framework for interdisciplinary research, education, and technology transfer. Such a framework is necessary to create broadly educated scientists, engineers and policy-makers able to invent technological and institutional solutions for the Nation’s water resources and environmental challenges.

In this regard, the WRRRI provides a unique network to address the challenges of interdisciplinary research, education, and technology transfer. However, the institutes cannot fully realize their potential at the current low rate of federal and State investment. I hope that the Initiative proposed here will also address the need for sustainable and sufficient funding needed to reverse the continued weakening of our water resources programs.

The NRC report also notes the need for a systems approach to water resources research, to avoid the “myopia” of limited jurisdictions or agency missions. Universities have a unique ability and range of disciplinary expertise necessary to take the broad view of water issues and to probe their resolutions. Universities, and WRRRI in particular, are uniquely situated to facilitate information exchange between State and local government agencies, non-governmental organizations and the private sector, and whatever federal body might be designated to coordinate federally-sponsored research.

As the NRC report notes, “The Water Resources Research Institute system . . . provides an existing, well-organized mechanism for articulating State-based research needs and for bringing together water managers, stakeholders across a wide cross section of the public, and academic researchers and academic institutions throughout each state.” As such, “. . . the institute system can provide an effective means of communication between, for example, a national-level research coordinating body and the State and regional water resources agencies.” In addition to State and local agencies and non-governmental organizations, the institutes already have close ties to State-based offices of Federal Government agencies.

WRRRI welcomes the opportunity to work with this committee and with this subcommittee to address water resource issues. WRRRI is uniquely positioned to assist in the proposed Initiative because:

- WRRRI program is **not limited by a policy-driven or regulatory mission** and thus can address the entire spectrum of water resources issues, including gaps between government agencies. By focusing on science, the program serves as an **objective broker** of information among a wide range of constituencies.
- University-based institutes are conducive to examining **long-term consequences** of policies and recognizing long-term problems, with access to expertise in **all water-related disciplines**.
- The WRRRI program can be more **flexible** in addressing emerging problems and more **adaptable** to local cultures, institutions of governance, and regional socioeconomic and physical conditions.
- Institutes and academic researchers are more likely than mission-driven agencies to consider **institutional, in addition to technical, solutions**.

- NIWR is an **established network** of immense and geographically diverse capabilities on the cutting edge of virtually every facet of water resources. The network facilitates **regional** as well as State and local cooperation.
- The Institutes provide hands-on **educational opportunities** to develop the **highly trained workforce** necessary to build our national capacity for sustainable water resource management.
- **Technology transfer** programs at each Institute provide scientifically credible communication of research needs and results **upward** from the states and localities to federal agencies and **downward** from these agencies to users of research results.
- Institutes are **experienced in assessing priorities** for research, having established Technical Advisory Committees with representatives from virtually all interested agencies and non-governmental organizations.
- WRRRI Program provides information to increase the **efficiency** of federal water resources research investment by identifying research gaps and avoiding redundancies.
- WRRRI Program provides funding to fill research gaps to improve the **effectiveness** of water resources management.
- WRRRI Program includes a **quality-review process** (similar to GPRA requirements) with mandated reviews every three years. Institutes are held accountable for expenditures as well as for the quality and relevance of scientific results and the vigor of outreach programs.

Mr. Chairman, thank you for this opportunity to participate in today's hearing. I applaud and encourage efforts by our federal and State-elected leadership to develop new policies and programs to meet the water challenges we face in the Twenty-first Century. I know I speak for my fellow directors of the State water resources research institutes when I say we are anxious to work with you and other stakeholders to address the water challenges we face in the future through research, education and training, and information transfer and exchange.

BIOGRAPHY FOR UPTON HATCH

Upton Hatch is Interim Director of the North Carolina Water Resources Research Institute, located at North Carolina State University. He is President-Elect of the National Institutes for Water Resources (NIWR). His academic appointment at North Carolina State University is in the Department of Agricultural and Resource Economics. His degrees are from Dartmouth College (B.A.), University of Georgia (M.S.), and University of Minnesota (Ph.D.), all in economics, particularly resource economics with a specialty in water resource economics. He is Professor Emeritus of Auburn University and former Director of the Auburn University Environmental Institute and the Alabama Water Resources Research Institute. His research and teaching have focused on resource economics.

DISCUSSION

THE NATIONAL SCIENCE AND TECHNOLOGY COUNCIL'S SUB-COMMITTEE ON WATER AVAILABILITY AND QUALITY (SWAQ) OUTREACH

Chairman LAMPSON. Thank you, Dr. Hatch. We will now begin with our first round of questions, and the Chairman will recognize himself for five minutes.

Let me ask you all a couple of questions. The Academies' Report indicated the outreach mandate needed to be strengthened and improved. What is the current experience with SWAQ, with respect to communication with yours or similar organizations, and are additional funds needed to support broader outreach effort, or is explicit direction to undertake these actions sufficient?

And Dr. Shannon, if you would start, and the rest of you comment.

Dr. SHANNON. Thank you, Chairman. Just to recap. The issue, you are asking specifically about the communication from the group, SWAQ, to the—

Chairman LAMPSON. And experience, yes.

Dr. SHANNON. The experiences from the industrial side of things, which is really what I have been representing, is that there has not been a lot of diffusion from the Federal Government to an organization that are building water technologies, and that would be a fantastic thing, if this could be improved and increased, to increase the diffusion of knowledge, and coordination.

Where there has been some with my, through the National Science Foundation, that I represent as well, and that is, of course, much more closely allied, so—with, you know, the work that has been done at the National Academy of Sciences, et cetera.

So, perhaps these folks here would be better in addressing your question.

Mr. CHRISTENSON. Thank you, Chairman. Yes, I am speaking for the beverage companies, I think there is, the right word from our participants is that there is a general need for greater coordination, but also, that communication is a key piece to that coordination, and interactive communication. So, it is a two way flow.

I think the general feeling of my constituents is probably to have access and provide input, so there is not a clear pathway or vehicle to communicate into these organizations necessarily, and communication outwards, and synthesis of that communication could be improved.

Dr. LOFTUS. It is my sense that there is little to no dialogue taking place between SWAQ or many federal agencies, and perhaps, the State of Illinois, which might be the most logical first step in communication, so I think there is room for improvement there.

Mr. JOHNSON. It seems to me that most of the communication has probably been through interest groups and associations, as opposed to bringing the effort down to the local level, where individuals who may not have the resources, or may not be a part of some of the national organizations, would have an opportunity to have more direct input into the effort. So, I think that that would be a very critical element. And I think it ought to be mandated, and I

managers, or the water managers, for the 11 largest cities in the State of North Carolina. So, I think it is very much a mixed picture for our NIWR group.

