S. HRG. 111–1183

EPA'S ROLE IN PROMOTING WATER USE EFFICIENCY

HEARING

BEFORE THE

SUBCOMMITTEE ON WATER AND WILDLIFE

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

MARCH 31, 2009

Printed for the use of the Committee on Environment and Public Works

Available via the World Wide Web: http://www.gpo.gov/fdsys

U.S. GOVERNMENT PUBLISHING OFFICE

94–025 PDF WASHINGTON : 2015

For sale by the Superintendent of Documents, U.S. Government Publishing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED ELEVENTH CONGRESS
FIRST SESSION

BARBARA BOXER, California, *Chairman*

MAX BAUCUS, Montana
THOMAS R. CARPER, Delaware
FRANK R. LAUTENBERG, New Jersey
BENJAMIN L. CARDIN, Maryland
BERNARD SANDERS, Vermont
AMY KLOBUCHAR, Minnesota
SHELDON WHITEHOUSE, Rhode Island
TOM UDALL, New Mexico
JEFF MERKLEY, Oregon
KIRSTEN GILLIBRAND, New York
ARLEN SPECTER, Pennsylvania

JAMES M. INHOFE, Oklahoma
GEORGE V. VOINOVICH, Ohio
DAVID VITTER, Louisiana
JOHN BARRASSO, Wyoming
MIKE CRAPO, Idaho
CHRISTOPHER S. BOND, Missouri
LAMAR ALEXANDER, Tennessee

BETTINA POIRIER, *Staff Director*
RUTH VAN MARK, *Minority Staff Director*

SUBCOMMITTEE ON WATER AND WILDLIFE

BENJAMIN L. CARDIN, Maryland, *Chairman*

FRANK R. LAUTENBERG, New Jersey
SHELDON WHITEHOUSE, Rhode Island
TOM UDALL, New Mexico
JEFF MERKLEY, Oregon
BARBARA BOXER, California *(ex officio)*

MIKE CRAPO, Idaho
JOHN BARRASSO, Wyoming
LAMAR ALEXANDER, Tennessee
JAMES M. INHOFE, Oklahoma *(ex officio)*

C O N T E N T S

EPA'S ROLE IN PROMOTING WATER USE EFFICIENCY

TUESDAY, MARCH 31, 2009

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON WATER AND WILDLIFE,
Washington, DC.

The subcommittee met, pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Benjamin Cardin (chairman of the subcommittee) presiding.

Present: Senators Cardin, Crapo, Whitehouse, and Udall.

OPENING STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR FROM THE STATE OF MARYLAND

Senator CARDIN. Good morning, everyone. The Subcommittee on Water and Wildlife for the Environment and Public Works Committee will come to order.

I first want to acknowledge this being our first Subcommittee hearing on an extremely important subject dealing with water efficiencies. I want to acknowledge the support of Senator Boxer for allowing the Subcommittee to move forward with this first hearing on water efficiency, and thank her for her leadership on water and wildlife issues.

We are going to deviate for a moment. Senator Crapo, who is the Ranking Republican on the Committee, and we appreciate his attendance, has about three other places that he is supposed to be right now, including a markup on some very important legislation. So I am going to yield to Senator Crapo, and then we will move forward with the hearing.

OPENING STATEMENT OF HON. MIKE CRAPO, U.S. SENATOR FROM THE STATE OF IDAHO

Senator CRAPO. Thank you very much, Mr. Chairman. I appreciate your accommodation.

As things would have it, not only do I have this first hearing that is very, very important for me to work with you on, but I have a markup on legislation where I have one of the key amendments that I need to go propose, plus the Finance Committee is having a hearing, but the beginning of that hearing is going to be a tribute to Senator Baucus for his 30 years of service. So I am expected to be there, too. So I appreciate you understanding my time constraints.

I will just submit my opening statement for the record, but wanted to say publicly how much I appreciate working with you. We

have sat down and had discussed the agenda items that this Committee could and should be focusing on, and you and I are in agreement on the importance of these issues and the agenda which we will follow. I look forward to working with you.

To our witnesses, I have reviewed your testimony, and I hope I can get back for some question and answer period, but no matter how it turns out, I again want to thank you, Mr. Chairman, for your friendship and for working with me on this Committee.

[The prepared statement of Senator Crapo follows:]

STATEMENT OF HON. MIKE CRAPO, U.S. SENATOR
FROM THE STATE OF IDAHO

Good Morning. Thank you, Mr. Chairman, for holding this hearing today.

Before I speak on the topic of today's hearing and welcome our witnesses, I would like to briefly say that I have enjoyed our recent discussions on this Subcommittee's agenda for the 111th Congress and I look forward to our continued work together. I might also add that the only thing I am looking forward to more than a field hearing on the Chesapeake Bay is having one in Idaho, particularly near one of our many beautiful rivers with lots of fish.

Today's hearing will focus on promoting water use efficiency and how the Environmental Protection Agency can work with local communities in furtherance of that important mission. As such, I am pleased that we are being joined today by Dr. Michael Shapiro, the Acting Assistant Administrator for the Office of Water at EPA. I also welcome our other witnesses—Mr. Mehan, Dr. Shannon, Ms. Dickinson and Ms. Davis. I look forward to hearing your testimony and discussing this important issue with you.

A recent article in the Wall Street Journal discussed how some power companies are beginning to look at ways to meet energy needs while using significantly less water than had been used in the past, due to increasing concerns about water availability and its use. The article details how some companies are halting plans to build traditional power plants that require significant amounts of water because, in some States, water is a very limited resource. We know this all too well in the West, where water is considered the lifeblood of many local communities and economies and where population growth and increasing needs are making efficient use of this precious resource all the more important.

Issues of water efficiency are critical in Idaho, and throughout much of the Country. In Idaho's case, limited water availability, drought and wildfires make efficient use of water highly important. It will only become more of a priority as emergencies, needs and populations continue to grow and States and local governments continue to be hard-pressed by the economic situation that we face. As such, it is all the more important that States and localities are able to receive help from the EPA, and that the agency understands and is willing to help address the needs of State and local governments without implementing unreasonable, costly, one-size-fits-all mandates.

I also want to take a moment to acknowledge the innovative and important work being done by water systems, product manufacturers, the public sector, universities, and the American people to meet the challenges of making more do with less. Innovation continues to be led by those most closely involved in the provision and use of the service, and it is critical that public policies are framed in a permissive way rather than in a command-and-control fashion. We should continue to provide the resources to the EPA and others to undertake research and development into water efficiency technologies, but we should also recognize that system operators and their customers know best what can and will work in their own situations. This has been the guiding policy of this committee for many years in the crafting of legislation in this arena.

Finally, we should take a moment to applaud the investments and steps taken by the end-use customers to be good stewards of the finite resource of water. Efforts to encourage and reward water use management have great promise to build on the progress and gains made by the consumer, who we must never forget is the focus of our activities and this hearing today.

Mr. Chairman, I know that the Committee is more interested in listening to the witnesses than in listening to me, so I will save the rest of my views for questions to the witnesses. Again, thank you for holding this hearing and I look forward to the testimony.

Senator CARDIN. Well, Senator Crapo, let me acknowledge the fact that our staffs have had a chance to meet, we have had a chance to meet. I think both of us understand the importance of the jurisdiction of our Subcommittee in protecting the waters of our Nation for the environment and for safe drinking and supply, and I look forward to working with you.

I do have a few issues in the Senate Finance Committee, so I hope that you will get there quickly and establish a relationship that perhaps our friendship will help me get those bills out of the Finance Committee.

[Laughter.]

Senator CRAPO. You got a deal.

Senator CARDIN. Without objection, your opening statement will be made part of the record.

Senator CRAPO. Thank you.

Senator CARDIN. I would ask unanimous consent that the testimony of Patricia Mulroy, General Manager of the Southern Nevada Water Authority be included in the record, at the request of Senator Harry Reid of Nevada.

Without objection, that statement will also be made part of the record.

[The referenced document follows:]

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON WATER AND WILDLIFE
"EPA'S ROLE IN PROMOTING WATER EFFICIENCY"
TUESDAY, MARCH 31, 2009

TESTIMONY OF PATRICIA MULROY
GENERAL MANAGER, SOUTHERN NEVADA WATER AUTHORITY

Optimizing the use of available water resources has always been a critical issue for metropolitan areas within the American Southwest. While the region's water supplies historically have been used to support agricultural activities—and in fact agricultural water use remains far greater than municipal demands even today—significant population growth throughout the Southwest has placed an additional strain on water resources during recent decades. Climate change, which is already manifesting in the form of decreased flows throughout the Colorado River watershed, will only exacerbate this challenge in the years and decades to come.

The Environmental Protection Agency (EPA) has a critical role to play in leading the United States and in particular the Southwest, through the challenges that lie ahead. The EPA's significant contributions to the success of the Energy Star program, along with its preliminary efforts with WaterSense, demonstrate the power the federal government has in guiding both public policy and initiatives within the private sector. Given the urgency of achieving significant advances in urban water efficiency, the need for an active federal role has never been greater.

EPA's initial foray into water efficiency through WaterSense has been successful because it has been able to demonstrate that the optimization of water resources does not necessitate a reduction in citizens' quality of life, or a decrease in the competitiveness of participating businesses. The

limitations of this well-conceived program lie primarily in its ability to be adopted on a national scale. To that end, the Southern Nevada Water Authority recommends that the EPA devote additional resources to expanding the reach of this program. This can be achieved by collaborating with related organizations on initiatives and events that significantly increase awareness of WaterSense and its associated benefits. As a case in point, the EPA in 2008 partnered with the international WaterSmart Innovations Conference and Exposition, an international summit of professionals from discrete disciplines with a common nexus—water efficiency. This event drew approximately 1,200 professionals from the plumbing, landscape architecture, and irrigation management industries, as well as representatives from municipal water agencies. By participating in what emerged as the world's largest urban water efficiency conference, the EPA was able to leverage its reach and create a platform from which to promote water efficient practices. The EPA should continue to engage stakeholders in this manner and actively cultivate stakeholder involvement. In so doing, it will be able to dramatically increase its reach without a commensurate escalation in resource expenditures.

One of the greatest obstacles to the broad adoption of water efficiency programs and standards has been the tendency by organizations to work in isolation. In many ways, this approach only serves to create competing initiatives, thus muddling the message and confusing the consumer. The EPA has, thus far, been very effective at working closely with stakeholders, but many more opportunities exist than EPA is able to capitalize upon with its current resources. EPA must continue to create strategic initiatives to embed WaterSense products into other successful programs, such as the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program, GreenGlobes and others. To the extent that EPA is able to work with

these organizations to establish mutually acceptable standards and integrate them uniformly, potential participants will have much clearer guidance and be more inclined to participate.

More than ever before, municipal water agencies are seeking guidance for water efficiency standards, practices and programs. The EPA has an extraordinary opportunity to take a leadership role in reshaping water use practices throughout the United States. By actively engaging key stakeholders and proactively promote the resulting knowledge throughout both the water sector and related industries, the EPA can capitalize upon that opportunity and achieve its goal of fostering water efficiency throughout the United States.

While optimizing the use of water resources is important on its own merit, it is important not to overlook the ramifications on energy consumption, and therefore greenhouse gas emissions, as well. The EPA has estimated that the nation's water and wastewater operations consume approximately 3 percent of the United States' total energy use. While this may seem like a small contribution, in real terms it represents roughly 56 billion kilowatt hours, contributing 45 million tons of greenhouse gasses into the environment. A reduction in water use affects both potable water and wastewater volumes, reducing the associated energy consumption at both stages of the urban water cycle. By investing in water efficiency, the EPA will be able to amplify the energy savings already realized through its capitalization of water and wastewater infrastructure energy efficiency upgrades, which are currently managed through the Drinking Water State Revolving Fund and the Clean Water State Revolving Fund.

Another issue that warrants leadership by the EPA is the use of graywater—untreated water from showers and drains—within urban systems. While this would seem to be a straightforward issue that is generally embraced because the concept is so appealing, the application of graywater systems is in fact quite complicated. To be certain, per-structure graywater systems are beneficial and feasible in certain conditions. However, there are ramifications associated with on-site graywater use that should be better understood before it can be endorsed. For instance, unlike recycled wastewater, there are no treatment standards for the use of graywater within residential or commercial properties—and in fact, most graywater systems do not feature any treatment at all—but human contact with graywater can pose a serious health risk because of contaminants. Standards and/or regulations related to the treatment and application of graywater are in the interest of protecting public health.

A second issue related to the widespread adoption of graywater systems is its implications on municipal wastewater systems. In the wastewater stream, graywater serves both a transport and treatment function. By reducing graywater flows, the concentration of solids in the wastewater stream is increased, which can lead to increased incidence of clogged wastewater pipelines and reduced efficiency of wastewater treatment systems. That is not to say graywater reuse is not feasible under any conditions, but that its impacts must be more fully understood.

The final issue related to graywater, and in some ways the most concerning, is a recent study conducted in Western Australia that demonstrated a significant increase in water use among households utilizing on-site graywater systems. This may be attributable to the perception on the part of the user that graywater is a "surplus" resource. While this finding could be specific to that

region, it would be beneficial for the EPA to thoroughly research this phenomenon, as well as the operational and public health issues associated with the use of graywater, so it is in a position to provide guidance to municipalities.

In closing, the EPA should be commended for its efforts to foster increased water efficiency within the United States. Its ideas are well-conceived and fundamentally sound. By more fully engaging stakeholders, capitalizing upon outreach opportunities and focusing its research efforts on issues of critical concern, the EPA can build upon its success and fundamentally improve the nation's water resource stewardship.

Senator CARDIN. First, let me say that today's hearing will focus on the role the Environmental Protection Agency must play in making our Nation more efficient in the way we use our water. For so many of us, we can turn on the tap or the washing machine or the dishwasher and have all the water we need to drink, to wash, and to water our lawns. We don't think about how much water we use in our daily lives, let alone the vast amount of water it takes to grow our food, to manufacture the goods we depend upon, or to produce the energy we need to power our Nation.

Water seems to be so abundant, in fact, that we often forget how precious it is and what a limited resource we have. EPA data shows how much water we use. The agency reports that water use in the United States is increasing every year. Since 1950, the United States' population has increased nearly 90 percent, yet our use of water has increased 209 percent. Americans now use on average 100 gallons of water per day every day per person.

This increased use is placing pressure on our water supply. In the last 5 years, nearly every region of the Country has experienced water shortages. At least 36 States are anticipating local, regional or statewide water shortages by 2013. In my own State of Maryland, we are one of those States. Population growth and changing growth patterns are placing increased pressure on water resources across my State.

In central and western Maryland, the Maryland Department of the Environment has found that there is not enough water for some of the planned growth activities. Water level in the aquifers in southern Maryland and the eastern shore are declining at a significant rate, with water levels in some being tens to hundreds of feet below their original levels.

Drought is intensifying these shortages in regions across the Country. We know in California, Governor Arnold Schwarzenegger declared a state of emergency this February due to drought, and the State is considering mandatory rationing. NOAA reports that the Great Lakes, which supply drinking water to more than 40 million U.S. and Canadian residents, are experiencing record low levels. The southeast is again suffering from drought. This is Texas's driest winter since records began in 1895.

According to a 2006 NOAA report, drought in the United States is estimated to result in average annual losses of between $6 billion to $8 billion across the sectors of our economy.

Climate change-related effects are predicted to place even greater stress on water resources in many areas of the Country. The Intergovernmental Panel on Climate Change's 2007 assessment projects that declining amounts of water stored in glaciers and snow covers will reduce the water available to one-sixth of the world's population.

The IPCC also predicts droughts will become more severe and longer lasting in a number of regions. The 2007 Ohio State University study projects that coastal communities could lose up to 50 percent more of their fresh water supplies than was previously thought. As sea levels rise, salt water will move inland and turn underground fresh water supplies brackish and undrinkable.

Water shortages aren't the only reason we should be looking at ways to be more efficient with our water. Our current water use

system based largely on centralized infrastructure that pipes in clean water and pipes away wastewater is inefficient and expensive. Our massive network of water pipes are broken and leaking. The American Society of Civil Engineers rates our water infrastructure at D-minus and estimates a 5-year investment need of $255 billion.

A survey conducted in 2000 suggests that more than 85 percent of Maryland water systems lose at least 10 percent of the water they produce, with the estimated average between 15 percent to 20 percent. In a needs survey released just last week, EPA estimates it will cost $5.4 billion over the next 20 years to repair and retain Maryland's drinking water infrastructure alone.

Plus, our system is increasingly energy intense. It is estimated that 10 percent of our Nation's imported energy goes to treating and pumping water.

So we can make huge progress here, not only on the supply of water, but the supply of energy. In recent years, fluctuating gas prices, the threat of climate change, and our vulnerability to parts of the world that don't like us much has made most of us realize that we have to change the way that we deal with energy. We realize with growing clarity that we have to move more toward greater energy efficiency and renewable technologies.

But too many of us don't yet see that we need also to change the way we use water. With better investment in research and development, with public education, with better incentives to use water-efficient technologies, we can begin to change public perception and change the way we use water.

I want to acknowledge that many of our States are leading us in this direction by offering incentives for water efficiencies in appliances and products. Water efficiency in green technology and demonstration projects are also helping us explore ways in which we can be more water efficient.

EPA's WaterSense project has also been effective in bringing public attention to water efficiencies. And the House of Representatives recently passed H.R. 631, which I think is a bill that we need to take a look at, which puts a spotlight on water efficiency through research and demonstration projects.

We can make sure we have the water we need to maintain our standard of living and ensure future economic growth. We can seize an economic opportunity to become an exporter of a new approach to water, and the technologies that go with it, to the rest of the world, but we have got to be more aggressive and with a greater sense of urgency if we are going to be able to accomplish these goals.

I look forward to this hearing from our distinguished panelists today in helping us figure out how we can move forward with this vision for America.

With that, we will turn to our first witness. I am very pleased that we have Michael Shapiro here, the Acting Assistant Administrator, Office of Water, U.S. Environmental Protection Agency. We appreciate you being here. Your entire statement will be made part of the record for all of our witnesses today, and you now may proceed as you see fit.

[The prepared statement of Senator Cardin follows:]

STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR
FROM THE STATE OF MARYLAND

Today's hearing will focus on the role the Environmental Protection Agency must play in making our Nation more efficient in the way we use our water. For so many of us, we can turn on the tap, or the washing machine, or the dishwasher, and have all the water we need to drink, to wash and to water our lawns. We don't think about how much water we use in our daily lives, let alone the vast amounts of water it takes to grow our food, to manufacture the goods we depend on and to produce the energy we need to power our economy. Water seems so abundant, in fact, that we often forget it's a precious and limited resource.

EPA data shows how much water we use. The agency reports that water use in the United States is increasing every year. Since 1950, the United States population increased nearly 90 percent. In that same period, public demand for water increased 209 percent. Americans now use an average of 100 gallons of water per person each day.

This increased use is placing pressure on our water supply. In the last 5 years, nearly every region of the Country has experienced water shortages. At least 36 States are anticipating local, regional, or statewide water shortages by 2013.

Maryland is one of those States. Population growth and changing growth patterns are placing increased pressure on water resources across the State.

In central and western Maryland, the Maryland Department of the Environment has found that there is not enough water for some planned growth. Water levels in the aquifers of southern Maryland and the Eastern Shore are declining at a significant rate, with the water level in some being tens to hundreds of feet below their original levels.

Drought is intensifying these shortages in regions across the Country. In California, Governor Arnold Schwarzenegger declared a State emergency this February due to drought and the State is considering mandatory water rationing. NOAA reports that the Great Lakes, which supply drinking water to more than 40 million U.S. and Canadian residents, are experiencing record low levels. The southeast is again suffering from drought. This is Texas' driest winter since records began in 1895.

According to a 2006 NOAA report, drought in the U.S. is estimated to result in average annual losses of between $6 billion to $8 billion across all sectors of the economy.

Climate change related effects are predicted to place even greater stress on water resources in many areas of the Country. The Intergovernmental Panel on Climate Change's 2007 assessment projects that declining amounts of water stored in glaciers and snow cover will reduce the water available to one-sixth of the world's population. The IPCC also predicts droughts will become more severe and longer lasting in a number of regions. A 2007 Ohio State University study projects that coastal communities could lose up to 50 percent more of their freshwater supplies than was previously thought. As sea levels rise, the saltwater will move inland and turn underground freshwater supplies brackish and undrinkable.

Water shortages aren't the only reason we should be looking at ways to be more efficient with our water. Our current water-use system, based largely on centralized infrastructure that pipes in clean water and pipes away wastewater, is inefficient and expensive. Our massive networks of water pipes are broken and leaking. The American Society of Civil Engineers rates our water infrastructure a D− and estimates a 5-year investment need of $255 billion.

A survey conducted in 2000 suggested that more than 85 percent of Maryland water systems lose at least 10 percent of the water they produce, with the estimated average between 15 percent and 20 percent. In a needs survey released just last week, EPA estimates it would cost $5.4 billion over the next 20 years to repair and retain Maryland's drinking water infrastructure alone. Plus, our system is incredibly energy intensive. It's estimated that 10 percent of our Nation's imported energy goes to treating and pumping water.

In recent years, fluctuating gas prices, the threat of climate change, and our vulnerability to parts of the world that don't like us much have made most of us realize that we have to change the way we get our energy. We realize with growing clarity that we've got to move toward greater energy efficiency and renewable technologies. But too many of us don't yet see that we also need to change the way we use water.

With better investment in research and development, with public education, and with better incentives to use water-efficient technologies we can begin to change public perception and change the way we use water.

