

NEWS Act

HEARING
BEFORE THE
SUBCOMMITTEE ON WATER AND POWER
OF THE
COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
ONE HUNDRED THIRTEENTH CONGRESS
SECOND SESSION
TO
HEAR TESTIMONY ON S. 1971, THE "NEXUS OF ENERGY AND WATER
FOR SUSTAINABILITY ACT OF 2014"

JUNE 25, 2014



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NEWS Act

WEDNESDAY, JUNE 25, 2014

U.S. SENATE,
SUBCOMMITTEE ON WATER AND POWER,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:31 p.m. in room SD-366, Dirksen Senate Office Building, Hon. Brian Schatz presiding.

OPENING STATEMENT OF HON. BRIAN SCHATZ, U.S. SENATOR FROM HAWAII

Senator SCHATZ. Good afternoon.

Today we will receive testimony on S. 1971, the Nexus of Energy and Water for Sustainability Act of 2014, also known as the NEWS Act. Earlier this year Senators Murkowski and Wyden introduced S. 1971. I'm pleased to be a co-sponsor along with Chairwoman Landrieu and Senator Tom Udall.

The term energy/water nexus is very popular these days and for good reason. Water is necessary to produce many forms of energy. Energy is required to move and treat water. The ongoing drought in many parts of the country coupled with the need to curtail certain power plants because of insufficient water supplies demonstrates the critical connection between energy and water.

In my home State of Hawaii we are on the forefront of a changing climate. It may seem counter intuitive but Hawaii is a water stressed State that often faces serious drought conditions. Over the last several years the Department of Agriculture has listed major portions of Hawaii as facing severe and even exceptional drought conditions. This means that we, in Hawaii, must think carefully about our water use.

I believe there are a few key steps that are critical to furthering the energy/water nexus discussion.

The first is there's clearly a need for high quality standardized data on both energy and water.

The second is the need for the Federal Government to act as a centralized hub of energy/water knowledge.

The NEWS Act directly addresses both of these needs. The bill promotes information sharing across the public and private sectors and creates a Federal interagency coordination committee to help the Federal agencies better understand the energy/water nexus and begin taking meaningful access, excuse me, action.

We look forward to hearing from the panel. I will, as you are aware, we have 7 votes starting right now. So I will gavel out, re-

cess and then the Ranking Member, Senator Murkowski will come back at 3:30 to continue the hearing.

[RECESS]

Senator BALDWIN [presiding]. Good afternoon.

I am delighted to be temporarily chairing and so unexpected was I for this that my first line is thank you, Chair Landrieu and Ranking Member Murkowski for holding this important hearing.

I'm actually going to reserve my opening statement for when we begin the question and answer.

Delighted to have our witnesses here.

Delighted to have an opportunity to highlight the important nexus between energy and water.

This is something that's incredibly important to my State of Wisconsin. I'm going to get into that a little bit more when we have our chance for questions and answers.

But I would yield to Ranking Member Murkowski for her opening statement.

**STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR
FROM ALASKA**

Senator MURKOWSKI. Thank you.

I'm pleased that we are able to have an uninterrupted period of time for this hearing. I would agree, Senator Baldwin, this is an important one.

I appreciate the indulgence of the 5 panelists that have joined us today. Thank you for appearing here this afternoon. We apologize for the somewhat disjointed Senate schedule, but as they say around here, it is what it is.

So I did speak with Senator Schatz on the Floor and he was glad to be able to start things off, but indicated that you and I would be doing the team here. So we'll have a good opportunity to visit with you and gain your input.

The energy/water nexus is a very important issue, certainly to me, I think to folks everywhere. It's pretty basic stuff. Water is essential in every aspect of our daily life. In addition to its vital role in sustaining life, it's crucial for the Nation's economic well being and sustained growth. Without water there's no electricity, no fuel to power our industry, our means of transportation and no plants to produce biofuels. This is the water for energy that we cannot do without.

When it comes to energy for water we need energy to convey water from its source to its consumers. We need the energy to pump and treat and increasingly, to reuse our water in the numerous waste water treatment plants that we have around the country. We obviously need water to treat and provide safe and readily available drinking water.

In addition to the legislation that we're talking about today, S. 1971, I recently released a white paper on the energy/water nexus interlinked resources that are vital for economic growth and sustainability. I did supply a copy of it to all my colleagues here on the committee. I would hope that most of you have seen it.

You know, you always take a little bit of pride in authorship. But I do think it is important that, from a policy perspective, we always be thinking about where water fits in to our discussion here. The

paper provides a more detailed description of the nexus issues and the linkages between the two resources. In it I also detailed how the Federal Government can work with external stakeholders, particularly the private sector to facilitate the technological innovations needed to make a real difference in the efficient and sustainable use of these important resources.

So the legislation that I've introduced which is S. 1971, I introduced with Senator Wyden back in January. It calls for several important actions that the Federal Government can do to initiate and sustain public/private partnership on the energy/water nexus issues. The legislation further seeks to streamline the government's activities across the various departments and agencies to minimize duplicative efforts and hopefully, save taxpayers money.

I also welcome the report that DOE released just last week, the Water/Energy Nexus Challenges and Opportunities. I think that this is a good first step as we look to implement constructive energy/water nexus related programs within our Federal Government. But it does leave unanswered, at least one question out there. That's pretty basic, is how we're going to accomplish that?

How do we get there? That's a question that I'm going to be looking forward to, kind of, probing you all on today. I think that my legislation can provide a path forward on the implementation.

This bill is co-sponsored by not only the Chair of the subcommittee, Senator Schatz, but also by Senators Landrieu, Senators Udall and I understand you, which I appreciate that, Senator Baldwin.

I also want to thank a number of organizations for their support including the Alliance for Water Efficiency, the Family Farm Alliance, the International Association of Plumbing and Mechanical Officials, the National Association for Clean Water Agencies, the National Electric Manufacturers Association and the Water Reuse Association.

So I've got letters of support that I've received on this bill that I would ask be included in the hearing record.

But again, I look forward to the comments from witnesses today and the time that you've given to this very important issue.

With that, Madame Chair, I thank you.

Senator BALDWIN. Without objection for the inclusion of the reports.

I'd like to welcome our witnesses today. I'm going to briefly introduce you by title and then have you present testimony in the order that you're seated and hopefully the order that I will introduce you.

Dr. Jonathan Pershing is the Principal Deputy Director for Energy Policy and Systems Analysis and Deputy Assistant Secretary at the Department of Energy.

Mr. Tom Iseman is a Deputy Assistant Secretary for Water and Science at the Department of Interior.

Ms. Nicole Carter is a Policy Expert at the Congressional Research Service.

Ms. Anda Ray is the Vice President for Environment and Chief Sustainability Officer at the Electric Power Research Institute.

Ms. Mary Ann Dickinson is the President of the Alliance for Water Efficiency.

Thank you all again for being here, for your patience while we vote.

Why don't we start with your testimony, Dr. Pershing.

STATEMENT OF JONATHAN PERSHING, PRINCIPAL DEPUTY DIRECTOR, OFFICE OF ENERGY POLICY AND SYSTEMS ANALYSIS, DEPARTMENT OF ENERGY

Mr. PERSHING. Thank you very much. Thank you, Senator Baldwin. Thank you, Senator Murkowski and through you, thank you to the entire subcommittee. I think it's a really tremendous opportunity to engage on this critical issue.

We certainly have a number of views. I'll share some of them here. I have a somewhat longer written testimony which we have submitted.

I think that the point that both of you have made and Senator Murkowski, you certainly elaborated on this and your report does as well, about the interactions between energy and water. We see them in very much the same way that you do and have articulated them perhaps in a somewhat more elaborate fashion in a much longer report. But your short document, I think, captures some of those key intersections.

But what's interesting to me is that given the inter linkage it's historically interesting that we have not, for the most part, developed these together. We tend to treat them in stove pipes. They're somewhat separable and unique.

But recently we think that some of the events out there in the world are focusing attention on the inter linkage. In that sense there's also a set of growing vulnerabilities that we have to pay attention to and that are quite critical.

Let me take some examples. We can start with a look at the drought from 2012, (you don't have to go back very far—I'll come back to the more recent examples in just a minute). In 2012, limited water availability constrained the operation of power plants. We're certainly seeing that.

This year, now, we have an example of where we are early in the season in California. Snow pack is only about 20 percent of normal. If you look at the projected consequence we could see the curtailment of something like 1100 megawatts of power. So it's a huge number, very significant playing out at this intersection.

Neither our energy nor our water systems, of course, are static. If we take a look at what things are changing.

We have changing demand.

We have new technologies.

We also have climate change.

All affecting these systems.

At the same time the systems are supported by private infrastructure. There is investment that's not public as well as public investment, and also Federal and State and local stakeholders with very clear interests. So arguably we're going to have to have collaboration engaging multiple actors to achieve a resilient system over time.

There are 4 major areas where we see the Department able to leverage some of our core competencies.

First, on integrated data, modeling and analysis. We can inform a systems understanding in support of decisionmaking.

Second, strategic investments in technology research where we can address system vulnerabilities and opportunities.

Third, policy analysis that can illuminate institutional barriers.

Fourth, stakeholder engagement where we can help streamline the pathways for deployment and implementation.

Building on the core competencies and thinking about these areas where we have capacity, we created a cross cutting internal group which we call the Water Energy Technology Team or the (WETT which is a nice little acronym), in the fall of 2012. It brings together over 100 participants from more than 20 different offices within the Department. We're pursuing a variety of cross cutting activities.

We've hosted workshops with the National Laboratories, which have scoped out data needs and options for future analysis there.

We're working with other agencies. For example, we've worked with EPA to identify areas for collaboration on the efficiency of water treatment, the energy demands on water treatment.

In the Office of Fossil Energy, we have a funding announcement which is looking at innovative uses of waste heat from power plants and energy efficient water treatment options.

These are just a few examples.

One of the major accomplishments was the release of our report (and you mentioned it a moment ago) called "The Water/Energy Nexus: Challenges and Opportunities". It analyzes physical interconnections between the systems and the complex decisionmaking landscape that we see.

Let me briefly describe some of its key conclusions:

Energy and water systems are highly interdependent.

We can't assume that the future is like the past in terms of climate, technology or decision landscapes.

Water scarcity, variability and uncertainty are becoming much more prominent potentially leading to increased vulnerability in the system.

We need a more integrated approach to addressing the challenges and opportunities at this nexus.

We think that we, at DOE (and we explain some of this in the report), have some key competencies that could contribute to this conversation.

While it's a lengthy report, it's only a first step. Senators, you've also outlined, both of you, some of the needs for moving forward. We have to engage others outside the Department, stakeholders in other agencies and outside the government in successes. In this spirit we very much look forward to the discussion with you.

Before I conclude let me just say a few words on S. 1971.

The Administration is still reviewing the bill and doesn't yet have a formal position. But I'd note that we very much applaud the committee's efforts to address this really important issue. We're in agreement that a close level of communication and coordination among agencies is important to advance our work.

We think that DOE can make a contribution. Moving ahead we look forward to working with the committee as we take next steps. Thank you very much.

I look forward to any questions.
[The prepared statement of Mr. Pershing follows:]

PREPARED STATEMENT OF JONATHAN PERSHING, PRINCIPAL DEPUTY DIRECTOR,
OFFICE OF ENERGY POLICY AND SYSTEMS ANALYSIS, DEPARTMENT OF ENERGY

Chair Landrieu and Chairman Schatz, Ranking Members Murkowski and Lee, and members of the Subcommittee, thank you for the opportunity to testify on behalf of the U.S. Department of Energy (DOE) on S. 1971, Nexus of Energy and Water for Sustainability Act of 2014. The Administration has not completed its review of the bill.

Last week, the Administration released a report entitled *The Water-Energy Nexus: Challenges and Opportunities* (U.S. Department of Energy 2014). This report provides a comprehensive analysis of the water-energy nexus and its many dimensions. Energy and water systems interact physically in many settings, including electricity generation, oil and gas production, bioenergy production, water treatment, and commercial and industrial facilities. Energy and water systems collectively include private infrastructure and investment, as well as Federal, state and local interests. Continuing analysis will be necessary to prioritize the appropriate collective approach, including the agencies (private, state, local, or Federal) and shares of any costs and responsibilities.

The effort to date demonstrated by the extensive research and comprehensive nature of this report illustrates the Administration's attention to this issue. In my testimony, I will provide an update on the Department's activities in this area—one where I believe we share a mutual interest and concern. As we pursue our important mission areas of climate change, energy security and environmental responsibility, we must take into account dynamic interactions among our energy system, the population, the economy, other infrastructure systems and natural resources. One crucial interaction is that between our present-day energy and water systems.

THE ENERGY-WATER SYSTEM

Action is required by private industry, as well as Federal, state, and local governments to ensure the development of the resilient, coupled energy-water systems of the future. We believe that the Energy Department, working in close cooperation with our interagency colleagues, is well positioned to help address the issues surrounding the energy-water nexus.

In particular, the Department can leverage its core competencies around four major strategic elements, including: user-driven, integrated data, modeling and analysis (DMA); strategic technology development; policy analysis; and stakeholder engagement.

Ultimately, we seek to:

- Advance next-generation, user-driven toolsets for deeper insights and planning, drawing on leading capabilities at our national laboratories while working in concert with the Nation's university community;
- Develop options for new solutions through strategic investments in technology research that target high priority opportunity areas;
- Analyze the policy space and ways to overcome institutional barriers that are preventing efficient and effective evolution of more resilient coupled energy-water systems; and
- Engage stakeholders in continuing discussions about alignment of these activities, pathways to implementation, and ways to create flexibility and institutional incentives in a rapidly changing decision landscape.

Our rationale for such action is clear: energy systems depend on water for nearly all phases of energy recovery, production, and electricity generation. Although some forms of renewable energy use very little water, overall, the dependency of the Nation's energy system on water is profound. Similarly, energy is essential to extract, convey, and deliver water of appropriate quality and quantity for diverse human uses, and then again to treat wastewaters prior to their return to the environment. Many operations in the energy sector rely on water, and many operations in the water sector rely on energy. They are inextricably linked. Developing ways to make our Nation's energy system less dependent on water will reduce stress on the available water supply and, as the Nation's energy system evolves, make sure that the needs of the newly configured system can be met.

Given this tight inter-linkage, it is noteworthy that historically, energy and water systems have for the most part, been developed, managed, and regulated independently. However, recent events have focused attention on emerging stresses and

growing vulnerabilities at the energy-water nexus, raising concerns about how we think about and engineer this interconnection. To list only a few:

- When severe drought affected more than a third of the United States in 2012, limited water availability constrained the operation of power plants and other energy production activities. Under such conditions, thermal efficiency decreased (meaning less power from each affected facility), water discharge temperatures increased, and with the latter there is increasing probability for compounding the problem through de-rating (reducing operations from full capacity) to manage discharge within acceptable limits. It is significant that approximately 40 percent of all freshwater withdrawals (and 49 percent of all combined fresh and saline water withdrawals) in the U.S. are for thermo-electric cooling. Energy and agriculture often compete for scarce water resources, a dynamic only partially offset by the fact that energy demands are largely non-consumptive uses (meaning water is returned) whereas agriculture are largely consumptive.
- Hurricane Sandy demonstrated, in very real terms, the implications of another extreme weather event and the stresses encountered by the coupled system, such as power losses preventing the delivery of clean water as well as the treatment of wastewater and basic sanitation.
- The recent rapid expansion of unconventional oil and gas development facilitated by hydraulic fracturing and horizontal drilling has also highlighted issues and catalyzed national discussions about energy and water interdependencies. There are implications not only for water quantity, but water quality as well. It is noteworthy that many productive fields are in arid and semi-arid regions.
- Increasing water demands in arid areas can lead to increasing energy demands, with the trend toward increasing vulnerability. Figure 1* and Table 1 (included at the end of this text) reflect some of these growing demands for energy to manage water supplies in select western states.

The water-energy infrastructure is long-planned and long-lived. Many factors influence our decisions on the coupled energy-water system, including changing weather patterns, population growth and migration, shifting patterns in economic development, changes in land use and land cover, technology development and deployment, and policy and institutional changes. This complex planning environment presents both challenges and opportunities. At the Department, and throughout the government, we need to better understand the system to ensure it is robust and resilient in the long term.

With that goal of better understanding the system, I would now like to turn to current efforts of the Department on two fronts. The first is the creation within the Department of a cross-cutting organization, the Water Energy Technology Team (WETT) and its accomplishments to date.

The second is last week's release of the major report entitled *The Water-Energy Nexus: Challenges and Opportunities* that I touched on at the beginning of my testimony.

WATER-ENERGY TECHNOLOGY TEAM

While DOE has been conducting research and development (R&D) related to the energy-water nexus for more than a decade, the formation of the WETT was prompted primarily by the Fall 2012 release of the fifth in a series of related reports from the Government Accountability Office (GAO) (GAO 2012). Following the GAO's recommendations, the DOE conducted a series of internal workshops in the fall of 2012 focused on power plant cooling, water in energy production, and DMA.

This effort also leveraged two significant and related activities undertaken by DOE's basic research program, the Office of Science. The first was a research community workshop involving representatives from many "water-interested" agencies. The resulting report, *Community Modeling and Long-Term Predictions of the Integrated Water Cycle* (DOE Office of Science 2012), has had impact on the conceptual framing of this topic.