Some states have quite an extensive program that could be supported further, or could be used as an example for some other states. But I would have to admit that it is not completely that NIWR deserves all the accolades there. It is often the local communities, and our particular community, universities and research, we are the Research Triangle. We have Duke, we have NC State, we have University of North Carolina. We have Wake Forest. So, it is a very unique situation that probably isn't replicated in many areas of the country.

THE FEDERAL GOVERNMENT'S ROLE IN ENSURING WATER AVAILABILITY AND QUALITY

Chairman LAMPSON. I am going to squeeze this in, and let you comment on it. If you will, make it as succinct as possible. What is the most significant deficiency with respect to the Federal Government's current role in ensuring water availability and quality? The most significant deficiency with respect to the Federal Government's current role in ensuring water availability and quality.

Dr. HATCH. Are you saying deficiency or inefficiency?

Chairman LAMPSON. Deficiency.

Dr. HATCH. Deficiency.

Chairman LAMPSON. The most significant deficiency.

Dr. HATCH. I believe it is coordination. I think the general public looks in the newspaper, and they see something about the Corps has this requirement, and they look in there, and they see that the hydropower, FERC, has another requirement. Then, they look at the city municipal drinking water, and they see yet another, and the governor has yet another opinion. So, it seems to me that this coordination is crucial that you are suggesting. We strongly support it.

Chairman LAMPSON. Anyone else want to comment? Dr. Loftus.

Dr. LOFTUS. We have the *Clean Water Act* and the *Coastal Zone Management Act* for water quality guidance. We don't really have anything similar for issues of water supply. And so, in my view, we might benefit from a National Water Policy Act of some sort, that does the water quantity what the other two acts have done for water quality. That is the biggest deficiency, in my view, and then, the other matter would be to ensure that we have got that vertical coordination. We definitely can use better coordination at the horizontal federal level, but we need it to also move up and down through states, providing states with goals and guidance and incentives, so that at the regional, on the ground level, where I am at, we have a strong sense for, you know, what the big picture is, and overarching goals are.

Chairman LAMPSON. Okay. Thank you. Anyone else want to make a comment?

Mr. CHRISTENSON. Quick comment if I may, Chairman. I believe the representative group that, the biggest deficiency is in the consolidation of information and data and communication. This Act is intended to address—serve as a clearinghouse, consolidate available information on water quantity and quality, and distribute that

information. So, some of the research that is here, to define our water resources, and provide the basis for planning and decision-making, and consolidation of the research at the federal level, is needed. That leadership piece is missing right now, in my opinion.

Chairman LAMPSON. Thank you.

Dr. SHANNON. I actually agree with all of these gentlemen. But just the issue is, is that there really is no coordination right now between the research that is done by the Federal Government, and funded by the Federal Government, and its diffusion into practice. That is also a key issue. It is just, it is missing.

Chairman LAMPSON. Yes. Mr. Spooner.

CARBON SEQUESTRATION'S IMPACT ON WATER SUPPLY

Mr. SPOONER. I would just like to repeat my concern about carbon capture and sequestration, that would effectively be mandated or strongly encouraged with some of the global climate legislation, where perhaps, the water quantity impacts have not been adequately considered.

Chairman LAMPSON. Thank you very much. My time has expired, and I recognize the Ranking Member, Mr. Inglis, for five minutes.

Mr. INGLIS. Mr. Spooner, following up on that part of it, does it—I am not sure I know how water is used in carbon sequestration. What is the process there? Do you happen to know, or are you just aware it uses a lot of water?

Mr. SPOONER. DOE has produced a series of reports, where they have looked at a number of the impacts of carbon capture and sequestration, on both retrofitting existing utility units and constructing new units. And that goes into quite a bit of detail, hundreds of pages, and I can't really paraphrase or summarize that very well, but it is a very water intensive process to capture the carbon dioxide.

Mr. INGLIS. Interesting. Anybody else know anything about that? I have to find out what the process is for the various technologies that we might use for carbon sequestration.

AVOIDING BURDENSOME BUREAUCRACY

This concept of coordination has got to be balanced against the experience, say, of homeland security, which some people think hasn't been so coordinated, and has, in fact, created additional layers of bureaucracy to respond to threats. Any ideas about how we make sure that we don't repeat those mistakes? To have coordination, but not a layer of additional bureaucracy that just is overlaid over the existing bureaucracy?

Mr. CHRISTENSON. If I may make a comment, from a strategic thinking perspective, or a strategic planning perspective, I think success is always founded in having a clearer vision of what you define as success, and putting those controls in. The catch to that is milestones, and clearly defining expectations for outcomes. So, I think they set it in a clear direction, and the boundaries and scope are probably the most critical piece to avoiding scope creep, which is often a problem. And I think that is one of the things that we see is, we are having a hard time envisioning, in the current discussion, and we see an opportunity to add more clarity on what the

vision is, and the purpose. This policy does not create another agency. This is not, that is how we are interpreting this policy, but it is actually a functional group that spans a certain scope of activity to the Federal Government, and helps create, set some focus, tighten the budgeting, and things of that nature. But from our perspective, I think that is one of the missing pieces, or truly a place to enhance the current policy discussion.

BENEFITS OF RESEARCH

Mr. INGLIS. I suppose that each of you must have some hypothesis about what this research is going to show about water usage and availability. Anybody want to dare to state a hypothesis about, I think it is going to have something to do with conservation, that would be my guess, as a hypothesis here? Anybody want to venture one, as to what the main thrust of this research might prove? Leaving aside some of the key issues that Mr. Johnson had mentioned about the pharmaceuticals and things like that, and that is very interesting research that is very important. And the other, the availability issue; there are probably some hypotheses out there about what you are going to find.

Dr. SHANNON. At the risk of trying to project out with a crystal ball, which I don't really have—but the issue, I think, if we get much better information as to where the water is, and the state that the water is at. Particularly the issues with downwater. Surface water is fairly well understood. USGS has done a great job. There has been a real fracture of who is responsible for collecting groundwater information, and we have really gone county by county. I mean, it is very, there is not really a whole database which is, you keep hearing referred to.

I think what people will find is that the replenishment rate is less than the withdrawal rate, and that issue will become really crucial. The main issue with what one can do about this. Can we reuse? Can we restore? Can we reclaim water, and recharge aquifers? That would be a critical issue, which nobody right now, there is no federal agency that says that is their charter. You can say, well, EPA has its charter for water quality, but what is the charter for that.

The Bureau of Reclamation has some charter, but there is no one particular agency, so the issue really, through your earlier question, what could happen is, is really to be, as Mr. Christenson said, you really make sure the scope is well-defined at each agency. I think right now, we have many agencies that are doing the same thing, and yet, nobody has a single charge, and to try to, if you can craft a way that this committee could actually define who does what, and who has what charter, I think, would be the best way of approaching it.

Dr. LOFTUS. Mr. Inglis, I would hypothesize that a nationwide commitment to conservation and efficiency will be the least expensive new supply we can develop.