We can make sure we have the water we need to maintain our standard of living and ensure future economic growth. We can seize an economic opportunity to be-

come an exporter of a new approach to water—and the technologies that go with it—to rest of the world. But we have got to move aggressively and with a greater sense of urgency.

I look forward to hearing from our distinguished panelists today on what steps EPA can take and this Congress can take to make that vision a reality.

STATEMENT OF MICHAEL H. SHAPIRO, ACTING ASSISTANT ADMINISTRATOR, OFFICE OF WATER, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. SHAPIRO. Good morning, Mr. Chairman. It is a pleasure to be here and I thank you for your leadership on this important issue.

I will be discussing EPA's efforts to promote increased water conservation and efficiency. My full statement will be made available for the record. I will summarize briefly a few key points.

Too often, we take for granted a system that provides reliable and safe water, as you have pointed out. Headlines about water crises in different parts of the U.S. and the world have raised the collective awareness about this precious resource.

States and communities across the Nation are facing difficult challenges in meeting their water resource needs. A report by the Government Accountability Office in 2003 indicated that 36 States projected water shortages by 2013. Continued population growth and the impacts of climate change are likely to further challenge our ability to provide reliable and safe water.

Improving water efficiency is one of the most effective ways for communities to manage their supplies. Moreover, increased water use efficiency will reduce utility operating and maintenance costs and reduce the need for expensive new infrastructure.

EPA is working to foster a national ethic of water efficiency so that water is valued as a limited resource that should be used wisely. In June 2006, we announced WaterSense, an innovative partnership program that helps American consumers, businesses and governments make smart choices that save money and maintain high environmental standards, without compromising performance or requiring lifestyle changes.

Products with the WaterSense label use at least 20 percent less water and perform as well or better than conventional models. In developing specifications, EPA works with voluntary consensus standard organizations, utility research committees, trade groups, and universities to develop information on product efficiency and performance. To earn the label, products must be independently tested and certified by a third party to meet EPA's criteria for efficiency and performance. This distinctive approach has been identified as a key strength of the WaterSense program by many stakeholders.

In less than 3 years and with the help of more than 1,000 partners nationwide, WaterSense has become a national symbol for water efficiency. The label can now be found on more than 700 varieties of water-efficient faucets and accessories and over 250 models of high-efficiency toilets.

EPA has developed a WaterSense certification program for irrigation designers, auditors, and installation/maintenance professionals that focuses on water-efficient landscape irrigation techniques.

We are also developing a New Homes label that is designed to reduce water consumption by setting criteria for both indoor and outdoor water use and by educating homeowners about water efficiency. This year, we plan to issue final specifications for high efficiency flushing urinals that will use 50 percent less water than standard models, and we will also develop a draft specification for high efficiency shower heads.

Water efficiency doesn't only result in water savings, as you have pointed out. Delivering water to homes requires a great deal of energy. The potential for preserving our water supply for future generations and reducing energy demand through this voluntary program is significant, and WaterSense will continue working on other residential and commercial products.

As I mentioned earlier, our efforts to promote water efficiency depend upon a national network of partners who help us with our product specifications, marketing, and consumer education. For example, the Alliance for Water Efficiency is establishing a water efficiency information clearinghouse that will complement EPA's activities.

We are also coordinating with EPA's Energy Star program, the U.S. Green Building Council's LEED program, and the National Association of Home Builders' Green Building program to incorporate WaterSense criteria into these broader energy efficiency and green building initiatives.

Additionally, EPA's sustainable infrastructure efforts look more broadly at water efficiency and asset management. We are working with public officials and utility managers and their professional organizations to identify strategies and tools for reducing water loss from systems, especially in the distribution system.

Clearly, it is important to carefully consider how the water resources of this Nation are used and how we can effectively manage into the 21st century. We have come a long way in a very short time with our WaterSense and sustainable infrastructure programs. As the stresses on our water resources grow, the need for the products and services we are developing through WaterSense will become even more important.

We look forward to working with our stakeholders and Congress as we look to expand EPA's efforts in these areas.

I ask that my full statement be submitted for the record and I look forward to addressing any questions you may have.

Thank you.

[The prepared statement of Mr. Shapiro follows:]

STATEMENT OF
MICHAEL SHAPIRO
ACTING ASSISTANT ADMINISTRATOR
OFFICE OF WATER
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
WATER AND WILDLIFE SUBCOMMITTEE
ENVIRONMENT AND PUBLIC WORKS COMMITTEE
UNITED STATES SENATE
March 31, 2009

Good morning, Mr. Chairman and Members of the Committee. I am Michael Shapiro, Acting Assistant Administrator for Water at the United States Environmental Protection Agency (EPA). I am happy to be here today to talk to you about our efforts to promote increased water conservation and efficiency.

Too often we take for granted a system that provides clean and safe water: from the drinking water that automatically appears when we turn on our taps or take a shower to the water found in our local watersheds where we live, work, and play.

But water is a finite resource – even though about 70% of the Earth's surface is covered by water, less than 1% is available for human use. Headlines about water crises in different parts of the U.S. and the world have raised the collective awareness about this precious and life-sustaining resource. States and thousands of communities across the nation are facing difficult challenges in meeting their water resource needs.

A report by the Government Accountability Office in 2003 indicated that 36 states projected water shortages by 2013. Studies of water use by the United States Geological Survey show that water withdrawn for the public supply increased by 7 percent from 1995 to 2000 -- an increase of 1 trillion gallons. The U.S. Bureau of Census projects that the U.S. population will increase by 3% by 2010, 12% by 2020 and 30% by 2040.

On average, the per capita residential water use in the U.S. is 100 gallons of water a day and in many areas of the country this rate is even higher. Areas with higher than average per capita water consumption are often experiencing unprecedented population growth. As a result,

communities across the country are facing challenges regarding water supply and water infrastructure.

Improving water efficiency is one of the most effective ways that communities can manage their supplies. With less water moving through the system, utility operating costs will decrease. They will avoid costs for treatment chemicals, residuals disposal, and energy associated with water collection, treatment, and disposal. In addition, water efficiency can help utilities better manage capacity expansion because necessary expansions can be delayed or reduced in size.

Water resources are also affected by decisions communities make about land use and development. Stormwater pollution from point sources and nonpoint sources is one of our nation's most challenging water quality problems and is a significant contributor to the impairment of the country's streams, rivers, and watersheds.

Unlike pollution from industry or sewage treatment facilities, which is caused by a discrete number of specific sources, pollution from stormwater varies widely, not only in the amount of water and the frequency, but also in the contaminants it carries into our rivers, lakes, and coastal waters. For example, rainwater and snowmelt in urban and suburban environments convey contaminants that run off from lawns, parking lots, streets, farms, and construction and industrial sites. The impermeable surfaces of our traditional urban and suburban landscapes interfere with the natural recharge of groundwater and surface water and also cause increases in the intensity and amount of stormwater.

It is clear that our nation must fundamentally change how we use and manage our water resources. We must reduce our water use and supplement our water resources through safe recovery and reuse of reclaimed water, rainwater, and stormwater. And, we must work towards integrating low impact development practices and water efficiency into existing communities and new construction to prevent problems in the future. These approaches are less energy intensive than traditional development and can help to reduce our carbon footprint.

The Office of Water, in partnership with the Office of Research and Development, sees an opportunity to keep pace with the water resource needs of the future by developing a

comprehensive strategy built upon several initiatives focusing on water efficiency, rainwater harvesting, stormwater management, and water recovery and reuse.

Several of our water programs are helping lead the changes necessary for communities to sustain their water resources for future generations. One of these is our WaterSense Program.

WaterSense Certification and Products

EPA is working to foster a national ethic of water efficiency, so that water is valued as a limited resource that should be used wisely. In June 2006, we announced WaterSense, an innovative partnership program that helps American consumers, businesses, and governments make smart water choices that save money and maintain high environmental standards without compromising performance or requiring lifestyle changes.

The WaterSense program is helping to reduce water use across the country by creating an easy-to-identify label for water-efficient products that is backed by strict criteria and independent certification. Products with the WaterSense label use at least 20 percent less water and perform as well as—or better than—conventional models. To earn the WaterSense label, products must be independently tested and certified by a third party to meet EPA's criteria for efficiency and performance. This distinctive approach has been identified as a key strength by many stakeholders.

In less than three years, and with the help of more than 1,000 partners nationwide, WaterSense has become a national symbol for water efficiency. The WaterSense label can now be found on more than 700 varieties of water-efficient faucets and accessories and over 250 models of high-efficiency toilets.

A large part of our success is due to our partners. More than 400 utilities and 170 manufacturers and retailers are helping promote WaterSense products. And more than a dozen states have taken the challenge to bring in additional partners. We are also working with distributors and the media to educate consumers on the benefits of switching to water-efficient products. Earlier this month we promoted our first ever "Fix a Leak" week. Cities and states from across the country promoted actions to prevent water loss and citizens in 35 states took a pledge to fix their leaks.

Our success is in the numbers. The WaterSense program is saving more than 277 million gallons of water per year and saving consumers $1.6 million on their utility bills. Our preliminary data shows that WaterSense labeled faucets and faucet accessories made up close to 20% of the products shipped in 2008, which is impressive given that our specification was finalized in October 2007.

The savings on WaterSense labeled toilets is also significant. Toilets account for about 30 percent of the water used in the home, and Americans waste 900 billion gallons per year by flushing old, inefficient toilets. By replacing an older toilet with a WaterSense labeled model, a family of four could reduce total indoor water use by about 16 percent and, depending on local water and sewer costs, save more than $90 annually.

If every home replaced just one old toilet with a WaterSense labeled High Efficiency Toilet, the water savings would be enough to supply nearly 10 million U.S. households with water for a year. Although we are still compiling last year's data, it is clear that the WaterSense label is gaining a foothold in the market, with close to 5 times more WaterSense labeled high-efficiency toilets shipped in 2008 than in 2007.

WaterSense New Homes and Outdoor Water Use

We know that individual products like water efficient toilets and faucets can have a big impact on a household's water savings. But to achieve significant savings in the future, we know that we also have to influence the construction of new homes and educate homebuyers. To help facilitate this, we are developing a WaterSense "New Homes" label. Our New Homes effort combines water-efficient products, enhanced design features, and homeowner education into a single residential program. WaterSense labeled new homes will be designed to reduce water consumption by setting criteria for both indoor and outdoor water use and by educating homeowners about water efficiency.

While working on a second draft of the specification for public comment, a pilot program was established last fall to test inspection and implementation procedures so that a program will be in place when the specification is finalized. Twelve single-family homes in North Carolina and Wisconsin have already been certified to meet the WaterSense draft new homes criteria. They

have used water-efficient hot water distribution systems as well as bathroom fixtures, dishwashers, and varied landscape plantings.

About 30 percent of the water used by the average American household is devoted to outdoor water use. In more arid parts of the country, however, homeowners use as much as 70 percent of their water outdoors. Experts estimate that up to 50 percent of landscape water use goes to waste due to evaporation, wind, or runoff caused by overwatering. In addition to overextending the water supply, the runoff from overwatering can convey chemical and microbial contaminants into aquatic environment such as fertilizers, herbicides, salts, and pathogens.

Our New Homes effort will address outdoor water use by requiring home builders to plan landscapes utilizing a mix of regionally-appropriate plantings that will require less water than comparable lawns comprised of turf. Also, if in-ground irrigation systems are installed, they will be audited to ensure proper design and installation to maximize water-efficiency.

Two years ago, EPA developed WaterSense certification programs for irrigation designers, auditors, and installation/ maintenance professionals that focus on water-efficient landscape irrigation techniques. A homeowner with an irrigation system who hires a WaterSense irrigation partner to perform regular maintenance can reduce outdoor water by 15 percent or about 9,000 gallons per year—the amount of water that would flow from a garden hose nonstop for nearly a day.

Currently, more than 600 irrigation professionals from across the country have partnered with WaterSense to advance water-efficient irrigation practices. In 2008 EPA will also continue working towards development of a WaterSense label for weather- or sensor-based irrigation control technology to provide irrigation professionals and homeowners with an important tool they can use to reduce outdoor water use.

Yes, WaterSense is making a big impact on reducing water use. But, water efficiency doesn't only result in water savings. Delivering water to homes requires a great deal of energy. Approximately 4 percent of the nation's electricity consumption is used moving or treating water and wastewater. We also use energy when we heat our water for bathing, cooking, even cleaning the dishes.

Given how closely related saving water is to saving energy, one of the best ways to conserve energy across the country – not to mention at wastewater treatment plants – is to use water more efficiently. Through water efficiency, utilities can realize significant energy savings, delay expansions to deal with population growth and make better use of existing resources.

If just one in every 10 homes in the United States were to install WaterSense labeled faucets or aerators in their bathrooms, in aggregate, they could save 6 billion gallons of water, and more than $50 million in the energy costs to supply, heat, and treat that water.

Leveraging WaterSense

The potential for preserving our water supply for future generations through this voluntary program is significant, and WaterSense will continue working on new product areas in the future. In 2009, we will work to issue a final specification for high efficiency flushing urinals that will use 50% less water than standard flushing urinals and issue a draft specification for showerheads.

Looking forward, we will move further into the commercial sector, conducting research on pre-rinse spray valves that are used in the food service industry and working with stakeholders to evaluate other products appropriate for WaterSense certification.

But, to advance an ethic of water conservation and efficiency, EPA cannot work alone. We rely on a national network of partners – who help us with our product specification efforts, marketing, and consumer education. The Alliance for Water Efficiency (AWE) is establishing a water-efficiency information clearinghouse and will expand to complement WaterSense's activities including monitoring national plumbing and appliance standards and codes. We are collaborating with public officials and utility managers to identify strategies and tools for reducing water loss from systems. We are also coordinating with EPA's EnergyStar program, the U.S. Green Building Council's LEED program and NAHB's Green Building Program to incorporate WaterSense criteria into these broader energy efficiency and green building initiatives.

And speaking of LEED, EPA is truly leading the way with its own facilities. One of EPA's newest and most impressive facilities, the LEED certified Region 8 Headquarters, will save

water through the use of high efficiency plumbing fixtures such as dual-flush toilets. It also has a green roof. EPA is also working to ensure that water efficient products and other more sustainable activities are considered as federal agencies, states, cities, and utilities make decisions on how to spend funding made available through the American Recovery and Reinvestment Act of 2009. EPA's Clean Water and Drinking Water State Revolving Fund programs, which are receiving $6 billion through the Recovery Act, are required to direct at least 20% of their funding for green projects, including those that promote water efficiency and green infrastructure. EPA is also working to ensure that funding made available for housing and federal facilities consider WaterSense labeled products when identifying projects.

Other EPA Water Efficiency Efforts

EPA's WaterSense program is not the only program focused on managing our water resources more efficiently. EPA's sustainable infrastructure efforts look more broadly at water efficiency and asset management and many states and utility managers are stepping forward to identify strategies and promote tools for water efficiency on the supply side. Making water distribution more efficient will not only save water and reduce costs, but it will save energy and significantly improve sustainability and increase capital available for infrastructure investment. Installing meters can help utilities better track water loss and also makes it possible to charge customers for their actual use of water, thus advancing full cost pricing.

We know that to reduce real water leakage we must better manage millions of miles of pipelines that are buried beneath our cities and suburbs to distribute water to users and collect wastewater and stormwater from urban environments. Reducing water use by decreasing leaks can reduce the energy costs of transporting additional water to and from users, preserve water resources, and reduce the amount of water that is processed. Reducing leaks is also very important for protecting public health. Pipeline failures and overflows from sewers can cause contamination of water supplies. Also, it is important to remember that what starts as a leak can result in a major line break that may interrupt water supplies resulting in hardships for hospitals, residents, and businesses that rely on uninterrupted access to water. Pro-active approaches to detect and prevent leaks have public health, economic, and environmental benefits in addition to contributing to water efficiency goals.

Green Infrastructure

Another area where EPA is helping lead the change in how we view our water resources is our Green Infrastructure initiative. Green infrastructure is based on the simple idea of creating stormwater management systems that mimic natural hydrology. Rather than piping stormwater away through "grey" infrastructure, we are managing it -- capturing and reusing it to reduce the volume of runoff entering our sewer systems, and ultimately our lakes, rivers and streams. Green infrastructure is also an excellent supplemental strategy to reducing the frequency of combined sewer overflow (CSOs) events.

On the regional scale, green infrastructure consists of an interconnected network of open spaces and natural areas (such as forested areas, floodplains and wetlands) that improve water quality while providing recreational opportunities and wildlife habitat. On the local scale, green infrastructure consists of site-specific management practices (such as rain gardens, porous pavements, green roofs and cisterns) that are designed to maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls, and by returning it to the atmosphere via plants.

With respect to wet weather management, green infrastructure techniques use exactly those mechanisms of stormwater collection, infiltration and evapotranspiration by utilizing natural systems, or engineered systems that mimic natural landscapes, to capture, cleanse and reduce stormwater discharges using plants, soils and microbes. Green infrastructure can also support harvesting and reuse of rainfall, thus also reducing the volume and impacts of stormwater discharges to water quality.

Two years ago, EPA embarked on an enhanced effort to promote green infrastructure through all of our water programs in conjunction with several partners. One of our initial releases, in January of 2008, was the *Green Infrastructure Action Strategy*. The Strategy is an action plan of several dozen activities and initiatives to overcome barriers to green infrastructure implementation, moving these sets of technologies from supplemental components of wet weather management to mainstream approaches.

Because design engineers, utilities, public works departments, transportation agencies and others may be unfamiliar with green infrastructure approaches, we are engaged in a wide variety of outreach and training activities, including workshops, webcasts, publication of many documents on a variety of critical topics. We are also working on partnerships with a variety of sectors such as Federal highways, and modification and development of models and calculators to make design work and life cycle costing analyses easier.

Weak or restrictive local regulations and codes can pose barriers to green infrastructure. These barriers are not insurmountable and cities with successful green infrastructure programs have been able to thoroughly revise their codes and ordinances, usually resulting in valuable modifications to these policies. To assist communities with this process, we have developed a helpful guidebook entitled *Aligning Local Codes and Ordinances with Water Quality Goals*. This document outlines a process for evaluating local policies and provides multiple options in a variety of different areas for modifying those policies to meet community objectives.

As green infrastructure still represents a new area of focus for water managers and local decision-makers, some questions remain. With respect to water quality and quantity, we understand performance of green infrastructure practices in some cases. However, we need better tools for estimating collective performance at regional scales, and there are still questions about long-term performance of some practices under various maintenance regimes.

In addition, we need better quantification of other benefits, such as urban heat island reduction and removal of particulates from the air. A comparison of the economics and performance of green infrastructure and how it can supplement grey infrastructure for the entire life cycle will be extremely useful in establishing the utility of green infrastructure. Moving research to practice is also an important need. There are many green technologies that can help protect water quality, and no single set of practices can be identified as the best for all circumstances.

Research to Integrate Public Health Protection, Water Availability, Water Efficiency, and Ecosystem Services

Clearly, it is important to carefully consider how the water resources of this Nation are used and how we can effectively manage them into the 21st Century, particularly in light of the

uncertainties surrounding climate. Our Nation's water resources face pressures on their quality and availability as a consequence of growing population, increasing urbanization, changes in irrigation and chemical management practices to support agricultural demands for food and biofuel feedstocks, and the need for water to support energy production and provide industrial process water. It is critical that water managers have scientifically sound approaches to implement water use and water management policies and practices that are resilient enough to respond to short-term fluctuations in water resource conditions and to adapt and integrate new knowledge.

As noted in reports by the Western Governor's Association and the National Advisory Council for Environmental Policy and Technology, authorities at the federal, state and local levels need to use robust integrated water resources management approaches to balance and optimize the available water supply and provide more flexible approaches for supply, managing, recovering, and reusing water. We can no longer afford to use water inefficiently Science can inform us about the availability and quality of our water resources and help us evaluate and predict the likely effects of water-policy and management practices and lead towards integrating public health protection with water sustainability to better prepare for the likely challenges related to climate change.

Recognizing that water efficiency and conservation are critical to ensuring water availability and protecting public health, EPA's Office of Research and Development (ORD) conducts several national research programs that build upon the programmatic efforts in the Office of Water (OW) and focus on sound science and engineering approaches that can improve water and energy efficiency. Cutting-edge research is targeted at water processing technologies, water reclamation and reuse, and sustainable infrastructure.

Implementing holistic approaches for producing safe drinking water, while promoting water and energy efficiency, can yield measurable benefits to water resource sustainability and also lead to lower costs of supplying potable water. In conjunction with the intramural research programs in our National Laboratories, ORD's Science to Achieve Results (STAR) grants program is funding research to link public health protection with water infrastructure sustainability by encouraging water reuse, low impact development, and green infrastructure. ORD has been at the forefront of

developing the tools that will be needed to make green infrastructure a reality including hydrologic models to help preserve critical water habitats and geospatial data to map development to inform smart-growth planning and combat urban sprawl.

OW is working closely with ORD to identify research needs related to water resources. Earlier this year, the two offices convened the first National Expert and Stakeholder Workshop on Water Infrastructure Sustainability and Adaptation to Climate Change. Also, ORD's Drinking Water, Water Quality, Ecosystem Services, Sustainability, and Global Change Research Programs are conducting cutting-edge research that can advance green infrastructure and water efficiency. Examples of research activities include modeling and field studies of sustainability of water infrastructure under different climate scenarios, and tracking the performance of green infrastructure in restoring water quality, reducing runoff, and recharging ground water levels. ORD is working with National Geographic to map impervious surfaces across the contiguous U.S. and to develop methods to estimate their effects on runoff and ground water recharge. ORD is also conducting a landscape analysis of the source watersheds for approximately 5,000 drinking water intake locations. This assessment may help identify locations where land conservation and green infrastructure might best protect the natural service of "water provisioning" to water intake locations, thereby preserving drinking water quality and avoiding costs associated with expensive water treatment.