The second was a study on *Climate and Energy-Water-Land System Interactions* (PNNL 2012), summarizing results of a second workshop and follow-up analyses that similarly involved other agencies and agency-designated scientists. This activity was coordinated through two working groups of the U.S. Global Change Research Program. These two workshops and corresponding reports helped inform the scope of the problem, the research needs, and the range of tools and capabilities that would be required to address the integrated DMA challenges. They helped to broad-

*Figure has been retained in subcommittee files.

en our vision of important, complex dynamics. For example, and particularly for the second report, they informed our understanding of the increasing energy demands in arid areas, issues associated with thermal discharge restrictions, and, more generally, variation and characteristic differences spanning regions. Additionally, the latter report made a strong case for the need to consider land-use and land-cover change as a key element when exploring the energy-water nexus.

As a result of the findings from these workshops and analyses, DOE formed the Water-Energy Technology Team that now includes well over 100 participants from more than 20 offices within the Department. It also includes representation from the national laboratories. It is currently organized into four working groups: (1) Data, Modeling, and Analysis, (2) Policy Frameworks and Analysis, (3) Stakeholder Coordination and Outreach, and (4) Technology Research, Development, Demonstration, and Deployment. These working groups, and the topics they address, are seen as part of an integrated systems approach.

A sampling of current cross-cutting activities includes, but is not limited to:

- The Data, Modeling, and Analysis team, which has:
 - Gathered more than 30 representatives from 11 national laboratories in early May of 2014 to begin considering options for future energy-water analysis strategies;
 - Instituted mechanisms to improve connections and synergies between offices;
 - Engaged other agencies for DMA, including the formation of a new ad hoc interagency working group for climate model downscaling to gain deeper, more consistent, and scientifically rigorous insights into U.S. regional climate outlooks for parameters of particular interest at the energy-water nexus;
 - Developed an extensive inventory of DOE and national laboratory core capabilities; and
 - Engaged the research community in various workshops and related venues.
- The Office of Fossil Energy recently released a Funding Opportunity Announcement that includes requests for innovative uses of waste heat from power plants, low-cost water treatment options, and novel concepts for high-temperature heat exchange, all of which have water-energy implications.
- ARPA-E recently held a workshop on breakthrough possibilities for air cooling of power plants (and other applications).
- Through their most recent open solicitation, ARPA-E has invested in a project that takes a novel approach to the recovery of energy from waste heat via a closed-loop salt water/electricity generation cycle.
- The Bioenergy Technology Office within the Office of Energy Efficiency and Renewable Energy (EERE) put out a Request for Information on the general topic of bio-waste-to-energy in FY 2014, and is planning a workshop on the topic in preparation for possible solicitations in FY 2015. Plans are to include both the EPA and external stakeholders in this effort.
- The Advanced Manufacturing Office within EERE is supporting a project that was competitively awarded under the Innovative Manufacturing Initiative FOA and that proposes a unique combination of forward osmosis, membrane distillation, and anaerobic membrane bioreactors in order to achieve dramatic reductions in the energy requirements of industrial and municipal wastewater treatment.
- The EPA and DOE are working closely together to identify potential areas for collaboration in improving the energy efficiency of water treatment, including the possibility of distributed generation of electricity from wastewater treatment plants.
- The Energy Policy and Systems Analysis office has planned to target strategic areas of policy analysis interest, including issues related to the energy-water nexus in the Quadrennial Energy Review (QER). Just last week, at one of our scheduled public listening sessions on the QER, we focused specifically on energy and water. The two panels, with experts from state and local government, academia, the private sector and civil society, underscored the nature of this nexus—not least given the extreme drought facing the West, and their collective expectations that such extreme events would become more frequent as the climate changes. Both a background paper prepared for that meeting, as well as the full transcript of the session itself are available on the DOE website at: <http://www.energy.gov/epsa/events/qer-public-meeting-san-francisco-water-energy-nexus>.
- DOE has participated in various national and international dialogs on this topic as part of focused and broader engagement efforts.

WATER-ENERGY REPORT

One of the major WETT accomplishments has been the preparation and June 18, 2014 release of the report entitled *The Water-Energy Nexus: Challenges and Opportunities*.

Overarching conclusions of the report include:

- Energy and water systems are highly interdependent;
- We cannot assume the future is like the past in terms of climate, technology, and the evolving decision landscape;
- Water scarcity, variability, and uncertainty are becoming more prominent, potentially leading to vulnerabilities of the U.S. energy system;
- We need a more integrated approach to address the challenges and opportunities of the water-energy nexus;
- DOE has strong expertise in technology, modeling, analysis, and data that can contribute to understanding the issues and solutions across the entire nexus; and
- Collaboration with DOE's many current and potential partners is crucial.

The report itself identifies six strategic pillars that inform approaches for addressing challenges across the water-energy nexus:

1. Optimize the freshwater efficiency of energy production, electricity generation, and end use systems.
2. Optimize the energy efficiency of water management, treatment, distribution, and end use systems.
3. Enhance the reliability and resilience of energy and water systems.
4. Increase safe and productive use of nontraditional water sources.
5. Promote responsible energy operations with respect to water quality, ecosystem, and seismic impacts.
6. Exploit productive synergies among water and energy systems.

In context of these pillars, and in the area of DMA, DOE seeks to pursue advances for robust projections, scenarios, analyses at decision-relevant scales; characterization of uncertainty and risks; modeling and analysis of extreme events with insights into potential system shocks; interoperable DMA platforms, including a layered, integrated data system; and improvements in evaluation of models with observations, as well as more effective and direct use of observations to improve projections. Data and information needs span a wide range of spatial and temporal scales, requiring improved capacity for "telescopic resolution."

Technology R&D in areas such as the recovery of dissipated energy, advances in cooling systems, alternatives to freshwater in unconventional oil and gas, desalination, net-zero wastewater treatment, and efficient equipment and appliances can increase the options available to meet challenges. More generally, improvements in sensors, data collection, analysis, and reporting could yield benefits to multiple decision-makers. Addressing energy and water systems as an integrated whole can stimulate additional innovations.

While the report seeks to outline some of the opportunities and risks in the energy-water system, it is clearly only a first step in a process that will need to engage many others outside the Department. It is thus intended as an opening to a much larger collaboration that will bring together many partners in the energy-water arena. Federal agencies have a role in the energy-water nexus, as do regional, state, tribal, and local authorities. Importantly, a diverse array of non-governmental organizations, including private companies, national non-governmental organizations (NGOs), foreign governments, universities, and municipal facilities must all be involved if we are to make adequate progress on these issues. It is in the interest of private firms to improve efficiency and continue to deliver their energy products reliably. Local and State governments that have primary regulatory jurisdiction in many of these areas will need and want to participate in prioritization of issues and seeking flexible solutions. If activities related to the energy-water nexus receive appropriations in future budgets, these activities could reside at multiple federal agencies that have authorities to undertake such activities, including DOE. We look forward to your reactions to this work.

S.1971

Before I conclude, let me comment briefly on S.1971, the Nexus of Energy and Water for Sustainability Act of 2014. While the Administration is still reviewing this bill and does not have a formal position at this time, we appreciate the Committee's efforts to address this issue. I can say that broadly we are in agreement that a close level of communication and coordination among federal agencies is important to ad-

vancing our work on this increasingly vulnerable intersection of our energy and water systems. Moving forward, we would like to continue working with the Committee on preliminary concerns regarding the details of the collaborative structure and reporting provisions on issues related to the nexus of energy and water.

CONCLUSION

DOE has undertaken an ambitious effort to respond to the challenge of the energy-water nexus. Strategic partnerships to advance and accelerate progress toward a robust and resilient energy and water system at the nexus of energy and water are important.

Ultimately, the Energy Department's longstanding leadership in modeling and technology research and development makes it well suited to contribute to the need for data-driven and empirical solutions to address energy system vulnerabilities arising from the coupled energy-water system. Forming the WETT, and the various accomplishments of our work to date, including our newly released report, are important.

Thank you and I look forward to any questions you may have.

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Table 1. Energy Use for Water Delivery at Selected Project Sites in the Southwest. (Source: PNNL 2012).

Project (State)	Water Delivery (AF/yr)	Net Energy Use (MWh/yr)	Sources
Lake Powell Pipeline (UT)	86,000	307,020	Volume data: Utah Department of Water Resources. 2011. Draft Lake Powell Pipeline Study Water Needs Assessment, prepared by MWH. March 2011. Energy Intensity data: Utah Board of Water Resources. 2008. Lake Powell Hydroelectric System Notice of Intent to File an Application for Original License (Volume 1).
Northern Integrated Supply Project (CO)	40,000	33,980 - 57,980	U.S. Army Corps of Engineers. 2008. Northern Integrated Supply Project Draft Environmental Impact Statement, table 4-15. April 2008.
Yampa Pumpback Project (CO)	300,000	595,680	Northern Water Conservancy District. 2006. Multi-basin Water Supply Investigation.
Regional Watershed Supply Project (CO)	250,000	199,000 - 496,000	Volume data: Wyco Power and Water, Inc. 2011. Application for Preliminary Permit, Regional Watershed Supply Project. Filed with the Federal Energy Regulatory Commission August 31, 2011. Energy Intensity data: Derived from Preliminary Permit Application; analysis summarized in Western Resource Advocates. 2011. Motion to Intervene in Opposition and Comments on the Preliminary Permit Application for the Regional Watershed Supply Project, Project No. P-14263-000. Filed with FERC on December 15, 2011.
Southern Delivery System (CO)	52,900	246,038	U.S. Bureau of Reclamation. 2008. Southern Delivery System Final Environmental Impact Statement. December 2008.
Groundwater Development Project (NV)	217,655	383,073	Volume data: Southern Nevada Water Authority. 2011. Southern Nevada Water Authority Clark, Lincoln, and White Pine Counties Groundwater Development Project Conceptual Plan of Development. Prepared for the U.S. BLM, March 2011. Energy data: Derived from power capacity needs and an assumed operating rate of 85% (data provided in SNWA, 2011).
Carlsbad Desalination Plant	56,000	260,680	City of Carlsbad, CA. 2005. Precise Development Plan and Desalination Plant Project Environmental Impact Report, p. 4.2-19.

Senator BALDWIN. Thank you, Dr. Pershing.
Next we'll hear from Dr. Iseman. Mr. Iseman.

STATEMENT OF TOM ISEMAN, DEPUTY ASSISTANT SECRETARY FOR WATER AND SCIENCE, DEPARTMENT OF THE INTERIOR

Mr. ISEMAN. Mr. Iseman.

Senator BALDWIN. Sorry.

Mr. ISEMAN. I noticed I was between two Doctors.

[Laughter.]

Mr. ISEMAN. Thank you, Senator Baldwin and Senator Murkowski. I'm Tom Iseman, Deputy Assistant Secretary for Water and Science at the Department of the Interior. Thanks for the opportunity to provide the views of the Department on S. 1971, the Nexus of Energy and Water for Sustainability Act of 2014.

I would also like to thank the committee for the tremendous outreach to the Department as this legislation was developed. We appreciate the committee's leadership on the energy/water nexus and the opportunity to work with you and your staff to address these issues.

In light of the Department of the Energy's newly released report the Administration would like to conduct additional review of the bill. The Department is very supportive of the committee's efforts and would like to work with you as this bill moves through the legislative process.

The Department has a number of existing programs in place that are consistent with the goals of S. 1971 which I will summarize today, specifically as they relate to the Bureau of Reclamation and the U.S. Geological Survey.

The USGS provides impartial scientific information on the health of our ecosystems and environment, the water and energy resources we rely on and the impacts of climate and land use change.

Reclamation is the largest wholesaler of water and the second largest producer of hydropower in the United States.

Interior has unique capabilities to understand and address the energy/water nexus.

I want to provide several examples that illustrate how these agencies are conducting research and implementing strategies that address the important interconnections between energy and water.

Understanding the value of interagency coordination, Interior has partnered with the Department of Energy and the Department of the Army through a 2010 memorandum of understanding to collaboratively address a host of energy/water nexus issues related to hydropower. By coordinating efforts these agencies have completed a number of projects that promote sustainable hydropower development.

For example, as a result of the MOU Reclamation has completed hydropower resource assessments, updated policies to encourage non-Federal development of hydropower and partnered with DOE to test the impacts of a hydrokinetic device on open channel hydraulics.

Earlier this month the Department announced that Reclamation will make a \$17.8 million investment in WaterSMART and water and energy efficiency grants available to 36 new and ongoing projects in the Western United States for activities such as conserving and using water more efficiently, increasing the use of renewable energy, improving energy efficiency and carrying out activities to address climate related impacts on water.

The USGS has been working with the Energy Information Administration since 2010 to improve estimates of water withdrawals and consumptive use associated with cooling water at thermoelectric generating plants across the Nation. Cooling water for such plants is the largest sector of water withdrawals in the United States. USGS with the assistance of the EIA developed a model that incorporates the heat budget of the thermoelectric generating plants that rely on water for cooling.

The model can be used both to estimate current and historical water use and to forecast future water use with different plant configurations and cooling water technologies.

Ultimately this information on thermoelectric water use can be incorporated into the USGS water census. As the energy sector is a primary user of water increased availability of water use information related to energy will be an important part of the water census.

Water availability, severe drought and long term climate trends have always posed a significant threat to energy development and electric generation. This is one of the broad systemic risks at the core of the energy/water nexus and a place where Interior would like to focus going forward.

In conclusion the Department shares the committee's goals to promote coordination between Federal agencies as it relates to the energy/water nexus. We appreciate the leadership of this committee in engaging Federal agencies to address these issues.

I would be pleased to answer questions at the appropriate time.
[The prepared statement of Mr. Iseman follows:]

PREPARED STATEMENT OF TOM ISEMAN, DEPUTY ASSISTANT SECRETARY FOR WATER AND SCIENCE, DEPARTMENT OF THE INTERIOR

Chairman Schatz, Ranking Member Lee and members of the Subcommittee, I am Tom Iseman, Deputy Assistant Secretary for Water and Science at the Department of the Interior (Department). Thank you for the opportunity to testify on S. 1971, Nexus of Energy and Water for Sustainability Act of 2014. The Administration has not completed its review of S. 1971 in conjunction with the report issued by the Department of Energy last week, entitled *The Energy-Water Nexus: Challenges and Opportunities* (U.S. Department of Energy 2014). The bill would create a Committee or Subcommittee on Energy-Water Nexus for Sustainability under the National Science and Technology Council (NSTC), co-chaired by the Secretary of Energy and Secretary of the Interior. The Department has a number of existing programs that address many of these energy-water nexus issues, some of which are summarized below.

Founded in 1879, the USGS is the Nation's largest water, earth, and biological science and civilian mapping agency. The USGS collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. The USGS provides impartial scientific information on the health of our ecosystems and environment, the water and energy resources we rely on, and the impacts of climate and land-use change. With a diversity of scientific expertise, the USGS carries out large-scale, multi-disciplinary investigations and provides scientific information to resource managers, planners, and other customers.

Reclamation owns and operates water projects that promote and sustain economic development within the 17 western States. The mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. Since it was established in 1902, Reclamation has constructed more than 600 dams and reservoirs including Hoover Dam on the Colorado River and Grand Coulee on the Columbia River. Reclamation is the largest wholesaler of water in the country, delivering water to more than 31 million people, and providing one out of five western farmers with irrigation water for 10 million acres of farmland across the United States. Reclamation is also the second largest producer of hydroelectric power in the United States, and provides significant amounts of renewable energy to customers throughout the West.

EXISTING PROGRAMS AT THE DEPARTMENT OF THE INTERIOR

The Department recognizes the importance of the energy-water nexus and supports a closer level of communication and coordination between the Department of the Interior, Department of Energy and the broader federal community. The Department of the Interior appreciates the Committee's leadership on the energy-water nexus issue. Energy and water issues intersect across a range of Interior activities, including hydropower generation, energy development, electricity generation, and water treatment, distribution, and conservation. Interior has a variety of programs that address the energy-water nexus, including USGS monitoring systems and research programs (including the National Water Census), Reclamation Basin Studies, and WaterSMART Grants. Understanding the value of interagency coordination, Interior has partnered with the Department of Energy and the Department of the Army (working with the U.S. Army Corps of Engineers) through a 2010 Memorandum of Understanding (MOU) to collaboratively address a host of energy-water nexus issues related to hydropower. By coordinating efforts, the signatory agencies have completed a number of projects that promote sustainable hydropower development, including hydropower resource assessments, unit-dispatch optimization sys-

tems, climate change studies, integrated basin-scale opportunity assessments, and funding opportunities to demonstrate new small hydropower technologies.

The Department is committed to integrating energy and water policies to promote the sustainable use of all resources, including incorporating water conservation criteria and the water/energy nexus into the Department's planning efforts. On June 9, 2014, the Department announced that Reclamation will make \$17.8 million in WaterSMART Water and Energy Efficiency Grants available to 36 new and ongoing projects in the Western United States for activities such as conserving and using water more efficiently, increasing the use of renewable energy, improving energy efficiency, encouraging water markets, and carrying out activities to address climate-related impacts on water. Reclamation also announced that it will make \$1.8 million available for comprehensive water basin studies conducted jointly with state and local partners in the Upper Red River Basin in Oklahoma, Upper Deschutes River Basin in Oregon, and Missouri River Headwaters Basin in Montana. These announcements support the President's Climate Action Plan by providing tools for states and water users to create water supply resilience to meet future water and energy demands in the face of a changing climate.