Mr. JOHNSON. That is very profound. I agree with all of the, both of my colleagues here, but I think that one of the things that we have learned, in particular, with the looking at nanotechnology and pharmaceuticals, is that we have developed technology to identify and define many of these elements that are out in the environ-

ment, and that that technology has been, has far outstripped the research and the technology that is necessary to avoid having those constituents and elements that have the potential to be harmful to health, in getting into the environment.

So, I think that those, that kind of research is going to need to catch up with the research for the identification of these things. The other thing, I think, is just methods that we might employ, in particular, in urban environments, to try to reduce pollution, and to capture that water supply as a better water supply, as it comes out of our urban environment, in particular.

Dr. HATCH. I have a comment. I think the most important element right now is the competing uses of this, of the supply. I think that we, through the last so many decades, have always used increasing storage, building reservoirs, as our way to deal with water resource problems, and I think now, it is more competing demands, and management, better efficiency, conservation, looking at things on a more long-term basis. Looking at things on a watershed basis is also crucial. Because we are getting into so many issues of jurisdiction. So—and I guess water quality is the other one. You can't separate quality from quantity. It is quality of a certain, I mean, quantity of a certain quality, so—I think those are the kinds of issues that are coming up.

Mr. SPOONER. I would just like to mention that, with the Georgia Water Management Plan, one of the first implementation steps was water conservation, more emphasis on that could be started and implemented, to some degree, almost immediately. And I would be glad to furnish a copy of the plan for the record, along with some information on CCS water use, in response to the prior question. Thanks.

Mr. INGLIS. Thanks.

Chairman LAMPSON. You are welcome. I now recognize, for five minutes, the gentlelady from Maryland.

WATER CONSERVATION

Ms. EDWARDS. Thank you, Mr. Chairman. I am curious. Each of you did talk about conservation as an important component, maybe even a principal component of looking at our nation's water supply. I am really curious as to whether you think that there is a place in the legislation that we are considering, where we might ask specific data points, and what those might be, regarding conservation. Mr. Christenson, particularly, you and your industry, looking at aspects, for example, of bottling water and that industry, competing uses of agriculture, and then what questions we also might ask regarding conservation that we can do as individuals and homeowners, that might impact our water supply. I think begin with you, Mr. Christenson.

Mr. CHRISTENSON. I need to ask for a clarification again, if you would restate or summarize your question.

Ms. EDWARDS. Well, I am curious about what your industry, you know, how your industry would look at conservation, because you mentioned conservation—

Mr. CHRISTENSON. Sure. Sure.

Ms. EDWARDS.—is an important aspect of the water supply, and how your industry looks at conservation and the data points that we might ask about what we can do around conservation to get—

Mr. CHRISTENSON. Certainly. We have measured, in the beverage industry, total water consumption amount very closely. They look at water use at various departments within the production process, and within the supply chain. So, we look beyond the four walls of the operating facilities, but also look down the supply chain, so beginning to take a life cycle assessment look at water consumption to develop a product.

In addition, you use the quantitative measurement, the use of water, and you begin to attack your heavy user water departments conceptually. And so, you are looking at water use efficiency, against some production quantity.

The other piece that I think people have had great effectiveness at is to create a culture within these businesses to water stewardship and conservation. So, if the employee that is walking around the plant sees a faucet on, turns it off, it is like turning the lights off when you leave the room.

So, the two aspects that we are looking at are the quantitative aspect of water use and efficiency, usually measured against, normalized against—production level, whether it is kilograms or per liter of product developed, whatever. And the other is really trying to look at and benchmark practices and culture within the business, as a data point and an indicator of how we are doing.

So, I hope that answers your question.

Ms. EDWARDS. Dr. Loftus, do you have a comment about what we might look at around conservation that could have an impact on water supply?

Dr. LOFTUS. Yes, thank you. In the Chicago region, we have adopted 14 specific measures, and they will aim at households, residential use. They will aim at commercial, industrial, institutional accounts, and so, there is something in there for everyone.

Some of those measures will require changes of behavior, and some will not. Some of those measures, you can very easily quantify water savings that could be expected upon implementation. Others are a little less easy to quantify. But the beauty of the whole conservation movement is that we only have to look to other states that have been in crisis mode, that have been forced to really lead this edge, California, Arizona, for example, Texas, and more or less emulate what they have already tried and learned about through trial and error, so that is one of the messages I brought back to Chicago, is we don't have to really recreate new wheels, so much as we have to emulate a lot of the good work that has already taken place in various parts across the country.

So, I called out California. The California Urban Water Conservation Council is a real pioneer, for example, in establishing a whole structure for promoting and achieving real conservation savings. The New Alliance for Water Efficiency, in some respects, is an outgrowth of the success of the California Council, but now, the Alliance has a North American scope headquartered in Chicago. They are very committed to promoting the whole conservation and efficiency agenda, because there are so many benefits, both on the water intake side, as well as on the wastewater treatment side.

Ms. EDWARDS. And is there a national snapshot of what a conservation strategy might look like for the country, as opposed to the individual snapshots that we might get in a region or a locality?

Dr. LOFTUS. Well, that is a good question. I want to say we could create one without too much work, if one didn't exist already. Maybe my colleagues can respond to whether or not such a snapshot exists.

Ms. EDWARDS. I think my time is up.

Dr. SHANNON. Oh, I actually, that was one of the—sorry—I actually showed one where I actually tried to capture the Nation as a snapshot in just one graph. Conservation is essential, because if we don't, if we stay on our current rate of increasing consumption per capita, we will have to increase our total water supplies by 60 percent over the next 30 years, which is not possible. So—but if we just focus on domestic use, that—we would have to cut our domestic use by 60 percent. Everybody would have to use 60 percent less. Our industries would have to use 30 percent, energy would have to use 30 percent less, and ag would have to use 20 percent less. Really, agriculture consumes 70 to 80 percent of the water used in the United States. So, in this talking about the different sectors, we really have to—and that is one of the essential things that the Federal Government can help do, is to bring all these different sectors together. Dealing with one sector without thinking of the other is—we can't—

Chairman LAMPSON. Okay. Thank you. Next, we have, I will recognize for five minutes Mr. Bartlett.

Mr. BARTLETT. Thank you very much. It is going to be a race between water availability and availability of liquid fuels, which brings our communities to their knees first.

You have been talking about water conservation, and we are not very aggressive in water conservation. I remember that I was proposing building houses that got all of the water from the water that falls on their roof. If you are in this area, with 40 inches of rainfall, you have an average house, enough water falls on the roof of your house to meet all of your water needs for the year, if you are at all conserving.

And I say, people said, oh, gee, you can't drink rainwater, cistern water, and I said well, let me understand this. The rain falls on the hog lot, and the water from the hog lot goes into the creek, and the creek goes into the river, and you pull the water out of the river and treat it, and that is my drinking water. I said can I please have the water before it goes through the hog lot. That seems to me to be a reasonable request.