The STAR grant program is soliciting research proposals to develop information and tools (such as coupling global climate models with regional-scale climate and hydrology models) that can improve assessments of climate change impacts on regional water quality to support human and aquatic life uses. ORD has also sponsored an annual competition for college students to develop and test sustainable designs. Many of the projects revolve around producing safe drinking water coupled with water and energy efficiency. The competition, called P3, which stands for People, Prosperity and the Planet will be held this April here in DC along the Mall.

In developing specifications for water efficient products, EPA's WaterSense program works with voluntary consensus standard organizations, utility research committees, trade groups and universities to develop information on product efficiency and performance. WaterSense also relies on research carried out by other federal agencies, including the survey of Estimated Water

Use in the United States which has been carried out by the U.S. Geological Survey every five years since 1950. .

EPA also continues to coordinate and collaborate with other federal agencies on research and other policy matters through our participation on the Western States Federal Agency Support Team (which was organized by the Western States Water Council) and a multi-agency memorandum that authorizes senior staff from EPA, NOAA, USDA, DOI and the U.S. Army Corps of Engineers to cooperate on climate change adaptation work related to water resources. Such cooperation is essential to leverage resources across agencies, avoid duplication of effort, and minimize confusion for states and the regulated community. We are also actively involved in several interagency committees that relate to water resources research including the National Science and Technology Council (NSTC) Subcommittee on Water Availability and Quality (SWAQ). We are also leading the efforts on water efficiency, water recovery, use, and rainwater harvesting that support a major goal in the Net Zero Energy, High Performance Green Building Research and Development Agenda that was recently released by the NSTC's Buildings Technology Research and Development Subcommittee. This program is targeting integrated approaches to reduce water use in buildings by 50%.

Conclusion

All of these actions and initiatives will prove to be critical as we develop adaptation strategies to prepare for potential changes in water resources driven by climate change where we can anticipate changes in contaminant concentrations in water, new patterns of rainfall and snowfall, recurring droughts that will limit water supplies, and more intense and frequent storms that will increase polluted stormwater runoff and threaten the capacity and integrity of our water infrastructure.

We have come a long way in a very short time with our WaterSense and green infrastructure programs. As the demands on our water resources grow, the need for the products and services we are developing through WaterSense will become even more important. Across the country, state and local governments appreciate the consistency that a national product label offers and the water savings the products provide. As we plan for the future, we also need to look towards more sustainable green practices that reduce water degradation and provide us with more livable

communities. We look forward to working with our stakeholders and Congress as we look to expand EPA's efforts in these areas. I ask that my full statement be submitted for the record and I look forward to addressing any questions you may have.

Thank you.

Environment and Public Works Committee Hearing
March 31, 2009
Follow-Up Questions for Written Submission

Senator Benjamin L. Cardin

1. **Mr. Shapiro, your testimony stated that water-use efficiency, conservation, water reuse and water recycling are components of ongoing EPA research programs. How could an increased focus on these topics bring new technologies into wide-spread use? And how can EPA's research and outreach efforts be enhanced to promote the diffusion of new technologies that help address water needs?**

An increased focus on these topics is best achieved by including water efficiency as an integral component of all research relevant to water systems. Such a systematic approach will lead to credible scientific and engineering support for new technologies. These new technologies can then be moved into wide-spread use through a variety of mechanisms, including demonstration projects. Demonstration projects are needed to evaluate performance under different geographic conditions and operating scenarios to identify environmental factors that might impact implementation of long-term performance. For example, EPA used demonstration projects to evaluate the effectiveness of technologies to remove arsenic from water. Demonstration projects can also help quantify costs, water and energy efficiencies, and carbon credits. Incorporating social science considerations in conjunction with the scientific and engineering research and demonstration activities will foster innovative approaches to overcome any behavioral, societal, or institutional barriers that may hinder widespread adoption. Another mechanism for moving technologies into use is our Environmental Technology Verification (ETV) program, which can include water and energy efficiency as criteria when verifying water technologies.

Additionally, the 2010 Budget includes $3 million to expand green infrastructure research to assess, develop and compile scientifically rigorous tools and/or models that will be used by EPA's Water program, States, and municipalities. This research will address region and climate-specific concerns and provide technical information that can be used to help quantitatively determine the benefits of green infrastructure and reduce the uncertainty involved in using it for compliance purposes. Through these efforts, EPA, States, and municipalities will have more information and a better understanding of the capabilities of green infrastructure to meet their needs.

With regard to EPA outreach efforts, the Agency is working to develop more robust approaches to communicating and disseminating the results of our research to promote the introduction and acceptance of new and more effective treatment technologies. The Agency routinely holds workshops, symposia, and training sessions to provide technology transfer to the water industry. For example, we have developed a variety of programs targeted at small water systems, with an emphasis on maintaining regulatory compliance and improving the cost-effectiveness and reliability of these water systems. In addition, EPA's water research programs play an important

and unique role in interfacing with Regional, State, and Tribal programs and engaging with university researchers and small businesses.

2. **Mr. Shapiro, in your testimony you said that Congress would have to weigh the benefits of creating a new research program focused on water-use efficiency, conservation and re-use. Can you describe what the benefits of such a program may be and how such a program could potentially accelerate ongoing efforts?**

As mentioned earlier, the 2010 Budget includes $3 million to expand green infrastructure research to assess, develop and compile scientifically rigorous tools and/or models that will be used by EPA's Water program, States, and municipalities. This research will address region and climate-specific concerns and provide technical information that can be used to help quantitatively determine the benefits of green infrastructure and reduce the uncertainty involved in using it for compliance purposes. Research will also be conducted to advance the use of gray water, particularly in areas facing water shortages, to help reduce the burden on water supplies and infrastructure.

These efforts complement ongoing EPA research programs that integrate water efficiency and conservation with work on water infrastructure and treatment technologies. Any additional research and development efforts should build on this work.

Senator James M. Inhofe

1. **In your testimony and on EPA's web page it is very clear that water and energy conservation go hand in hand. It would seem that having all of these conservation efforts under one consistent and easily-understood brand, such as "Energy Star," makes more sense. Why has EPA created an artificial distinction between "Water Sense" and "Energy Star"? Please explain why you believe this action does or does not require congressional authorization.**

It is true that water efficiency and energy efficiency go hand-in-hand. Since the inception of the WaterSense program the Office of Water (OW) has been working very closely with the Office of Air and Radiation (OAR) to ensure that WaterSense and Energy Star are closely coordinated. However, the Agency does believe that it was important that its water-efficiency program stand alone from the Energy Star program

WaterSense has definitely benefited from the consumer recognition of product labels like ENERGY STAR. However, given the unique challenges faced by promoting non-energy using products such as water-efficient toilets or irrigation products, it just made sense to create a separate brand for water efficiency. Not only did consumers respond well to a water-efficiency label in focus groups, they responded best to the term "WaterSense," which made them feel like they were doing something smart to save water. Furthermore, water utilities from around the country strongly advocated for a separate label that would emphasize the importance of saving water to help protect the environment. Also, the Consortium for Energy Efficiency's (CEE) "National Awareness of Energy Star for 2008, Analysis of CEE Household Survey" found, by far, that the most common message associated with the Energy Star label was "energy efficiency or energy savings" (63%) and no respondents associated the Energy Star label with water savings. Additionally, EPA has worked very hard to ensure that the WaterSense brand becomes synonymous with water-efficient products that are certified to perform well, a key factor in overcoming the consumer bias over the "low-flow" toilets and other water-using items of the past that demonstrated performance problems.

While EPA can continue to carry out the WaterSense program without a formal authorization, granting authority for the program would show the commitment of the government to water efficiency and help the Agency to better advance the overall WaterSense program.

2. **I am pleased with the great response to the Water Sense program by both utilities and manufacturers. I know this public -- private partnership has worked well for the Energy Star program. Please elaborate on some of your efforts to educate consumers about the benefits of the Water Sense label.**

By working closely with our partners, carefully focusing our messages, and taking advantages of cost-effective outreach strategies, the WaterSense program has successfully communicated the importance of water efficiency and how the WaterSense label saves water.

Following are just a few of the efforts EPA has undertaken to educate consumers about the WaterSense label:

- Facts and stats: EPA has developed statistics that resonate with consumers about the need for water efficiency and potential for savings from using WaterSense labeled products. For example, our "super flush" statistic during the NFL Super Bowl garnered major media coverage just based on calculating the water savings if everyone flushed a WaterSense labeled toilet in their home during halftime instead of a conventional toilet.
- Web site: The WaterSense program's consumer-friendly Web site at www.epa.gov/watersense draws visitors to lists of WaterSense labeled products, statistics, and the benefits of water efficiency. We continually work to increase web traffic through a frequently updated "widget" posted on partner, media, and stakeholder Web sites; an interactive game that teaches about water efficiency; an online newsletter sent to a growing number of consumers interested in water efficiency; and annual events such as "Fix a Leak Week," where consumers were invited to take the pledge to fix leaks and save water by replacing outdated fixtures with WaterSense labeled products where appropriate.
- Public service announcements: Eye-catching print PSAs have graced the pages of consumer publications (including O, Oprah's magazine) and been posted to partner Web sites.
- Partner tools: From bill stuffers and brochures to press releases and point-of-purchase materials, EPA has helped our utility, manufacturer, retailer, and community partners promote WaterSense labeled products to consumers with branded materials that can be easily tailored to partner needs. We have four different partner tool kits online, each with dozens of materials designed to promote the WaterSense label.
- Other outreach: Through strategic placements on CNN, Good Morning America, The Today Show, USA Today, and hundreds of other consumer media outlets, EPA has spread the message to look for the WaterSense label. Meteorologists broadcast seasonal tips on saving water and looking for the label through messages we provide the Earth Gauge network. In addition to water savings, media outreach also contains messaging about the ancillary benefits from WaterSense labeled products, such as the "drops to watts" energy savings that results from using faucet aerators.

3. **I was very encouraged by your description of the success you are having assisting state and local governments with their green infrastructure programs. I believe that giving local governments a wide variety of tools to help tailor change for their communities is the fastest and most effective way to implement change. How is EPA allowing local municipalities to decide what technology works best rather than mandating a one-size-fits-all approach? Will EPA be undertaking similar efforts to help local governments with pipeline leaks and Water Sense integration?**

EPA is providing technical information on the wide array of green infrastructure approaches because we know that there are a number of variables that must be considered to fit the appropriate control or practice to a given situation. In a regulatory context, EPA is recommending performance standards (rather than design standards) because this provides significant flexibility for implementers to decide which combinations of practices will meet the environmental objectives they are trying to achieve.

When looking at means for helping communities to improve their water efficiency, EPA will continue to work cooperatively with state drinking water programs and the drinking water industry to promote water loss management programs at public water systems. EPA will also continue efforts with its NGO partners to reduce in-system water leakage. EPA will collect and share information on state and water system approaches, and will develop a cost/benefit analysis template for implementing a water loss management program which will address savings in water as well as the potential savings in resources and energy usage. When looking at improving efficiency on the demand side, EPA will continue to promote the WaterSense program and work with stakeholders such as the Alliance for Water Efficiency to provide communities with information to help them identify solutions that fit their circumstances.

4. Please outline some of the current research that EPA is either conducting or assisting other agencies in that deals with water efficiency.

In addition to the Office of Water's WaterSense Program, the Office of Research and Development is actively involved in water efficiency-related research. One focus area is the Aging Water Infrastructure Research Program. This program is (1) evaluating drinking water and wastewater pipe condition assessment technologies to identify leaking pipes or those at imminent risk of failure; (2) providing information and guidance on the most appropriate strategy for pipe repair, replacement, or rehabilitation; and (3) designing and testing advanced water conservation approaches.

Research is also being conducted in the area of water reclamation and reuse. Examples of topics being investigated include the feasibility of industrial water reuse for biofuel production and field-scale testing of the use of reclaimed water for ground water recharge. In the area of green infrastructure, we are conducting field testing at our Green Infrastructure Research Facility on optimizing the recovery of stormwater and reuse of gray water and rain water. The 2010 Budget also includes $3 million to expand green infrastructure research to assess, develop and compile scientifically rigorous tools and/or models that will be used by EPA's Water program, States, and municipalities. This research will address region and climate-specific concerns and provide technical information that can be used to help quantitatively determine the benefits of green infrastructure and reduce the uncertainty involved in using it for compliance purposes. Research will also be conducted to advance the use of gray water, particularly in areas facing water shortages, to help reduce the burden on water supplies and infrastructure.

The Agency is working closely with other Federal agencies such as USGS, NIST, NOAA, and USDA, on these and other water-related issues.

5. How does EPA ensure that it is promoting cost effective water efficient technologies?

The WaterSense program considers cost-effectiveness in its initial selection of products categories for labeling by considering the payback period associated with the product. While cost savings are important, our research shows that consumers are also interested in the environmental benefits associated with the products. Consumers may see a greater benefit from the cost savings of WaterSense products as water utilities move to a full cost pricing model for setting water rates.

WaterSense does try to set specification criteria so that manufacturers will develop many new products to meet the specification. This enables greater consumer choice in terms of both style and price range. For example, when WaterSense first began the labeling of high efficiency toilets there were about 22 models that ranged in price from $120-500. Now there are well over 250 models with some costing less than $100, which is about the lowest price one can get for a high performing toilet.

Senator CARDIN. Well, first, Mr. Shapiro, let me compliment you on sticking exactly to 5 minutes.

[Laughter.]

Mr. SHAPIRO. We worked hard on that.

Senator CARDIN. Let me thank you for your testimony, and thank you for your leadership on these issues.

Unlike the Energy Star program, the WaterSense program does not have formal authorization. Would formal authorization by Congress help in what you are trying to do with the WaterSense program?

Mr. SHAPIRO. Well, I think it would be beneficial in a couple of ways. First, direct recognition by Congress of the importance of the program and its role I think would further support our efforts at outreach and communication, and give the program additional visibility.

Also, as I understand it, there are, although in general we have been fairly successful to date in launching the WaterSense program, there are certain bounds as to how far we can go, for example, in endorsing products with the WaterSense label because we don't have a separate authorization that would allow it as the Energy Star program does.

So there I think are areas where a specific authorization would add some benefits to our existing program.

Senator CARDIN. Could you give a little bit more detail as to what are the standards for WaterSense? I particularly want you to comment, if you would, on the IG's findings in regards to Energy Star that there have been, at least at times, products that have been given the rating that have not fully complied with the standards. So are you concerned that we might be running down a path in which we are giving a stamp of approval when in fact that's not the case?

Mr. SHAPIRO. Well, I think that in the case of the WaterSense program, we have a program design that really I think limits the ability to misrepresent products. The manufacturers themselves cannot claim that they meet a WaterSense standard unless their products have been tested and certified by an independent third party, and that third party itself is authorized through a process that meets international standards for independent certification programs.

So in order to maintain that certification, the manufacturer or service provider has to continually demonstrate that they are conforming with the standard. The standards that we developed are done as collaboratively as possible so that we build wherever possible on standardized testing techniques and measures that have already been approved or supported by national consensus bodies.

So we think we have put a program in place that limits the ability for misrepresentation because of the third party certification process, and we certainly feel that once the manufacturers invest in this process, they will certainly be on the look out for folks that are trying to evade the system and misrepresent their products as well.

Senator CARDIN. Now, I strongly support the WaterSense program and applaud you for the initiative, and personally believe it would have more legitimacy if it were authorized. There is a real

concern about getting more public interest and knowledge about the importance of water efficiencies, so I think it makes sense for Congress to act in this area.

The IG, though, pointed out that at least in the energy program there as not much opportunity for oversight for those who used the label to find out whether in fact they were complying with the standards. It is one thing for a manufacturer to say that they have used third party verification. It is another thing in fact that their products meet what they say they meet.

So are we going to be creating a problem if we have an authorized program for WaterSense in monitoring and making sure that in fact the products that are labeled WaterSense meet what the manufacturer says it is going to meet. How do we oversee that?

Mr. SHAPIRO. Well, again the certification process includes testing the products as they come off the manufacturing line on a periodic basis. So again, you can't be 100 percent sure, and I think at the end of the day if products are not performing, we will have a responsibility, and we do have a responsibility, to identify those manufacturers who aren't playing by the rules and take appropriate measures to deal with them.

However, again our experience to date has been that the process that is designed, which again is built on models where there is independent verification of certification, will give, should give the consumers a lot of confidence that the products bearing the label in fact will perform as certified and as tested.

Senator CARDIN. Your testimony points out the importance of green infrastructure. I would like to explore that a little bit more as to how EPA can be more helpful in promoting green infrastructure. Are there things that Congress should be looking at to give you more tools to move forward in this area?

Mr. SHAPIRO. Well, I think at this point we have the tools. Green infrastructure, as you know, generally involves applying concepts of natural hydrology to deal with stormwater management, so we look at naturalistic systems for increasing infiltration, for reducing the peak surge flows that occur as a result of storms in areas with traditionally a lot of impervious pavement, and encourage evapotranspiration as ways of managing the stormwater runoff. And in many cases, helping to recharge groundwater.

I think there is a lot of understanding about how many of these systems, such as infiltration swales and bioretention facilities and rain gardens work on an individual basis. What we need to do and we have begun to do is research to help us understand how these individual approaches can operate within an entire watershed to manage the water resource on a more integrated basis.

Again, progress is being made in that area. There is a lot of good work being done. So our tools and techniques are improving dramatically. I think there has traditionally been a reluctance to, on the part of water utilities, to adopt some of these measures. We are beginning to overcome that through the provision of information and technical training. And certainly the stimulus bill and the provision for a 20 percent setaside for green projects, which include green infrastructure, I think will provide additional incentives for water utilities to begin to look at these tools more frequently as they are making design choices.

Senator CARDIN. Well, I visited a green building in Howard County not too long ago, Howard County, Maryland, which is I think a model for a company that is innovative in green technology, building a building to operate that reflects that commitment, where they do have the rain gardens and they do recycle the stormwater and they do, I think, put it all together in a way that it should be, reflective of saving energy, being friendly toward our environment, and conserving water. All that is built into the technology.

Now, that is done in partnership with a local government, which has been a supportive partner. The EPA has programs that will allow you to participate in these types of ventures, but you don't have a separate research arm devoted toward water efficiencies. The House bill tries to do something about that by establishing an authorization for, and a person to deal with water efficiency research, and then allows for demonstration programs.

Would that be useful for you to spotlight the water efficiency issue? Or should we continue down the path of strengthening EPA's ability to deal in a broader sense, expecting that there would be attention paid to water efficiency issues?

Mr. SHAPIRO. Well, I think there are sort of multiple questions in there. As you know, the Administration hasn't taken a position on that House bill. I think that bill focuses specifically, as you say, on research relating to water efficiency. I think there are some areas of research within EPA today, especially relating to green infrastructure and the detection and correction of leaks in grey infrastructure that we are working very hard on.

At the moment, EPA doesn't have a research component that focuses on especially consumer and commercial water-using products and appliances. There are a number of external organizations to EPA that we rely on today to get the information that we use to develop our WaterSense criteria. And I think in looking at where to put funding in different areas, I think Congress would have to judge whether opening up an additional focus area for EPA's research versus other organizations that may already be playing in that area is the best use of money for water efficiency purposes.

Again, I think the overall needs for research and information to support a more efficient and sustainable water infrastructure is significant overall.

Senator CARDIN. Well, that was a very fine, diplomatic answer considering the agency has not taken a position. That was as positive of a response that I think you could have given. I thank you for that.

Here is our dilemma. Let me tell you why I think we do need legislation similar to what the House has passed. We may want to take a look at it and see whether we can't improve upon that. But we have huge problems in this Country, and as we look in Baltimore, we have aging pipes that need to be replaced. We are in the process of replacing some. The cost is well beyond the capacity of the local governments, and they are under court orders because of environmental violations.

But we really haven't taken a focus as to the cost benefit ratios on water efficiencies, which I think would be very helpful to have that type of information available as we make decisions on how to proceed locally, as well as a national strategy.

So I think having the information base, and President Obama talked frequently about having decisions made by best science and best information, it would be useful to be able to know the cost benefit ratios on dealing with water efficiency issues. And I don't think you really have that capacity today within EPA. You do look at these issues, but it is not the center focus. It becomes perhaps the byproduct of other research that you are doing.

So I think what Congressman Matheson was doing in the House bill has merit for us to take a look at here. And the reporter doesn't show those nods, so we will just reflect the fact that there was a friendly smile at the Chair.

[Laughter.]

Senator CARDIN. Again, let me thank you for your testimony. We look forward to working with you on this issue. Obviously, this is the first hearing of our Subcommittee, but the first hearing I think Congress has had, the Senate has had on this issue. And I know that the Chairman is interested in this and other Members are interested in this, and we will be getting back to you I think for specific additional information that we may need from you.

Mr. SHAPIRO. Thank you very much.

Senator CARDIN. Thank you.

I would also ask unanimous consent that Senator Boxer's statement be made part of the record. She is on the Senate floor this morning working on an amendment to the budget resolution, and asked me to welcome our witnesses from her home State of California on her behalf.

[The prepared statement of Senator Boxer follows:]

STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR
FROM THE STATE OF CALIFORNIA

We are here today to review EPA's efforts to promote water-use efficiency.

I would like to extend a special welcome to my fellow Californian, Martha Davis from the Inland Empire Utility Agency. Ms. Davis will be testifying about her agency's innovative efforts to better use California's precious water resources.