Water and Energy Efficiency Grants and Basin Studies are part of the Department's WaterSMART Program. WaterSMART Grants provide cost-shared funding to States, tribes, and other entities with water or power delivery authority for water efficiency improvements, with additional consideration given to proposals that include energy savings as a part of planned water efficiency improvements. Water management improvements that incorporate renewable energy sources are also prioritized for WaterSMART Grant funding. These grants directly address the energy-water nexus and provide a concrete means of implementing on-the-ground solutions to energy-water issues. The FY 2014 Water and Energy Efficiency Grant projects are expected to conserve more than 67,000 acre-feet of water annually and 22.9 million kilowatt-hours of electricity—enough water for more than 250,000 people and enough electricity for more than 2,000 households. Basin Studies are collaborative studies, cost-shared with non-Federal partners, which analyze how climate change may affect water supply, demand and operations in the future and identify adaptation strategies to address imbalances in water supply and demand.

In addition to long-standing USGS efforts in water supply and availability and in energy resource assessments and research, which provide an essential foundation for understanding issues related to the energy-water nexus, the USGS participates in a number of interagency efforts. The USGS has been working with the Energy Information Administration (EIA) since 2010 to improve estimates of water withdrawals¹ and consumptive use associated with cooling water at thermoelectric generating plants across the Nation. Cooling water for such plants is the largest sector of water withdrawals in the United States, at 49% of all water withdrawals nationwide, according to USGS Circular 1344, *Estimated Use of Water in the United States in 2005*. A recent USGS report, *Methods for Estimating Water Consumption for Thermoelectric Power Plants in the United States* (Scientific Investigations Report 2013-5188), documents the model that the USGS developed with the assistance of the EIA for estimating electric generating plant water withdrawals and consumptive use, which are currently not consistently reported. This ground-breaking model, which incorporates the heat budget of each of the approximately 1,300 thermoelectric generating plants that rely on water for cooling, can be used both to estimate current and historical water use and to forecast future water use with different plant configurations and cooling water technologies.

In addition to the efforts above, the FY 2015 President's Budget requests an additional \$2 million for the USGS to provide water use grants to States that will increase availability and quality of water use data—including data related to water used for energy. These grants would provide financial resources, through State water resources agencies, to improve the availability and quality of water use data that they collect and would integrate those data with the USGS Water Census. Funding provided to States through these grants would be targeted at improvements to water use data collection and integration that will be of the greatest benefit to a national assessment of water availability and use. As the energy sector is a primary user of water, increased availability of water use information related to energy will be an important part of this effort.

In mid-April 2014, the USGS released an expanded and updated version of the USGS oil, gas, and geothermal Produced Waters Database and Map Viewer; the revised database contains nearly 100,000 new samples from conventional and unconventional well types, including geothermal. The availability of more samples and

¹Withdrawals are defined as water removed from the ground or diverted from a surface-water source for use.

more types of analyses will help farmers determine the quality of local produced water available for possible remediation and reuse, will enable local and national resource managers to track the composition of trace elements, and will help industry plan for waste-water injection and recycling.

The Powder River Basin in northern Wyoming and southern Montana has experienced a rapid expansion in the development of coalbed natural gas. About 90 billion liters of water were produced annually in the Wyoming portion of the Basin between 2002 and 2011 as part of the extraction process. The produced waters are moderately saline and have high proportions of sodium relative to calcium and magnesium, thus rendering the waters unsuitable for irrigation without treatment. USGS studies have examined the environmental impacts of different disposal options. Results indicated that infiltration impoundments had the potential to contaminate underlying fresh groundwater supplies, but that with specific treatment the produced waters could be used in subsurface drip irrigation operations that minimized potential for groundwater contamination and provided beneficial use of the waters to enhance agricultural production in this semiarid region.

Other Departmental programs and activities relate directly to the energy-water nexus, including hydropower development, water treatment and desalination, pumping and water delivery, BLM energy permitting, and USGS research on energy resources and induced seismicity. We are happy to provide the Committee with additional information on these programs as needed.

S. 1971, NEXUS OF ENERGY AND WATER FOR SUSTAINABILITY ACT OF 2014

Section 3 of S. 1971 requires the Director of the Office of Science and Technology Policy to establish either a Committee or Subcommittee on Energy-Water Nexus for Sustainability under the NSTC, co-chaired by the Secretary of Energy and Secretary of the Interior. The Committee or Subcommittee is directed to: (1) serve as a forum for developing common federal goals and plans on energy-water nexus issues; (2) promote coordination of the related activities of several federal departments and agencies identified in the bill; (3) coordinate and develop capabilities for data collection, categorization, and dissemination of data from and to other federal departments and agencies; and (4) engage in information exchange between federal departments and agencies.

Section 4 of S. 1971 requires the Director of the Office of Management and Budget to submit to Congress a report that includes an interagency budget crosscut that: (1) displays the budget proposed for the upcoming fiscal year, including any interagency or intra-agency transfer, for each of the federal agencies that carry out energy-water nexus projects and (2) identifies all federal and state expenditures since 2011 on energy-water nexus projects. The report to Congress would also provide a detailed accounting of all funds received and obligated by all Federal and State agencies with energy-water implementation responsibilities during the previous fiscal year and list all energy-water nexus projects to be undertaken in the upcoming fiscal year, with the federal portion of funds for those projects.

The Department appreciates the Committee's leadership and the opportunity to strengthen capabilities to address the energy-water nexus. Given the breadth and many facets of this issue, we support close collaboration with the DOE and other Federal agencies. Moving forward, we would like to continue working with the Committee on preliminary concerns regarding the details of the collaborative structure and reporting provisions on issues related to the nexus of energy and water. The Department supports interagency collaboration and information sharing to support sound decision-making, leverage resources, and reduce duplication. But, the Administration believes this can be done through more effective and efficient collaboration and program management, rather than an unduly and potentially ineffective reporting requirement.

If enacted, it is the Department's view that the committee or subcommittee created under S. 1971 should focus its attention on key vulnerabilities where there is an appropriate federal role and capability to have a positive impact. It is the Department's view that that focus should be on data gaps associated with water use and availability.

Water availability, severe drought, and long-term climate trends have always posed a significant risk to energy development and electric generation. This is one of the broad, systemic risks at the core of the energy-water nexus. Decreased water availability, prolonged drought, and more pronounced climate trends could increase that risk and require the use of accelerated adaptation strategies.

The Department supports the type of coordination and data exchange encouraged under S. 1971 and is already undertaking a number of steps to do so as discussed in the testimony above. Such efforts could help close existing gaps, increasing our

understanding of water supply availability to benefit water and energy decision makers.

If enacted, S. 1971 may present challenges to the Department. The Department would need to evaluate whether the commitments and reporting requirements in the bill may require additional resources to carry them out. Additionally, while S. 1971 allows for the coordination of federal activities, the Department would like to stress the importance of providing the scientific community with autonomy to design and execute studies. Finally, States play the key role in allocating and administering water, and they must be a partner in energy-water efforts. S. 1971 does not address the important relationships with states and the private sector, where significant work on energy-water nexus projects is accomplished. Finally, as drafted, it is unclear to the Department what qualifies as an “energy-water nexus project” under S. 1971.

CONCLUSION

In conclusion, the Department shares the Committee’s goals to promote coordination between Federal agencies as it relates to the energy-water nexus. We appreciate the leadership of this Committee in engaging Federal agencies. The Department has numerous programs in place that encourage coordination not only within the Federal Government, but as public-private partnerships. The Federal Government has a role in providing leadership and tools to address the challenges of imbalance between supply and demand. Sustainable water supplies and energy use are important parts of a stable economic base, employment continuity, and smart growth.

I would be pleased to answer any questions the Subcommittee may have.

Senator BALDWIN. Thank you, Mr. Iseman.
Dr. Carter.

STATEMENT OF NICOLE T. CARTER, PH.D., SPECIALIST IN NATURAL RESOURCES POLICY, CONGRESSIONAL RESEARCH SERVICE

Ms. CARTER. Thank you, Senator Baldwin and Senator Murkowski. My name is Nicole Carter. I’m a specialist in natural resources policy at the Congressional Research Service. Thank you for inviting CRS to testify on S. 1971, the NEWS Act.

In serving the U.S. Congress in a non partisan and objective basis, CRS takes no position on this legislation. We have been asked to provide background and analysis.

S. 1971 would require the Director of the Office of Science and Technology Policy to establish within the National Science and Technology Council a committee or subcommittee on energy/water nexus for sustainability. Here and after referred to as the NEWS Committee.

This cabinet level council and its committees are the principle means for the executive branch to coordinate science and technology policy across the Federal Government. The NEWS Committee would be co-chaired by the Secretary of Energy and the Secretary of the Interior. It would be tasked with coordinating Federal investments in science and technology to address energy/water nexus issues. This effort would cover at least 13 Federal departments, agencies and offices.

S. 1971 identifies duties of the NEWS Committee.

Providing a forum for developing Federal energy/water nexus goals and plans.

Identifying opportunities to advance nexus science and technologies including through public/private partnerships.

S. 1971 also would require annual energy/water cross cut budget of Federal and State funding.

Delivering water to communities, industries and agriculture and treating municipal waters and waste waters consumes energy.

Similarly population distribution, electricity demand and domestic energy development influences how much and where the energy sector relies on water to cool power plants, to generate hydropower and to produce conventional and unconventional fuels.

In a 2013 review of global corporations 45 percent of energy companies indicated that water stress or scarcity represented a direct risk to their business operations. While many Federal entities collect data and support research relevant to the energy/water nexus and in the case of the Department of Energy there's a recently released departmental strategy.

Actions to coordinate and strategically plan Federal energy/water nexus efforts have been limited. A few Federal entities have attempted to have a collaboration, like we just heard from Tom, and while some of these have produced results the impacts of others remain to be seen. For example, significant data gaps persist. The water use data for oil extraction and refining that are commonly cited are decades old, poorly documented, lack verification and represent limited samples. Such data gaps persist in part because the energy sector is largely private, dispersed and quickly evolving.

Ensuring data consistency, accuracy and currency can require investment of effort and resources. S. 1971 would task the NEWS Committee to engage in information exchange as well as promote data collection and dissemination.

Regarding the impact of S. 1971.

The bill would provide the executive branch with Congressional direction to coordinate Federal energy/water science and technology investments and provide both the forum and budget information to strategically ameliorate energy/water issues through targeted results from Federal research and science programs across the Federal Government.

The annual cross cut budget requirement in S. 1971 may pose some implementation challenges.

First, a key term for the cross cut, the energy/water nexus projects is not defined.

Second, the requirement to include State government expenditures from all 50 states and expenditures back to FY2011 may be difficult to assemble.

Except for the cross cut budget, S. 1971 requires no specific deliverable and limits its direction to the NEWS Committee on how to accomplish its duties and measure its success. That is, the legislation provides the NEWS Committee with implementation flexibility.

While implementing S. 1971 would require an investment of resources and staff it also has the potential to produce benefits.

It may assist in focusing Federal research on priority nexus challenges. Thereby fostering the technology, science and data to mitigate energy/water nexus related business risk and to more reliably deliver affordable energy and water.

Thank you. I'm happy to answer any questions.

[The prepared statement of Ms. Carter follows:]

PREPARED STATEMENT OF NICOLE T. CARTER, PH.D., SPECIALIST IN NATURAL
RESOURCES POLICY, CONGRESSIONAL RESEARCH SERVICE

Chairman Schatz, Ranking Member Lee, Members of the subcommittee, my name is Nicole Carter. I am a Specialist in Natural Resources Policy at the Congressional Research Service (CRS). Thank you for inviting CRS to testify on S. 1971, The Nexus of Energy and Water for Sustainability Act (the NEWS Act). In serving the U.S. Congress on a non-partisan and objective basis, CRS takes no position on this legislation, but has been asked by the Subcommittee to provide background and analysis of the legislation and its context. CRS remains available to assist the Subcommittee in its consideration of this legislation, related issues, and potential concerns among affected stakeholders.

DESCRIPTION OF LEGISLATION

S. 1971 would require the Director of the Office of Science and Technology Policy to establish a Committee or Subcommittee on Energy-Water Nexus for Sustainability (hereinafter referred to as the NEWS Committee). The NEWS Committee would be within the National Science and Technology Council (NSTC). The NSTC was established by Executive Order 12882 on November 23, 1993. This Cabinet-level council is the principal means within the executive branch to coordinate science and technology policy across the federal research and development enterprise. A primary objective of the NSTC is the establishment of clear national goals for federal science and technology investments; the NSTC also prepares research and development strategies coordinated across federal agencies to form investment packages aimed at accomplishing these goals.

The NEWS Committee would coordinate federal energy-water nexus efforts, which the bill defines as the link between (1) energy efficiency and the water quantity needed to produce fuels and energy and (2) the energy needed for transporting and treating water. It would be co-chaired by the Secretary of Energy and the Secretary of the Interior and include at minimum 11 other identified federal departments, agencies, or offices. The duties of the NEWS Committee would include the following:

- providing a forum for development of federal energy-water nexus goals and plans,
- promoting coordination of energy-water nexus activities across federal agencies,
- supporting federal energy-water nexus data capabilities and dissemination, and
- identifying opportunities to advance energy-water nexus science and technologies, including through public-private partnerships and innovative financing.

S. 1971 also would require an annual energy-water crosscut budget of federal and state funding of energy and water nexus projects to be transmitted within 30 days of the President's budget submission to this Committee and two House Committees. Currently, few activities are identified as energy-water nexus related in federal budget and appropriations documents, although we know that numerous federal programs, activities, and grants support energy-water nexus research and data, often as part of their broader missions.

FEDERAL ENERGY-WATER NEXUS EFFORTS

A 2012 Government Accountability Office (GAO) report provides some context for this legislation. It described how the lack of comprehensive energy-water data and research hampers effective policy choices; the report stated: "Congress and federal agencies may be making decisions that affect energy and water supplies without fully understanding the impact of these decisions."¹ In a 2013 review of global corporations' disclosures, 45% of energy companies indicated that water stress or scarcity represented a direct risk to their business operations.²

Domestic energy development, electricity demand, and population distribution affect how much and where the energy sector relies on water to cool power plants, to produce conventional and unconventional fuels, and generate hydropower. Similarly, delivering water to communities, industries, and agriculture and treating municipal and industrial wastewaters consumes energy. While many federal entities collect energy-water nexus relevant data, support related research, and in the case of the Department of Energy have a departmental strategy, the coordination and

¹ U.S. Government Accountability Office (GAO), Energy-Water Nexus: Coordinated Federal Approach Needed to Better Manage Energy and Water Tradeoffs, GAO-12-880, September 2012, <http://www.gao.gov/assets/650/648306.pdf>.

² Carbon Disclosure Project, Moving beyond business as usual: A need for a step change in water risk management, CDP Global Water Report 2013, 2013.

strategic planning of federal energy-water nexus efforts have been limited and of limited impact in guiding research and improving investments and policy choices. Some agencies have taken steps to improve energy-water nexus data collection and dissemination of research results and attempted some targeted collaboration. However, the results and impact of these efforts to date remain to be seen. For example, the Multi-Agency Collaboration on Unconventional Oil and Gas Resources consisting of U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the U.S. Geological Survey (USGS), targeted release of a multi-year research plan by January 2013; the plan has yet to be made public. Another example of mixed results is the availability of reliable data for informing policies and public debates. Significantly more data and analysis are available today than five years ago on the water use associated with different thermoelectric power generation technologies and fuels; however, significant data gaps remain regarding water use associated with fuels, especially on a water use per unit of energy produced basis. For example, the water use data for oil extraction and refining that are often cited are decades old, poorly documented, lack verification, or represent limited samples. Energy-water data gaps persist in part because improving available data is challenging: much of the energy sector is private, dispersed, and quickly evolving; and ensuring data consistency, accuracy, and currency is challenging and can require an investment of resources and effort.

S. 1971 would assign the NEWS Committee to engage in information exchange, collaboration, and promote data collection and dissemination. The legislation also calls for the NEWS Committee to identify opportunities for public-private partnerships and collaborations. Together these efforts may stimulate innovation in related science and technologies and assist in addressing in the long-run some of these persistent data and knowledge gaps that remain for the United States and internationally.

As previously noted, S.1971 would require an annual crosscut budget of nexus activities. The U.S. Department of Energy's activities can illustrate how crosscuts may provide federal funding information that otherwise would not be available. The Energy Policy Act of 2005 directs the Secretary of Energy to carry out a program to address the energy-water nexus and assess the effectiveness of existing programs at DOE and other federal agencies. To date, DOE has neither received nor requested any funding specifically designated to carry out this provision; however, the department has been active in various energy-water research efforts. A crosscut budget would presumably document any federal spending on energy-water related activities such as this, even if they do not appear as appropriations line-items. The energy-water crosscut budget could be of use to Congress, the executive branch including the NEWS Committee, and non-federal stakeholders.

IMPACT OF LEGISLATION

Regarding the impact of S. 1971, the bill would provide congressional direction to the Administration on how to accomplish federal energy-water nexus coordination, and provide the forum and budget information for development of integrated multi-agency research plans.