I also suggested that in conserving water in the home, that you might use gray water. We are one of the few major countries that uses drinking water to flush its toilets and wash its streets. And one of the counties, they said oh, gee, you can't do that. Somebody might drink the water of the hose when they were washing their car. And my response was you don't drink water out of your toilet, do you? You learn where you get drinking water, and where you don't get drinking water.

You mentioned the relationship between energy and water. Indeed, they are very closely related. We are getting, now, a bit more

Chairman LAMPSON. Thank you, Mr. Bartlett. Your thoughts are always impressive and causes us to think. We will see where we go with it all. We have, next, Mr. McNerney. You are recognized for five minutes.

CONSERVATION AND AGRICULTURE

Mr. MCNERNEY. Thank you, Mr. Chairman. The areas I am most interested in is the impact of efficiency, water efficiency and conservation on farming, in terms of productivity and profitability. Could any of you take that question on? How is efficiency is going to make farming more profitability or more productive? Can it, or are farmers going to be taking a hit when we go toward conservation? It is inevitable.

Dr. SHANNON. Anybody else? I will be willing to tackle this.

Mr. MCNERNEY. Sure.

Dr. SHANNON. I actually went to India and—a couple of weeks ago, just to give, issue about agriculture, and they doubled their food production by basically doubling their water withdrawals out of their aquifers to reach the Green Revolution, and now, their aquifers are drying. So, they are very, very worried about to do to maintain their efficiency. Well, Israel has really done a tremendous job in cutting the amount of water and increasing their agricultural output.

So, this is an area that, with some new technologies and some new investment, we can actually increase, I think, agricultural output in many regards, while reducing the amount of water use. Doing groundwater drip irrigation, where you go right below the soil, has benefits, by reducing the amount of fertilizers needed, as well as water, and you can increase productivity.

So, there are a lot of places in the world that are looking at this. The United States is somewhat doing this in California, from what I understand. Of course, through the Midwest, we don't yet.

Mr. MCNERNEY. Well, I have got a lot of almond farmers in my district, and I mean, they tell me, when they reduce water usage, their almond production goes down. It is that simple. Is that, in your mind, is that necessarily the case?

Dr. SHANNON. Well, it is connected with the biology, which is the trans-evaporation rate. To get more output, you have to have that go up, and so, that is where the consumption comes in. But it is the pan-evaporation that is not, doesn't lead to that, that we have to minimize. And if you can minimize the pan-evaporation, that doesn't leave the crop, but you do have to have the, what is called trans-evaporation to produce crop, and there is just no way of getting around that.

Mr. MCNERNEY. You seem to be——

Dr. HATCH. I have a comment.

Mr. MCNERNEY. Oh, go ahead.

Dr. HATCH. There is the basic issue of getting the water to where it is needed, which is the root zone or the leaf. You could argue that spraying water out into the air isn't very efficient. You could argue that where it is possible, drip irrigation doesn't work with all crops, but drip irrigation not only delivers water, but more and more farmers find they can deliver various chemicals or other

things, it becomes like an IV, if you will, for a human. It is a great delivery system.

So, in crops and agricultural situations where you can use something like that, or you can figure out a way to get more of the water that you are taking out of a storage pond, or out of a river, wherever it is coming from, get more of that water into the affected location, then that is a great efficiency, and if that is done, then the productivity could actually increase. And I think that is what he is referring to in Israel.

Mr. MCNERNEY. And sort of a related question, you discussed the depletion of groundwater aquifers. It is a big issue. Are there geologic consequences to that, and how can we better use rainfall to recharge these? I mean, in California, we are close to the ocean. The rain comes, and we flush it out to avoid flooding. But is it an effective way to use that, to recharge our aquifers?

Dr. HATCH. I guess I can—if somebody else wants to jump in. Groundwater recharge is an issue. If you don't recharge, the land subsides, and there is subsidence occurring everywhere around the world, and in the United States. Singapore, by the way, has subsided almost 30 centimeters in 30 years from pumping out groundwater aquifers. Same thing with Mexico City, and of course, New Orleans, we know about that, and other places.

But you can recharge with rainwater, but typically, the water needs to be really clean to get fast recharge rates. If it is not clean enough, it is slow. If it is muddy water, it doesn't recharge, and then, you have to get rid of it from floods. So, there are, there is work going on to be able to clean it up effectively, so that you can recharge aquifers more effectively.

Mr. MCNERNEY. Dr. Loftus.

Dr. LOFTUS. And to go back to your previous question, I think there is an opportunity here to think a little more holistically, thinking about agriculture and their needs for water. You know, we have spent billions and billions of dollars improving our wastewater treatment plants, and we really produce some pretty high quality wastewater that can present no health problems. But yet, it is nutrient-rich, and so, you could apply treated wastewater to corn, for example, and eliminate the farmer's need to buy urea or other forms of nitrogen that they use at great expense, given the price of oil these days, and actually, boost their productivity and profitability, and at the same time, provide, you know, an outlet for effluent that might otherwise cause a problem, if it is being put into a sensitive stream and degrading water quality, for example.

Mr. MCNERNEY. My time is about expired, Mr. Chairman.

Chairman LAMPSON. Sounds to me that that would involve actually planning the use of the land, as well, so that you could have best use of the land nearest where, there is a lot that has to go on.

Mr. CHRISTENSON. And we are seeing that happening now, beginning to happen. In the beverage industry, certainly, we are seeing beneficial reuse of their waste streams directly for land application, things of that nature. So, those practices are evolving. If I may make a quick comment.

Chairman LAMPSON. Please.

Mr. CHRISTENSON. Just to the, again, the agricultural discussion. You know, I think the whole discussion really speaks to the need for the various sectors to come together and be looking for solutions in total. You know, we have got Pepsi and Coca-Cola, and we all know the rivalry between those two businesses, working together on a common problem, and a common issue for their industry. And I think the same opportunity exists here. I think the agriculture industry, the heavy and the technical manufacturing industry, food and beverage industry, need to come together and be looking at, and collaborating, looking at their water uses and practices. There is a lot of new technology that is being developed. Agricultural industry should not be afraid of this. We all need their products, as we need other products.

So, for us to take, have the sectors coming together, and realizing that this current federal policy we are discussing today works to coalesce and get collaboration across federal agencies. Somewhere out there, we need to begin to create this cross-industry sector collaboration and solution-solving forum. So, I am just kind of hearing—what we are talking about here today. These are the kind of things I think that we see need to happen, and certainly trying to do within the beverage industry.

Chairman LAMPSON. Ms. Biggert, you are recognized for five minutes.

Ms. BIGGERT. Thank you, Mr. Chairman, and thank you for holding this hearing. It has been very interesting. I was just sitting here looking at this bottle of water, and thinking that it wasn't too long ago that this bottle of water cost more than a gallon of gasoline.