The topic of today's hearing is very important to me and to my home State of California, and I would like to thank the Subcommittee Chair, Senator Cardin, for holding this hearing.

In California, we are currently in the third year of one of the worst droughts in the State's history. Reservoirs are at historically low levels, dozens of water agencies have already ordered water rationing, and just last month, the Governor declared a State-wide water emergency.

But California is not alone in the water problems that we face. A 2003 GAO survey of State water managers showed that 36 States expected water shortages by the year 2013.

The pressures on our water resources will increase in the future. Population in the U.S. is expected to grow 30 percent by 2030. And global warming is predicted to increase the occurrence of drought and reduce the reliability of water supplies.

There are a number of options that can be implemented now to deal with today's water crises and prepare for a future of growing demand and less water. Water reclamation and recycling, groundwater cleanup and more water efficient products are all technologies that are currently available.

I look forward to hearing from today's witnesses on how EPA can help communities implement these environmentally beneficial water infrastructure projects.

There are also emerging technologies, such as lower energy desalination and innovative water recycling systems, that show great promise. We should invest in research and development to help ensure that good water management ideas like these are available to address this growing problem.

I believe that today's hearing will help us to better understand EPA's role in addressing this challenge.

Senator CARDIN. We will now go to the second panel, which includes Martha Davis, the Executive Manager for Policy Development, Inland Empire Utilities Agency; Mary Ann Dickinson, Executive Director, Alliance for Water Efficiency; Mark A. Shannon, the James W. Bayne Professor, Director of the Center of Advanced Materials for the Purification of Water With Systems, University of Illinois at Urbana-Champaign; and G. Tracy Mehan, III, Principal, The Cadmus Group, Inc.

Welcome all of you, and particularly those who are from California from our Chairman, welcomes you, and I am supposed to make sure that you are well taken care of in the Committee.

So Ms. Davis, you are from California, I take it?

Ms. DAVIS. Actually, I was [remarks off microphone].

Senator CARDIN. Well, under those circumstances, you can go first.

[Laughter.]

STATEMENT OF MARTHA DAVIS, EXECUTIVE MANAGER FOR POLICY DEVELOPMENT, INLAND EMPIRE UTILITIES AGENCY

Ms. DAVIS. Thank you, sir. I will try to emulate Mr. Shapiro's brevity.

Mr. Chairman, thank you for the opportunity to present testimony [remarks off microphone].

My agency is located in San Bernardino in Southern California. We are a wholesale water district formed in 1950 to distribute imported water supplies and we are a member of the Metropolitan Water District of Southern California.

We also provide regional wastewater treatment for over 850,000 residents and we are proud to provide three products to our community: recycled water, compost and renewable energy.

Mr. Chairman, for the record, I am supplying an updated corrected copy of my statement. I would like to emphasize three points from my testimony. First, these are challenging times for all water managers. As you pointed out in your opening statement, our Nation's population continues to grow, there are increasing conflicts over existing water supplies, which in California and many other places have led to court rulings and regulatory developments that constrain these deliveries.

Climate change adds an entirely new variable as rising temperatures will increase water demands at the same time that rainfall patterns shift and droughts become both more severe and more erratic.

Water agencies throughout the Nation are responding by implementing water efficiency programs. Last year, California's Governor Schwarzenegger called for a 20 percent mandatory reduction in per capita water usage by 2020, which translates into a potential 1.74 million acre feet of additional water supplies for the State of California.

The State water plan, which has just been released, recognizes water use efficiency as a central element of the State's strategy to enhance water supply reliability, restore ecosystems and respond to climate change.

Clearly, improving the efficiency of appliances both indoors and outdoors so that we can structurally build in water savings is a

vital part of transforming the Nation's water use. I have had an opportunity to review Ms. Dickinson's testimony and concur with the recommendations put forward for expanding the WaterSense program. There are many synergies with the very successful Energy Star program, and opportunities to combine the two should be implemented.

Second, many of our water projects throughout the Nation were designed decades ago and were built around the concept of using water once and then discharging it. Yet if water is recycled and reused, it stretches out water supplies with three primary benefits.

First, recycled water is drought proof, which means it is available when other supplies are not. Second, the reliability of recycled water means that it is a core supply that agencies can rely upon to help adapt to climate change impacts. And third, having recycled water as part of an agency's supply enables our agencies to optimize the delivery of potable supplies and non-potable supplies to the appropriate use. What we want to do is reserve the best quality water for drinking water purposes.

Similarly, the development of local resources—capture of stormwater, rainwater, conjunctive use of our groundwater basins, desalination—all are parts of a comprehensive strategy to improve water supply reliability. The EPA's State Revolving Funds program is a core source of funding for water reuse and other local water supply infrastructure, as well as for water efficiency.

So all of these projects—water efficiency, recycling, local stormwater capture—all these projects that make improved use of existing water supplies, should be recognized as green infrastructure, and the funding priority established for these projects similar to what occurred under the American Recovery and Reinvestment Act of 2009.

Third, preparing for climate change, both through adaptation and mitigation strategies is something our water agencies have to start doing now. Our agency participated in a National Science Foundation grant that was conducted by the RAND Corporation 2 years ago, which concluded that the development of a multifaceted strategy, increased water efficiency, recycled water, stormwater capture, reclaiming of poor quality groundwater supplies, was the most cost-effective utility strategy for meeting the impacts of future climate change.

We also know, as you pointed out in your opening statement, that the use of water is very energy intensive, with 18 percent of the Nation's electricity used to pump, treat and deliver water supplies. And we also know that the energy generation required to provide this power creates high levels of carbon emissions.

Use of water supplies that have a lower embedded energy requirement can significantly contribute to the reduction of greenhouse gases, and I provide an example in my testimony comparing the use of our recycled water to imported water, which is our most energy-intensive water supply because it has to be pumped up and over the Tehachapis to come into Southern California.

We can save an estimated 7,500 kilowatt hours per million gallons of recycled water used. In real terms, we are on track to be able to use 50,000 acre feet of water per year in our service area

within the next 3 years. And if we do this, this is roughly equivalent to taking 6,500 cars off the road every single day.

So clearly, more information is urgently needed to document the energy and greenhouse gas emission reduction benefits from water efficiency and from the development of local supplies that can replace more energy-intensive water supplies.

In closing, we believe that the U.S. EPA has a core role to play in helping to develop information and technologies to improve water efficiency and the development of local water infrastructure. In my testimony, I called out H.R. 631 as the type of legislation that I think is the right approach. Quite frankly, it is a modest investment, a down payment if you will, on the development of information that will help guide all of our water agencies and our Nation to figuring out how to do a better job of increasing water efficiency and developing water supply reliability, and actually meeting the climate change and water supply reliability challenges of the future.

And I would be happy to answer any questions. Thank you for this opportunity to testify before the Subcommittee.

[The prepared statement of Ms. Davis follows:]

SUBCOMMITTEE ON WATER AND WILDLIFE

OF THE

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

EPA's Role in Promoting Water Use Efficiency

March 31, 2009

Testimony by

Martha Davis
Executive Manager, Policy Development
Inland Empire Utilities Agency

Introduction

Mr. Chairman, Ranking Member, and members of this Subcommittee on Water and Wildlife, thank you for this opportunity to testify today regarding the EPA's role in promoting water use efficiency. I am the Executive Manager of Policy Development for the Inland Empire Utilities Agency and oversee the Planning and Water Resources Department within the Agency. I also serve as Co-Chair of the California Watershed Advisory Committee, an appointed position by the California Secretary of the Natural Resources Agency.

Inland Empire Utilities Agency

The Inland Empire Utilities Agency, located in San Bernardino County, was formed as a wholesale water utility in 1950 to become a member agency of the Metropolitan Water District of (MWD) of Southern California and distributes about 70,000 acre-feet of imported water to the cities of Chino, Chino Hills, Fontana (through the Fontana Water Company), Ontario, Upland, Montclair, Rancho Cucamonga (through Cucamonga Valley Water District) and the Monte Vista Water District. The Agency also provides wastewater treatment service through four regional water recycling plants that produce about 60 million gallons per day or 63,000 acre-feet per year. Excess recycled water flows downstream into the Santa Ana River, and the Orange County Water District recharges that water into the Orange County groundwater basin for drinking water. IEUA currently serves a population of about 880,000 residents.

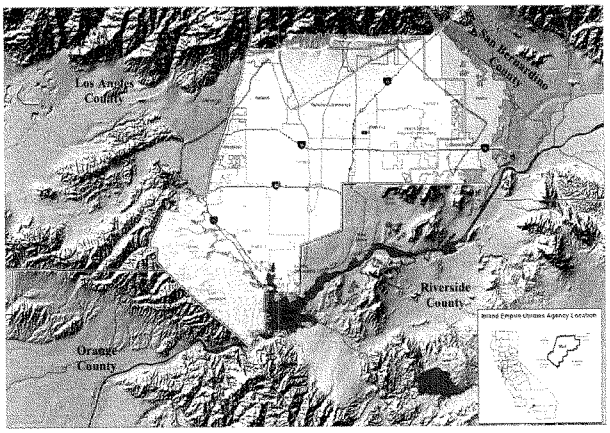


Figure 1 - IEUA's service area located in western San Bernardino County

The Agency has received numerous awards from U.S Environmental Protection Agency, U.S. Department of Agriculture, U.S. Department of Energy and the Department of the Interior as well as twice from the Governor of California, and other state agencies and non-profit organizations for its innovative environmental programs on water use efficiency, reuse and recycling, renewable energy and state of art wastewater treatment technologies.

Water Resources Planning within IEUA's Service Area

Overall water use within the Agency's service area is about 2600,000 acre-feet annually (2009 IEUA Drought Plan and 2009 MWD Water Supply Allocation Plan). About 75 % of these supplies are derived from local groundwater and surface supplies within the Santa Ana Watershed and 25 % is from imported water supplies delivered through the State Water Project by MWD.

IEUA's service area is located over the Chino Groundwater Basin, one of the largest groundwater basins in Southern California. The Chino Basin was adjudicated in 1978 and is governed by the Chino Basin Watermaster, which has adopted an Optimum Basin Management Plan (OBMP) to protect water quality and to manage the local supplies for the maximum benefit of the local ratepayers. The OBMP is consistent with the 2004 Santa Ana Regional Water Quality Control Board "Maximum Benefit" Basin Plan for the Chino Basin.

Until the beginning of the economic recession last year, the IEUA service area was one of the most rapidly growing areas in California. When the nation's economic economy rebounds, this region is expected to become one of the State's primary growth areas again, with the potential to increase by 50% to 1.3 million people within the next 20 years.

Under traditional water resource planning assumptions, demand for imported water supplies from MWD in IEUA's service area could increase from the current level of 70,000 acre-feet per year to 150,000 acre-feet in 2020 to meet this population's water needs. However, current conditions make the assumption that additional imported water supplies will be available in future years uncertain at best. Recent court rulings and regulatory developments have constrained MWD's water deliveries from the State Water Project, the source of the service's area's imported water supplies. In addition, climate change would likely acre-feet water supplies in California and the arid Southwestern portions of the United States in the next decade, as reported by the U.S. Bureau of Reclamation. California is currently experiencing a third year of drought and the State's Governor Schwarzenegger has announced a drought emergency. Within the next month, IEUA anticipates that mandatory rationing will be imposed throughout the State.

IEUA Integrated Water Management Strategy

Five years ago, the Agency's five-member, elected board of directors recognized the need to develop a sustainable long-term water resources management strategy that would "drought" proof the service area's economy and ensure that adequate water supplies would be available to meet future growth. The cornerstone of the program is the development of new local water supplies to offset the need for additional imported water.

IEUA decided to invest in local supplies through a multifaceted watershed-based strategy that would capitalize on increased conservation; recycled water use; and storm water capture in the local groundwater aquifers. Specifically, the Agency has accelerated water conservation and efficiency practices, expanded a water distribution system for irrigation and industrial uses by replacing drinking water with recycled water and developed infrastructure and programs to utilize local groundwater supplies as effectively as possible.

Over $350 million has been invested by IEUA and seven of its municipal customers in new water infrastructure in the past five years. Key goals for water supply development are:

- Water Conservation –target 10% savings – 25,000 acre-feet per year (2012)
- Water Recycling – target 50,000 acre-feet per year (2012)
- Stormwater – target 12,000 acre-feet of new supplies (annual average)--implemented
- Local Groundwater Storage and Conjunctive Use – target 200,000 – 300,000 acre-feet of new storage (MWD storage program implemented 100,000 AF)
- Chino Brackish Groundwater Desalters- completed 27,000 AF and an additional 12,000 AF expansion under design and completion by 2012

Water Conservation (25,000 acre-feet per year, 10% reduction in per capita water usage)

IEUA and its retail utilities are committed to implementing the Memorandum of Understanding (MOU) regarding Urban Water Conservation in California. IEUA is an active member of the California Urban Water Council (CUWCC) and the Alliance for Water Efficiency. IEUA's goal is to reduce its per capita water use by 20%, consistent with Governor's Schwarzenegger's water conservation mandate, through aggressive implementation of customer conservation programs. The Agency, in partnership with MWD, currently provides rebates for customer investment in water efficient appliances such as low flow toilets, washing machines, water brooms, water efficient x-ray machines and irrigation control devices that are achieving new water savings each year of 500 acre-feet – 1,000 acre-feet (cumulative life time savings to date projected at 60,000 acre-feet).

Because an estimated 60% of residential water in the service area is used for outdoor landscaping, the Agency has initiated a number of new innovative programs targeting this sector, including grants to remove lawns and replace them with water efficient plants and irrigation systems (Water Wise

Landscaping Program, establish water efficient gardens in elementary schools (Garden In Every School Program), provide residential and commercial water audits (Chino Basin Water Conservation District Leadership Landscape Evaluation and Audit Program), and install water efficient /low maintenance landscaping in low income areas through block grant-funded neighborhood improvement programs (Ontario Cares).

IEUA has also led the formation of the Chino Basin Landscape Alliance, a voluntary coalition of elected officials representing all of the service area's cities and water agencies, to promote water efficient landscaping and low impact development (LID) practices that capture rain and storm water. The Alliance recently completed and adopted a model water efficient landscaping ordinance for the Chino Basin (consistent with stringent requirements of AB 1881) which is now proposed to be adopted as the landscape ordinance for San Bernardino County. The Alliance also provides tours and educational workshops for planning commissioners, city staff and elected officials to showcase model examples of water efficient landscapes for residential, commercial and institutional properties.

Water Recycling (50,000 acre-feet per year by 2012)

IEUA owns and operates four water recycling plants that produce high quality water which meets all state and federal requirements for non-potable landscape irrigation, industrial uses and groundwater replenishment. The Agency currently recycles about 25,000 acre-feet annually and, in response to the drought that California is currently experiencing, is implementing a Board-adopted plan to expedite increased usage of recycled water to approximately 50,000 acre-feet within the next 3 years.

The Agency is constructing a new 75-mile "purple" recycled water pipeline (along with pump stations and reservoirs) that will connect and deliver recycled water to existing large customers (schools, golf courses, city parks). In addition, IEUA and the Chino Basin Watermaster have secured court approval to expand the artificial recharge of the Chino Groundwater Basin. Recycled water is being blended with stormwater and imported water in a coordinated fashion with the San Bernardino Flood Control District to ensure that as much local water can be conserved as possible. The Agency's $200 million capital program in recycled water is funded through low interest loans from the State Revolving Fund, revenue bonds, state and federal grants, as well as by local property taxes, connection fees and user charges.

The increased use of recycled water is a key *conservation* strategy. Recycled water enables water agencies to optimize the delivery of potable and non-potable water supplies to the appropriate use, reserving its best quality drinking water for potable uses. The provision of recycled water in IEUA's service area is one of the primary ways in which Agency expects to reduce the need for more imported drinking water in the future – ultimately reducing costs to customers by 10% to 20% as the population increases.

Stormwater (12,000 acre-feet annual average of new stormwater capture and percolation)

One of the critical issues facing urban areas is the loss of permeable surfaces that allow water to infiltrate into groundwater basins as a result of hardscaping and storm water runoff structures.

IEUA, in coordination with the Chino Basin Watermaster, the San Bernardino County Flood Control District and the Chino Basin Water Conservation District, is developing an integrated recharge master plan that will optimize the capture of stormwater (along with the use of imported water from MWD and local recycled water) to enhance the storage and recovery of water from the Chino Basin. To date, a combination of 19 existing flood control retention basins and new recharge basins have been improved at a cost of $50 million and recharge capacity has increased to more than 110,000 acre-feet annually. Basin maintenance, including silt removal to maintain recharge capacity, averages $750,000 annually.

In addition, IEUA is working in coordination with the Inland Empire Landscape Alliance and the Chino Basin Water Conservation District to develop land use policies, practices and programs that will encourage capture of rain and stormwater for infiltration into the Chino Groundater Basin. IEUA constructed the nation's first Platinum LEED-rated office headquarters by a public agency, which features low impact development strategies such as permeable pavers, porous concrete, and bioswales. The 29-acre site is capable of retaining a 25-year flood event. Currently the Agency is developing an innovative pilot rebate program in partnership with MWD, San Bernardino County and the Southern California Porous Concrete Association in which an incentive will be offered for use of porous concrete (in lieu of traditional hard surfacing) in areas where it can be demonstrated that infiltration will benefit the Chino Groundwater Basin.

Local Groundwater Storage and Conjunctive Use - target 200,000 – 300,000 acre-feet of new storage

The Chino Basin Watermaster is implementing an Optimum Basin Management Plan to enhance the conjunctive use storage of the Chino Basin. The goal is to store 2000,000 – 300,000 acre-feet of imported water that can be delivered during wet years (the one time when this source may be plentiful in the future) for dry year withdrawal for local, regional and statewide benefits. In June, 2003, IEUA, the Chino Basin Watermaster, Three Valleys MWD, Western MWD and the Metropolitan Water District executed an agreement for an initial 100,000 acre-feet of storage and recovery projects. Over $27.5 million from MWD and state grants has been expended on the development of 20 additional wells and wellhead treatment to enable recovery of this water. By last May, MWD had over 88,000 acre-feet in storage and made a call for the first 33,000 acre-feet of this water to supplement supplies that had been impacted by the drought. Planning to expand the MWD program to 150,000 acre-feet of storage is underway, which is expected to increase dry year yield from 33,000 to 50,000 acre-feet – a 50% increase.

Chino Desalination Projects (40,000 acre-feet per year by 2012)

Like many parts of the nation, historic land use practices have caused areas of the Chino Basin to have high salts that make the water unfit for domestic uses. To correct this problem, protect the Santa Ana River and the 7 million downstream water users in Orange County, and recover this poor quality water, the Chino Basin Optimum Management Plan recommends implementation of groundwater cleanup projects to pump and treat poor-quality groundwater to drinking water standards. Since 2000, two Chino Basin desalters have been constructed that are recovering over 26,000 acre-feet of groundwater that is now blended into the region's water supplies. The Omnibus Public Lands Act approved this month provides authorization under the Bureau of Reclamation's Title XVI program to provide funding for a third desalter that, together with brine line improvements, is expected to achieve the 40,000 acre-feet annual production goal by 2012

Benefits of the Integrated Water Management Strategy

IEUA's strategy is designed to increase water supply reliability while reducing the utility's dependence on imported water supplies. This is an important approach to help drought proof the local economy as well as to anticipate and prepare for the potential impacts of climate change that are expected to significantly intensify drought events in the future. A recent feasibility study commissioned by the a National Science Foundation grant of $1.5 million and conducted by the RAND Corp. concluded that development of a multifaceted strategy of increasing conservation recycled water stormwater capture and reclaiming of poor quality groundwater supplies was the most cost-effective utility strategy to address the potential impacts of climate change on Southern California.

However, there are significant additional energy and climate-related benefits to the region, state and to the nation from this strategy. Use of water is very energy intensive, with over 19% of all electrical consumption in the state related to pumping, treating and distributing water (18% in the nation). Increased population and related water consumption will only increase energy use. In addition, energy generation, particularly from conventional sources such as coal and natural gas, generate high levels of carbon emissions. As a result, water efficiency and use of water supplies that have lower embedded energy requirements can contribute significantly to the reduction of greenhouse gas emissions in the nation.

For example, importing water to southern California is one of the most energy intensive supplies – second only to ocean desalination, as is shown below in Figure 2. The State Water Project, which is the direct source of IEUA's imported water supplies, uses about six times the energy that an equivalent amount of recycled water requires. Increasing the daily amount of reuse from 15 million gallons per day to 50 million gallons per day , and using this water to replace imported supplies, will be equivalent to saving about 7,500 kWh per 1 million gallons of water. This is equivalent to a 79% reduction in carbon emissions, roughly the same as taking 130 cars off the road for every 1 million gallons of recycled water

that is used within IEUA's service area (the use of 50,000 acre-feet of recycled water as planned by IEUA would be equivalent to removing 6,500 cars from the road).