The crosscut budget requirement in S. 1971 may pose some implementation challenges. First, while S. 1971 defines "energy-water nexus," the term "energy-water nexus project" is not defined. In particular, the bill does not clarify whether this term is limited to research, development, and demonstration or includes infrastructure and other larger-scale investments. Second, the requirement to include state government expenditures from all 50 states and expenditure data back to FY2011 may be difficult to accomplish. It is unclear if state governments would have incentives to cooperate, and if the aggregated data state data would be sufficiently consistent to be useful to the crosscut budget effort. In the face of challenges like these, other existing and proposed federal crosscut budget provisions have utilized joint federal-state institutions or narrowly limited the nature of state-level information to be compiled.³ For crosscut budgets to be most useful they need to be accurate and targeted at the most pertinent information for decision-making in order to reduce unnecessary effort and cost associated with their compilation.

Except for the annual crosscut budget, S. 1971 requires no specific deliverable and provides little direction to the Administration on how the NEWS Committee should accomplish its duties or measure its success. S. 1971 does provide the OSTP Direc-

³See, for example, crosscut budget provisions for Great Lakes restoration (P.L. 113-76, Division E, Title VII, Section 738; 128 Stat. 238); and proposed crosscut budget provisions in H.R. 2773 (Great Lakes Ecological and Economic Protection Act of 2013, as introduced) and H.R. 2954 (Title X of the proposed Public Access and Lands Improvement Act, 113th Congress, Chesapeake Bay Accountability and Recovery Act, House-passed).

tor discretion to terminate the NEWS Committee after 10 years based on a determination of its relevance and effectiveness. The flexibility S. 1971 provides to the NEWS Committee may allow it to anticipate and respond to developments affecting the energy-water nexus as they arise (which can be rapid, as illustrated by the quick rise of unconventional oil and gas development since the late 2000s), to be innovative in how it coordinates, and how participating federal agencies engage non-federal and private entities.

While S. 1971's implementation would likely require an investment of resources and staff (e.g., to accomplish the coordination, prepare plans, and assemble data and crosscut budgets), it also has the potential to produce benefits. It may result in research plans that reduce duplicative research efforts, knowledge to help avoid unintended policy outcomes, and technologies to more reliably deliver affordable energy and water, efficiently use and conserve natural resources, and mitigate energy-water nexus related business risks.

This concludes my statement. Thank you. I am happy to answer any questions you may have at the appropriate time.

Senator BALDWIN. Thank you, Dr. Carter.
Next we'll call on Ms. Ray.

STATEMENT OF ANDA RAY, VICE PRESIDENT FOR ENVIRONMENT AND CHIEF SUSTAINABILITY OFFICER, ELECTRIC POWER RESEARCH INSTITUTE

Ms. RAY. Thank you, Ranking Member Murkowski, Senator Baldwin and all the members of the committee. I am Anda Ray. I'm the Vice President and Chief Sustainability Officer for the Electric Power Research Institute, often referred to as EPRI. We really thank you for letting us testify here today.

For over 40 years EPRI has conducted research and development relating to the generation, delivery and use of electricity to benefit the public. EPRI is a non-profit, independent organization which brings together scientists and engineers, along with experts in academia and industry to address the challenges associated with electricity, be it reliability, environmental issues, safety issues, efficiency, affordability.

EPRI's members represent about 90 percent of all of the electricity generated in the United States. We have about 700 staff and an annual budget of about \$400 million.

So one of the most important areas of research for EPRI is water. Water availability is clearly and we've all identified this, a critical issue for the power sector. Many of the power plants and the thermoelectric plants were designed to take advantage of the plentiful water resources.

Water is used for cooling in all types of thermoelectric plants, be it nuclear, oil, coal, gas, biofuels and even solar thermal. It's used in those same plants as well for fuel processing, ash handling, scrubbing of emissions and of course, the potable water requirements for the work force.

It's important to note that while the electric sector is responsible for approximately 40 percent of the fresh water withdrawal in the United States, it represents about 5 percent of the actual consumption because most of the water that is used for cooling is actually returned to the source.

Now while water is critical to the electric power industry, we've all identified that the reverse is true as well. Without electricity most Americans would not have access to clean water or effective waste water treatment. EPRI's research on electricity needed to

transport and treat water has focused mainly on the characterization and conservation of electricity used for those purposes.

Our analysis shows that the amount of electricity used for drinking water which is primarily pumping and for waste water for treatment which is primarily for aeration to remove the organic matter and nutrients, accounts for approximately 2 percent all of the Nation's electric usage. With the increase in the desalination process, electricity is going to increase proportionately as well.

So it's clear that the economic viability of the Nation's communities is very dependent on getting both reasonably priced fresh water and having affordable electricity.

Now since the 1970s EPRI has been using its collaborative research model to focus on 3 primary areas of the energy/water nexus.

The first is the cooling of thermal power plants.

The second is on water availability.

The third is reducing energy used in the transportation and treatment of water.

All of these are encompassed in the proposed NEWS Act.

If I may I'd like to give you two examples of research that address some of the issues associated with the energy/water nexus.

Starting with EPRI's water analytics research.

This research includes the development of methodologies and tools to help us better understand and sustainably manage our water resources. This tool compares regional watershed uses from all industry sectors with that same region's watershed availability of water, both ground water and surface water. You can see that comparing those, what's taken out and what goes in, is very obviously a regional specific type of analysis.

The second example is on EPRI's collaborative research for thermoelectric cooling. EPRI and along with the National Science Foundation have joined to launch a joint—have joined together to launch a research program to develop advanced cooling technologies. Some of these technologies also show promise for application in other industries as well such as the data management and refrigeration industry.

So EPRI and the National Science, excuse me, National Science Foundation have funded approximately \$6 million over a period of 3 years. We've identified in our funding 10 different projects.

So the NEWS Act would also serve to coordinate and develop capabilities associated with the dissemination and collection of data with other Federal agencies. We want to encourage you that we think it's important as well to encourage the public/private partnerships and synergies with sharing with that data. EPRI already works with Federal agencies to exchange information in many ways. For example EPRI serves as a member of the Federal Advisory Committee on Water and Information providing data to both the EPA, Department of Interior and others.

So in summary, I just want to mention that over 4 decades of research EPRI has identified very similar gaps as noted in the NEWS Act. There is clearly a need for better coordination of energy/water activities among Federal agencies as well as the public/private entities. There is clearly a need for more consistent and accessible, high quality data and of course, there is clearly a need to

identify and conduct appropriate research to support the adoption of efficient technologies.

In closing I'd like to thank Senator Murkowski and her staff, especially Ron Falbush, for devoting so much attention to an issue that is not only critical to the power sector, but for the well being of the Nation.

I'd like to also acknowledge the Department of Energy's increased focus on leadership under Secretary Moniz and the Department of the Interior's work, especially through the USGS, in providing important data related to the energy/water nexus.

Thank you for the opportunity to testify before the committee today.

[The prepared statement of Ms. Ray follows:]

PREPARED STATEMENT OF ANDA RAY, VICE PRESIDENT FOR ENVIRONMENT AND CHIEF SUSTAINABILITY OFFICER, ELECTRIC POWER RESEARCH INSTITUTE

Chairman Schatz, Chairman Landrieu, Ranking Member Murkowski, Ranking Member Lee: My name is Anda Ray, and I am Vice President for Environment and Chief Sustainability Officer for the Electric Power Research Institute, frequently referred to as EPRI.

Thank you for inviting me to testify before the Water and Power Subcommittee of the Senate Energy and Natural Resources Committee on the subject of the energy-water nexus and S.1971, the Nexus of Energy and Water for Sustainability (NEWS) Act of 2014. This is certainly a critical issue not only for the power sector, but also the long-term well being of the Nation.

EPRI conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including, reliability, efficiency, affordability, health, safety and the environment. EPRI's members represent approximately 90 percent of the electricity generated in the United States. EPRI has some 700 staff and an annual budget of nearly \$400 million. EPRI's principal offices and laboratories are located in Palo Alto, CA; Charlotte, NC; Knoxville, TN and Lenox, MA.

Water availability represents a growing concern for meeting future power generation needs. Thermoelectric plants of all types, including nuclear, coal, oil, gas, solar thermal and biofuels were designed to use the once plentiful water resources as their primary cooling component. And the need for cooling water continues today, at a time of declining supply, both globally and domestically. In the United States, projected population growth rates, energy consumption patterns, and demand from competing water use sectors will increase pressure on power generators to reduce water use. Water is critical to the electric power industry. It is also used for such things as fuel processing, ash handling, scrubbing, landscape integration, and potable requirements for power plants. In addition, the economic viability of the nation's communities served by the electric power sector depends on the availability of reasonably priced freshwater.

Approximately 40% of all fresh water withdrawals in the United States are by the electric sector. However, the electric power sector is responsible for only approximately 5% of the nation's total freshwater consumption, making it one of the least "consumptive" industry sectors. That is because, most of the water withdrawals are not consumed, but returned to its source. 90% of the water withdrawn is used for cooling purposes, primarily for condensing steam exhaust from the turbines that drive the generators.

While water is critical to the electric power industry, the reverse is also true: electricity is critical to water. Without electricity, most Americans would not have access to clean water. Approximately 2% of electricity in the United States is used to transport and treat water and wastewater.

EPRI is founded on a collaboration model and water resource research has been an important body of work since the 1970s. EPRI has focused on thermal power plant cooling, water availability and reducing energy use for the transportation and treatment of water. All of which are encompassed in the scope of the proposed NEWS Act.

I will briefly describe some of EPRI's work related to energy conservation for water, and water conservation for energy research as relevant to informing this hearing.

I'll start with an example of the need for consistently reported, high quality data. EPRI's water analytics research includes development of methodologies and tools to better understand and sustainably manage water resources and risk management needs at national, regional and local levels. EPRI's "Water PRISM" model can be used to evaluate water allocations for all sectors, including energy, municipal, agricultural, industrial and ecosystem requirements. The model can be used to project water needs for the next 30-50 years, including conservation efforts in each sector, and to assist in determining whether use of the available finite water resource can be sustained and maintained. Water Prism focuses on modeling at the watershed level, since there are significant regional variations in water use and availability. The model relies on data that is often provided by federal agencies such as the United States Geological Survey (USGS) and United States Army Corps of Engineers (USACE), state and local governments, and industry. You can see where access to high quality data sets is imperative to attain accurate modeling of future conditions.

Another example is where the adoption of innovative technologies can lead to more efficient energy utilization practices for water use. EPRI's research on energy use for water work focuses on characterization and conservation of electricity used for transport, treatment and distribution of water and wastewater. U.S. public drinking water systems use roughly 39.2 billion kWh per year, which corresponds to about 1% of total electricity use in the U.S. Most of the energy use is related to pumping. A small percentage of water is supplied from the desalination of sea water and brackish water (less than 4%), but this is growing. Desalination is the most energy intensive process with respect to water supply. Municipal wastewater treatment systems in the U.S. use approximately 30.2 billion kWh per year, or about 0.8% of total electricity use in the U.S. There exist various technologies ready for pilot testing or proof of concept research that have the potential to increase energy efficiencies both for water delivery and waste water treatment such as advanced microbial deammonification and Supervisory Control and Data Acquisition (SCADA) systems. Collaborative and synergistic research is going to be key to leveraging the finite resources that are dedicated to research and development.

The final area of research I'd like to mention, specifically addresses thermoelectric generation. I have saved this for last because it is perhaps the most central to the hearing today. Since most of the water withdrawn by the power sector is used for cooling purposes, it is understandable that much of EPRI's research on water is directed towards improved options for thermoelectric cooling. Since one technology cannot meet all of the requirements for every power plant, EPRI has funded a suite of research projects on multiple fronts. Each technology has benefits and tradeoffs, with initial barriers such as initial cost, operating and maintenance issues, efficiency penalties, environmental impacts, reliability and safety. Our collaborative research programs have targeted these issues by addressing the following:

- Reducing the cost and energy penalties associated with dry cooling
- Developing new water saving wet, dry and hybrid cooling technologies
- Identifying and characterizing degraded water sources such as municipal wastewater treatment plant effluent, agricultural discharges, storm water runoff, water produced in association with oil and gas extraction, and brackish groundwater, and
- Researching more efficient treatment technologies to reduce the cost of wastewater and degraded water treatment and reuse.

A collaborative, public-private industry-wide effort is needed to evaluate the performance of a number of innovative new ideas, lab prototypes, and early stage commercial technologies that have the potential to reduce plant water use anywhere from 15% to 100% while substantially limiting adverse impacts on power production. Research to develop the design basis for the technologies and to demonstrate them in actual power plant environments is necessary. To help advance this research agenda, EPRI has actively pursued partnerships with the National Science Foundation and the Department of Energy, and partnered with industry and academia to leverage research funding and results. As an example industry partnership, EPRI is collaborating with Georgia Power Corporation (GPC) and Southern Company Services (SCS) to support the Water Research Center (WRC), located at Plant Bowen in Cartersville, GA. The WRC is an important option in the Water R&D "pipeline" to accomplish the advanced cooling and water treatment research objectives described above.

The NEWS Act would encourage information exchange between Federal Departments and agencies “to leverage existing programs by encouraging joint solicitation’s, block grants, and matching programs with non-Federal entities,” and “to identify opportunities for public-private partnerships, innovative financing mechanisms, and grant challenges.” EPRI’s collaborative business model has long found such partnerships to be productive in advancing science and technology for the benefit of the public, the industry and government. There is always room for greater collaboration to increased opportunities to leverage scarce resources

For example, EPRI and the National Science Foundation have joined together to launch a joint research program to develop advanced cooling technologies. Each organization has contributed funds totaling \$6M over 3 years, and EPRI and the NSF have funded 10 promising cooling projects. EPRI and the NSF recently held a joint workshop to review these 10 projects. This public-private partnership is leveraging both industry money and federal money to develop technologies with the promise of providing novel ways of cooling with substantially less water consumption. Some of these technologies show promise not only for power plant cooling, but for many other types of cooling application as well.

EPRI has also explored developing a collaborative research arrangement with the Department of Energy (DOE) on thermoelectric cooling research. EPRI has experience coordinating research programs with DOE in other areas. For example, in 2010 EPRI and DOE executed a Memorandum of Understanding (MOU) with DOE in the area of Nuclear Plant Long Term Operations research. This MOU calls on EPRI and the DOE to periodically map the related research of each organization, helping ensure that EPRI and DOE take advantage of each other’s scientific findings, avoid duplication of effort, and advance joint objectives. Should DOE ramp up its cooling technology efforts, such an arrangement with energy-water nexus research could be helpful as well.

The NEWS Act would also serve to “coordinate and develop capabilities for data collection, categorization, and dissemination from and to other Federal departments and agencies.” I would note that coordinating and disseminating data to and within the private sector is important as well, to encourage public-private partnerships and synergies.

Since a major focus of the NEWS act is coordination of energy-water nexus efforts within the federal government and engagement with the private sector, it is appropriate to mention some of the ways EPRI can already see the many facets of government that are already engaging, in some way, in the Energy-Water nexus. EPRI, along with other organizations representing diverse public and private water resource stakeholder groups, serves on the Federal Advisory Committee on Water Information (ACWI). Through ACWI, EPRI provides technical advice to USEPA, USDI, USDA, USACE, TVA and NOAA. EPRI belongs to the Energy/Water Nexus Group, a consortium of national energy laboratories actively engaged in studying the energy/water nexus. EPRI also partnered with national energy laboratories and the University of Texas on an investigation of the Water Constraints on Western Energy Interconnects, funded by USDOE on behalf of WECC and ERCOT. In addition, EPRI co-authored, along with Sandia, Los Alamos and NETL, the USDOE report, Energy Demands on Water Resources, Report to Congress on the Interdependency of Energy and Water (2006).

In summary, with almost 4 decades of research in this area, EPRI has identified some similar gaps as those in the NEWS Act. There is a need for better coordination of energy-water activities among federal entities, as well as the public and private sectors. There is a need for more consistent, transparent and high quality data. And of course, there is ongoing need to identify and conduct appropriate research to support the adoption of effective, efficient and affordable innovative technologies.

EPRI looks forward to continued growth in public/private cooperation to address this strategic research need. With your assistance, the United States can become a leader in water stewardship and provide the technologies needed for conservation of this vital resource. Thank you again for the opportunity to testify before the committee today.

Senator BALDWIN. Thank you, Ms. Ray.
Next we hear from Ms. Dickinson.

**STATEMENT OF MARY ANN DICKINSON, PRESIDENT/CEO,
ALLIANCE FOR WATER EFFICIENCY**

Ms. DICKINSON. Thank you.

I represent today the Alliance for Water Efficiency. We are very pleased to be here today to speak in support of S. 1971, the NEWS Act of 2014. We believe that passage of this bill will be a critically important first step in promoting better joint management of two important natural—national resources, water and energy and beginning at the Federal level.

On May 15, 2014 we filed with you an official support letter but it was signed not only by us, but by 30 different organizations, clearly showing strong support for this important issue.

We have been interested in the relationship between water and energy since we were founded 7 years ago. A project of which we're particularly proud is a joint effort we undertook with the American Council for an Energy Efficient Economy, ACEEE, in 2010 to coalesce the views of 75 organizations involved in the water/energy arena. The resulting work product, A Blueprint for Action, contains numerous recommendations for national and State action in the areas of policy, standards and codes, programs and research.

Of particular importance to this hearing and to us at the Alliance for Water Efficiency is the recommendation in the Blueprint that we accurately determine on a national basis how much water is needed or embedded in the generation of electricity and how much energy is needed or embedded in drinking water pumping and treatment as well as waste water treatment.