Now, it is no longer true, and unfortunately, it is not that the price of water has gone, but the price of gasoline has skyrocketed. So, we have a lot of challenges, I think, facing us, and hopefully, that we are, we can come up with some solutions quickly.

And I would like to welcome Dr. Loftus here from the CMAP. I live in the metropolitan Chicago area, and so, certainly appreciate all that you do to provide us with drinking water. When I first moved to Hinsdale, we had well water, and it smelled like rotten eggs, and finally we did go off the well water and use Lake Michigan. That has been a wonderful resource, but it, you know, there are challenges there, too, in how much water we can use.

THE FEDERAL GOVERNMENT'S ROLE

But I just wanted to ask everybody, and then come back to another question, just so that we can be clear, do you envision a bureau to control water usage, or merely to monitor and predict it, and such as the bill that we are, the draft legislation that we are looking at now? Should it be to control water use, or to monitor and predict it? And start with you, Dr. Shannon.

Dr. SHANNON. I was envisioning this as a way to monitor and provide new ways of providing new waters, not as a control, but as a, providing opportunities to improve water management.

Ms. BIGGERT. Mr. Christenson.

Mr. CHRISTENSON. Same answer. I view this as a means of collecting some of the information and data, and technology development that will allow us to make the decisions we need to make, or

have the impact, and put the controls in place. So, without some of the foundational research and technology development that this policy would create, we are not really in a position yet to make the appropriate decisions of control.

Ms. BIGGERT. Dr. Loftus.

Dr. LOFTUS. I don't see a present need for control. I think we have an opportunity to better orchestrate a lot of good pieces that are already in place.

Ms. BIGGERT. Mr. Johnson.

Mr. JOHNSON. Yes. I think I would agree that the need for control is certainly not there, and I think it would be a very, very difficult undertaking, and if we put that same level of energy into coordinating the research that is currently available, and the prospective research, and I think pulling together some of the NGOs along with the Federal Government, to make those things happen, then we see ourselves in a very different environment, and causing people to think differently about resources that we are utilizing.

Ms. BIGGERT. And Mr. Johnson, I would like to thank you for tearing up the street in front of my house here in Washington, and getting rid of the lead pipes.

Mr. JOHNSON. I have never seen a new street that I didn't want to cut.

Ms. BIGGERT. Well, it is a very nice street now. And Mr. Spooner.

Mr. SPOONER. I agree with the other panel members. The research and information needs to precede any control mechanisms.

Ms. BIGGERT. Okay, and Dr. Hatch.

Dr. HATCH. I think we are all unanimous. It is a more a coordination, management, research, information, those areas. It is not control.

Ms. BIGGERT. Thank you. Then, Dr. Loftus, you said in your testimony that overall, as elsewhere in the United States, our challenge in the Chicago region is not so much water scarcity, but water waste. Do you mean the treatment of water, or wasting, you know, or not conserving it?

Dr. LOFTUS. The latter. More, you know, I hesitate to say this, but I kind of say that we are sort of spoiled in the Chicago region, and we have had abundant, you know, very generous supplies. We haven't really needed to conserve water. It has been priced quite low. So, naturally, it is hard to conserve something that is nearly free, or priced I inexpensively. So, I think there is just an opportunity to value water much more highly, and as a result, just simply become more efficient with its use without causing pain.

Ms. BIGGERT. Do you think that, then, going to a national level, as far as, you know, the coordination with, on a national level with all of the states and the local governments, that this, that we can get a message out to people to conserve more? Is this—

Dr. LOFTUS. Yes, ma'am. Absolutely. I think it is critical that the Federal Government become an active voice, and show leadership, and provide guidance to states who have programs that, like our own State of Illinois program, is interested in evolving, and becoming better at managing State supplies. But you know, again, guidance, incentives, direction from the Federal Government would be, and maybe I am an idealist, but I think it would be really useful.

Ms. BIGGERT. Thank you. I yield back.

Chairman LAMPSON. Thank you. And I recognize Ms. Giffords for five minutes.

GROUNDWATER RESEARCH

Ms. GIFFORDS. Thank you, Mr. Chairman. Thank you, Ranking Member Inglis. This is a terrific hearing, and I am very pleased that so many of you could be here today to talk about an issue that is really going to drive our economy, and certainly, national security into the future.

I think that wars of the future will be fought over water, not necessarily oil, and I don't think the American people really understand what we have got headed down the road towards us. I come from Southern Arizona. We have an interesting situation, where we have had delivery of the Central Arizona Project for many years. I come from a part of Arizona, though, that has been heavily reliant on groundwater for most of those years, where our larger city, Phoenix, has been reliant on surface water for most of its growth.

So, there is an interesting relationship that we have. Southern Arizona conserves much, much more than Phoenix. When you go to Southern Arizona, you rarely see a lawn, rare to see larger swimming pools. I mean, you will see a lot more of that up in the Phoenix area.

So, my first question is for Dr. Shannon, because you talk a lot about groundwater. I just had a town hall hearing a couple weeks ago in Sahuarita. It is a booming part of Southern Arizona, a lot of retirees, near Green Valley, just north of Nogales. And there is a shortage of about 35,000 to 40,000 acre feet per year that we are seeing in this area of drawdown, and I am concerned, because this area is going to continue to boom, and we are the second fastest growing state in the Nation, and this area is also sandwiched between large agricultural interests and mining interests as well. We all know that we have record drought in the West, and certainly, we see that with that record drought, that we are going to have more and more users on the Colorado, but less and less water supply.

I was also surprised to read your testimony about how little actually is known about groundwater, how, we don't have a lot of information out there. So, could you specifically talk about some of the necessary research that we are going to need in the future towards groundwater?

Dr. SHANNON. Thank you very much for this question, because it is actually a crucial question, where I think the Federal Government can make a huge impact.

Understanding groundwater is, we understand it fairly well, if you can actually drill wells, and you can actually look at how it flows. But water flows, if you draw down one, it actually will pull from another area, and will impact another area. Also, the depths at which you go to the water. Typically, as you go down deeper and deeper, it gets saltier, because heavier water drops, and when you are down in the oil regions, it is all very, very salty, typically, and the salts are different. There are some mostly hard salts, and so, as you are looking at how the water moves from the surface to the ground, and from the ground to the ground, it is a very difficult thing to be able to do, and there is certainly, USGS and others

have, and oil companies have certainly looked a lot at this issue, but more research really needs to be done to understand this movement.

And as you draw down, it actually changes the amount of water that is at the surface, and I was at a meeting at the Joint Services, because the Department of Defense is very interested in this issue, and they were talking about a base in Arizona, and I am trying to remember the name of the base.

Ms. GIFFORDS. Huachuca.

Dr. SHANNON. Yes. And they were—thank you. And they were looking at the water, and they have done most of the research there on the way it is flowing, and as they have drawn down the aquifer more, literally the river that flows on top of it gets pulled down, and so, there becomes less surface water, because it is starting to recharge that aquifer.