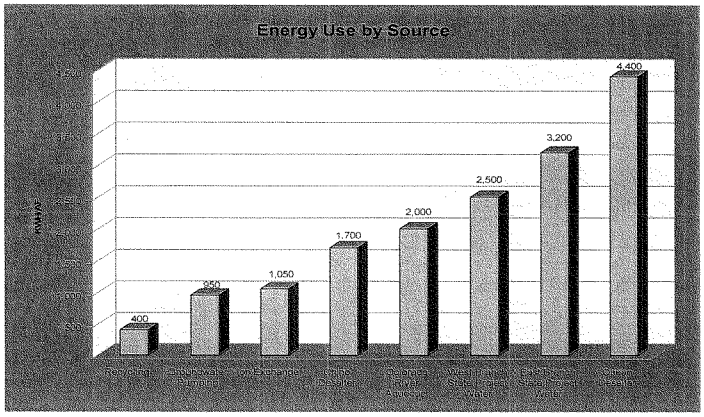


Figure 2 - Energy Use by Source in IEUA's Service Area, Prepared by Professor Robert Wilkinson, U.C. Santa Barbara, 2004

An integrated local water supply strategy can provide important environmental and habitat benefits. Development of wetlands and natural treatment systems, such as those developed in the Prado Basin by Orange County Water District and featured by IEUA at its Chino Creek Wetlands and Educational Park, enhance water quality, improve air quality, and offer opportunities to restore native habitats that have been removed by urban development. Low impact development and restoration of the ability of local landscapes to better process rain water and stormwater improves water quality at the same time as it restores infiltration capacity for groundwater resources and reduces potential for floods. A multi-benefit approach, such as that presented in the Chino Creek Watershed Plan that was prepared by IEUA and regional stakeholders in 2007, underscores the value of development a balanced strategy to local resources management.

Finally, the development of local resource projects is an important vital part of creating green jobs. The American Recovery and Reinvestment Act of 2009 allocates $6 billion for local clean water and water infrastructure projects ($4 billion for Clean Water Drinking State Revolving Fund and $2 billion for Drinking Water State Resolving Fund). The Alliance for Water Efficiency estimates that a $10 billion investment in water efficiency and conservation projects alone could boost the nation's GDP by $13 to $15 billion while employing 150,000 to 200,000 and saving trillions of gallons of water. Similarly

construction projects like IEUA's recycled water project are green infrastructure programs that will bolster local economy.

Future Issues and Role of the U.S. Environmental Protection Agency

The nation today faces significant water challenges. Ensuring that there are sufficient water supplies to reliably meet the country's future water requirements, especially given the predicted impacts of climate change, will be formidable. What is needed is a balanced approach to the development of multiple sources of water supplies, with a clear priority for water efficiency, local water supply management, and an emphasis on less energy intensive uses of water that will also protect water quality and enhance wildlife habitats. Legislation like H.R. 631 underscores the value of a modest investment (proposed at $20 million annually) in research and technological transfer on water efficiency, water reuse and other water resource strategies that will result in millions of dollars in energy and water savings, reductions in greenhouse gas emissions as well as more locally and economically secure water supplies.

The U.S. Environmental Protection Agency can play a pivotal role in helping provide water agencies with much needed information on water efficiency and conservation actions, as well as the integrated development of wastewater treatment, reuse, desalination and groundwater recharge and recovery strategies. The development of strategies and encouragement of coordinated regional infrastructure planning for water supply, groundwater management, stormwater, wastewater reused and recycling needs to be integrated at a watershed scale. It is also vital that the U.S. Environmental Protection Agency coordinate with the U.S. Bureau of Reclamation, U.S. Department of Agriculture National Resources and Conservation Service, U.S. Army Corps of Engineers, and the U.S. Department of Energy as each contributes to implementation of water-related research and water efficiency and local water supply development programs.

I would particularly recommend that embedded energy in water and the related potential for reduction in greenhouse gas emissions be incorporated into the proposed U.S. Environmental Protection Agency research and development program. Water and wastewater agencies have the potential to play a pivotal role in reducing greenhouse gas emissions through the development and use of water supplies that have lower energy and carbon footprints. In addition, water efficiency and energy efficiency programs are closely linked and should be reflected in national coordination of such customer end use conservation programs as WaterSense and Energy Star.

In closing, thank you for this opportunity to testify. If I can provide any additional information on the opportunities for development of water resources management programs from a local perspective, please don't hesitate to contact me.

Senator CARDIN. Thank you.
Ms. Dickinson.

STATEMENT OF MARY ANN DICKINSON, EXECUTIVE DIRECTOR, ALLIANCE FOR WATER EFFICIENCY

Ms. DICKINSON. Good morning, Mr. Chairman. Thank you for the opportunity to come and testify.

I represent the Alliance for Water Efficiency, which is a North American nonprofit organization composed of diverse stakeholders with significant experience in cost-effective water conservation programs and policies.

We represent water utilities, plumbing and appliance manufacturers, the irrigation industry, government agencies, retailers, academic researchers. We have a list of our representatives on the board in our testimony.

Our mission is to promote the efficient and sustainable use of water, to promote the cost-effective measures that you have mentioned earlier, Mr. Chairman, that will reduce wasteful consumption, reduce the need for additional drinking water and wastewater capacity, and provide multiple energy, economic and environmental benefits.

And in that mission, we work closely with the staff at the Environmental Protection Agency, as the Nation's steward of ambient water quality as well as safe drinking water. They have been a very strong promoter of water efficiency's many benefits. Programs have existed at EPA for well over 20 years in the Office of Water and Wastewater, albeit modestly funded and staffed.

But the limited focus began to grow within EPA with the launching of the WaterSense program in 2006. Like it Energy Star cousin, WaterSense is aimed at product efficiency, product labeling, and consumer messaging. And unlike its Energy Star cousin, it is funded at a very modest level, $2.4 million annually, 20 times less than the Energy Star program.

So what we are recommending, as WaterSense being an important flagship program with very visible links to the water utilities, the private sector and the public, we are recommending that that funding level be measurably increased. WaterSense has made extraordinary strides in the past 3 years, launching a nationwide program, testing and labeling hundreds of products such as high efficiency toilets and faucets.

Their effort in rolling out the program quickly has been truly remarkable and commendable. However, it must be acknowledged that that quick success was primarily possible because important work had already been done in the water efficiency community to help pave the way. Now that other product specifications need to be fully researched and tested, it is critical that WaterSense be provided sufficient funds to carry out the mission and to keep its partners engaged.

The private sector also strongly supports the WaterSense program and has demonstrated its desire to be participating partners, to see faster progress, and to see the labeling of more product categories. By comparison, WaterSense has so far been able to label fully three product categories versus Energy Star's 60, so there is quite a bit of work to do.

WaterSense also has some important differences. No label goes to a product that isn't 20 percent more efficient than the national efficiency standard for that product. And as we have already discussed, it is third-party verified. So it provides, the label provides the consumer with not only a guarantee of water efficiency, but a guarantee of superior performance. So the double-flushing toilet of the past will not be returning.

So to continue this work, we recommend that WaterSense be authorized by Congress, to be given official status, not only to ensure its longevity, but to signal important policy approval from this current Administration. We recommend that its funding be increased to at least $10 million annually, which is still only one-quarter of the Energy Star program.

If you leave it at its current annual funding level of $2.5 million, they will only be able to label one to two product categories a year, which is not sufficient to meet the true needs that are now in the marketplace. There are literally dozens of products waiting to be considered, both in the commercial as well as residential sectors. And so addressing the largest water use, which is urban irrigation, is a critical need that WaterSense must spend considerable time working on and working in cooperation with the stakeholder community.

We also have a number of detailed recommendations for the WaterSense program that are contained in our testimony. We have also developed very specific recommendations for funding of State Revolving Loan Funds and continuing the 20 percent set-aside that was instituted in the American Recovery and Reinvestment Act. We would like to see that 20 percent set-aside continued, and we would like to see it continued in a way that perhaps required planning and water efficiency performance improvements in the water utilities that are applying for those funds. So we have recommendations in our testimony on that.

And I would like to conclude by saying that our testimony also has a list of water efficiency research needs that were developed in response to earlier drafts of Congressman Matheson's bill, H.R. 631. We have developed a list of about $31 million worth of projects which are just the beginning of what we have identified as research opportunities in the United States. So clearly, as Martha mentions, $100 million would be a very minimal amount to devote to this topic.

Successfully reducing water consumption requires careful examination of products, programs and practices, and the research that we are recommending is applied research. It is not technical or theoretical. It is applied research that guarantees the water savings and documents those cost-effective benefit cost savings.

So we want to thank you for the opportunity for this testimony, and I encourage you to take a look at the detailed recommendations that we have provided. And I am happy to answer any questions you may have.

Thank you.

[The prepared statement of Ms. Dickinson follows:]

Statement of Mary Ann Dickinson

Executive Director

Alliance for Water Efficiency

EPA's Role in Promoting Water Efficiency

Hearing of March 31, 2009

Subcommittee on Water and Wildlife

Senate Committee on Environment and Public Works

The Alliance for Water Efficiency is pleased to appear before you today to offer views on activities and programs to improve water efficiency throughout the United States. We are a North American non-profit organization, composed of diverse stakeholders with significant experience in water conservation programs and policies. Our mission is to promote the efficient and sustainable use of water, to promote cost-effective water efficiency measures that will reduce wasteful consumption, reduce the need for additional drinking water and waste water capacity, and provide multiple energy, economic, and environmental benefits. And in that mission, we work closely with staff at the Environmental Protection Agency (EPA).

As the nation's steward of ambient water quality as well as safe drinking water, EPA has promoted water efficiency's many benefits. Programs have existed for over 20 years in EPA's Office of Water and Wastewater, albeit modestly funded and staffed.

WaterSense

This limited focus began to grow with the launching of the WaterSense program in 2006. Like its Energy Star cousin, WaterSense is aimed at product efficiency, product labeling, and consumer messaging. Unlike its Energy Star cousin, however, WaterSense is funded at a very paltry level of $2.4 million annually, compared with over $44 million annually for Energy Star.

WaterSense is EPA's most important flagship water efficiency program, with visible links to the water utilities, private sector, and the public. Despite low levels of funding, WaterSense has made extraordinary strides in the past three years, launching a nation-wide program, and testing and labeling hundreds of products such as high-efficiency toilets and faucets. EPA's effort in rolling out the program quickly has been truly remarkable and commendable. However, it must be acknowledged that quick success was possible primarily because the water efficiency community had already paved the way with preliminary testing and product specifications, for high-efficiency toilets in particular. Now that other product specifications need to be fully researched and tested, it is critical that WaterSense be provided sufficient funds to carry out its mission and to continue to keep its partners engaged. The private sector strongly supports the WaterSense program, has demonstrated its desire to be participating partners, and is anxious to see faster progress, and the labeling of more product categories.

WaterSense has some important differences from its Energy Star cousin. No product receives a label without a performance test by a third party certifier. No product receives a label unless it is 20% more efficient than the national efficiency standard for that product. And product specifications are based on field as well as laboratory analyses. Thus, a WaterSense labeled product provides the consumer with a guarantee of not only water efficiency, but superior performance. The double-flushing toilet of the past will not be returning.

But to continue this great work, WaterSense needs to be authorized by Congress, not only to ensure its longevity, but also to signal important policy approval from the current Administration. We recommend that its funding be increased to at least $10 million annually. If left at the current annual funding level of $2.4 million, only 1-2 product categories per year – at the most – could be launched. This would be unacceptable. There are literally dozens of products waiting to be considered, in both the commercial as well as residential sectors. And addressing the largest growing water use – urban irrigation – is a critical need that must be adequately funded to ensure that product specifications are effective and reasonable.

We have a number of further detailed recommendations for development of the WaterSense program which are included in our full testimony.

Funding and Policy for Water Efficiency Programs

EPA's funding of State Revolving Funds (SRF) is an important policy opportunity. Until the American Recovery and Reinvestment Act of 2009 (ARRA), green infrastructure projects did not receive much official recognition in clean water and drinking water programs. The ARRA changed all that by designating a mandatory 20% set-aside for green projects such as energy efficiency, water efficiency, or innovative environmental projects. This was an important step, a step which should be continued in the future and codified in federal SRF requirements, in order to ensure that adequate consideration is given to funding infrastructure projects that include efficiency as an important part of project goals.

Further, EPA should require that states examine ways to require water efficiency as part of its own implementation of SRF awards. EPA recommended this strategy – albeit on a voluntary basis – in its Water Conservation Plan Guidelines to States, published in 1998. And some states have adopted it. California requires that all Clean Water SRF applicants commit to implementing the state's Water Conservation Best Management Practices before state SRF funds can be awarded. A similar requirement exists on the Drinking Water SRF side. Requiring this kind of commitment of all states will ensure that federal funding will be spent on

sustainable, efficient projects which are appropriately-sized with less environmental and energy impact.

Water Efficiency Research

With drought gripping much of the country and with water supplies in shortage conditions in many locations, the time is right for the federal government to carefully assess water efficiency as a beneficial strategy, and to do so in a manner carefully structured to ensure measurable results. The Alliance prefers that a well-grounded and well-organized Research and Development program get firmly established, rather than for any particular research program to get funded. And we also believe that the criteria for a water efficiency research program should be carefully vetted with stakeholders. One important stakeholder group is the Plumbing Efficiency Research Coalition, launched earlier this year and comprised of six major plumbing and water efficiency organizations nationwide.

Successfully reducing water consumption requires careful examination of products, programs, and practices. Unlike the theoretical research that is often conducted in other environmental programs, water efficiency research must be applied research, testing programs and products in real world situations. How low can fixture flow go without potentially impacting the flow in drain lines? How can water, once used for potable purposes, best be kept on site to re-use for landscape irrigation? What are the direct reductions of greenhouse gas emissions that are possible with water efficiency programs?

This type of applied research can benefit EPA's overall sustainability approach, not just water efficiency. Of particular concern is gray water. Gray water is an on-site source of water that embodies no energy for pumping and transport from some remote location. It does require a level of treatment dependent upon public health and safety, and one which corresponds to its ultimate end use. But gray water holds significant promise in helping US consumers to reduce their need for potable water for landscape irrigation. To enable this to happen, however, a

universal Federal definition of gray water and its requirements must be set by EPA and the States to enable moving forward with actions to capture and use this resource.

Finally, although many water-efficient products, technologies, and programs already exist, more research and development is needed. Funding to date has been limited and woefully insufficient given the chronic need. Many of the projects undertaken in the past ten years have been funded by utility dollars. In our full testimony we offer the subcommittee an illustrative list developed by the Alliance's Water Efficiency Research Committee, which includes potential high-value research topics to advance our water efficiency knowledge and to help speed the commercialization of water-efficient products and practices.

In summary, we urge the Committee to consider making water efficiency a program worthy of continued Congressional review:

1. **WaterSense authorization and funding;**
2. **Setting requirements for water efficiency project funding with State Revolving Fund programs; and**
3. **Comprehensive water efficiency research programs that will yield important findings about appropriate standards and specifications and measurable savings for future sustainability.**

Thank you for the opportunity to testify.

Mary Ann Dickinson
Executive Director
Alliance for Water Efficiency
P.O. Box 804127
Chicago, IL 60680

773-360-5100 office
771-345-3636 fax

maryann@a4we.org
www.allianceforwaterefficiency.org

ALLIANCE FOR WATER EFFICIENCY BOARD OF DIRECTORS

Carole Baker (Chair)
Director of Intergovernmental Relations, Subsidence District (Texas)
Gunnar Baldwin
Water Efficiency Specialist, TOTO USA, Inc. (New Hampshire)
David Bracciano (Vice-Chair, Programs)
Demand Management Coordinator, Tampa Bay Water (Florida)
Timothy Brick
Chairman of the Board of Directors, Metropolitan Water District (California)
Joyce Coffee
Director of Project Development, Chicago Department of the Environment (Illinois)
Alice Darilek
President, PCR Consulting (New Mexico)
Al Dietemann
Acting Resources Conservation Manager, Seattle Public Utilities (Washington)
Elizabeth Gardener
Manager of Water Conservation, Denver Water (Colorado)
Warren Gorowitz
Vice-President, Sustainability and Conservation, Ewing Irrigation Products (California)
Richard Harris
Water Conservation Manager, East Bay Municipal Utility District (California)
Dr. James Heaney
Chair, Department of Environmental Engineering Sciences, University of Florida (Florida)
J.B. Hoyt
Director of Government Relations, Whirlpool Corporation (Michigan)
Dr. Kelly Kopp (Secretary)
Assistant Professor, Department of Plants, Soils & Biometeorology, Utah State University (Utah)
Rebecca Pearson
Senior Program Specialist, Great Lakes Commission (Michigan)
Alice Miller Keyes (Vice-Chair, Membership)
Policy & Planning Advisor to the Director, Georgia Environmental Protection Division (Georgia)
Betsy Otto
Senior Director for River Advocacy, American Rivers (Washington, DC)
Glen Pleasance (Treasurer)
Water Efficiency Coordinator, Regional Municipality of Durham, Ontario (Canada)
John Sommers
Departmental Merchandise Manager, Bath and Plumbing, The Home Depot
Susan Stratton
Executive Director, Energy Center of Wisconsin (Wisconsin)
Thomas Swihart
Administrator, Water Resource Management, Florida Dept of Environmental Protection (Florida)
Amy Vickers
President, Amy Vickers & Associates, Inc. (Massachusetts)
David Viola
Technical Director, IAPMO (Illinois)
Ron Wolfarth
Director, Landscape Irrigation Division, Rain Bird Corporation (Arizona)

FURTHER DETAILED RECOMMENDATIONS: WATERSENSE

1. Create a "road map" for labeling in the non-residential sector

WaterSense needs to address the non-residential sectors, particularly those that are known high water users. There are many items of equipment, as well as practices both indoor and outdoor, that are prime candidates for evaluation, stakeholder input, specification development and, eventually, labeling. In doing this, WaterSense needs to meet with water utility conservation practitioners to identify the key elements of and general path for the road map. This includes early identification of the specific sectors in the non-residential category to be given the highest priority.

2. Develop outreach and implementation through new business sectors

At this time, candidate non-residential sectors that should be considered by WaterSense in the road map are Hospitality (Lodging, Food Service, Entertainment), Medical Services (Hospitals, Diagnostic and Treatment Centers, Medical and Dental Offices), and Public Facilities (Municipal Facilities, Courts and Penal Institutions, Education, etc.). In each of these categories, stakeholder organizations already exist that are concerned with "green" construction and operating efficiencies (water and energy). Therefore, these three (and perhaps others) constitute a ready and available vehicle for dialog with WaterSense on promotion of further water use reductions. (Many have already achieved significant efficiencies.)

Whether through a formal partnership or an informal relationship, stakeholder organizations in these three areas can be used for both outreach and implementation, something that is not being done on the residential side with the plumbing installers. These organizations can give guidance to WaterSense on how to most effectively communicate with their constituents as well as be useful to WaterSense in offering programs and opportunities that actually yield product installations.

3. Certify plumbers

As the WaterSense Program is currently being implemented, the lack of a direct "connection" to the plumbing trades is somewhat inhibiting take up of labeled product. It is critical to the indoor portions of the program (plumbing, appliances, and equipment) that the installations be performed by plumbing professionals formally trained and certified in water use efficiency and WaterSense. The current "gap" between outreach and promotion and the actual selection and installation of products is easily addressed.

Rather than the WaterSense developing and maintaining a costly individual certification program for plumbers, WaterSense should instead ally itself (either formally or informally) with GreenPlumbersUSA and other organizations that already have training and certification processes in place. This would be a far more cost-effective and user-friendly approach to

involving this important trade. Furthermore, it would assure that new construction seeking a WaterSense "label" would be fully supportive of the program, the products, and the systems. This, then, leads to including a requirement for WaterSense "certified" (or "recognized", "qualified", or "credentialed" if the term "certified" is unacceptable) plumbers to install systems and products in new WaterSense homes.

4. Enact parallel activities

In general, without a clear road map, WaterSense developments (except for New Homes) seem to move forward in a serial process, rather than parallel, if at all. For example, product candidates are evaluated and specifications developed before any outreach to the sectors using those products takes place. In our view, the development of new WaterSense product specifications (medical equipment, on-premise laundry equipment, food service equipment, water treatment devices, etc.) should move forward along with a parallel track as noted above. That is, developing relationships with the hospitality sector ought to be taking place concurrently with the evaluation of products for that sector; likewise, for the medical services sector. In this way, product evaluation will be enhanced and, to some extent, simplified, as the end-users are involved in WaterSense decisions about water-using products.

5. Represent WaterSense on all national green building guidelines and standards activity

As WaterSense gains traction in the marketplace, WaterSense specifications and labeled products are being called out in national and regional green building programs, guidelines, and ANSI standards across the U.S. Yet, the "connection" between these efforts and the WaterSense staff is limited, largely due to budget and staffing constraints at the agency. It is critical to the future of the green building movement and to the success of WaterSense that this "sector" be recognized. The dominant programs, guidelines, and ANSI standards of national scope need to have WaterSense representation and participation on their committees. This includes the USGBC (LEED), ASHRAE (S189.1 and S191), National Association of Home Builders, and Green Building Initiative.

6. Develop product research

Currently, WaterSense's evaluation, specification development, and labeling in product areas are being delayed because of a lack of meaningful data on the product and/or the marketplace. WaterSense needs to be authorized to commission the laboratory and field research that is necessary to get their product evaluation process moving forward. In many cases, relying instead upon others to provide data usually results in product categories being shelved, when, in reality, they represent very large areas of potential water use reduction. See further detailed recommendations on water efficiency research later on in this testimony.

FURTHER DETAILED RECOMMENDATIONS: GRAY WATER

1. Recognize gray water as a legitimate source of "new" water

Graywater is an on-site source of water that embodies no energy for pumping and transport from some remote location. It requires a level of treatment dependent upon public health and safety and also upon its ultimate end use. However, a universal federal definition of graywater would aid the EPA and states to move forward with actions to capture and use this resource.

