Statement of Mary Ann Dickinson
President/CEO, Alliance for Water Efficiency
Regarding S. 1971

For the Record of the Hearing of June 25, 2014
Subcommittee on Water and Power
Senate Committee on Energy and Natural Resources

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 re-use, 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.

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.

Tables and Figures Referred to in the Testimony

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%**

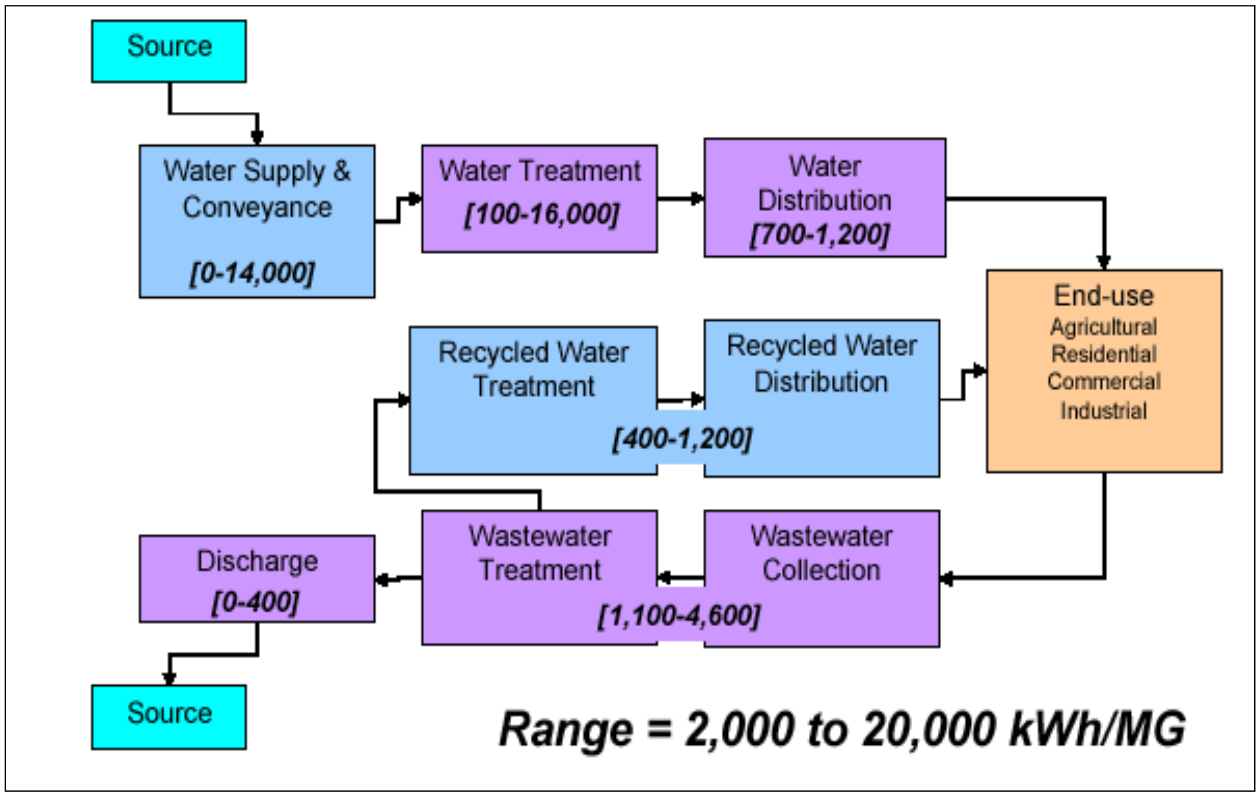
gpm: gallons per minute

gpf: gallons per flush

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

FIGURE 1

The Energy Intensity of Water



Source: *Integrated Energy Policy Report*, California Energy Commission, 2005.

TABLE 2

Retail Energy Intensities

	KWh/MG		
Local Supply Energy Intensity Defaults	**Low**	**High**	**Mid**
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.