So, understanding the whole water balance is absolutely crucial, and it is not, it needs a lot more research to be able to know what to do. Right now, we kind of guess, and a lot of it is just guessing, and if you sit there watching it drop, and you say well, maybe we should draw less, but it is not fully understood yet.

And I know that sounds strange after all these hundreds of years of looking at it, but it still needs more research, and this is something where the Federal Government can really have an impact.

Ms. GIFFORDS. Well, I appreciate you mentioning Fort Huachuca. There is an interesting relationship between the San Pedro River—

Dr. SHANNON. Right.

Ms. GIFFORDS.—which is the second most diverse ecological area outside of Costa Rica in all of North America. It is a small river. It is known as the last free flowing river of the West. It is not very wide. Obviously, it is through the desert, but the amount of species that are there are fabulous. I mean, very incredible migratory area, of course, for birds, but because of the Endangered Species law, the Fort was required to reduce its water consumption.

PUBLIC EDUCATION

So, I guess my next question is really aimed at Dr. Hatch but following up on Representative Biggert. What the Fort did in less than a couple of years, is the garrison commander came into Fort Huachuca knowing that it had to reduce the water consumption. Essentially, they put in low flow toilets, and they put in low flow water, you know, shower heads on the taps, and went through all those lawns. He said you know what, we can't have lawns here anymore. We are in the desert. We have got a drought. And, I mean, that is pretty heavily monitored. So, they cut their water consumption by about 50 percent, which is extraordinary.

Now, he can do that because he is a garrison commander, and he can go around to all of these different houses, and tell people what they have to do. But you know Dr. Hatch, this whole concept of public education is phenomenal, but I want to know where it actually works. Because I think that we, as humans, we really like our creature comforts. We like having our nice hot showers. We like being able to turn on the tap and know that we are going to

have direct delivery of water, and that is very much the quality and the standard of life we are accustomed to.

But starting with Dr. Hatch, and the others can join in. Can we talk about how we are going to educate the public and get them to change some of their behaviors so that we don't just continue to think that just water comes out of bottles, that it is very inexpensive and ready to use, because we really do have some challenges ahead.

Dr. HATCH. I guess there are several problems, that is a big question. One of the things I am working on is the effectiveness of conservation measures, and immediately, you hit up against the problem that the pricing, I mean, as I said earlier, it is so inexpensive, I joke that if I could get my son to stop text messaging, I would probably save more money than I would not drinking, not using water at all in my house.

Obviously, there is, you can go to certain states, and I think this was mentioned earlier by the person from Chicago, that you can learn a lot from other states. I think Florida, for the Eastern states, Florida has done quite a bit with low flow showers, various types of appliances and this kind of thing. There is other places that are giving rebates for using water-conserving appliances. But once again, I think it is as much the issue of attitude. Just because it is inexpensive, it is just not on a lot of people's radar screens.

And I think the, it seems like it takes a drought to get people's attention, and it has definitely gotten people's attention in Atlanta, North Carolina, Georgia area, with the recent drought, but you are always concerned that after a few years of adequate rainfall, maybe people are just going to become less interested. So, I think some research into the effectiveness of these management measures or methods would be very useful.

MUNICIPAL WATER UTILITIES: DCWASA

Chairman LAMPSON. Thank you. This has been fascinating. I do want to ask Mr. Johnson a quick question about your testimony. You discussed how DCWASA is different from most other U.S. municipal water utilities. What can you teach us, what can you tell us about better coordination, based on your experiences at DCWASA?

Mr. JOHNSON. Well, I think that based on our experiences here, one, we are, I think, the District of Columbia and the State of Wyoming, I believe, are the only two entities that are not regulated by State organization, where primacy resides with the states. So, our interactions are primarily with the U.S. EPA, out of Region 3. That is one of the unique characteristics, and the fact that we are established as, both by local and federal law.

I think that that kind of regulatory regime puts us a little closer to where a number of things are happening with, across the country, in terms of some of the research and other things that are occurring, certainly much closer to a stricter regulatory regime. And what we are finding here in the District that is kind of unique is that when we start talking about sharing these water bodies, and my view is that we have probably outlived the usefulness of the Clean Water Act in its present form, and need to start looking at things like watershed-based utilization of resources and water, be-

cause we can have, something to occur in the District of Columbia, and across Southern Avenue, and Prince George's County, with regard to water supply will be totally different, in terms of what we have to do for restrictions and other kinds of things.

So, we ought to be managing these pieces on the worst-problem-first basis, as opposed to those things that are first legislated for us to do. And I think that would give us a very different outcome, an experience both in the clean water side as well as the wastewater side.

Chairman LAMPSON. Clean water versus wastewater.

Mr. JOHNSON. Well, I think that they are, the two are tied very closely together. As an example, if we talk about pharmaceuticals, do you control the source and keep them from ever getting into the water body? Do you control it through treating the water on the, at the water purification plant? Or do you treat it at the wastewater plant, where it is coming out and being discharged into the waterway, which is probably the most expensive approach?

So, that is why I say that we have to couple these things together, and look at them, look at this research kind of as one, both on wastewater and water, in order to get an effective approach for looking at how we manage water resources in totality. The use of graywater is an example. The reuse of water is something that people have been experimenting with on a very limited basis here in this country, but it has been very widely used in other countries.

So, I think that those two things have to come together in order for us to have an effective and well coordinated plan. We have a situation now wherein some agencies of the Federal Government, the permit writers don't talk to the people who are the regulators, who don't talk to the people across the hall, who are the permit writers. And that is all dealing in one area, so I think if we started to cross pollinate all of those, and begin to pull them together, we see ourselves making some sense of a resource that is rapidly becoming a limited resource in this country. Things will change, with climate change and other factors, and will not always remain the same. We will not always be a water-rich community, as we currently are today, and we need to plan for that.

Chairman LAMPSON. And I hope we, I certainly hope we do. And we were talking about a few minutes ago about this small quantity of water in this bottle, and the bottle itself took about three times the amount of water to make the bottle than what is contained with it.

Is that pretty accurate, Mr. Christenson, and how much of that is recycled?

Mr. CHRISTENSON. I am not in a position to comment or give you exact figures, and go on any kind of record with those numbers, but yeah, certainly, you have to, any product, there is the packaging component does consume water, as does the product itself. Food is the same way. So, you know, this is 100 percent water inside the bottle. There is, obviously, a water consumption. To say it is three times, I am certainly not in any position to say that that is a fact.

Mr. JOHNSON. Well, Mr. Chairman, I can certainly speak to the cost of delivering water. In this city, I can deliver water to you, to your tap, for 0.7 cents a gallon. That is less than a penny a gallon

for water that has been tested, that meets all the federal regulations and standards that are established for water supplies.