With a fuller understanding of the significant relationship Federal policies and funding programs can be developed which will cost effectively and collectively save the most amount of energy and water for the United States. We believe that S. 1971 provides the perfect vehicle for obtaining this information on a national level and beginning to develop regional and national data bases of energy and water use.

Subsequent to publication of our Blueprint for Action and following one of the report's specific recommendations we created, in 2001, a water/energy research committee composed of 43 energy and water experts from all over the U.S. This group convened regularly to share reports on the latest water/energy research work.

In June 2013 we cataloged the available primary research that had already been undertaken and assembled links to over 200 publicly available primary research documents that are now posted in a 44 page, online data base and summarized in a final report which we published in June with ACEEE. Both the report and the data base are online and the links are in the testimony.

There are 38 findings about the existing research.

Overall, we found that few detailed studies exist that audit embedded energy and water and waste water systems. No such assessments have been done at a regional or national level.

What do exist are very high level assessments. Most of the research has been published within the past 10 years. So it's relatively recent. But we do believe that public funding of research is also needed to spur additional investigations of alternative clean sources of energy and water.

So the report concluded with 13 recommendations for new research and policy actions which are in the testimony, but which I won't go and read now.

I'd like instead to conclude with making 3 basic points to end my testimony.

Water efficiency, No. 1, is successfully saving the Nation's water and energy resources and helping to defer expensive new capacity infrastructure. This has been a 20 year effort beginning with the Federal Energy Policy Act of 1992 and subsequent legislative changes. We estimate that for toilets alone, 18.2 trillion gallons of water have been saved over the past 20 years of implementation of this act, equivalent to the water use of Chicago, Los Angeles and New York combined for a 20-year-period.

EPA's WaterSense label launched in 2006 has labeled nearly 11,000 products. The sales of which have resulted in 757 billion gallons and 101 billion kilowatt hours saved. EPA's work in this area is a significant achievement in a very short time. We believe the program deserves Congressional authorization and funding.

Saving water saves energy. The benefits are documentable. California has done terrific work in this area which is all in the public record.

Now we believe that the work that's been undertaken in California can be productively used to estimate energy savings from future water efficiency programs which include a wide variety of measures and not just limited to hot water efficiency programs.

An examination of how Federal actions can promote research and program incentive funding into this area is desperately needed and could be part of S. 1971.

Last, research should be undertaken to examine the energy and water benefits from integrated approaches at the local level.

In Boston, the Charles River Watershed Association is leading a highly innovative project to build new waste water treatment plants that generate electric energy, capture thermal energy from the waste water to heat and cool surrounding buildings and reuse the treated water ultimately returning the treated water to the ground to restore lost urban streams. This approach is truly transformative providing renewable energy, reducing water consumption and building community resilience. The potential for energy savings is significant. CRWA estimates, at a minimum, one megawatt of electricity each day for each million gallons of waste water treated.

These types of innovative projects should certainly be researched and incentivized so that they can be replicated across the country.

To conclude, we strongly support the passage of S. 1971 as a needed first step in coordinating Federal activities in this important energy/water nexus area.

We further recommend that a national policy be instituted to allow energy efficiency funding to be used for cold water conservation programs as well as hot water programs because of the clear, embedded energy benefits that this investment would provide.

Thank you for the opportunity to comment.

[The prepared statement of Ms. Dickinson follows:]

PREPARED STATEMENT OF MARY ANN DICKINSON, PRESIDENT/CEO, ALLIANCE FOR WATER EFFICIENCY

The Alliance for Water Efficiency is pleased to speak in support of S. 1971, The Nexus of Energy and Water for Sustainability Act of 2014. This bill would provide direction for federal coordination of water and energy programs within the National

Science and Technology committee, specifically to coordinate and streamline federal activities related to the management of the energy-water nexus. Passage of this bill will be a critically important first step in promoting better joint management of these two important national resources, beginning at the federal level. On May 15, 2014 we filed with you a support letter on the bill signed by 30 different organizations.

The Alliance is a non-profit organization of diverse stakeholders with experience in water conservation programs and policies, and dedicated to furthering the efficient and sustainable use of water in North America. It is the only non-profit organization devoted solely to this purpose.

We have been interested in the relationship between water and energy since we were founded seven years ago. A project of which we are particularly proud is a joint effort we undertook with the American Council for an Energy Efficient Economy (ACEEE) in 2010, to coalesce the views of 75 organizations involved in the water-energy arena. The resulting work product, A Blueprint for Action, contains numerous recommendations for national and state action in the areas of policy, standards and codes, programs, and research. Of particular importance to this hearing and to us at the Alliance for Water Efficiency is the recommendation in the Blueprint that we accurately determine on a national basis how much water is needed (or “embedded”) in the generation of electricity, and how much energy is needed or “embedded” in drinking water pumping and treatment as well as waste water treatment. With a fuller understanding of this significant relationship, federal policies and funding programs can be developed which will cost-effectively and collectively save the most amount of energy and water for the United States. We believe that S. 1971 provides the perfect vehicle for obtaining this information on a national level and beginning to develop regional and national databases of energy and water use. (Electronic copies of A Blueprint for Action can be downloaded at the following link: www.allianceforwaterefficiency.org/blueprint.aspx.)

Subsequent to the publication of A Blueprint for Action and following one of the report’s specific recommendations, the Alliance for Water Efficiency created in 2011 a water-energy research committee composed of 43 energy and water experts from all over the US, and this group convened regularly to share reports on the latest water-energy research work. In 2013, the Alliance for Water Efficiency catalogued the available primary research that had been already been undertaken, and assembled links to over 200 publicly-available primary research documents that are now posted in a 44-page online database and summarized in a final report which we co-published in June, 2013 with ACEEE. (Both the database and the final summary report are at: www.allianceforwaterefficiency.org/Water-Energy-Research-Group.aspx.)

The published report listed 38 findings about the existing research as of June, 2013. Overall we found the following:

- Few detailed studies exist that audit embedded energy in water and wastewater systems, and no such assessments have been done at a regional or national level. What do exist are very high level assessments.
- Most of the available research has been published within the past 10 years.
- Public funding of research is needed to spur additional investigations of alternative clean sources of energy and water.

The report concluded with 13 recommendations for new research and policy actions on a national level which could be addressed with the passage of S. 1971:

1. Develop comprehensive studies and associated guidelines to conduct a detailed audit of embedded energy demands for an entire local, regional or national water/wastewater system for purposes to determining system optimization.
2. Assess technical and economic energy efficiency and demand response potential in water and wastewater systems and develop industry accepted guidelines for such studies on individual systems.
3. Identify and eliminate regulatory barriers to co-implementation of efficiency programs in the water and energy sectors.
4. Develop water AND energy industry-accepted Evaluation, Measurement and Verification (EM&V) protocols for use in efficiency programs.
5. Develop industry standards, protocols and business models for advanced biogas development programs and net zero facilities at wastewater treatment plants.
6. Conduct landscape irrigation equipment efficiency potential studies to support establishment of efficiency standards.

7. Identify rate structures, price constructs, and financing mechanisms that eliminate the disincentives of efficiency programs and alternative supplies use in the water sector.

8. Evaluate technologies and practices that can reduce the energy demand of desalination and lower its costs.

9. Continue investigations into the water energy tradeoffs of differing resource development & management choices that can better inform multi-sectoral integrated resource planning.

10. Develop technologies and protocols that can increase water use efficiency and reuse, support water supply switching, and reduce water quality impacts of power generation facilities and other energy fuels development.

11. Assess potential impacts to water supplies and quality of energy resource development, such as fracturing for natural gas and biofuels development; identify methods, practices and technologies that reduce or eliminate these impacts.

12. Develop supply chain and product embedded water-energy evaluations that inform consumers of the energy and water intensity of the products or services they buy.

13. Identify effective methods, forums, practices and other mechanisms for communication and engagement by the research and policy communities to ensure commercialization and adoption of research results and technological developments.

We wish to conclude our testimony by making three basic points:

1. Water efficiency is successfully saving the nation's water and energy resources and helping to defer expensive new capacity infrastructure

Federal plumbing product and appliance standards, in effect since the Energy Policy Act of 1992 and refined in subsequent legislation, have produced significant savings (see Table 1). The Alliance for Water Efficiency estimates that at least 18.2 trillion gallons of water savings for just toilets alone, equivalent to the 20 years of combined water use of the cities of New York, Chicago, and Los Angeles. EPA's WaterSense label, launched in 2006, has labeled nearly 11,000 products, the sales of which have resulted in 757 billion gallons and 101 billion kWh hours saved. EPA's work in this area is a significant achievement in a very short time, and the program deserves Congressional authorization and adequate funding.

2. Saving Water Saves Energy—and the benefits are documentable

California has been a leader in this area, having done the seminal research in 2005 which the Blueprint for Action recommends be duplicated nationwide. This work by the California Energy Commission showed that the amount of embedded energy in water and wastewater was in the range of 2,000 kWh to 20,000 kWh per million gallons of water produced (see Figure 1)*. Further studies completed by the California Public Utilities Commission clarified in more detail the extent of embedded energy in a variety of different water supply sources (see Table 2). Energy intensities for drinking water and wastewater treatment technologies were documented in pilot projects. Now these values can be productively used to estimate energy savings from future water efficiency programs which include a wide variety of measures, and which should not be limited to just hot water efficiency programs. An examination of how federal actions can promote research and program incentive funding into this area is desperately needed.

3. Research should be undertaken to examine the energy and water benefits from integrated approaches at the local level

In Boston, Charles River Watershed Association is leading highly innovative work to build new wastewater treatment plants that generate electric energy, capture thermal energy from the wastewater to heat and cool surrounding buildings, and reuse the treated water, ultimately returning the treated water to the ground to restore lost urban streams. CRWA anticipates using restored urban streams to spike housing and commercial development while actually providing new storage in the City for floods and droughts. The approach is truly transformative, providing renewable energy, reducing water consumption, and building community resilience. The potential for energy savings is significant: CRWA estimates at a minimum one megawatt of electricity each day for each million gallons of waste water treated. (That the approach will also restore the Charles River is an added benefit.) These types of innovative projects should certainly be explored and incentivized so that they can be replicated across the country.

*Figure has been retained in subcommittee files.

To conclude, we strongly support the passage of S. 1971 as a needed first step in coordinating federal activities in this important energy-water nexus area. We further recommend that a national policy be instituted to allow energy efficiency funding to be used for cold water conservation programs as well as hot water conservation programs because of the clear embedded energy benefits that this investment would provide.

Thank you for the opportunity to comment.

TABLE 1

Water Consumption by Water-using Plumbing Products and Appliances -- 1980 to 2012

Water-using Fixture or Appliance	1980s Water Consumption	1990 Requirement	EPAct 1992 Requirement	2009 Baseline Plumbing Code	2012 'Green Code' Requirement*	% Reduction in avg water use since 1980s
Residential Bathroom Lavatory Faucet	3.5+ gpm	2.5 gpm	2.2 gpm	2.2 gpm	1.5 gpm	57%
Showerhead	3.5+ gpm	3.5 gpm	2.5 gpm	2.5 gpm	2.0 gpm	43%
Toilet -- Residential	5.0+ gpf	3.5 gpm	1.6 gpm	1.6 gpm	1.28 gpf	74%
Toilet -- Commercial	5.0+ gpf	3.5 gpm	1.6 gpm	1.6 gpm	1.6 gpm	68%
Urinal	1.5 to 3.0+ gpf	1.5 to 3.0 gpf	1.0 gpf	1.0 gpf	0.5 gpf	67%
Commercial Lavatory Faucet	3.5+ gpm	2.5 gpm	2.2 gpm	0.5 gpm	0.5 gpm	86%
Food Service Pre-rinse Spray Valve	5.0+ gpm	No requirement	1.6 gpm (EPAct 2005)	No requirement	1.3 gpm	74%
Residential Clothes Washer	51 gallons/load	No requirement	26 gallons/load (2012 standard)	No requirement	16 gallons/load	67%
Residential Dishwasher	14 gallons/cycle	No requirement	6.5 gallons/cycle (2012 standard)	No requirement	5.0 gallons/cycle (ASHRAE S191P)	64%

gpm: gallons per minute

gpf: gallons per flush

**International Association of Plumbing and Mechanical Officials (IAPMO) Green Plumbing and Mechanical Code Supplement (GPMCS)*

TABLE 2
Retail Energy Intensities

	<u>KWh/MG</u>		
	Low	High	Mid
Local Supply Energy Intensity Defaults			
Local Surface Water	152	1213	682.5
Groundwater	906	2924	1915
Brackish Desalination	1415	1824	1619.5
Recycled Water	1072	3410	2241
Seawater Desalination	13800	13800	13800
Local Treatment Energy Intensity Defaults			
Coag, Flocc, Filtration	44	457	251
Microfiltration	220	718	469
Disinfection (Ozone)	168	272	220
Water Distribution Energy Intensity Defaults			
Booster Pumps			
Flat Terrain	48	60	54
Moderate Terrain	45	956	501
Hilly Terrain	379	1574	977
Pressure System Pumps	360	2569	1465
Wastewater Energy Intensity Defaults			
Wastewater Collection Pumps	2	455	229
Primary + Secondary	488	1622	1055
Primary + Secondary + Tertiary	1086	4531	2809
Microfiltration (incremental energy)	794	836	815
Reverse Osmosis (incremental energy)	1578	1595	1587
UV (incremental energy)	306	330	318

Source: "Embedded Energy in Water Studies, Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles." Prepared for California Public Utilities Commission by GEI/Navigant Consulting, 2010, Table 4-6, p 85.

Senator BALDWIN. Thank you, Ms. Dickinson. Thank you to all of our witnesses today.

As I said earlier I'm very delighted, in fact, that our committee is highlighting the critical relationship between energy and water.

In Wisconsin forward looking energy and water strategies are also driving economic development which is always very exciting. My State is home to, what is becoming, a world hub for water research in industry innovation in the Milwaukee region of the State. Both public and private entities in the State have partnered together to lead international conversations on fresh water management, treatment and efficiency. These efforts have been led by the Water Council at its Global Water center in Milwaukee.

That center is a water research hub and business accelerator for water related businesses. Members of the Water Council are involved in many aspects of the water/energy nexus. From breweries, which by the way are a big business in Wisconsin, that have reduced their water use and made their processes much more efficient to companies that are designing the next generation of highly efficient water heaters that reduce water use and energy consumption.

Dr. Pershing, I was pleased to hear your testimony and see the Department's focus on the energy/water nexus. It's obviously a broad topic with many implications across the economy. The recent white paper pointed out to a role that DOE will have with research and development.

In your testimony you also talked about the competency that you bring with regard to stakeholder engagement. So I'd like to hear more about how the Department will focus on this and will partner with existing institutions like the Water Council that I was just talking about which have already laid the ground work in establishing public/private partnerships that are so important to transferring research into commerce.

Mr. PERSHING. Thank you very much, Senator.

I had the opportunity to engage with some of the folks at the Water group, the Council. They have a very interesting website. A lot of work, in fact, is going on there now. I did part of my work in Minnesota just across the way. So we have some of the same overlapping issues that play on both sides.

The DOE work, I think, fits nicely into a couple of categories. Part of what we bring to the table is this really deep capacity in technology development and support and that crosses an enormous array of issues. On one end it's around how do you make efficiency improvements in water requirements?

As a number of the other panelists have suggested, efficiencies can be found in every sector of the energy system. The big one, obviously, is in withdrawals and pass through for cooling. So we've got technology R and D on how you can reduce that.

Now there are some tradeoffs. So for example you can either run it through your system (in which case you pass it back out and it's heated up a little bit) or you can consume it, in which case it mostly evaporates. The latter uses less water in terms of how much flows through, but it is then no longer available. It doesn't pass through to the next user.

So there's tradeoffs that you have to think about in that domain. Work that we are currently investing in is how do you use less to cool more?

But you can look at other sectors as well. Look at oil and gas. An enormous amount of water goes in.

The, kind of, rule of thumb number that you might think about, for every barrel of oil produced 7 to 8 barrels of water are required. That's a big number. You start thinking about what that implies in terms of opportunities to do better.

Could you do it for less water? What does that mean? What else could you use besides fresh water?

I lived in Alaska for a number of years. When I was there, we did sea water injection as part of oil extraction. We now use CO₂. These are very interesting, different kinds of models.

There are other ways to do this—ways to minimize your water requirements and really move forward.

Then to comment briefly on the other part of your question, how do you engage?

I'll give just two examples, but there's a legion. Many, many of them are done with interactions between players in the public and private sector.

States, many of your States, but all the ones on the committee here, have been very interested. There is a lot of work underway, with local players and actors. A great deal of work is underway from water utilities, and also power utilities.

There's an enormous amount of work in the private sector. People who make commercial profits out of this as well as in the public, civil society.

Our effort in developing this report and in going forward has been to engage as many of those actors as we can.

Senator BALDWIN. I think my next question will take more than my 40 seconds. So maybe we'll do another round. But why don't I yield right now to Ranking Member Murkowski.

Senator MURKOWSKI. Thank you.

I want to continue with you, Mr. Pershing, just for a moment. I have welcomed your report out of DOE and others have as well. I think it does a pretty good job in terms of summarizing where we are, the relevant issues.

You talk about some of the technological innovations that are out there and how working together with related R and D we can promote some of these efficiencies that, I think, will be that breakthrough whether it's for the oil and gas industry or whatever it might be.