2. Research gray water applications and long-term effects of graywater diversion

Gray water diversion, treatment, and reuse -- while certainly providing some significant benefits -- also creates some potential issues that need to be investigated. Apart from public health and safety, research is needed in the following areas:

a) Treatment requirements for individual end uses (see 3. below). Each water-using appliance or fixture within a building demands a certain quality of water to function properly and maintain the warranty provisions. Graywater (untreated and treated) distribution within a building, including piping sizes and colors, cross-connections, and related issues. Necessary separate conveyance systems for collected raw and treated graywater can increase building costs. The need to physically distinguish between blackwater, raw graywater, treated graywater, and potable water piping in the plumbing system is crucial.

b) Effects of diverting large amounts of graywater that would otherwise be directed to the building drainlines and, ultimately, to the municipal sewer. As less and less liquids are available to transport the solids in the drainlines and sewers, the potential for serious blockages increases. In Australia, advance indications of such problems have been found in some municipal sewer systems.

3. Set national definitions of water quality as they relate to graywater treatment and reuse

Plumbing manufacturers are concerned that treated gray water meet their specifications for water quality in order for that water to be used to flush their toilets and urinals. Yet, no one has clearly defined what water quality levels will suffice. Appliance manufacturers are reticent to guarantee the cleaning performance of their clothes washers without the use of high quality water. Again, that requested quality level has not been defined. The successful reuse of treated graywater depends upon a full investigation and definition of expected quality metrics.

FURTHER DETAILED RECOMMENDATIONS: RESEARCH

A national water efficiency research program could be structured as follows:

1. There should be a clear definition of conservation and/or water use efficiency. With states, communities, and EPA itself all facing enormous exposure to the rising costs of water and wastewater infrastructure over the coming decades, an appropriate focal point for research would seem to be the measures and practices that have the greatest potential to make significant reductions in the volumes of treated drinking water deliveries and the associated volumes of wastewater requiring treatment. A quantitative goal of water savings and/or infrastructure dollars avoided may also be useful as an organizing tool for the program. In any event, definitions of end use efficiency, efficiency of potable water distribution systems, and on-site capture and re-use would be most helpful. It is essential that this research program have a focus, and that focus should be articulated in the authorizing legislation.

2. As the Department of Energy has learned from years of experience with its energy efficiency R&D programs, road-mapping with industry partners is quite crucial for identifying research agendas that are well-grounded in the real world and focused upon overcoming specific barriers to more efficient technologies and practices. Partners will tend to bring a range of concerns – beyond simply reducing water consumption – to the table, and help identify research directions that have multiple benefits for stakeholders. We recommend that a water efficiency research program contain explicit delineation of stakeholder coordination.

3. The issue of cost-sharing should be carefully considered. It may be appropriate for governments to fully fund basic research in fundamental sciences, but a useful water conservation and efficiency R&D program must also consist of applied research. Cost-sharing can help identify research partners who are serious and capable, as well as technologies that have been validated by non-federal financial support. The closer that such technologies are to being market-ready, the greater the non-federal contribution for should be for the remaining research.

4. The research program should build in an assessment function that can document measurable results. A research portfolio must include a range of measures, some of which may pay off big and some pay off little if at all. We should not shy away from frank assessment of results; indeed, we should build it into the program from the beginning. The Department of Energy's entire energy efficiency research program was in serious jeopardy in the mid 1990's until the General Accounting Office identified five technologies out of the hundreds that DOE had funded that more than paid for the whole program in energy savings for consumers. EPA ought to be doing that kind of assessment from the beginning of any water efficiency research program.

Specific Water Efficiency Research Needs

Indoor plumbing product and appliance performance testing and savings measurement.

This research, largely funded to date by individual water utilities, has been very successful in results achieved even though modestly budgeted. The principal purpose of the testing is to verify that the flow rate or flush volume of the fixtures is at the proper standard, that it can be sustained over time, and that the product performs properly under all conditions. Many independent studies have been completed or are underway, funded by dozens of water utilities and municipalities in U.S. & Canada. Initially undertaken because these utilities wished to test the products they were offering in rebate programs, the studies added value by ranking products for consumers and in identifying needed areas of change for manufacturers. As a result, new specifications have been drawn and products developed; the high-efficiency 1.28 gallon per flush toilet is an example of a product that evolved based on this work and which was subsequently used productively by the WaterSense program. Another example is the 1.6 gallon per minute pre-rinse spray valve used in food preparation establishments. Only five years ago pre-rinse spray valves were the subject of prototype research at the Food Service Technology Center. After testing, and then successful field installation, they proved successful are now a national standard in the 2005 revisions to the Energy Policy Act.

Attached is a spreadsheet of research needs. Some research projects are already underway, but most remain unfunded as of this date and need sponsorship. More work is needed in this area to ensure that products perform well as the water efficiency of those products is improved. The consumer needs that performance assurance to make smart investments in water efficiency. The projects total $770,000 over two years.

Some examples of this work from the attached spreadsheet:

- Evaluating new commercial food steamers that are boiler-less and connection-less;
- Testing the transport of waste in drain lines connected to water efficient plumbing;
- Testing the flow rates of showerhead and multiple shower systems;
- Testing the performance and rating of 460 toilet fixture models; and
- Quantifying the savings, if any, of sensor activated faucets and flush valves.

Here are some additional research ideas for the indoor water use sector:

a) **Reduce the waste of water in hot water lines.** This waste is both a water and energy problem. A hot water distribution field study is needed to assess the solutions for reducing water waste in new construction as well as in designs for retrofitting existing household and commercial buildings. (Estimated budget: $350,000.)

b) **Test the water factor ratings of water using appliances such as dishwashers and clothes washers** in a lab setting and in the field. Since the water factor rating (or

amount of water needed to complete an appliance cycle) is a measure of a machine's water efficiency, it should be tested the same as plumbing fixtures have been tested. Another consideration is the performance of these machines over their life cycle, looking at factors like customer satisfaction, reliability, and cost. (Estimated budget: $300,000.)

Specific Water Efficiency Research Needs

Outdoor water use management and improved landscape irrigation efficiency.

According to NASA, turf grass is the largest irrigated crop in the U.S, irrigating three times the area of any other crop. As a result, in most areas of the U.S., outdoor irrigation of landscapes is the largest single category of average and peak water use in the urban environment. To determine the water needs of their landscape, Americans have historically relied on the research of agricultural scientists to determine the water needs of plants – even those grown in urban landscapes. This is problematic as the goals of agriculture (maximizing growth and yield) are often different from the goal of urban irrigation (maximizing appearance while minimizing maintenance and water use). Defining the water needs of plants for American urban environments is a huge challenge, but one that must be tackled in order to increase outdoor water efficiency.

Despite droughts and water supply shortages, outdoor water use in this country is steadily increasing. Formerly a fraction of household water use, in some areas of the country it approaches 80% of the water consumed by the average American single-family household. (The national average is likely between 10% and 50%). Water conservation programs have been very successful indoors; retrofitting a home with water efficient fixtures saves roughly 30% of a household's indoor water use, as studies have shown. The nation needs to be as effective with outdoor water use. More research and development is needed to better understand not only where the best efficiency improvements lie in irrigation system design, installation, and management, but also to understand what motivates the consumer and to identify educational and marketing needs.

Here are some research ideas for the outdoor water use sector:

a) **Optimize urban irrigation efficiency: minimize water use while maximizing appearance.** This study would measure the water needs of key urban crops such as turf grass and popular ornamental plants under a variety of climatic and soil conditions, in order to develop evapotranspiration (ET) crop coefficients that can be used to minimize unnecessary supplemental water use. This data is particularly important as advances in irrigation technology make it possible to take advantage of this information. In addition, this study would identify the extent of deficit and surplus irrigation practices in the U.S. and the implication of these practices for optimizing irrigation efficiency. (Estimated budget: $5,000,000.)

b) **Development of regional plant water use lists.** In order to create landscapes that would have differing levels of drought tolerance, it is necessary to develop plant lists that consumers can use to develop water efficient landscapes with or without the use of permanent in-ground irrigation systems. This issue is particularly critical in new growth

areas where land grant colleges have historically focused on agricultural research only. (Estimated budget: $1,000,000.)

c) **Develop irrigation product protocols for installation and management standards** to eliminate inefficient irrigation systems from the marketplace and to encourage consumer retrofit. (Estimated budget: $1,000,000.)

d) **Design effective landscape marketing programs** in a technology transfer approach to the customer. The best solution for reducing outdoor water use will not be effective if the consumer doesn't participate. (Estimated budget: $500,000.)

e) **Designing irrigation systems for efficient application rates.** Most in-ground irrigation systems are installed for convenience, not designed for efficiency. Even those using reclaimed water are often inefficient. Many water utilities start their programs for the reuse of domestic wastewater believing that reused water should be free or very inexpensive in order to sell the product, and therefore it doesn't matter how much recycled water is applied to the landscape. Times have changed. Reuse water now needs to be conserved as well, both from a conventional water supply shortage management perspective and cost of service perspective. Regardless of the source of water, research is needed to create high efficiency examples that can be utilized as "model" designs that can be adopted by utilities, contractors, and homeowners. (Estimated budget: $1,000,000.)

f) **Evaluate the reliability of projected savings from irrigation restriction ordinances.** Many communities are restricting the number of days per week that irrigation is allowed. Some field experience is suggesting that restricting the number of days may actually increase water use, as customers tend to over-irrigate on their designated days. This study would empirically evaluate the extent that consumers are overcompensating, thereby estimating true water savings potential of ordinance-based strategies. (Estimated budget: $300,000.)

g) **Encourage as federal policy separate, dedicated metering and measurement of water used for landscape irrigation.** When landscape water use is accurately measured and separately billed to the customer, opportunities for incentivizing efficiency emerge. Experience has shown that water budgets applied to these irrigated areas are a successful strategy in getting consumer response. Unless the customer knows how much water is being applied annually to the landscape, efficiency practices cannot be effectively marketed.

h) **Establish testing facilities for independent evaluation of conventional as well as alternative irrigation systems.** Third party testing is critical to maintaining credibility, and at present no independent testing facilities for irrigation exist except small installations at selected universities. This is a significant issue for the proposed WaterSense label on irrigation equipment, whereas plumbing products bearing the WaterSense label have been third-party certified as to efficiency standards and performance. We need to build an independent third party irrigation testing and certification facility. (Estimated budget: $2,000,000.)

i) **Evaluate the suitability of rainwater harvesting to reduce water use and reduce storm water runoff impacts.** This option has been proven successful where rainfall is regular. However, it can also be successful in more arid regions. A nationwide study can identify geographic locations where rainwater harvesting would be cost-effective, reliable, and can assess any potential side effects of rain water harvesting or regulatory barriers that may exist. (Estimated budget: $200,000.)

Specific Water Efficiency Research Needs

Integrative Research on Selected Topics.

This research is not directly tied to any specific water efficiency product or program, but instead assesses overall effectiveness, reliability of savings, or consumer responses. This research is critical to evaluating beneficial water use efficiency strategies from a policy as well as program planning perspective.

a) **Quantify the water and energy connection on a national basis.** The California Energy Commission has conducted research into the embedded value of energy in the state's water supplies. 19% of the state's electric energy demands are related to the pumping, treatment, distribution of drinking water and the collection, treatment and disposal of waste water. 32% of the state's natural gas demands are related to the heating of domestic water. Saving water therefore saves energy and therefore reduces greenhouse gas emissions. It has been quantified in California. But what is the relationship nationally? Regionally? How can water and energy efficiency programs be optimally paired? A national assessment is needed. (Estimated budget: $350,000.)

b) **Develop models for state and regional analysis of the water-energy connection**. More and more cities, regions, and states are adopting very challenging goals to reduce the emission of greenhouse gases. State "Climate Action Plans" call for up to 80% reduction in emissions by 2050. Success will require close attention to all of the human activities associated with the production of greenhouse gases, including water. Creating databases and assessment models for the relationship between water withdrawal, transport, treatment, distribution, end use, and eventual wastewater treatment would aid jurisdictions all over the country in determining what the most cost effective local measures are to implement in programs to reduce climate change impacts. (Estimated budget: $250,000.)

c) **Re-examine baseline data, both residential and non-residential.** Our best, most recent baseline end use data in the U.S. is now 10 years old. In order to plan conservation programs and to forecast future demand it is critical to understand where and how people use water. What potential exists for water conservation? Which end uses should be targeted? What is the saturation rate of efficient fixtures? This fundamental data needs to be collected on a regular basis. This study will quantify where water is used in homes and businesses across the U.S., identifying key opportunities for conservation savings. (Estimated budget: $3,000,000 residential; $3,000,000 commercial/industrial.)

d) **Maximize urban drought response and water shortage demand reductions.** Drought may be a defining feature of the American landscape in the coming decade. When a drought and associated water shortage occurs, urban water providers need reliable information on how to achieve rapid and quantifiable demand reductions. Many of the most sophisticated drought/water shortage response tools must be implemented in advance (such as automatic meter reading and water budgets) through integrated water shortage planning, but others (such as emergency drought pricing and irrigation restrictions) can be implemented quickly when a drought occurs through a similar planning process. Water providers need a toolkit for maximizing drought/water shortage response over a wide range of scenarios including long-term supply shortages. This study will identify a broad range of effective drought/water shortage response and demand reduction measures and implementation regimes that are applicable to water providers across the United States. (Estimated budget: $1,500,000.)

e) **Minimize the economic costs associated with drought response.** Water curtailments due to shortage conditions can result in severe economic damages to both residential and business users. Economic impacts can affect the ways in which urban water providers implement and prioritize management measures. More research is needed to understand the economic costs of coping with water restrictions and the implications for long-term investment in water efficiency and supply development. This study will survey coping behaviors and the range of economic impacts that are likely to be realized during water shortages of various frequencies and durations. The study will assist water providers in properly phasing their drought response plans and will provide and demonstrate criteria for assessing needs for long-term investments in water efficiency for the purposes of increasing water supply reliability. (Estimated budget: $3,000,000.)

f) **Analyze water billing data: Making the Most of an Under-Utilized Resource.** American water utilities typically read water meters and bill their customers once a monthly or every two months. Once this is done, the consumption data is usually stowed away and forgotten. Yet utility billing data is a tremendously rich resource that can be used in a wide variety of ways to target water efficiency efforts, track changes in water use, identify potential leakage, and help with infrastructure and conservation planning. This study will tackle the subject of water billing data from top to bottom, developing a set of best management practices for classifying water customers and storing, maintaining, and utilizing these data to their maximum potential. (Estimated budget: $750,000.)

g) **Analyze the true impacts of "Demand Hardening."** Demand hardening is a theory that puts a negative spin on water conservation efforts. According to this theory, as an area's water conservation potential is maximized there is less that can be done in times of a water-shortage or drought. In other words, it is perceived that water conservation may impact a water system's flexibility in times of a water shortage. Field experience suggests that as technology changes and new products appear in the marketplace, there will always be additional conservation potential. However, research should be

undertaken to determine if demand hardening is indeed a negative side effect of water conservation and what can be done to deal with it in times of a water shortage. Metrics also need to be established to determine what constitutes efficient water use to avoid penalizing already efficient water users when drought occurs. (Estimated budget: $400,000.)

h) **Assess the Benefit of Water Conservation on a National Level.** How does water conservation fit within the broader social, economic, environmental and other policy trends facing the country today? Water conservation on a National level and the resulting economic and environmental benefit needs to be studied and well articulated. Why should we conserve water and what is the national benefit as opposed to the local or regional benefit? An in depth study that assesses multiple regions of the United States in regards to fresh water resources, political issues and water rights, Federal policies regarding water supply subsidy, regional water conflicts, current water treatment/delivery infrastructure, current water demands, future water demands, energy implications, and conservation potential will help strengthen our collective understanding of freshwater resources and raise awareness for the need for water conservation. (Estimated Budget: $600,000.)

i) **Opportunities to better utilize waste heat among commercial and industrial water users.** Many businesses need to discharge waste heat from a variety of cooling and process water applications. This waste heat could be better utilized to pre-heat water for other applications by that business or other nearby businesses. Research is needed into opportunities and barriers to the creation of public/private "hot water utilities". These utilities would purchase waste heat and in turn sell hot water or generate energy. These new utilities would help conserve both water and energy by better utilization of industrial waste heat. (Estimated budget: $300,000.)

j) **Analyze the Effectiveness of Consumer Outreach and Education.** It is currently difficult to estimate the savings associated with water conservation outreach and education programs. There is a need for research in this area that will help planners estimate the impact of outreach efforts. What exactly do outreach and education programs provide in regards to social capital and water savings? Actual case studies can be followed and impacts of outreach and education can be determined using qualitative analysis and sophisticated modeling to isolate the actual water savings. (Estimated Budget: $300,000.)

Specific Water Efficiency Research Needs

Opportunities for Innovation in Green Building.

The Brookings Institution estimates that of all the homes that will exist in the US by 2030, a full half of them have not yet been built. This is a significant opportunity: to build that half as sustainably as we can. The trend is unfortunately the reverse. New homes that are now being built use 12-20% more water, as studies have shown. In one development the homes used 60% more water than their neighbors. Research and development needs to take place in this critical area, to foster water-efficient designs alongside specifications for green building materials and energy efficiency.

Here are some research ideas in this area:

a) **Design more effective residential hot water distribution systems.** The designs and specifications should include manifold systems, hot water re-circulating and on-demand systems. (Estimated budget: $400,000.)

b) **Incentivize new building comfort systems and technologies** that will focus on water efficiency. Cooling towers in air conditioning systems are a significant opportunity for water savings. (Estimated budget: $300,000.)

c) **Assess the cost-effectiveness of centralized automatic monitoring systems** for managing water demand. The consumer appears to respond to such systems for managing their energy demands. Would the same be true for water? (Estimated budget: $400,000.)

d) **Analyze the water quality implications of joint use of landscapes for infiltrating storm water and reuse water**. What do we need to know before this strategy gets too prevalent? Are there water quality and health risks? Local Health Department barriers? (Estimated budget: $700,000.)

e) **Develop small scale gray water reuse systems for residential and small commercial use.** One of the best opportunities for conserving water in America is the re-use of gray water for flushing toilets and watering plants. Economically, it often makes sense to accomplish this at the customer level. There are currently numerous barriers to using gray water ranging from western water law to local health codes. This study will examine the issue of gray water and will propose a set of federal regulations that can help clear the way for widespread implementation of small-scale gray water reuse. This study will help Americans to take advantage of one of the easiest and best water saving opportunities available. (Estimated budget: $3,000,000.)

f) **Develop a simple method for the consumer to evaluate water conservation options**. This goes beyond the applicable water saving technologies to get at the cost and benefit issues of water conservation at the consumer level. Simple evaluation techniques need to be developed to help water customers understand life cycle benefits of conservation and therefore the benefits of investing in alternative retrofits or new construction options. This research could result in an educational curriculum, report, and/or instructional website that would provide guidance on determining relevancy and estimating costs and benefits from water efficiency. (Estimated budget: $250,000.)

g) **Create green building guidelines for landscapes that emphasize minimal or no irrigation once established**. The purpose of these guidelines would be to develop model standards that could be adopted by utilities and local governments. (Estimated budget: $500,000.)