THE DRAFT LEGISLATION'S POTENTIAL

Chairman LAMPSON. We had that conversation up here a few minutes ago as well. And we may be talking about some more of that. All of these things have been fascinating, and many of our colleagues have mentioned some things, the Ranking Member and I, Mr. Inglis, were talking, a couple of the things that have come up. One, the—refer to it as injection, but the—restoring water, putting water back into aquifers. We talked about how, in so many of our areas along the coast—we have storms, and storm, we have significant quantities of rain that come, at times. We are spending huge amounts of money to channelize water routes, to get rid of that water. We are buying up houses, in places, so that we can stop having to pay so much money to rebuild those houses every time they flood.

The list of the things that we have been doing seems to go on and on and on, and are we going to, this question, are we going to find ourselves at a point where we are wanting to go back and undo all those things that we have done? And I am not so sure that that is not something that we shouldn't be considering, and the sooner, the better.

And I guess my question, if there is a question, is will, what our proposal is, create a committee to address these issues, assist in getting us to a point where we can address some of these kinds of things? Anybody have a thought on it? Are we going in the right direction?

Mr. CHRISTENSON. We believe you are, because it is not just about conservation. It is not just about changing our habits. It is about looking at reuse applications. It is about recycling water. It is about directing water to beneficial reuse. It is about all of these things, and many of the outcomes that you laid out in this policy take us down that path, and again, starting with inventory of what we have, and beginning to look at needs, and beginning to, starting the process of cross-agency collaboration.

And hopefully, we can build similar models, as we have in the beverage group, get cross sector collaborations going and exchange. And we are seeing that beginning to happen, but certainly not at the rate it may be necessary. But yes, you are going in the right direction.

Chairman LAMPSON. Mr. Inglis.

Dr. LOFTUS. Oh. If I may, I just wanted to say yes. I think the draft legislation holds a lot of promise. You can't expect one piece of legislation to be all things for all people, but this is a definite step in the right direction. I would just urge you to think hard about extending that coordination, so that it just isn't horizontal at the federal level, but somehow, makes tangible connections with states and the private sector, so that we can really make progress together.

The other thing I would urge you to consider is to have that National Water Census address the issue of water use reporting. Again, we can't manage what we don't measure, so there is potential, in that census, to take a meaningful step in that direction.

Chairman LAMPSON. Thank you.

Dr. SHANNON. If I could just say real quickly. The points that were being made here, I can sort of say it is stovepiping. Right now, everything is stovepiped, and we call it the stovepipe, but you know, we have drinking water, we have wastewater, we have storm sewer water. Everything gets divided up. Each agency divides everything up, and we really have to break down these stovepipes, and I think this type of legislation can go a huge way towards that. That is why I am very excited about it.

RETENTION PONDS

Chairman LAMPSON. Now, Mr. Inglis.

Mr. INGLIS. Thank you. The Chairman and I were just talking about these retention ponds, and can somebody tell me whether those, do those replenish groundwater, or do they ultimately make their way into replenishing aquifers, or—does anybody know?

Mr. CHRISTENSON. Excuse me, are you talking about the retention ponds next to new construction building? It is likely they are not having a great impact on our source aquifers. Shallow aquifers, yes, but it is probably feeding some of the surface water bodies, and much more shallow aquifers, which in the more immediate area, probably manifests itself into some surface discharge.

Dr. SHANNON. To actually do direct recharge of a deep water aquifer, you actually have to drill a pipe, and pump it up, and actually pressurize it, which costs money and energy. Or you can get the water very clean, and then, it can actually flow more readily. And it depends on the ground, but the typical retention pond is not a percolation pond. It may do something, it will affect it somewhat, but you know, you need a lot of pressure to really get it to go down. So, I mean, you may need a lot of area, and that costs land, or a smaller area and higher pressure, typically.

Mr. INGLIS. So, a retention pond is not a percolation pond, you are saying?

Dr. SHANNON. Not typically, no. Actually, many of them are lined with clay and the like, so that you don't cause contamination of shallow aquifers from a retention pond that is capturing runoff, because runoff has all sorts of things in it, distillates and oils, and all sorts of things from storm water. So, storm water retention ponds typically are not, they are to prevent flooding, but not for recharge. If one wants to use it, you can do it, and there are places that do do that, and—not as many in this country, but there are a lot of places that absolutely depend and rely on this runoff for their sources of water. But you have to do some cleaning to do it, typically.

Mr. INGLIS. A percolation pond, it does clean as it goes through, or—

Dr. SHANNON. Yeah, it is, usually, it is graded gravel, so you will start with, you know, some sands and gravel, and as you go down, the engineers will grade it so that it does some filtering as the water seeps down, and makes a more direct route to the aquifer.

Mr. JOHNSON. I believe what the gentleman is saying is correct. One good example of where that has been utilized for recharging and for drinking water is Austin, Texas, which has done a tremen-

dous job, but they have had to do several different things in order to make it work.

One is change people's habits with regard to fertilizers and use of other pollutants that go into those retention ponds, and—but they attempt to recapture all of the water that comes across the land, and reuse it there. Very effective project.

Mr. INGLIS. Thank you.

Chairman LAMPSON. I am curious to know where a project is where there is actual recharging or injecting water that has been held back, and trying to replenish. Any place in the United States where that is being done? Does anyone know?

Dr. LOFTUS. Well, I think kind of what we are talking about here is conjunctive use, conjunctive management of water, and I think California, Colorado, and Arizona might be leaders in the complementarity that is available in managing surface and groundwater supplies, which in some cases, includes artificial recharge of aquifers during flood events, for example, where we are capturing that extra flow that would otherwise just make its way to the ocean, capture it to recharge an aquifer. Using the aquifers during dry times, rather than really wet times, when there is access to a surface water source.

It is not available everywhere. It really does depend on, you know, the, yeah, the geology, the lithology of that particular spot on Earth, whether or not it is amenable to accommodating infiltration or not.

Chairman LAMPSON. This has been fascinating. I could stay here for a long time, and could think of questions, just to try to learn this stuff. I think that we have got an awful lot of teaching to do across the country. How we build our communities, what we are going to be doing with land and water. We are starting to see planned communities come up, and particularly in our area, which is so low, along the coastline, and there has been so much flooding, now we are doing much better use of those retention ponds. Always too easy, it seemed like, to dredge a channel to get rid of the water that we know is going to ultimately flood, so we could go build some more houses over here in this pasture.

And now, we are, you know, starting to realize the benefit of retention, and now, if we can figure out how to use the water that we capture, all that much better.

Well, thank you all very much. We appreciate you appearing before the Committee this afternoon. Dr. Hatch, I apologize. I didn't look up as often as I looked at this level, and so, I hope we didn't exclude you from that.

Dr. HATCH. No problem.

Chairman LAMPSON. We appreciate you joining us in the manner in which you did.

Under the rules of the Committee, the record will be held open for two weeks for Members to submit additional statements, and any additional questions that they might have for the witnesses.