But as I mentioned in my opening statement what we haven't clearly identified is what that path forward is then on how the Department would implement an energy/water nexus R and D program. You've mentioned that you've got a technology research portfolio analysis that will address the risk performance targets, impacts, R and D pathways and learning curves.

Is this something that is being outlined in this next step forward? Just a little bit of a discussion here, if we may, about how we can implement this R and D initiative that we're all talking about.

Mr. PERSHING. Thank you very much.

I think that there are two different parts where I'd like to frame for you the way we're thinking about it.

The first one really has to do with data. I think a number of us have commented on this particular question going forward. I am struck in the work that we've done so far on how difficult it's been to even really get a good handle on the data. Exactly where is the energy going? Exactly where is the water going? How do we understand it regionally? How do we understand it by technology?

I think we need much more work on data. We have some institutions that collect some. It's not comprehensive. It's not longitudinally very good. It means you don't have long timelines for it.

We don't do a very good job about projecting what that might look like in the future—which means some modeling capacity. How do you think about where it's going to go?

I think that's been very clearly identified as a big gap in our work. We think we have to pursue that direction.

The second is a different box—really are about technologies and to a certain extent they're contingent on the first one.

If we make some decisions, collectively, around what kind of energy system we might have, we will make certain other decisions about its water implications. So for example, at the moment we

have these enormous new reservoirs of gas coming into the system, really opening up windows of opportunity for the country. We have a very great interest in all the new capacity we've got on renewables.

Both of those open up questions around water demand. We can begin to look specifically at the technologies that could minimize that demand in those systems.

So we're looking at those two tracks. I don't mean to limit to those two technologies. But broadly, the technology opportunities that you can take to really reduce consumption and the data and the data structure. I think both of them really require more work.

This report begins to lay out issues, barriers, vulnerabilities. Where we are now is in designing next steps and recommendations.

Senator MURKOWSKI. Comparing what you're outlining and what Mr. Iseman mentioned, you've got a water census that you're working on. So much of what it appears we need to do in addressing these data gaps is it may be that we don't have the gaps there. But we just don't know what you all are doing in DOI verses what you are doing in DOE which brings us back to this need for collaboration in a way that takes us outside of our silos.

This has been the struggle. This is not unique to this issue. This is something that is endemic to our systems here.

But it seems to me that this is an area where if we can truly work to be sharing more of what is going on with one another. We're not reinventing. We're building off of the data that we acknowledge may not be 100 percent. But if we take what you have been building and what you have been building, we might get there a heck of a lot quicker.

I worry about whether or not what we're doing is sufficient and that was the impetus for this NEWS Act, to try to get all of the relevant stakeholders working together.

In the next round here I think I want to talk a little bit more about this whole governance aspect of it because if we can't figure out how we do that then we're going to continue to operate in our silos, collecting our data and thinking well, we got about 75 percent of it here. But we can't get any more.

So when we talk about what that path forward is for the Departments I really do hope that we can coalesce more around some genuine partnering that takes us outside of our usual comfort zones, I guess.

Senator BALDWIN. There are a number of companies, I guess there's a theme for my questions which are things happening in Wisconsin. That's not unusual for me. But there are number of companies that are working on innovative ways to process waste water in the State to reduce the energy used in that processing.

One company in my hometown of Madison, called AquaMost now makes a low energy, water treatment system specifically to recycle the waste water in oil and gas processing. This reduces the water used in hydraulic fracturing and also reduces the energy used to produce natural gas.

On the residential and community side, the city of Milwaukee has set a goal of using renewable energy for 100 percent of the energy needs in waste water treatment. They're doing so by using anaerobic digesters and methane from a local landfill.

I'm interested in hearing from the entire panel on what types of barriers exist to the adoption and development of these types of technologies. We've just been talking about the limitations of information and data. So please, since all of you have referenced that in your testimony, feel free to identify that or elaborate on that. But what sort of additional information would help drive this sort of innovation that we're seeing and improve the efficiencies that are being delivered by products like the ones that I was just referencing.

Dr. Pershing, why don't we start with you and get a couple of comments from each of our panelists?

Mr. PERSHING. So thank you very much.

I don't know this particular company. But there is other work like it underway. So I'll kind of draw from that broader example.

I think it's an enormously promising area of work. Some of the DOE activities, in fact, specifically are designed around at looking at waste water and waste water treatment and the energy sector component of that. How you can manage that.

So let me turn to the other question because I think there is technology unfolding—and I see barriers falling into a couple categories.

One, it tends to be higher cost. At the moment many times what you've got is a conventional supply that can provide energy at an assured rate with guaranteed performance. You've got this new technology which frankly has somewhat different risks attached to it.

Two, you often have a process in which the company that's seeking to make the investment doesn't have a privileged position. It's already looking at an existing relationship. So how do you manage to move into that kind of arena? The existing one may be working perfectly well, right? So it has a different set of characteristics, but it's doing fine.

Three, we tend not to value some of the things around water costs the same way as we do around energy. So if we take a look at the relative rank ordering as a business matter, its often about prioritizing by price and price right now is much more focused on my energy costs than on water costs.

As a business, if I can find ways to think about these connections differently, perhaps I'd change that, but that requires a very different approach than we've ever sought to take. At the moment I don't see that as very likely for most jurisdictions.

Then finally there's the question about how this technology is maintained and run. I'm a business. I look out there at the world and I say nobody else is doing this. Do I want to be first?

If I can't manage my waste I have a really big problem in Milwaukee. If I can do it, I'm happy to be third or maybe fifth, once the technology has been proven.

So one of the things we think we probably have to do something about is on deployment. Create some models where its tried, and something where people could point to it and say it was used here, successfully, at a price I could meet.

That demonstration component is another part of what DOE can often bring to the table.

Senator BALDWIN. Mr. Iseman.

Mr. ISEMAN. Thank you.

I would first say two things.

That our two bureaus that I described, the U.S. Geological Survey and the Bureau of Reclamation are both doing work on waste water disposal and waste water treatment. I agree that it's an important area of opportunity. A lot of work is focusing on better technologies, ways to reduce the costs and energy associated with waste water treatment. So it's consistent, I think, with what you described for those farms in Wisconsin.

I think Dr. Pershing did a great job of identifying some of the barriers.

I would just go to the point about cost. I think one of the things we see and particularly in the Western United States is there's more demand or more scarcity for water supplies. We're going to see an additional driver to improve some of those treatment technologies.

Senator BALDWIN. Dr. Carter.

Ms. CARTER. Thank you for the question.

Similar to Mr. Iseman, there are actually a lot of opportunities. So yes, there are barriers, but we're actually seeing an energy sector. A lot of these technologies are already adopted.

We have seen significant changes in how unconventional gas in say, the Marcellus, is being developed using reused water, using some of these technologies to treat it for a second time in a fracking operation as well as treatment processes for the water that's produced from those operations.

So we're actually, not just—we don't just have barriers. We actually see some adoption especially in the rapidly changing energy sector.

Similar to what Dr. Pershing said, I think there are also opportunities for demonstration including some demonstration facilities that the Bureau of Reclamation has. But there are also a lot of opportunities internationally that are happening for demonstration. But getting—those are fairly competitive to get to participate in some of those. So I think there—you do hear companies identifying that demonstration is sometimes a barrier.

Then as more attention is given to the energy/water nexus and the potential risks and vulnerability it represents than you are actually seeing more interest as well. So I think the barrier, in part in the past, had been education and understanding and that is starting to diminish.

Senator BALDWIN. Thank you.

Ms. Ray.

Ms. RAY. OK. I think I'll address most of the technologies associated with the thermoelectric which also you have in Wisconsin as well.

Senator BALDWIN. OK.

Ms. RAY. So I think the biggest issue is there's not a one size fits all. There's not a silver bullet for solving these issues.

On the thermoelectric side you've got the cost issues, the retrofits verses the technologies that are primarily for new installations and that goes for water treatment as well as for power, thermoelectric power plants.

You've got efficiency penalties. How do certain fans, if you're using fans, what the penalty for the amount of electricity that they're using verses what that power plant may be producing?

You've got local synergies. For instance you mentioned the methane gas that they were burning. If you have those co-located that provides a tremendous benefit that someone else in another facility wouldn't have.

Then finally the footprints that are required. Sometimes there just physically isn't enough, like for air cold condensers that you may put on to do dry cooling for a thermoelectric plant or a data center or a refrigeration type of industry.

So I think the biggest issue is there's lots of technologies out there. They all have their benefits. But they all have tradeoffs associated with reliability, penalties, environment safety. You're going to have to find some kind of a model that says how can I plug and play what's best for my facility in this county, in this city.

Senator BALDWIN. Thank you.

Ms. Dickinson.

Ms. DICKINSON. This is a great question because it encapsulizes all of the issues involved in the research that I think this bill would be directing these agencies to do.

I think you've had some terrific responses from the panel. I especially liked Dr. Pershing's barriers list.

But the thing about the barriers and the reason it would be good to catalog those and research the reasons for those barriers is that they are constantly changing. Yes, water prices are very cheap now. That is not going to be the prices of the future.

As we enter the area of scarcity and, you know, the incredible amounts of infrastructure repair and replacement that's going on in the water sector, you're going to see doubling and tripling of water prices which changes the economics of a lot of innovative solutions.

But I think the biggest thing I wanted to mention here is that there's not been enough integration of the solutions. We tend to take a problem and identify technology that fixes that problem rather than looking at it from a systems perspective which is why I mentioned the Charles River Watershed Association example because that's a very big attempt to solve a number of water issues all at once.

I think in the water/energy nexus it's not just about availability of water. It's about how that water exists in that ecosystem too.

So there are regulatory issues associated which are a barrier that I would like to add to Dr. Pershing's list. Sometimes from a regulatory perspective the new technology is not allowed to function in the way that we would otherwise like.

So I really think this would be a great topic for the committee to be addressing under S. 1971.

Senator BALDWIN. Thank you very much.

Senator Murkowski.

Senator MURKOWSKI. Good. That was good feedback.

Let me try to drill down just a little bit more with the data gaps and the recognition that within the Departments you've got work that is ongoing and, you know, how we can better collaborate within the Departments, I think, is important. But we also have the

private sector side and a recognition that there's a great deal that is happening on the ground, out in the marketplace. Again, a source for taking that data and then as we work together really building on it.

But there are barriers there. There's certain sensitivities, I think, that folks have in not wanting to share some of this data. So I guess I direct this to you, Ms. Ray and Ms. Dickinson.

What can we be doing from your perspective to encourage greater collaboration and efforts when it comes to how we deal with the data gaps that we recognize exist here?

Ms. RAY. So, let me mention that we all know that research is very, very costly and money talks. So when there's an opportunity to leverage data and resources so that everybody can share those people will pay attention.

But let me give you an example of a sharing opportunity that EPRI had with DOE, not in this particular area. It was actually in nuclear, long term operations. We had a memorandum of understanding in which we specifically set periodic times to compare data and research in that particular area. So that we could say we wanted to avoid duplication. We wanted to take advantage of each other's scientific and technical expertise and as well as looking at joint objectives.

So there was an opportunity to pull that data together and do it in such a way that it did not lend to disclosing proprietary information that EPRI had with its utility members. So there are mechanisms out there. I think people want to see an ability to leverage and avoid duplication because it's in no one's best interest to have silo data sets.

Senator MURKOWSKI. Did you want to add anything, Ms. Dickinson?

Ms. DICKINSON. Yes. I'm particularly interested in the embedded energy and water issue. In that respect there are water systems all over the country that probably have data within their systems. They can read their electric bills, figure out what their embedded energy footprint is for their different water supply sources.

But they don't have a vehicle for sharing that information with a broader network. I think the data is out there. I think it needs to be assembled. I think there could be partnerships that could easily be developed that wouldn't be very costly to get some of this information that, I think, would be needed to be aggregated on a regional basis and a national basis.

So I suspect that the data is available in places that we just need to go and ask for it.

Senator MURKOWSKI. Let me ask the question then about governance and the structure as we've outlined in the legislation here.

We'll start with you, Dr. Carter on this.

I do appreciate you've worked well with our staff on this. We really appreciate the efforts that you have given in this. When we're talking about what the ideal structure of this NEWS Committee might look like, the type of interactions that we have between the principals, between the other stakeholders there, the internal, external.

Do you have anything further that you might want to share with the committee in terms of how we do all of what we've been talking

about here, better integration of the data that is out there, better collaboration, not only within agencies, but with our private stakeholders as well?

Mr. Iseman, in your testimony you have raised concerns about this cross cut budget.

Dr. Carter, you have as well.

It seems to me that that's something that we have the ability to produce a cross cut budget. We've done it with the Cal Fed law that this committee enacted several years ago. So you both raise concerns in that area.

Talk to me a little bit about why you think that wouldn't work? We're trying to figure out a way that we've got some light to, kind of, shine on what's going on out there and thought that that might be the approach.

So if both of you can address that aspect of it?

Ms. CARTER. Thank you, Ranking Member Murkowski.

I'll start with the second question.

Senator MURKOWSKI. OK.

Ms. CARTER. So cross cut budgets can and have provided a useful function. It is the crafting of them that can make them easier or more difficult to assemble. So it is, I'd say, that the comments were meant to indicate items that may be harder to implement, not necessarily that there would not be a utility for that.

Actually DOE is a good example of where there would be a utility. If you look at DOE's FY'15 budget request it says that it has a cross cutting initiative for energy and water. But it does not identify how much is going to be spent on that initiative.

So what a cross cut would do would reveal that information that the agencies may already know or may have to do some data collection to know. But—and they're the only ones who can produce that data. So cross cuts can produce very valuable information that would not be otherwise available.

But it's trying to figure out how to do it. Especially since it will be an annual cross cut budget that is easily assembled and easily produced and provides the most useful information for those trying to make decisions based on that which will take me to the first question regarding the governance.

So the placement of the NEWS Committee within the NSTC is putting it with the other entities with similar goals which is basically to have the Administration coordinate among the Federal research and development enterprise. Usually the Administration—this is an entity that was created by Executive Order and that it does these—it creates committees and subcommittees and disbands them as need be. In this case Congress is saying this is a need.

This is what they typically do is they try to coordinate strategies to identify goals. Then they do sometimes produce reports. But often we probably don't see what these committees are doing. Often it is those discussions among the 13 identified agencies that is producing some of the integration and results.

Often, my understanding is that, OMB will contact these committees and subcommittees for advice on whether the budget that they are proposing is consistent or not with what the subcommittees and committees have developed.

Senator MURKOWSKI. Mr. Iseman.

Anything at all. So speak to the governance aspect of it as well.
Mr. ISEMAN. Sure, sure.

I'll start with a cross cut budget. I just wanted to thank you for the question. I agree with your premise.

I think it was you who stated in your opening remarks and also I think it's the premise of the bill that there are a lot of these energy/water activities happening in different agencies within Interior and across the Federal Government as well as with the private sector and with the States. In order to do a better job of coordinating that and to do it efficiently we need to understand exactly what those activities are. So I think it's right that we want a better understanding of what's happening across the Federal agencies in terms of energy and water activities.

One of my specific concerns about the cross cut budget was the definition of an energy/water project and just making sure that that's narrow enough that we get something that's useful when we look to gather these activities across the Federal agencies.

I think one of the things that we've looked at and we've talked about how the energy/water nexus touches on all these issues is that it can sweep in a lot potentially. We want to make sure that we get at those issues and activities that are really addressing the intersection of energy and water in order for this survey to be useful.

In terms of the governance.

I'll just say that we would like to continue to work with the committee. We've appreciated your efforts and the efforts of the committee staff to engage with us and to have a conversation about how to structure this coordination.

We agree that this is an important issue. We do need more conversations among the Federal family and with partners. We would like to continue to work with the committee and your staff to determine the most effective way to do that.

Senator MURKOWSKI. I think that's truly the goal here. The design of this legislation is to figure out how we can be more effective, be more efficient with the collaboration and the program management.

Mr. Iseman, both you and Dr. Pershing have indicated that from whether it's Department of Energy or Department of Interior's perspective that you're continuing to review the legislation. I would ask that you continue to work with us on this.

I think that it is an issue that we can talk about here with great interest in terms of what's going on with the technologies. But as several of you have raised the issue of access to water and the affordability of that is one that, I think, we have a tendency to take for granted. In particularly areas in the South and Southwest right now that are experiencing drought, they know that you can't take it for granted.

So many aspects of industry as has been noted, this is a pretty intense part of the business. Things are such that we just cannot continue to assume that unlimited quantities of affordable water will be available to us. So how we work smarter, how we work more efficiently is really the challenge to us all.

I think we've got some good constructive ideas and approaches here. But I would ask you all to continue to engage with us as we try to develop this further.

With that, I'm done. I just want to thank the witnesses for, not only your testimony here this afternoon, but your very obvious engagement and input on an important issue.

Thank you.

Senator BALDWIN. I want to join the Ranking Member in those sentiments. Thank you for being here. Thank you for your testimony.

With, there being no further questions, the testimony and any statements we receive related to today's hearing will be made a part of the official hearing record.

We will also keep the record open for an additional 2 weeks to receive other statements and additional testimony.

With that this hearing is adjourned.

[Whereupon, at 4:33 p.m. the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSES OF TOM ISEMAN TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. In the NEWS Act, as in my energy-water nexus whitepaper, I call for better and closer collaboration with external stakeholders—and especially with the private sector—to promote and develop innovative and advanced technologies and scientific tools for water for energy and energy for water systems. Could you please share with us the current state of affairs and how would you envision expanding and enhancing such collaborations?