ALLIANCE FOR WATER EFFICIENCY
Proposed Research Projects: Estimated Budget Summary

1	Indoor plumbing products research *(separate spreadsheet)**	$870,000
2	Reduce hot water waste	$350,000
3	Test water factor ratings of appliances	$300,000
4	Develop ET crop coefficients	$5,000,000
5	Regional plant water use lists	$1,000,000
6	Irrigation product protocols/standards	$1,000,000
7	Effective landscape marketing programs	$500,000
8	Efficient systems for irrigation application	$1,000,000
9	Study of irrigation restriction ordinances	$300,000
10	Testing facilities for irrigation technology	$2,000,000
11	Evaluate rainwater harvesting	$200,000
12	Quantify water/energy nationally	$350,000
13	Models for analysis of water/energy	$250,000
14	Baseline data: residential	$3,000,000
15	Baseline data: commercial/industrial	$3,000,000
16	Drought response & demand reductions	$1,500,000
17	Economic effects of drought response	$3,000,000
18	Analyze water billing data	$750,000
19	Analyze demand hardening	$400,000
20	Benefits of conservation	$600,000
21	Utilizing waste heat	$300,000
22	Effectiveness of consumer outreach	$300,000
23	Design new hot water distribution systems	$400,000
24	New building comfort systems	$300,000
25	Evaluate consumer real time water monitoring	$400,000
26	Water quality of storm water/reuse water	$700,000
27	Small scale gray water systems	$3,000,000
28	Consumer cost/benefit methods	$250,000
29	Green Building guidelines for minimal landscape watering	$500,000
	TOTAL	**$31,520,000**

*upper limit estimate

Water Efficiency Research Committee Research Project List

Proj No.			Issues to be Addressed	Deliverables	Status
1	**Plumbing Standards - U.S. and Canada** (ONGOING WORK)		STANDARDS: Plumbing standards form the basis for many of the plumbing code provisions. As such, standards are continually evolving as new products and technologies are developed for the marketplace. Today, new water-efficient products and technologies are being developed by the plumbing industry and many creative individuals. In many cases, these products and technologies need to be addressed by standards and permitted by the plumbing codes. The plumbing standards committees are currently addressing the following topics related to water-efficiency and water conservation programs: (1) Currently underway: harmonizing the plumbing standards of the U.S. and Canada to create a single standard that will ultimately result in more water-efficient products in the marketplace; (2) development of showerhead performance specifications as part of ASME A112.18.1/CSA 125.1 and in support of the EPA's WaterSense Program; and (3) about to commence: amendment of the existing ASME ANSI standards for toilets and urinals to fully recognize HETs and HEUs as a separate set of water-efficiency thresholds.	1) Twice annual status reports to participating (funding) organizations 2) Periodic standards updates on selected water efficiency websites 3) New U.S.-Canadian harmonized standards for plumbing fixtures and fittings 4) Standards for high-efficiency urinals (HEUs) and high-efficiency toilets (HETs)	1) Published ASME A112.19.19-2006 for vitreous china non-water urinals 2) Ongoing work to harmonize standards between the U.S. & Canada (toilets, urinals, and other plumbing fixtures & fittings covered by ASME A112 and CSA B45) 3) To begin work toward an additional water-efficiency threshold in the A112.19.2 standard that would cover 0.5-gpf/1.9-lpf urinals (high-efficiency urinals - HEUs) and high-efficiency toilets (HETs). 4) Showerhead standards (A112.18.1), including efficiency and performance, currently being addressed by U.S.-Canadian harmonization group in coordination with the WaterSense Program 5) Additional water-efficient technologies and plumbing products will be introduced in the coming years and may need to be addressed within the national standards.
		Estimated Annual Funding Level: Small			
2	**Plumbing & Building Codes (Residential & Commercial)** (ONGOING WORK)		CODES: Plumbing codes are the means by which new standards are implemented and maintained. For example, the need for codes to fully address and permit non-water urinals is an example of current focus. (Some jurisdictions do not currently permit these urinals for a variety of reasons.) A second critical area is that of incorporating structured plumbing into the plumbing/building codes. The third area of importance relates to expanding the applications of greywater systems into the codes.	1) Twice annual status reports to participating water utilities 2) Periodic updates on selected water efficiency websites 3) Adoption and/or expanding water-efficient technologies into prevailing plumbing codes and building codes (non-water consuming urinals, structured plumbing, greywater systems, and others)	1) Uniform Plumbing Code (UPC) will fully address non-water urinals. 2) **Alliance for Water Efficiency** representation on the UPC Technical Committee and Task Groups will be continued. 3) Additional representation by water-efficiency interests is needed.
		Estimated Annual Funding Level: Small			
3	**UNAR Development & Implementation (Res. & Commercial Toilet Fixtures)** (ONGOING WORK)		UNAR (Uniform North American Requirements) for toilet fixtures: Water utilities implement toilet replacement programs without assurance that predicted water savings will materialize (flapper failure, incorrect flapper replacement, customer tampering with the toilet, unsatisfactory performance, etc.). Furthermore, even with efforts to encourage improved flush performance, a few toilet fixtures are still not stellar performers and generate complaints from customers. UNAR provides information re: which toilet fixtures assure long-term water savings AND meet customers' flush performance expectations. UNAR provides for testing toilet fixtures against its own performance and water savings sustainability requirements. Water utilities are using the web "list" of UNAR-qualified fixtures as criteria for toilet rebate or voucher programs, or for guiding toilet purchases for giveaways or direct install programs. A UNAR for flushometer type toilet fixtures is planned.	1) UNAR qualified toilet lists - documented and posted for public use 2) Periodic progress reports to participating water utilities posted on the web	UNAR for toilets is a combination of Maximum Performance (MaP) testing and the Los Angeles Supplementary Purchase Specification (SPS). A full specification (version 1.2 - posted on the AWE website) has been developed and has been addressed by stakeholder representatives. (Stakeholders include water utilities and plumbing manufacturers.) UNAR is being used by water utilities in the U.S. and Canada as the specification-of-choice for their toilet replacement programs. The list of UNAR-compliant toilet fixtures is posted on the AWE website (and others). The UNAR specification for HETs was one of the bases for the WaterSense specification for HETs. As such, with minimal exception, the two specifications are identical. (NOTE: Ultimately, the WaterSense specification for HETs and listings will replace the UNAR listing for HETs as a higher percentage of UNAR HETs become WaterSense-certified and are labeled with the WaterSense logo.) The next step for the UNAR for toilet fixtures process is to address commercial flushometer valve toilets.
		Estimated Funding Level (Remaining Work): Small			
4	**Flapper Identification and Listings** (ONGOING WORK)		TOILET FLAPPERS: Toilet flappers are subject to periodic degradation and failure during the life of a gravity-fed fixture and, as a consequence, can lead to leakage and loss of expected water savings. It is critical that the end-user (customer) be equipped with the information needed to identify and locate the correct replacement flapper for the toilet. Tampa Bay Water developed and made public a substantial database on ULF toilets and their flappers - see website: www.toiletflapper.org Using this database, customers will be more likely to install a replacement flapper that maintains the original 1.6-gpf/6.0-L design flush volume. Database needs information "gaps" filled in and must be continually updated as new toilet fixtures are introduced into the marketplace.	1) The database has been posted by Tampa Bay Water on www.toiletflapper.org and will be periodically updated as new information is added. This is an ongoing process and will not be the subject of a "final report" per se.	Up-to-date listing of flappers to be completed annually.
		Estimated Funding Level: Micro			

Water Efficiency Research Committee Research Project List

Proj No.		Issues to be Addressed	Deliverables	Status
5	**Commercial Dishwashers** (WORK YET TO BE FUNDED AND SCHEDULED) Estimated Funding Level: Medium	COMMERCIAL DISHWASHERS: Commercial dishwashers in food service operations are significant water users, sometimes involving more than one-half of all water consumed by such an establishment. Both water-efficient and inefficient machines are available in the marketplace. No independently verified field data exists, however, that would yield meaningful performance and efficiency thresholds. This task would involve specification research and a limited amount of field study to provide the needed data.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Funding to be secured. Program would be run through PG&E Food Service Technology Center.
6	**UNAR for Urinals** (WORK TO BE FUNDED AND SCHEDULED) Estimated Funding Level: Small	UNAR (Uniform North American Requirements) for Urinals: (Refer to Item 6 above) Stakeholders (manufacturers of urinals and water utilities) have requested that urinal fixtures be addressed with a UNAR specification similar to that of toilet fixtures (refer to Item 3 above), covering urinal performance, sustainability, and water savings. UNAR for urinals would yield new standards that can be used by green building programs and water utilities to encourage the reduction in water use by urinal fixtures. Given the recent technological developments in these fixtures, it appears that efficiencies will be significantly improved over the current 1.0-gpf products.	1) UNAR qualified urinal lists - documented and posted for public use 2) Periodic progress reports to participating water utilities posted on the web	This project is dependent upon completing the urinal study outlined as Project 6 above. Work is underway to implement changes to the national standard (ASME A112.19.2/CSA B45). (See Project 1 above for the changes to the national standards.) At that time, this mfr. stakeholder group showed a preference for an initiative by the water utilities to measure performance and water use through the UNAR approach. Later, the standards committee decided that it would instead develop a water-efficiency threshold in the A112.19.2 standard as noted above. Work on this project to begin in 2009 in conjunction with the work undertaken Item 6 above IF standards committee fails to perform its commitment.
7	**Ice Cream Soft-Serve Machines** (WORK TO BE FUNDED AND SCHEDULED) Estimated Funding Level: Small	ICE CREAM SOFT-SERVE MACHINES: Refrigerated ice-cream soft-serve machines are another food service industry product that requires field study as to energy and water-efficiency in order to provide food service industry with data on which machines are the most cost-effective to operate. Further, these products are being considered for inclusion in Federal programs such as Energy Star and Water Star. Without accurate operating data, performance thresholds cannot be developed.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Project to commence when funding becomes available. This project is of low priority.
8	**Field Study - High-Efficiency Toilets (Pressure-Assist and Gravity-Fed only)** (WORK TO BE FUNDED AND SCHEDULED) Estimated Funding Level: Medium	HIGH EFFICIENCY TOILETS (HETS): Currently, the only HETs that have been field measured to establish **"real world" water savings** are dual-flush fixtures. Programs currently encouraging the installation of the pressure-assist (1.0-gpf) and gravity-fed single-flush (1.28-gpf) fixtures in residential and commercial applications have no authoritative data available on water savings achieved through replacement of 5.0-, 3.5, and 1.6-gpf fixtures. Instead, "engineered calculations" are used to estimate water use. These calculations do not reflect any changes in user habits as a result of replacing a gravity-fed with a pressure-assist fixture (changing flush frequency, double-flushing, etc.). This study would be the first to yield some important data for the water suppliers implementing HET programs.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Project to commence in 2009 dependent upon funding. (Some minimal funding is available from one water agency in California) This project is of high priority.
9	**Field Audit - Previously MaP-Tested Toilet Fixtures** (WORK TO BE FUNDED AND SCHEDULED) Estimated Funding Level: Small	MaP-TESTED FIXTURES - FIELD AUDIT OF PERFORMANCE: Nearly 1,000 different toilet fixtures have been MaP tested in a laboratory and the results reported on various water utility websites for the benefit of customers, specifiers, retailers, plumbers, government, water utilities and others. These individuals and organizations rely upon the performance data to make specification and purchase decisions. Unfortunately, feedback received by the authors of the MaP reports indicate that a small number of models available at retail or at supply houses do not appear to perform satisfactorily. Suspicion is growing that the models supplied to and sold at these outlets are not necessarily the same as the model (of the same name and number) originally MaP tested. If such is the case, those models that are not identical to the tested model need to be identified and dealt with. Various avenues are available for that possibility. A more complete scope of work for the proposed audit process is available upon request.	1) Completed test reports will be made available to the non-compliant manufacturer for correction. 2) Failures to correct a performance/design issue will be noted and highlighted in publicly available MaP reports	Project to commence in 2009 dependent upon funding.

Water Efficiency Research Committee Research Project List

Proj No.			Issues to be Addressed	Deliverables	Status
10	**Dipper Wells** (WORK TO BE FUNDED AND SCHEDULED)		DIPPER WELLS: Coffee houses, ice cream establishments, and similar retail operations are required by health authorities to employ some form of ongoing rinsing and/or cleaning of ice cream dippers that are in continuous use. The majority of such establishments use continuous-run dipper wells wherein dippers (scoops) are plunged into the water-filled well (about 1-2 quarts in capacity) after each use. Running water is used to create a continuous exchange of water in the well. Other approaches may be available to maintain health code standards without a continuously running system. This project is designed to evaluate water-saving alternatives to traditional dipper wells and estimate the potential water use reduction in the U.S. and Canada for each such alternative. NOTE: The Food Service Technology Center is considering a major role in this investigation.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Project to commence in 2009 dependent upon funding.
		Estimated Funding Level: Small			
11	**Graywater Systems** (WORK TO BE FUNDED AND SCHEDULED)		GRAYWATER SYSTEMS: The proliferation of package graywater treatment systems for home and business has led to a number of questions about system economic viability, issues with health and plumbing code compliance, system maintenance requirements, public perceptions, and potential water savings that might be capturable. The water utility industry is peripherally involved in a few minor studies to identify answers to some of these questions. A more concerted effort is required in order to answer the questions for water utilities, the public, the plumbing trades, permitting agencies, builders, and health code authorities. NOTE: This is one of two major areas of study being contemplated by the Plumbing Efficiency Research Coalition under the terms of the AWE-IAPMO-PHCC-PMI-ICC Memorandum of Understanding.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Project to commence in 2009 dependent upon funding.
		Estimated Funding Level: Large			
12	**Commercial Building Drainline Systems Study** (WORK TO BE FUNDED AND SCHEDULED)		COMMERCIAL BUILDING DRAINLINE SYSTEMS: With the enactment of the Energy Policy Act of 1992, all toilets manufactured in or imported into the United States were required to flush no more than a maximum average of 1.6 US gallons, effective January 1, 1994 for residential models and January 1, 1997 for all models. At that time, concern for drainline transport efficacy was voiced by many in the plumbing trade and those in various professional associations. However, early reporting and research on 1.6-gpf/6.0-lpf models focused primarily on the flush performance (waste removal) of the various models on the market in response to significant consumer complaints about poor flush performance. Since then, manufacturers have made great strides in improving flushing performance. Intermittent and anecdotal complaints of drain line carry transport problems were not thoroughly researched and largely attributed to older or faulty sanitary drain lines. The advent of toilets flushing at as little as 0.8-gpf/3.0-lpf has focused even more attention on drainlines. The Plumbing Engineering Research Coalition will seek funding to conduct scientific research to determine the effect of reduced flows into our domestic and commercial plumbing systems. Due to the complexity associated with the number of variables in "real world" plumbing systems, it is believed that research is required on several fronts, specifically; computer modeling studies, laboratory testing and field studies conducted on actual plumbing systems. NOTE: This is one of two major areas of study being contemplated by the Plumbing Efficiency Research Coalition under the terms of the AWE-IAPMO-PHCC-PMI-ICC Memorandum of Understanding.	1) Periodic PERC progress reports to participating water utilities and other interested parties 2) Final report - documented and posted for public use	Project to commence in 2009 dependent upon funding.
		Estimated Funding Level: Large			

Water Efficiency Research Committee Research Project List

Proj No.			Issues to be Addressed	Deliverables	Status
13	**Green Building Programs, Standards, and Initiatives** (ONGOING WORK)		GREEN BUILDING: A large number of voluntary green building initiatives have been initiated by various organizations in the past 10 years, some of which are now becoming mandatory in certain jurisdictions through legislation and/or regulation. These initiatives relate to both existing and new buildings in all sectors of the built environment (residential, commercial, institutional, industrial). They take the form of both guidelines (which are not written in code-adapted language) and ANSI standards (code adaptable language). Examples are the USGBC's LEED guidelines, the Green Globes-Green Building Initiative (GBI) ANSI standard, the ASHRAE 189.1 ANSI standard for high-performance buildings, ASHRAE 191 ANSI standard for water efficiency, NAHB's ANSI standard for homes, and countless other regional and local guidelines for new homes. The Alliance is currently involved in most of the national standards and guidelines committees and continues to provide technical advice to the sponsoring organizations developing these products. As water supply and wastewater treatment issues escalate due to climate change, population growth, and aging infrastructure, it is imperative that the Alliance continue its involvement. This project is intended to increase the current level of participation as more attention is given to water efficiency by these organizations.	1) Twice annual status reports to participating (funding) organizations 2) Periodic updates on selected water efficiency websites 3) Proposed new ANSI green building standards circulated for public comment in accordance with ANSI process	Project underway and ongoing with limited AWE funding. Additional funding required to complete the work programmed for 2009 and 2010.
	Estimated Annual Funding Level	Small			
14	**WaterSense Pre-Rinse Spray Valves** (WORK TO BE FUNDED AND SCHEDULED)		Pre-Rinse Spray Valves: EPAct 2005 limits flow rates of pre-rinse spray valves to 1.6 gpm. WaterSense is interested in examining ultra high-efficiency pre-rinse spray valves with a flow rate of 1.0 gpm or less. Specifically, WaterSense would like to investigate if product usage times correlate with performance ratings achieved on the ASTM F2324-03 cleanability test. WaterSense seeks data that asks the following questions: 1. How does water usage and time usage vary among pre-rinse spray valves currently on the market? 2. Do usage times in the field correlate to cleanability times achieved using the ASTM F2324-03 test method?		Project to commence in 2009 dependent upon funding.
	Estimated Funding Level	Small			

Note: All of the above project descriptions are subject to change as new study elements are proposed and existing study elements are completed or modified.

Funding Legend:
Micro = <$20,000
Small = >$20,000 - <$50,000
Medium = >$50,000 - <$100,000
Large = >$100,000

Question from Senator Boxer:

What incentives could be provided to ensure more widespread use of green infrastructure?

The American Recovery and Reinvestment Act of 2009 contained a requirement that 20% of the $6 Billion in funding awarded to the Clean Water and Drinking Water State Revolving Funds (SRFs) be reserved for "green infrastructure projects." EPA provided guidance[1] on how those projects were to be defined, and how States needed to re-evaluate their current applicant SRF project lists in light of this new additional requirement. However, States were also allowed to consider existing projects on the list as "green" projects, to interpret that the minimum criteria were met with perhaps only minor changes to existing projects. And because of the high backlog of projects needing funding on existing SRF lists, States have as a result been considering funding existing project applications as part of this "green project reserve."

This response is primarily driven by a critical overall shortage of funds. EPA's *Clean Water and Drinking Water Infrastructure Gap Analysis* (2002)[2] estimated that if capital investment and operations and maintenance remained at current funding levels, the potential shortfall for drinking water and wastewater infrastructure would be $531 billion by 2020. The $6 Billion awarded in the American Recovery and Reinvestment Act, while an important step, did not come close to meeting that projected need. Because of this chronic funding shortfall, many States have very long existing project application lists and thus are choosing NOT to open up their lists to new "green" projects that could potentially be far more water and energy efficient and therefore "green" than the existing projects that have been on the list for some time.

Additional funding for water and wastewater infrastructure can certainly improve this picture by relieving the backlog of critical projects. Further, special incentives can help to encourage greater green design in that infrastructure investment.

Incentives can be financial, or they can be prescriptive.

Financial incentives use the carrot of funding to drive investment in a certain direction. Future stimulus funding or funding for water and wastewater infrastructure could contain specific legislative conditions that would pull to the top of the list projects with clear water efficiency, energy efficiency, and carbon reduction benefits. Such conditions could be based on documentation of expected water, energy, and carbon savings, with the expected savings receiving bonus points or serving as a form of forced project ranking or prioritization. Special financing incentives like lower interest loans, or principal forgiveness grants, could also be made available to these higher priority "green" projects.

---

[1] EPA Guidance Document: "Award of Capitalization Grants with Funds Appropriated by P.L. 111-5, "The American Recovery and Reinvestment Act of 2009." March 2, 2009.

[2] Clean Water and Drinking Water Infrastructure Gap Analysis Report, EPA 816-R-02-020. September 2002

Another example of a financial incentive is an "entry requirement" incentive that the utility demonstrate minimum levels of efficiency before qualifying for any federal funding. An example of this is the California Clean Water SRF requirement that applicants for SRF funding commit to implementing all water conservation best management practices that are cost-effective for that water utility. SRF applicants are required to sign the California Memorandum of Understanding[3] as a pre-condition before any funds can be awarded. There could be a similar pre-condition requirement for federal SRF infrastructure funding.

Another example of a financial incentive is using federal SRF infrastructure funding for actual implementation of stand-alone water efficiency programs and projects that would help reduce the capacity needed in a future infrastructure project. This stand-alone project funding is currently allowed under federal SRF and EPA policy, but it is not allowed in many State SRF programs as defined in their implementing regulations. This is an important barrier to remove. If corrected, SRF funding could also then be specially earmarked for stand-alone energy efficiency and water efficiency projects in a permanent set-aside of the SRF funding. This would result in more projects funded that have true "green" benefits, such as greater water and energy efficiency and reduced carbon emissions.

An example of a prescriptive incentive is Texas's requirement that all utilities conduct distribution system water audits to determine how they can productively and cost-effectively reduce their system water losses[4]. With the proper audit undertaken first, utilities can then better determine the most efficient means of managing their losses, reducing their non-revenue water, and determining the proper asset management and pipe replacement programs that are also funded with state and federal funds. Thus, the drinking water infrastructure projects that would be proposed as part of a detailed audit could result in more "green" infrastructure and greater water efficiency in the optimized management of the system. Examples of green projects in this area would be pressure-management valves to reduce pressures and therefore water losses in a system, or high-tech automated meters that can provide accurate time-of-day customer consumption profiles.

As Congress considers legislation on climate change and energy efficiency, we believe that water efficiency should be included. Water supply pumping and treatment, combined with wastewater pumping and treatment, are high energy users across the nation, often the highest energy use in any state. In California, a full 20% of the State's electric energy load is the embedded energy of water and wastewater. Thus, any energy efficiency incentives being considered in national energy and climate change legislation should be similarly applied to water. Significant energy efficiency savings and thus carbon emission reductions are possible

[3] California Urban Water Conservation Council. "Memorandum of Understanding Regarding Urban Water Conservation in California," First signed September, 1991 and revised December, 2008.

[4] Texas HB 3338, 2003

with water efficiency programs, as has been well documented by the California Energy Commission.[5]

Questions from Senator Inhofe:

1. Other than the federal actions and funding mentioned in your testimony, what more can states, local public water agencies, and the private sector do to promote water efficiency?

States could do the following:

a) Require "Efficiency First" before allowing new capacity expansions for drinking water storage, drinking water treatment, or waste water treatment. This idea of a "loading order" was developed initially in the energy efficiency community, and should be applied to the water and wastewater community as well to ensure that cost-effective water efficiency options are explored first before expensive new infrastructure options are pursued.

b) Enact benchmark reductions as a matter of State policy. States can embody in legislation or Governor's Executive Order the goals and benchmarks set forth in a State Plan. California has done something similar with a formal policy declaration of a 20% reduction in per capita water use by 2020, and state legislation to codify that goal is currently under consideration. Another way to achieve benchmark reductions is to embed the stated goals in local plans. An example of this is the Texas requirement that every water utility define in their conservation plans specific five and ten year goals, such as reductions in gallons per capita per day, as well as reductions in distribution system water loss. Progress toward those goals will be required to be documented in annual implementation reports to be filed in Texas beginning in May, 2010.

c) Pass legislation or regulations to require minimum implementation of cost-effective water conservation. This can be done several ways, and here are four state examples of different approaches: Florida has adopted a set of 24 Best Management Practices, 4 of which are deemed mandatory for all water utilities. Texas will be requiring beginning in May, 2010 annual implementation reports of Texas water utilities to document water conservation progress toward stated conservation goals. The State of Washington has adopted a regulation setting minimum requirements of all water utilities (establishing water saving goals, meeting a distribution system leakage standard of 10%, developing a water use efficiency program, evaluating the implementation of water use efficiency measures, and reporting annually on progress.) Finally, California has for over a decade

[5] 2005 Integrated Energy Policy Report, California Energy Commission, Chapter 8.

embedded cost-effective implementation of best management practices in its legislatively mandated Urban Water Management Planning requirements, and water utilities are required to document every five years what measures are being implemented in their submitted water management plans. (Best Management Practices NOT being implemented must be documented by the utility in its plan as being not cost-effective or feasible.)

d) Embed water conservation implementation requirements in state permits for water supply withdrawal or water rights allocations. Texas requires the submission of water conservation plans of any water utility with a minimum 1,000 Acre-Foot surface water right, and the State will be requiring annual reports of actual implementation beginning in May, 2010. Florida's Water Management Districts set minimum conservation requirements as a condition of continued water supply withdrawal. (Here is language from the St. John's River Water Management District Code: "All available water conservation measures must be implemented unless the applicant demonstrates that implementation is not economically, environmentally or technologically feasible.") Connecticut does the same: water conservation plans are required as a condition of regular reissuance of water utility water supply withdrawal permits. In California, the State Water Resources Control Board has similarly conditioned water rights permits for certain water districts on proof that adequate water conservation programs are being implemented.

e) Tie state investments in water supply and other types of funding to minimum water conservation implementation. Texas requires that any water utility receiving $500,000 or more in state funding file water conservation plans, and beginning in May, 2010 annual implementation reports will be required to document progress. Similarly, California requires compliance with the 14 Adopted Best Management Practices as a condition of receiving any funding from state water grants. In addition, California conditions funding awarded under their SRF Programs for either Drinking Water or Clean Water on water utility implementation of the 14 Best Management Practices.

f) Require that all utilities audit and report on their non-revenue water in order to reduce water loss in utility distribution systems. Texas now requires that all water utilities of a certain minimum size file detailed water audits every five years. The State of Washington has adopted general regulations for water efficiency which include a specific focus on minimizing distribution system leakage: a 10% water loss goal has been set as a mandatory requirement.