This hearing is now adjourned.

[Whereupon, at 11:47 a.m., the Subcommittee was adjourned.]

Appendix:

ADDITIONAL MATERIAL FOR THE RECORD

[DISCUSSION DRAFT]110TH CONGRESS
2D SESSION**H. R. _____**

To implement a National Water Research and Development Initiative, and
for other purposes.

 IN THE HOUSE OF REPRESENTATIVES

Mr. GORDON of Tennessee introduced the following bill, which was referred
to the Committee on

A BILL

To implement a National Water Research and Development
Initiative, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the "National Water Re-
5 search and Development Initiative Act of 2008".

6 **SEC. 2. NATIONAL WATER RESEARCH AND DEVELOPMENT**
7 **INITIATIVE.**

8 (a) **INITIATIVE AND PURPOSE.**—The President shall
9 implement a National Water Research and Development

1 Initiative (in this Act referred to as the "Initiative"). The
2 purpose of the Initiative is to improve the Federal Govern-
3 ment's role in designing and implementing Federal water
4 research, development, demonstration, education, and
5 technology transfer activities to address changes in water
6 use, supply, and demand in the United States, including
7 providing additional support to increase water supply
8 through greater efficiency and conservation.

9 (b) INTERAGENCY COMMITTEE.—

10 (1) IN GENERAL.—Not later than 3 months
11 after the date of enactment of this Act, the Presi-
12 dent shall establish, or designate, an interagency
13 committee to implement the Initiative under sub-
14 section (a). The Office of Science and Technology
15 Policy shall chair the interagency committee.

16 (2) COMPOSITION.—The interagency committee

17 shall include a representative from each agency that
18 conducts research related to water or has authority
19 over resources that affect water supply, as well as a
20 representative from the Office of Management and
21 Budget.

22 (3) FUNCTIONS OF THE INTERAGENCY COM-
23 MITTEE.—The interagency committee shall—

24 (A) develop a National Water Availability
25 Research and Assessment Plan (in this Act re-

1 referred to as the “plan”) in accordance with sub-
2 section (c);

3 (B) coordinate all Federal activities per-
4 taining to water; and

5 (C) ensure cooperation among Federal
6 agencies with respect to water-related manage-
7 ment and research activities to avoid duplica-
8 tion of effort and to ensure optimal use of re-
9 sources and expertise.

10 (4) NATIONAL WATER INITIATIVE OUTREACH
11 OFFICE.—

12 (A) IN GENERAL.—Not later than 3
13 months after the date of enactment of this Act,
14 the President shall establish a National Water
15 Initiative Outreach Office (in this Act referred
16 to as the “Office”), with full-time staff, to—

17 (i) provide technical and administra-
18 tive support to the interagency committee;

19 (ii) serve as a point of contact on
20 Federal water activities for government
21 agencies, organizations, academia, indus-
22 try, professional societies, and others to ex-
23 change technical and programmatic infor-
24 mation; and

1 (iii) conduct public outreach, including
2 the dissemination of findings and rec-
3 ommendations of the interagency com-
4 mittee based on the activities conducted
5 pursuant to the Initiative.

6 (B) FUNDING.—The operation of the Of-
7 fice shall be supported by funds contributed
8 from each agency represented on the inter-
9 agency committee.

10 (c) NATIONAL WATER AVAILABILITY RESEARCH AND
11 ASSESSMENT PLAN.—

12 (1) PLAN DEVELOPMENT.—The plan required
13 under subsection (b)(3)(A) shall establish the prior-
14 ities for Federal water research and assessment for
15 the 4-year period beginning in the year in which the
16 plan is submitted to Congress and shall utilize up-
17 dated recommendations from the 2007 report issued
18 by the Subcommittee on Water Availability and
19 Quality (SWAQ) of the National Science and Tech-
20 nology Council's Committee on Environment and
21 Natural Resources.

22 (2) SPECIFIC REQUIREMENTS.—The plan
23 shall—

1 (A) identify each current program and ac-
2 tivity of each Federal agency related to the Ini-
3 tiative;

4 (B) identify funding levels for the previous
5 fiscal year for each program and, where appli-
6 cable, each activity identified in subparagraph
7 (A);

8 (C) set forth a strategy to achieve the out-
9 comes described in subsection (d) and shall de-
10 scribe—

11 (i) each activity required of each
12 agency responsible for contributing to each
13 such outcome;

14 (ii) the funding levels necessary to
15 achieve each such outcome; and

16 (iii) the distribution of funds between
17 each agency based on such agency's role in
18 carrying out such activity;

19 (D) be subject to a 90-day public comment
20 period and shall reflect suggestions received
21 from the public in the form of changes to the
22 plan; and

23 (E) be submitted to Congress not later
24 than 1 year after the date of enactment of this
25 Act.

1 (d) WATER RESEARCH OUTCOMES.—The plan shall
2 outline and direct agencies under the interagency com-
3 mittee to work to achieve the following outcomes:

4 (1) Implementation of a National Water Cen-
5 sus, which shall include the collection of water data
6 to create a comprehensive water database that in-
7 cludes information about the availability and quality
8 of ground water and surface water resources.

9 (2) Development of a new generation of water
10 monitoring techniques.

11 (3) Development and expansion of technologies
12 for enhancing reliable water supply.

13 (4) Development of innovative water-use tech-
14 nologies and tools to enhance public acceptance of
15 such technologies.

16 (5) Development of collaborative tools and pro-
17 cesses for United States water solutions.

18 (6) Improvement of understanding of water-re-
19 lated ecosystem services and ecosystem needs for
20 water.

21 (7) Improvement of hydrologic prediction mod-
22 els and their applications.

23 (8) Analyses of the energy needs required to
24 provide reliable water supplies throughout the
25 United States.

1 SEC. 3. BUDGET COORDINATION.

2 (a) IN GENERAL.—The President shall provide guid-
3 ance to each Federal agency participating in the Initiative
4 with respect to the preparation of requests for appropria-
5 tions for activities related to the plan.

6 (b) CONSIDERATION IN THE PRESIDENT'S BUDG-
7 ET.—The President shall submit, at the time of the Presi-
8 dent's annual budget request to Congress, a description
9 of those items in each agency's budget which are elements
10 of the plan or help to achieve the outcomes of the plan.

11 SEC. 4. ANNUAL REPORT.

12 Concurrent with the annual submission of the Presi-
13 dent's budget to Congress, the President shall submit to
14 Congress a report that describes the activities and results
15 of the Initiative during the previous fiscal year and out-
16 lines the objectives for the next fiscal year. The report
17 shall include detailed information on all programs and ac-
18 tivities involved in the Initiative, including an analysis of
19 progress towards achieving the outcomes listed in section
20 2(d). The report shall contain information on economic,
21 demographic, climatic, and technological changes that
22 have contributed to changes in our Nation's water avail-
23 ability and quality.