Alliance for Water Efficiency Board Members

Carole Baker
Texas Water Foundation
Austin, TX

Gunnar Baldwin
TOTO USA, Inc.
Thornton, NH

David Bracciano
Tampa Bay Water
Clearwater, FL

Timothy Brick
Arroyo Seco Foundation
Pasadena, CA

Pete DeMarco
International Association of Plumbing and Mechanical Officials
Dayton, NJ

Richard Harris
East Bay Municipal Utility District
Oakland, CA

Kelly Kopp
Utah State University
Logan, UT

Zane Marshall
Southern Nevada Water Authority
Las Vegas, NV

Glen Pleasance
Region of Durham
Ontario, Canada

Jennifer Riley-Chetwynd
Denver Botanic Gardens
Denver, CO

Kirk Stinchcombe
Econics
British Columbia, Canada

Susan Stratton
Northwest Energy Efficiency Alliance
Portland, OR

Jeff Taylor
Freese and Nichols
Houston, TX

Deven Upadhyay
Metropolitan Water District
Los Angeles, CA

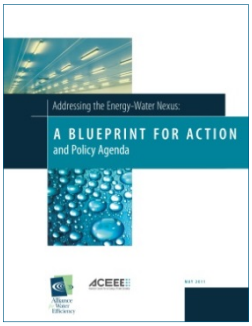
ALLIANCE FOR WATER EFFICIENCY
Water and Energy Resources

Alliance for Water Efficiency (AWE) Water and Energy Web Page

The AWE Water and Energy page provides information on the water-energy nexus. The page includes discussion on energy embedded in water, water embedded in energy, the AWE/ACEEE collaboration, and what utilities can do. The page also contains links to over 40 related resources.
www.a4we.org/water-energy-intro.aspx

AWE/ACEEE Water and Energy Blueprint for Action

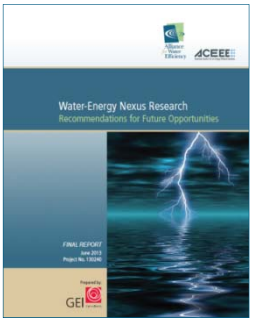
The blueprint provides a framework for collaborative action between the water and energy communities and addresses three broad elements: policy/codes, research, and programs. It was developed based on input from over fifty thought-leaders from the energy and water efficiency communities.
www.a4we.org/blueprint.aspx



AWE/ACEEE Water and Energy Research Work Group Web Page

(Includes meeting presentations)
As part of its collaboration with ACEEE, the Alliance for Water Efficiency assembled a working group to explore ongoing and prospective research regarding the water-energy nexus. The work group meetings consist of presentations and discussions that help promote, track, and understand water and energy research. All of the meeting presentations are posted for download on the work group page.
www.a4we.org/water-energy-research-group.aspx

AWE and ACEEE White Paper: *Water-Energy Nexus Research: Recommendations for Future Opportunities*



The AWE-ACEEE Water and Energy Research Work Group meetings culminated in a white paper that identified research needs that was released on July 9, 2013. The paper was produced by GEI Consultants, Inc. and vetted by the workgroup.
www.a4we.org/water-energy-research-needs-white-paper.aspx

AWE/ACEEE Database: Water and Energy Nexus Research

A database of existing water-energy research was produced in tandem with the AWE-ACEEE Water and Energy Research Work Group White Paper. The database lists over 200 reports and resources and includes a summary of key findings for each.
http://aceee.org/w-e-programs

AWE/ACEEE Report: *Tackling the Nexus: Exemplary Programs that Save Both Energy and Water*

AWE and ACEEE gave the first-ever awards for exceptional efficiency programs that save both water and energy. There were a total of 12 top programs including five exemplary award winners and seven honorable mentions. The details of the programs and lessons learned are contained in the report.
http://aceee.org/research-report/e131

AWE/ACEEE Report: *Saving Water & Energy Together: Helping Utilities Build Better Programs*

Recognizing the water-energy nexus in the planning of efficiency programs can help create a better understanding of the full benefits of efforts to reduce water and energy consumption. This report provides recommendations on program models and frameworks that utilities can use to save both water and energy.
www.a4we.org/saving-water-and-energy-together-oct-2013.aspx

The Alliance for Water Efficiency is a stakeholder-based 501(c)(3) nonprofit organization dedicated to the efficient and sustainable use of water. Headquartered in Chicago, the Alliance serves as a North American advocate for water-efficient products and programs, and provides information and assistance on water conservation efforts.

Alliance for Water Efficiency | 300 W. Adams Street, Suite 601, Chicago, Illinois, 60606 | 773-360-5100 | www.a4we.org, www.home-water-works.org