Answer. The Department of the Interior (Department) shares the Committee's goal of close collaboration with stakeholders around the energy-water nexus. Several existing programs and activities that relate directly to the energy-water nexus within the Department are focused on collaboration with states and non-federal entities. For example, the Bureau of Reclamation (Reclamation) is conducting Basin Studies to evaluate water supplies and demands over time, including under climate change, and to identify adaptation strategies to meet future water demands. The Basin Studies are cost-shared and co-led by state and local stakeholders and have spotlighted emerging clashes between competing demands, including energy, and limited supplies of water. Additionally, WaterSMART Grants provide cost-shared funding to States, tribes, and other entities with water or power delivery authority for water efficiency improvements, with a priority for those proposals that describe the estimated energy savings from those improvements. These grants provide one vehicle for implementing on-the-ground solutions to energy-water issues.

Likewise, through the Cooperative Water Program and other activities, USGS is supporting state priorities in better understanding water budgets associated with unconventional oil and gas development. One recent example of USGS working with state geological surveys, academia, and industry to build better tools for the water for energy and energy for water systems referenced in your question is the compilation and release of an updated produced waters database. Produced waters are those volumes of water that are typically recovered during oil and gas exploration, development, or production. This database is an update of the 2002 USGS Produced Waters Database, adding more than 100,000 new samples with greater spatial coverage and from both conventional and unconventional oil and gas development. Scientists studying produced waters and their geochemical and environmental impacts have a powerful new tool in the newly released USGS Produced Waters Geochemical Database. This database is publicly available to all scientists and interested members of the public.

As mentioned during the roundtable convened by the Committee in July 2013, states play a key role in allocating and administering water, and they must be a partner in energy-water efforts. Although the base grants program is under spending pressure, we see an opportunity to engage the state Water Resources Research Institutes (WRRIs) as a federal-state bridge. WRRIs exist in every state, they have relationships with local players, and they have a strong functional relationship with USGS. WRRIs could serve as a local hub and contribute to a national, USGS-managed database on water use and its intersection with the energy sector.

Question 2. As we've heard today, the DOE and DOI have been working together in the past on data collection related to, for example, hydropower development in the U.S. and perhaps on other issues as well.

How do you envision the expansion of such collaborative efforts in the near future, given that the NEWS Act calls for the Secretaries of Energy and Interior to work

closely together as the co-chairs of the proposed Nexus of Energy and Water for Sustainability federal coordination committee (the NEWS Committee)?

Answer. Expansion of collaborative efforts could be accomplished through the Department expanding direct collaboration with the Department of Energy (DOE) and the energy sector. Currently the Department collaborates with DOE on the collection of consistent information on withdrawals of water for use in thermoelectric power plants. We need to find more effective ways to link DOE's detailed information on the status and trends in energy production with comprehensive information on water supply and use. The DOE-funded project with the Western Governors' Association provides a leading example of integrating energy and water information to shape regional decisions.

Coordination often occurs on a project-by-project or as-needed basis. This process allows for coordination around the full array of energy-water issues, not just within our two Departments but across the federal agencies that deal with the energy-water nexus.

Question 3. I understand that the Water Census activity under the WaterSMART initiative is meant to expand, improve and streamline data collection on water use in the U.S. Does water "use" include consumption as well as withdrawals? I know, for example, that the USGS currently only collects water withdrawal data.

Answer. Yes. The USGS defines water use in the following way: "...water use pertains to the interaction of humans with and influence on the hydrologic cycle, and includes elements such as water withdrawal, delivery, consumptive use, wastewater release, reclaimed wastewater, return flow, and instream use." (Page 49, USGS Circular 1344—Estimated Use of Water in the United States in 2005, Kenny, J.F. et al, 2009)

It is true that the USGS 2005 water use circular, referenced above, only provides water withdrawal information for the Nation, and the USGS has not provided consumptive use information since its water use circular for 1995, primarily because consumptive use is frequently not reported or is reported inconsistently from state to state. However, the USGS is reinstating consumptive use reporting for thermoelectric cooling water for year 2010 in a report that was issued in September 2014. This consumptive use information will be based on a model that the USGS has developed and published in a report entitled "Methods for estimating water consumption for thermoelectric power plants in the United States" (Diehl, T.H., et. al., 2013, U.S. Geological Survey Scientific Investigations Report [SIR] 2013-5188, 78 p.). That report (SIR 2013-5188) was released to the public in November 2013. The USGS is striving to reinstate consumptive use reporting for other water use sectors. Consumptive use information is important in water availability management and central to the energy-water nexus. The next sector of water use that we will tackle for consumptive use information will be the public water supply sector.

RESPONSES OF TOM ISEMAN TO QUESTIONS FROM SENATOR JEFF FLAKE

Question 1. In your testimony you raise an important issue regarding the role of states and state regulators with regard to both water supplies, which are largely governed by state water law, and energy supplies, which (at least for investor-owned utilities in Arizona) are overseen by state regulators. Yet, you note that S.1971 does not address this important state responsibility. How could this bill be improved to better account for the role that states play in regulating and managing water and energy supplies?

Answer. States play a key role in allocating and administering water, and the Department will continue to work with the states and other stakeholders in energy-water efforts. S. 1971 may be improved by directing the Committee to consult with states and stakeholders as it fulfills its duties.

Question 2. Given the Department of the Interior's role as trustee for Native Americans, I was surprised to see that your testimony did not include any discussion of how S.1971 would impact Native Americans. Arizona is home to 22 federally recognized Indian tribes and communities. It is critically important that any conversation about the energy-water nexus include those communities. For example, over the course of the last few years, EPA has sought to impose a regional haze plan on a power plant in Arizona that is located on the Navajo Reservation. The Bureau of Reclamation partially owns the plant. It uses the power output to pump water from the Colorado River to central Phoenix, where some of the water is used to satisfy Indian water settlement delivery obligations. Can you explain how the Department would represent the critical energy-water nexus issues as they relate to Native American communities, such as those in Arizona?

Answer. The Department recognizes and is fully engaged in its federal trust responsibility to Native American tribes. Native American communities are valuable

partners to the Department, and the Department is committed to working with tribes on a government-to-government basis. Reclamation is committed to actively seeking partnerships with Native American tribes to ensure that tribes have the opportunity to participate fully in the Reclamation programs that affect the development and management of tribal water and related resources. We have worked closely with the Navajo Nation and other affected tribes to address the energy-water issues you identify at Navajo Generating Station. If S 1971 is enacted, the Department would look forward to the opportunity to engage in a more systematic information and data exchange on energy-water issues with our tribal partners, as described under Section 3 of the legislation. Tribes would also likely benefit from the identification and documentation of Federal and non-Federal programs and funding opportunities called for in S. 1971.

Question 3. EPA is specifically mentioned among the departments and agencies that would be part of the coordinated effort outlined in S.1971. What role would the Department envision for the energy-water nexus committee relative to EPA's rule-making process, specifically EPA's promulgation of regulations that impact energy and water production and deliveries?

Answer. New water treatment, thermoelectric cooling, and other technologies have the potential to increase the array of options to protect the environment while also saving energy and/or water. EPA's current long term engagement with DOI and other interagency collaborators pursuing research into such technologies helps inform EPA'S rulemaking process.

Question 4. How does the Department believe the coordinated approach in S.1971 will enhance federal policy, as opposed to leading to another layer of bureaucracy?

Answer. The Department supports the type of coordination and data exchange called for in S. 1971 and already has a number of programs in place that involve coordination with other federal agencies to address the energy-water nexus, as discussed in the testimony. This ongoing coordination will continue to help close existing data gaps, provide a more systematic and comprehensive view of energy-water issues, and increase our understanding of water supply availability to benefit water and energy decision makers. As indicated in the testimony, the Department would need to more closely evaluate the commitments and reporting requirements in the bill and the additional resources that may be required to carry them out.

RESPONSES OF JONATHAN PERSHING TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. In the NEWS Act, as in my energy-water nexus whitepaper, I call for better and closer collaboration with external stakeholders—and especially with the private sector—to promote and develop innovative and advanced technologies and scientific tools for water for energy and energy for water systems. Could you please share with us the current state of affairs and how would you envision expanding and enhancing such collaborations?

Answer. We agree that consultation and ongoing communication with stakeholders is critical to understanding problems and identifying possible solutions across the energy-water nexus. The release of *The Water-Energy Nexus: Challenges and Opportunities* has encouraged the private sector, municipal actors, and other stakeholders to reach out to DOE. We have both been following up with those that have contacted us, and are also actively working to strengthen our relationships in the sector. Key entry points to the private and municipal community are industrial associations and research institutes. We are currently developing connections with organizations such as the Water Environment Federation (WEF), the Water-Environment Research Foundation (WERF), and the National Association of Clean Water Agencies (NACWA) to address opportunities in the water sector. Organizations in the energy sector (many of which have a longer history of collaboration with DOE), such as the Electric Power Research Institute (EPRI) and the National Electrical Manufacturers Association (NEMA), have recently highlighted their interest in water. DOE is further expanding its network by participating in relevant conferences. In the coming months, we are considering organizing several workshops on key topics as a follow-up to our report, and will use these as a further means of gaining insight from the private sector and others.

Question 2. As we've heard today, the DOE and DOI have been working together in the past on data collection related to, for example, hydropower development in the U.S. and perhaps on other issues as well.

How do you envision the expansion of such collaborative efforts in the near future, given that the NEWS Act calls for the Secretaries of Energy and Interior to work closely together as the co-chairs of the proposed Nexus of Energy and Water for Sustainability federal coordination committee (the NEWS Committee)?

Answer. DOE and Department of Interior (DOI) have complementary roles and interests. The two agencies are currently working together in a variety of areas. For example, the U.S. Geological Survey (USGS) is working with the Energy Information Administration (EIA) to improve water consumption data in electricity generation. DOE shares an interest in the beneficial use of produced water with the Bureau of Reclamation. We are exploring opportunities to collaborate on the development and use of hydrologic models. DOE and DOI are also collaborating with other agencies. For example, A Memorandum of Agreement (MOA) is in place among DOE, DOI, and the Environmental Protection Agency (EPA) on unconventional oil and gas development. In addition, DOE, DOI, and the Army Corps of Engineers (ACE) have an MOU on hydropower.

Question 3. The NEWS Act calls for a strong research and development component of any federal coordination effort to advance scientific and technological innovations to increase the efficiencies and reduces the costs of innovative energy and water related technologies. It appears that the recent organizational changes at DOE that brought together the Science and Energy related programs under one Undersecretary for Science and Energy present a unique opportunity to do just that. Can you please share your views on that, and specifically, on the role ARPA-E can play—particularly if the current nominee to head ARPA-E, Dr. Ellen Williams, who has demonstrated a strong interest in the energy-water nexus issues in her former role as BP's Chief Scientist, is confirmed?

Answer. DOE's Office of Science, Energy program offices, ARPA-E, and the Office of Energy Policy and Systems Analysis (EPSA) have all played important roles in DOE's recent water-energy work. Moving forward, DOE anticipates that the various offices will continue to work together productively.

Technology innovations that reduce costs and improve efficiencies are often the result of focused research and development that builds on fundamental research. Both fundamental and applied sciences also inform a full range of modeling and analysis needed to support understanding and inform decision-making. The Water-Energy Nexus: Challenges and Opportunities lays out possible next steps in all of these areas. DOE's new organizational structure made it easier to recruit authors for this report from both the Office of Science and several Energy program offices. EPSA also provided leadership for this cross-cutting work.

RESPONSES OF JONATHAN PERSHING TO QUESTIONS FROM SENATOR JEFF FLAKE

Question 1. EPA is specifically mentioned among the departments and agencies that would be part of the coordinated effort outlined in S.1971. What role would the Department envision for the energy-water nexus committee relative to EPA's rule-making process, specifically EPA's promulgation of regulations that impact energy and water production and deliveries?

Answer. New water treatment, thermoelectric cooling, and other technologies have the potential to increase the array of options to protect the environment while also saving energy and/or water. EPA's current long term engagement with DOE and other interagency collaborators pursuing research into such technologies helps inform EPA's rulemaking process.

Question 2. How does the Department believe the coordinated approach in S.1971 will enhance federal policy, as opposed to leading to another layer of bureaucracy?

Answer. Existing interagency coordination processes provide mechanisms for agencies to work together on topics where they have a shared interest. In most relevant areas, collaboration and coordination are already taking place. For example, there is an MOA among DOE, DOI, and EPA on unconventional oil and gas development and an MOU on hydropower among DOE, DOI, and the Army Corps of Engineers (ACE). In addition, there is collaboration between USGS and EIA on water consumption data in thermoelectric generation.

RESPONSE OF NICOLE T. CARTER TO QUESTION FROM SENATOR MURKOWSKI

Question 1. As we try to address the recurring drought conditions across the nation, could you discuss your views on the obvious and not so obvious links between the energy-water nexus issues and water shortages and mitigation strategies? How can S. 1971 address these links?

Answer. Drought Exposes the Value of Decoupling Energy and Water Systems.—Drought exposes how dependent activities and populations are on water. It is often during drought when the economic, social, and environmental value of available freshwater is highest. That is, scarcity, including scarcity caused by drought, often drives up the value of water in all its uses. Therefore, the value of decoupling en-

ergy sector activities and processes from freshwater often pays off most during drought.

Water Shortages Often Tighten the Links of the Energy-Water Nexus.—Some activities negatively impacted by drought can be offset by activities in other regions not experiencing drought (e.g., corn, wheat, hay, and cotton production), while other water uses are harder to reduce quickly or substitute, such as drinking water, water for other public health and safety needs, and in-stream flows for ecosystems and species. Technologies exist to augment municipal water supplies during a drought, but some of these technologies are particularly energy-intensive, such as standard desalination technologies (reverse osmosis dominates desalination in the United States). That is, desalination, which may produce one of the most drought-resilient supplies, also is among the most energy-intensive forms of municipal water supply. Numerous innovative desalination technologies, energy recovery technologies within desalination facilities, and combined desalination and renewable electricity generation may provide opportunities to reduce the energy inputs associated with desalination, thereby increasing its appeal during drought as well as under normal water conditions. Other water supply augmentation options such as long-distance water transport also can consume significant energy depending on the amount of pumping required. For the electricity sector, less water-dependent cooling may allow power plants to avoid generation curtailments that would otherwise result due to water withdrawal limits during low flows. Available dry and hybrid power plant cooling technologies often are more expensive and less efficient at cooling than the more water-intensive cooling technologies currently used.

Science and Technology Can Reduce Barriers and Expand Options for Decoupling Energy and Water Systems.—S. 1971 would require the creation of a National Science and Technology Council committee (or subcommittee) to coordinate federal energy-water nexus science and technology activities. The Committee would guide how the federal research and development enterprise can address energy-water nexus challenges, including activities aimed at improving water-efficient power plant cooling and reducing energy requirements for desalination, water treatment, and water transport. Advancements in technologies relevant to the energy-water nexus may assist to reduce energy and water demand and disruptions during drought, thereby creating more resilient water and energy systems and sectors. While S. 1971 makes no specific mention of drought, science and technology that allow the energy sector to reduce its demand for water may be most valuable during a drought. The science and technology that would be guided by the NSTC Committee created by S. 1971 may improve drought resilience by reducing the water demand of the energy sector over the long term. Through inclusion of federal entities like the Department of Agriculture and the National Oceanic and Atmospheric Administration within the NSTC Subcommittee, S. 1971 would appear to provide a forum for identifying how guided federal science and technology investments can effectively address the energy-water nexus to further drought mitigation.

Drought Resilience is Determined by Both Long-Term and Drought-Specific Actions.—Responding to drought is not only defined by the actions and policies undertaken in midst of a drought, but also by the actions and policies that determine investments, decisions, behavior, and trends over the long term. Therefore, it is not just the technologies, action, and programs specific to drought that constitute drought mitigation, but also the science, actions, and programs that establish the long-term trajectory of water use that influence local, regional, and national resilience to water shortages.

RESPONSE OF MARY ANN DICKINSON TO QUESTION FROM SENATOR MURKOWSKI

Question 1. Your organizations have done quite a bit to better understand the implications the energy-water nexus has for your members from the electric and water utilities, research community, and others. In my energy-water nexus white paper from this past May, I recommend that we ought to take a serious look at establishing an external organization, such as a foundation, to implement a robust multi-stakeholder energy-water nexus program. The thought is that such a congressionally-mandated organization could raise private money to support collaborative efforts between all stakeholders, both private and federal. Can you please share your thoughts on this?

Answer. The Alliance for Water Efficiency shares the view expressed in the White Paper that “a national platform be established for exchanging information, data collection, dissemination and standardization; identification of innovative technologies and methodologies, including best practices and deployment incentives, and innova-

tive RD&D projects.”¹ We identified the need for such a platform in our Blueprint for Action report² where we highlighted the need for coordinated national and state actions in the areas of policies, best practice programs, codes and standards, and research. In the report, we identified eight thematic areas that would benefit from the creation of such a platform to coordinate these activities:

1. Increase the level of collaboration between the water and energy communities in planning and implementing programs.
2. Achieve a deeper understanding of the energy embedded in water and the water embedded in energy.
3. Learn from and replicate best practice integrated energy-water efficiency programs.
4. Integrate water into energy research efforts and vice versa.
5. Separate water utility revenues from unit sales, and consider regulatory structures that provide an incentive for investing in end-use water and energy efficiency.
6. Leverage existing and upcoming voluntary standards that address the energy-water nexus.
7. Implement codes and mandatory standards that address the energy-water nexus.
8. Pursue education and awareness opportunities for various audiences and stakeholders.

The basic question is: How should this national platform be created and structured? Should it be developed and assigned to an existing federal agency such as the Department of Energy or the Council on Environmental Quality? Should it be a new public-private entity created by Congress for this purpose? Or should the new entity be entirely private and self-governed—perhaps a non-profit organization or a private foundation?

In our view, the answer is likely a combination of the above. Organizations already exist that are separately working on the energy-water nexus, particularly in the non-profit sector, although the work is largely uncoordinated at present. Federal agencies such as the Department of Energy and the Department of Defense already have activity underway on this topic. And foundations have started directing some of their philanthropy funding to climate change and energy-water issues. As an example, the Alliance for Water Efficiency’s energy-water nexus work was funded by the Turner Foundation and The Kresge Foundation. The Mitchell Foundation funds energy-water nexus research in Texas. In our view, the existing landscape of organizations should provide some good candidates. The Energy Foundation or the National Science Foundation, for example, would be great vehicles for national coordination of these issues and additional directed funding on this topic.

So if there are existing players out there already, why has this “platform” not yet happened? The reason is that there isn’t a coordinated focus or specific assignment to any one entity. Creating a brand new foundation might be one way to do this, since a Congressional mandate for creating such a foundation brings cachet and status for the energy-water nexus issue. But frankly there is nothing to prevent the existing organizations out there from doing it now. The fact is that the foundation world—and particularly the Energy Foundation—has been focused on funding other initiatives or only funding energy-water work in a very limited way.

In our view the platform activity would be best managed on a centralized basis by a federal agency such as the Department of Energy, working in tandem with a foundation such as the Energy Foundation for additional needed research funding. Creating a brand new separate foundation might work, but it does presume that there is significant opportunity for private donations. A model for this idea is the National Park Foundation, chartered by Congress in 1967 as the only national charitable nonprofit whose sole mission is to directly support the National Park Service. It does this by raising money from other foundations, from corporations, and from private citizens—and by all accounts has been highly successful in raising money to support the national park system.

However, we don’t believe that this same model for a private foundation to support energy-water nexus activities will work as successfully as the National Park Foundation does. There isn’t the same direct and emotional connection to the energy and water issue that people clearly feel for preservation of their national parks. The extent of individual citizen contributions will be very small. Corporate contributions

¹“The Energy -Water Nexus: Interlinked Resources That Are Vital for Economic Growth and Sustainability”, White Paper published by US Senator Lisa Murkowski, May 2014

²Addressing the Energy-Water Nexus: A Blueprint for Action and Policy Agenda, Alliance for Water Efficiency and the American Council for an Energy-Efficient Economy, May 2011

will be more likely to occur, but it will need to be clear how the corporate donors may be involved in governance of the foundation and the eventual determination of the funded projects. An important consideration will be how to involve them without creating obvious conflicts of interest that might violate the IRS 501(c)(3) private foundation rules.

RESPONSE OF ANDA RAY TO QUESTION FROM SENATORS MURKOWSKI AND SCHATZ

Question 1. Your organizations have done quite a bit to better understand the implications the energy-water nexus has for your members from the electric and water utilities, research community, and others. In my energy-water nexus whitepaper from this past May, I recommend that we ought to take a serious look at establishing an external organization, such as a foundation, to implement a robust multi-stakeholder energy-water nexus program. The thought is that such a congressionally-mandated organization could raise private money to support collaborative efforts between all stakeholders, both private and federal. Can you please share your thoughts on this?

Answer. Thank you for your question regarding the establishment of a congressionally mandated external organization that could raise private money to implement a multi-stakeholder energy-water nexus program. I appreciate the opportunity to comment on this issue.

EPRI has extensive experience working with both public and private stakeholders at the energy-water nexus. I am pleased to share insights from this experience as they relate to the establishment of such an external organization.

EPRI was founded on a collaborative model in which members pool funds in order to advance a common research agenda for the public good. This model has worked well for over 40 years.

Because energy and water are critical to the very existence of our society, a collaborative approach is particularly important in the energy-water nexus space. Sustainable water resource management, for example, involves collaborative decision-making across multiple societal and economic sectors, including, energy, municipal, residential, agricultural and industrial stakeholders. A congressionally established external organization might find ways to facilitate cooperation, collaboration, and coordination around the energy-water nexus.

EPRI's collaborative model is strengthened when our work is leveraged with state and federal funds. However, no government funding is proposed for the establishment or operation of this external organization. Additional federal funds, with a focus on "leveraging" private/public resources, could help address research needs currently unmet by the private sector and take better advantage of private sector funding. Leveraging funds involves specific guidelines (for example, provisions addressing proprietary information), but also has the embedded flexibility to provide opportunities for a diverse set of co-funders including government agencies, vendors, academia, and non-governmental organizations.

Several questions are left unaddressed by the proposal in its current form. For example, who could do the work of the external organization (government, non-profits, private sector, all of the above)? Who would own any work created by the external organization? What would be the Scope of the foundation/external organization? What would it NOT be?

Again, I appreciate the opportunity to provide written comment for the record on this issue. Please do not hesitate to contact me if I can be of further assistance.

APPENDIX II

Additional Material Submitted for the Record

May 15, 2014.

Hon. MARY LANDRIEU,
Chair,

Hon. LISA MURKOWSKI,
*Ranking Member, Senate Committee on Energy and Natural Resources, 304 Dirksen
Senate Office Building, Washington, DC.*

DEAR SENATORS LANDRIEU AND MURKOWSKI:

The Alliance for Water Efficiency (AWE) and the undersigned organizations would like to express our strong support for S. 1971, The Nexus of Energy and Water for Sustainability (NEWS) Act of 2014, and we thank you for your leadership on this important legislation. This bill would provide direction for federal coordination of water and energy programs within the National Science and Technology Committee, specifically to coordinate and streamline federal activities related to the management of the energy-water nexus. Passage of this bill will be a critical step in promoting better joint management of these two important national resources beginning at the federal level.

AWE is a stakeholder based non-profit organization dedicated to the efficient and sustainable use of water. Our members and supporters include regional, state and local water utilities, plumbing, appliance, and irrigation manufacturers, governmental planning agencies, environmental and energy advocacy organizations, water-use experts, corporations and individuals—all of whom share an interest in promoting water efficiency and sustainability in the United States and Canada.

We are very interested in the energy-water nexus and have done considerable work in this area to highlight its importance. We stand ready to assist you in the successful passage of this bill.

Sincerely,

Alliance for Water Efficiency; Alliance to Save Energy; American Council for an Energy-Efficient Economy; American Standard; Amy Vickers & Associates, Inc.; Cahaba River Society; Center for Water-Efficient Landscaping; Ecoblue; Econics; Environmental Defense Fund; Global Water Policy Project; IAPMO; Kohler Co.; KWC America; Marin Municipal Water District; National Association of Water Companies; National Insulation Association; Neponset River Watershed Association; New York City Environmental Protection; Plumbing Manufacturers International; Round Rock, TX, City of; SeaCo Supply Corporation; Texas Water Foundation; Toto USA; Utah Water Conservation Forum; WasteWater Education; Water Demand Management; Waterless Co.; Western Resource Advocates; Woodcock & Associates, Inc.

STATEMENT OF DAN KEPPEN, EXECUTIVE DIRECTOR, FAMILY FARM ALLIANCE,
KLAMATH FALLS, OR

On behalf of the Family Farm Alliance, I write to express our strong support for S. 1971, the “Nexus of Energy and Water for Sustainability Act of 2014” (NEWS Act of 2014).

The Alliance is a grassroots organization of family farmers, ranchers, irrigation districts and allied industries in 16 Western states. Several of our members are mutual ditch and irrigation districts. The Alliance is focused on one mission: To ensure the availability of reliable, affordable irrigation water supplies to Western farmers and ranchers. S. 1971 calls for better coordination and management of relevant en-

ergy-water nexus activities across the Federal Government by establishing a clear mechanism for this purpose.

Western farmers and ranchers are concerned with the significant new overall power demands that are already being felt with demand growing in the future. The total water consumed by electric utilities accounts for 20 percent of all the nonfarm water consumed in the U.S. Vast amounts of water are used every day to produce vital fuels and to cool power plants in the United States. Without this water supply, most of our electricity would stop flowing and our economy and other essential functions would cease. At the same time, a great deal of energy is needed to treat, transport and convey water throughout the Western U.S., not only to support economic growth and well-being but also to sustain basic life. These inseparable links of “water for energy” and “energy for water” comprise the energy-water nexus.

The NEWS Act instructs the Director of the Office of Science and Technology Policy (OSTP) to establish a committee or a subcommittee under the National Science and Technology Council (NSTC) to coordinate and streamline the activities of all Federal departments and agencies on energy-water nexus issues. This new panel will be co-chaired by the Secretaries of Energy and Interior and will be tasked with identifying all relevant energy-water nexus activities across the Federal Government; enhancing the coordination of effective research and development activities (both on-going and in the future); working to gather and disseminate data to enable better practices; and exploring relevant public-private collaboration. The bill also calls for the Office of Management and Budget to submit to the relevant congressional committees a so-called “cross-cut” budget soon after enactment of this act. The cross-cut budget will detail various expenditures across the Federal Government related to energy-water activities and will greatly assist in coordinating and streamlining these activities and identifying and eliminating duplicative efforts to the extent possible.

This bill is expected to be “budget-neutral”. The NSTC is expected to utilize existing coordination mechanisms with minimal or no additional spending.

This is a very large mission, and we anticipate that it may be difficult to implement, due to the significant coordination that will need to occur, with a large number of entities. With that said, we believe this is an important bill, and the Family Farm Alliance urges your Committee to consider and pass this important legislation. I encourage you or your staff to contact me at (541)-892-6244 if you have any questions.

STATEMENT OF MELISSA MEEKER, EXECUTIVE DIRECTOR, WATERUSE ASSOCIATION,
ALEXANDRIA, VA

On behalf of the WaterReuse Association (WaterReuse), I write to express our strong support for S. 1971, the “Nexus of Energy and Water for Sustainability Act of 2014” (NEWS Act of 2014).

WaterReuse represents 400 organizational members, including water agencies and corporations throughout the United States who actively practice and support water reuse and recycling. Water recycling and reuse remains the one reliable and readily available new source of fresh water across the Nation, and we believe the reuse and recycling of water to be a key part of intelligent conservation and management of both energy and water resources that will help us meet the demands of tomorrow.

S. 1971 calls for better coordination and management of relevant energy-water nexus activities across the Federal Government by establishing a multiagency process for this purpose.

WaterReuse believes that we, as a Nation must focus on the relationship that energy and water have with one another in order to provide sustainable supplies of these important resources in the future. WaterReuse believes that overall energy demands will continue to grow, putting even more pressure on the limited water resources so important to the Nation, as large volumes of water are used daily in the production of electricity. In the United States, for example, the total water consumed by electric utilities accounts for 20-percent of all the nonagricultural water consumed in the U.S. At the same time, large amounts of energy are used to treat and move water to people, farms and factories. In our view, these two resources must be considered as connected in the planning and development of future sources of both energy and water supplies in order for the Nation to continue to grow and prosper.

The reuse and recycling of water must be considered a significant tool that can be used to manage both energy and water resources. In many instances, raw water supplies must be pumped, transported, and treated using tremendous energy resources in the process to meet water demands. This water is then used and treated

again, many times to be “thrown away”. By reusing this water, we can recapture the energy resources already invested by simply administering a final treatment and recycling this water back into the system to meet ongoing demands. This additional supply of recycled water can also conserve the energy used in transporting and pumping raw water by reducing and replacing the demand for that raw water. In summary, water reuse and recycling projects can conserve both energy and water by utilizing the water that is already on site and readily available.

WaterReuse supports the fact that the NEWS Act would coordinate and streamline the activities of all Federal departments and agencies on energy-water nexus issues. The Act would engage the Secretaries of the Departments of Energy and the Interior and task them with identifying all relevant energy-water nexus activities across the Federal government, including the Environmental Protection Agency, and enhancing the coordination of effective research and development activities. Also, the Act would require the Federal agencies to gather and disseminate data to enable better practices and explore relevant public-private collaboration. We believe the NEWS Act can provide new opportunities to conserve and manage our limited energy and water resources, as well as provide a streamlined, coordinated approach to energy-water nexus partnerships with the Federal government, especially in the areas of enhanced project funding and financing, and on the research and development of next generation water reuse technologies.

In conclusion, WaterReuse thanks you for your leadership on this important nexus, and urges your Committee to consider and pass this important legislation. I encourage you or your staff to contact me at (703) 548-0880 Ext. 102 if you have any questions.

STATEMENT OF EVAN R. GADDIS, PRESIDENT AND CEO, NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION, ROSSLYN, VA

The National Electrical Manufacturers Association (NEMA) commends you for advancing the important issue of the energy-water nexus.

As you know, power generation is the number one use of freshwater in the United States, accounting for roughly 201,000 million gallons per day. Similarly, water delivery is heavily dependent on energy in the extraction, treatment, and distribution of the water supply. Estimates of the amount electricity needed at the state level for the purpose of water processing can be as high as 19 percent of their total energy consumption.

NEMA and its 400-plus member companies manufacture more than 50 types of products that provide greater energy efficiency. For example, with the right combination of efficient motors, drives and motor control systems, NEMA members’ technologies can reduce both the energy needed and operating costs of treating and transporting water. These technologies are ready today and greater deployment of them will help to address the challenges associated with the energy-water nexus.

More specifically, S. 1971, the Nexus of Energy and Water for Sustainability (NEWS) Act of 2014 is an important step that will bring together government, industry, and other stakeholders to develop practical responses to the energy-water nexus.

We appreciate your efforts to bring greater attention to the energy-water nexus. NEMA and its members stand ready to assist you and your staff.

STATEMENT OF DAIN M. HANSEN, VICE PRESIDENT, GOVERNMENT RELATIONS, INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS

On behalf of The IAPMO Group, thank you for introducing S.1971, “The Nexus of Energy and Water for Sustainability Act of 2014.” The NEWS Act will institute a clear mechanism for interagency coordination across the federal government by establishing a committee devoted to identifying all energy-water nexus issues. Consequently, this legislation will provide a much-needed platform for collaboration among all stakeholders on relevant research and development efforts, enabling better practices. As an organization invested in resource conservation and the advancement of technology, we commend your efforts on this front.

The links between water and energy are undeniable, as the production of one resource is highly dependent on the utilization of the other. In fact, 86% of electricity in the United States is produced utilizing steam turbines in thermoelectric power generating stations—equalling more than 3.4 trillion kilowatt hours (kWh.) Additionally, more than 12 billion gallons of freshwater are consumed daily, cooling the power plants that produce the fuels upon which our economy relies. Conversely, vast amounts of energy and electricity are expended in the treatment and transportation

of water. The availability of life's most basic and essential need is greatly dependent upon large amounts of energy and it should be the top priority of our lawmakers to ensure its security.

Along these lines, I'd like to call your attention to the National Institute of Building Science's 2013 Report to the President of the United States. IAPMO chairs the Energy and Water Topical Committee for the Institute's Consultative Council and this year's report contains specific recommendations pertaining to the water-energy nexus, along with additional recommendations pertaining to energy and water efficiency. We welcome you to download the report at: http://c.yrncdn.com/sites/www.nibs.org/resource/resmgr/Files/NIBS_2013_AnnualReport_web.pdf.

Our need for water and energy cannot be avoided, but our use of them can be improved. The NEWS Act will encourage and foster an environment of open and continuous communication among all stakeholders, greatly enhancing research efforts and allowing for valuable knowledge and data to be shared effectively. This legislation will help us to secure our nation's resources for generations to come.

Thank you again for all of your work and introducing S.1971. We support this legislation and look forward to working with you to ensure its passage.

STATEMENT OF KEN KIRK, EXECUTIVE DIRECTOR, NATIONAL ASSOCIATION OF CLEAN WATER AGENCIES

The National Association of Clean Water Agencies (NACWA) is pleased to support S. 1971, The Nexus of Energy and Water for Sustainability Act of 2014 (NEWS Act), which recognizes the important connection between energy and water by creating a committee within the National Science and Technology Committee to coordinate and streamline federal activities related to the management of the energy-water nexus; the notion that all forms of energy production require water and that our use of water requires energy.

In many communities around the country, public wastewater utilities are the single largest consumer of energy due to the vast amount of power needed to move, treat, and reclaim millions of gallons of wastewater every day. This is not only resource intensive, it is expensive for the ratepayers who bear the costs. As such, improving energy efficiency within the wastewater sector is an absolute priority for NACWA's member utilities. Wastewater utilities can also provide recycled water for cooling sources. By embracing new technologies and cutting-edge practices, clean water utilities have become a vital partner in this country's work to manage our energy and water resources more efficiently, effectively, and affordably.

The energy-water nexus is a central to NACWA's Water Resources Utility of the Future campaign, which recognizes the important innovation occurring within the wastewater sector to help communities better manage their clean water needs. NACWA extends its thanks to you for your leadership in this area, and urges all Members of Congress to support this important legislation.