Local public water agencies or utilities could do the following:

a) Enact water efficiency programs. A local public or private water utility should implement all water efficiency measures for their customers that cost less than the utility's marginal cost of new supply. In other words, conservation that saves the

utility and rate-payers money should be automatically implemented. These conservation programs extend the life of existing water supplies, allow growth with existing resources, and are a cheaper way to provide new supplies in a "green" manner.

b) Audit the distribution system. Many water utilities are assuming that their water losses are minimal without having done the necessary detailed system audit to verify that. Audits can identify water losses and point to cost-effective opportunities for water loss recovery.

The private sector could do the following: Invest in water efficient technology development. Work cooperatively with communities to promote utility programs. Help increase public awareness.

2. **Your testimony supports the need for further qualifications on water efficiency when considering SRF eligibility. Do you believe that water efficiency qualifications would show a bias against different-sized facilities applying for SRF funds – for example, would small communities be able to meet these sorts of qualifications?**

Water efficiency, when done correctly, is designed to address each community's situation and needs; it is specifically geared to the local water system's characteristics and to the customer's consumption patterns. Is the system experiencing a high growing summer peak that will require new capacity? Water Efficiency strategies can help lower the peak, and thus reduce the need for immediate infrastructure investment to supply that peak. If the water conservation strategies are chosen carefully based on careful analysis of performance and savings payback, they should never cost more than the water utility's marginal cost of new supply, therefore proving its worth as an investment.

Because of this individualized approach, water efficiency provides benefit to water supply systems of all sizes, and does not have a negative impact on small systems. Indeed, small systems often benefit more from water efficiency than larger systems do, as water supply shortages cause greater dislocations in small systems and the new supply options to solve the shortages are harder to finance in small systems with a smaller ratepayer base. There are numerous examples of small systems of less than 10,000 connections that have very aggressive water conservation programs, driven primarily by drought and water supply shortfalls. The cost of the conserved water in these small communities is still far less than the cost to provide that same water by new supply procurement. The benefit/cost ratio of these programs is always greater than 1. Where it isn't – where water supply is abundant, where no growth is occurring, and where no new infrastructure needs to be built – then conservation is not cost-effective and should not be undertaken. But where is that situation these days?

3. **What are the barriers for putting in place the green infrastructure solutions you spoke about in your testimony? If there is significant cost associated with these projects up front is the rate of return on the investment not effective?**

   There are numerous barriers that prevent more widespread green infrastructure project funding:

   a) State SRF regulations which prohibit the funding of stand-alone water efficiency projects without an "attached" larger infrastructure capacity application. Federal guidance could help clarify this and promote State regulation modification.

   b) State SRF regulations which prohibit use of SRF funds for water efficiency investments on the customer side of the meter, with the exception being publicly-owned buildings. This restriction effectively eliminates all water conservation retrofit projects except in public spaces. Again, federal guidance could help clarify this and promote State regulation modification.

   c) State SRF regulations which prohibit use of SRF funds for grants rather than loans. Even with the clarification in the American Recovery and Reinvestment Act, some states could not use the stimulus funds for grants. Again, federal guidance could help clarify this and seek State regulation modification.

   d) Inability for some water utilities to capitalize water efficiency program costs as they would other water supply augmentation projects. This is a significant issue, as the large up-front financial investment in water efficiency should not come out of current year operating revenue when the project provides long-term multi-year benefit. It is a classic case for capitalization, the equivalent of building a "virtual" reservoir of water conservation savings. However, it appears that federal guidance may be legislatively necessary to allow some utilities to capitalize costs on the customer side of the meter.

   e) Inability for some water utilities, particularly small systems, to "front" the investment expenditure necessary for a water efficiency program, despite rapid payback and near immediate return on investment. Since SRF funds are designed for revolving loans payback of those loans, SRF's are a perfect mechanism for funding water efficiency up-front costs if the barriers listed above can be removed. Good water efficiency investments could then be encouraged, incentivized, and prioritized for funding based on projections of kWh saved, BTU's saved, carbon saved, and gallons saved.

4. **How does EPA ensure that it is promoting water efficient technologies?**

   EPA does not promote products or technologies per se, but the agency does promote efficiency overall through its WaterSense program, which labels products that meet strict

pre-defined standards. The first basic requirement is that a labeled product be 20% more efficient than the legal flow standard for that product. The second requirement is that a labeled product perform well, with demonstrated proof through third-party testing.

Because of the modest level of funding of the WaterSense program, EPA does not have the capability to do significant new research on new water efficient technologies nor to promote heavily the concept of water efficiency among the American consumer. With growing water shortages around the country, there is a critical need for greater consumer awareness. The excellent outreach of consumer information and marketing in the Energy Star program needs to be replicated in the WaterSense program, with similar levels of marketing funding, in order to achieve the levels of public understanding that are ultimately necessary.

Senator CARDIN. Thank you very much.
Mr. Shannon.

STATEMENT OF MARK A. SHANNON, JAMES W. BAYNE PROFESSOR, DIRECTOR OF THE CENTER OF ADVANCED MATERIALS FOR THE PURIFICATION OF WATER AND SYSTEMS, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Mr. SHANNON. Thank you so much for having me, Mr. Chairman. I am really excited to be here to talk to you about these issues.

I again am going to hit just some really quick points. We passed the 300 million mark and we are growing in population. This graph is just to show, if you look at the top graph, the top curve there, the green one, that is showing that if we stay on the current path of consumption that was outlined actually by the Texas Commission, we are going to have to grow our water supply by 62 percent by 2040 because of population growth.

The bottom one is if we conserve, and really conserve. That bottom growth details a 60 percent drop in domestic use, 30 percent in energy, and 20 percent in agriculture. We are still going to have to grow water supplies by 29 percent.

So we are going to have to conserve and we are going to have to be efficient with water, and we have to come up with new ways to do it. And it is not just averages. This next graph projects water use, using the projections from the same Texas Commission report for the United States, versus population growth, and local areas are going to see dramatic increases in demand on water.

And this is going to be very expensive to try to be able to do it, as you noted in your opening remarks about using just the current infrastructure approach. It is just going to be amazingly expensive.

So we need new ways to think about this problem. And that is what our Center is really trying to do. It is trying to understand how we can tackle some of these problems.

But along with demand, at the same time as you heard comments already, we are seeing declines in the actual supply because of primarily mining of aquifers and loss of snowpack storage. So we are seeing this perfect storm of increasing demand and decreasing supply at the same time.

So rather than just getting morose about this, I really like to think about the fact that there are lots of really good opportunities out here. We are really far from the natural law limits, which means we can do things and separations that we haven't done before.

And we in the United States are really one of the best innovators in the world in these types of technologies and types of science that we can change the equation fundamentally about how we can save large amounts of water and conserve large amounts of water. So I think it is very important that we look at doing this.

One of the things you have heard discussed many times now is about this connection between water and energy. Well, in wastewater there is a huge amount of energy in wastewater that we spend a huge amount of energy to destroy currently, with our techniques of pumping air and using ozone and chlorine. I mean, when you think about it, we burn up, I just calculated, 100 million kilowatt hours a year just to destroy the energy that is in there. And

we have new technologies that can recover this in a very distributive fashion so that one can put it in like in the Solara Building in New York city, where they have put these types of treatment right in their basement. They don't even discharge it as sewage, and they have cut their water use by 50 percent. We can go all the way to 80 percent and not have a drop in the standard of living.

So we don't have to think that water-conservation equation means you have to deal with less. That is not necessary.

So one of those things that I would like to point out is that there is a water innovation imperative occurring across the world right now. It is very exciting, but unfortunately it is not happening in the United States. It is happening in Singapore. It is happening in Switzerland, the Netherlands, China, India. It is not happening here. Large investments are being made. The companies are going there, GE, Siemens, and they are investing large dollars there.

I think we need to lead this imperative here so that we can have U.S. companies, U.S. workers help develop these technologies that can really fundamentally change our water equation.

So just some quick recommendations. I think we need to increase the investment in water R&D to provide these technologies so that U.S. companies and workers can do this, and all types that you heard discussed here, plus increasing water efficiency and energy efficiency at the same time, getting low energy reuse and desalination technologies that can really fundamentally change the equation. So we don't have to sit there and say we can't make up water demand without extra supply.

And I think the EPA would be a perfect place for looking at how you can test that, verify it, to diffuse it into the marketplace, because we need that diffusion in the marketplace to be successful.

We could create national centers that could focus on efforts coming out of our universities and our labs and companies so we can make this change. So it is really at many different levels that we have to do this. And I think the Federal Government can reinvigorate this sector in a way that hasn't been seen since, say, the 1960s when they made those really early initial investments that we are still benefiting from today, those investments in membranes and desalt technologies that are now the state of the art. It came out of the U.S. It came out of Federal investment, and it would be a great opportunity.

So I want to thank you very much, and I hope that you can read my full testimony.

Thanks.

[The prepared statement of Mr. Shannon follows:]

TESTIMONY OF

MARK A. SHANNON
DIRECTOR
CENTER OF ADVANDED MATERIALS FOR THE PURIFICATION OF WATER WITH SYSTEM SYSTEMS (*WaterCAMPWS*)
University of Illinois at Urban-Champaign, Urbana, Illinois 61801

BEFORE THE ENVIRONMENT AND PULBIC WORKS COMMITTEE
UNITED STATES SENATE: WATER AND WILDLIFE SUBCOMMITTEE

March 31, 2009

Good morning Chairman Cardin, Ranking Member Crapo, and distinguished members of the Water and Wildlife Subcommittee. I want to thank you for the opportunity to testify before the Subcommittee today. I especially want to thank Chairman Cardin for his leadership on this issue, which is critical to the public health and economic prosperity of our Nation. I am Mark Shannon, Director of the Center of Advanced Materials for the Purification of Water with Systems, a National Science Foundation Science and Technology Center headquartered at the University of Illinois at Urbana-Champaign. This Center focuses on finding solutions to the coming water crisis through revolutionary advances in science and technology. We partner with major stakeholders in the water sector through an Industrial Affiliates program of companies across the U.S.[1] I am also the Co-Founder of the United States Strategic Water Initiative, which is a consortium of companies, academic researchers, and water associations acting together to advance the science of water purification and to accelerate delivery of new U.S. technologies necessary to increase and protect fresh water supplies, including different types of sourcewaters that are not now readily usable.[2] In particular we seek increase the chemical and energy

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

[2] List of signers: Ken Kirk - National Association of Clean Water Agencies; Mark Shannon, Jian-Ku Shang, Michael Plewa, Eberhard Morgenroth, Timm Strathmann, Richard Sustich - *WaterCAMPWS*/University of Illinois at Urbana-Champaign; Kofi

efficient use of water, and to create new methods to conserve, desalinate, reuse, decontaminate, and disinfect waters. By doing so, we will be able increase the amount of available water to meet the future needs of our country and world, without needing to transport fresh waters over long distances at huge costs in capital and energy usage.

I appreciate this opportunity to provide input to the Committee on the issues of water use efficiency and conservation, particularly with respect to critical research the Environmental Protection Agency will need to address. I believe strongly that research and development (R&D) into new water technologies can lead to new opportunities for U.S. companies, providing good jobs for Americans, while solving our water problems. It is my opinion that legislation is needed to enhance the United States R&D, demonstration, education, and technology transfer efforts in water technologies. In particular, I would like to talk about needs for new research in water use efficiency and conservation conducted by and for the Environmental Protection Agency.

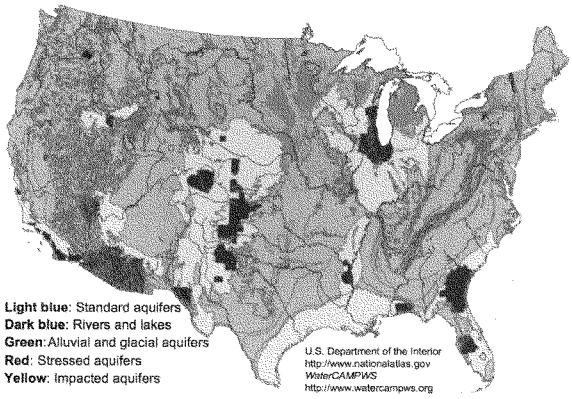
Water Availability Issues

A key driver for efficient water use and conservation is the ongoing reduction in clean water available from our lakes, rivers, and ground water aquifers (our largest source of fresh water for human use). As shown in the U.S. map of aquifers, regions shown in red have reported rapidly dropping aquifers. For instance, regions of the High Plains Aquifer in New Mexico and Texas experienced water level declines of more than 60 feet between 1980 and 1999. As aquifers are drawn down to great depths, the water becomes saltier, since saltwater is heavier than fresh. Some wells around the U.S. are so deep that the waters are becoming brackish, and

---

Bota, Eric Mintz - *WaterCAMPWS*/Clark Atlanta University; Rishi Shukla - Archer Daniels Midland; Greg Pepping - University of Wisconsin; David Henderson - XPV Capital Corporation; Richard White - Lawrence Livermore National Laboratory; Shaurya Prakash - Rutgers University; Lutgarde Raskin - University of Michigan; Slav Hermanowicz - University of California at Berkeley; Tanna Borrell - University of Michigan; Scott Husson - Clemson University; Eva Steinle-Darling - Stanford University; Wen-Tso Liu - National University of Singapore; Daniel Brunelle - GE Global Research; Mark Rigali - Sandia National Laboratories; Darren Sun - Nanyang Technical University; Franz Hoffman – Procorp Enterprises, Milwaukee.

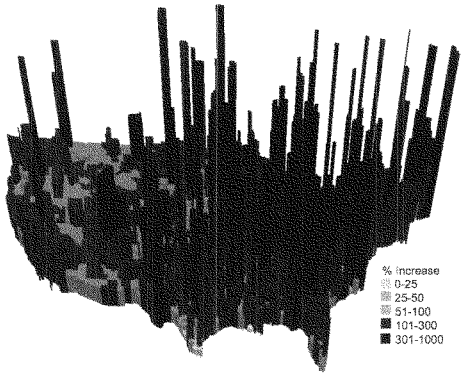
need desalinating before they can be used. Also, along the oceans and bays, saltwater is drawn into aquifers that are drawn down, making them brackish too, which is a growing problem along the Gulf Coast, and southern Atlantic and Pacific coasts. Salting of rivers and lakes is also occurring from land runoff and chemical use by every sector in the U.S. Thus, the U.S. is losing available fresh water by salting. If we add in periodic droughts across the U.S. that dramatically increase the drawdown of aquifers, and the loss of storage of water in the snowpack of the western mountain ranges, critical shortages in available water will become more frequent and severe. Recent reports of the declining water level in Lake Mead suggest that if it continues, within a decade the level may drop below the intakes. If this happens, water supplies will be dramatically cut for 30 million residents in southern Nevada, Arizona, and California. It is vital to have in place before it happens ways to mitigate shortages and to increase available supplies for all regions of the U.S. While there are regional efforts to look at water availability, national legislation is needed to address the growing number of critical issues with water availability.



A U.S. Map of all rivers, lakes, standard and "fossil" groundwater aquifers, which waters deposited thousands of years ago, and are slowly replenished if at all. Over-pumping can stress aquifers, and can impact water supplies. Estimates are shown of stressed (red) and impacted (yellow) aquifers throughout the U.S. More data is needed to know the rates of depletion and recharge of the sourcewaters.

At the same time that water supplies are decreasing, growth in population, energy use, and hopefully economic expansion, will drive demand for more water use. Local water demand will vary throughout the U.S., with many areas likely to experience very high growth rates, as shown below of the local projections in percentage increase in water use by 2030 over that used in 2000. Finding that water will be difficult and very expensive for conventional sources of water, since all the all the easy, low-cost water has already been developed. Therefore new ways to extend current sources of water are needed, as well as low-cost ways to expand water supplies.

While the projections show large increases throughout the U.S. if we do not change our water use practices, the good news is that large increases in potable and non-potable fresh water supplies can be realized by reusing existing wastewater, and desalinating brackish and saline sources (lakes and deep



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

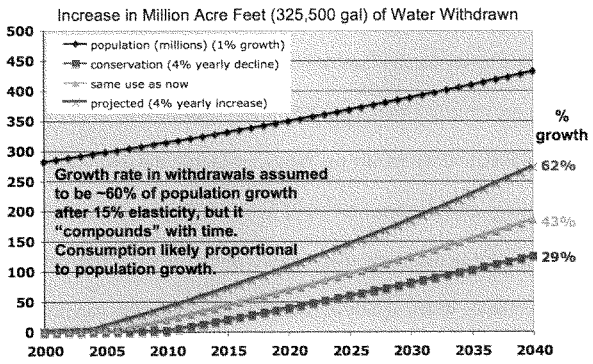
Population data and projections from U.S. Census Bureau (http://www.census.gov/population/www/projections/stproj.html, http://www.census.gov/popest/datasets.html). Water Use Data from USGS (http://web1.er.usgs.gov/NAWQAMapTheme/index.jsp). Water use based on Texas Water Use 60 Year Projections (http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/2007StateWaterPlan.htm)

aquifers that exist almost everywhere in the U.S.). Perhaps surprisingly, our best technologies today are far from being limited by the natural laws of physics and chemistry. But in biological systems, salts and contaminants are removed from water very close to the natural limits. Thus, it *is possible*, in spite of common opinion, to dramatically cut the use of energy and chemicals in desalination and reuse technologies. Energy efficient desalination of saline and impaired waters that currently are not used as sourcewaters, as well as desalination of seawater along the coastlines, can have a profound impact on increasing available water supplies. Therefore, legislation that can help accelerate the development of low-energy desalination methods is timely and needed.

Critical research needs that can be supported through the EPA to enhance water availability includes: (i) low-energy use desalination technologies below that possible by state-of-the-art reverse osmosis methods, including combined energy and water generation systems, (ii) reduction of the brine leftover from desalination to near zero to allow efficient inland desalination and zero discharge of brine along coastlines, (iii) recovery of valuable minerals from the concentrated brine resulting from desalination seawater and saline aquifers, and (iv) investigation of compounds in desalinated and reused waters to ensure safety of the new water supplies.

Water Conservation and Reuse

In order to meet the water needs of Americans, we need new ways to conserve water to dramatically reduce consumption. With a projected U.S. population growth of over 100 million people within 30 years and the growth in consumption patterns with respect to domestic, industrial, agricultural, and energy usage, the U.S. will need to increase total water supplies by up to 62 percent using current technologies and practices, as shown in the figure below. Even if we are able to restrict per capita consumption to 2000 levels, we will need up to a 43% increase



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

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

in water supply capacity by 2040. But with conservation, we can cut in half the demand for new water supplies. Lots of technologies from low-flow showerheads and toilets exist, but none that can reduce water use by an average of 4% per year every year for the next 3 decades. To achieve that reduction, domestic use would have to decline by 60%, energy use by 30%, and agriculture by 20% per capita. But conservation via improved efficiencies and reduction in wastewaters can reduce the costs of clean water, increase the standard of living, and halve projected consumption.

Perhaps the single largest conservation opportunity is through reuse. Currently, in most of the U.S. we treat all water to the highest possible standard – drinking water. However, most of our uses do not need to meet the quality of human health. Uses such as flushing toilets, cooling water for air conditioning, laundry, irrigation, and washing autos, etc. comprise much of the use. Technologies exist today that can reclaim wastewaters and make them safe for non-potable uses.

Where these systems have been installed, water use has dropped by some 50%, without any decline in the standard of living. Moreover, the amount of wastewater discharged also declines, improving the environment. With new research, an even higher percentage of water (80% or higher) can be recovered, creating even more conservation at lower cost and a higher standard of living. In addition, new technologies can be created to recover the energy that wastewater contains, so that less energy is used in the water treatment. Less water discharged, pumped, and treated for both supply and waste means far less energy needs to be spent on treating and pumping water. Currently ~10% of all the oil energy we import every year is used to treat and pump water. Thus, conserving water though reuse can also dramatically reduce energy consumption. Finally, the nutrients that are found in wastewater can also potentially be recovered when reusing water, and made into fertilizer. New research to recover water, energy, and nutrients from wastewater can dramatically increase our ability to conserve these resources.

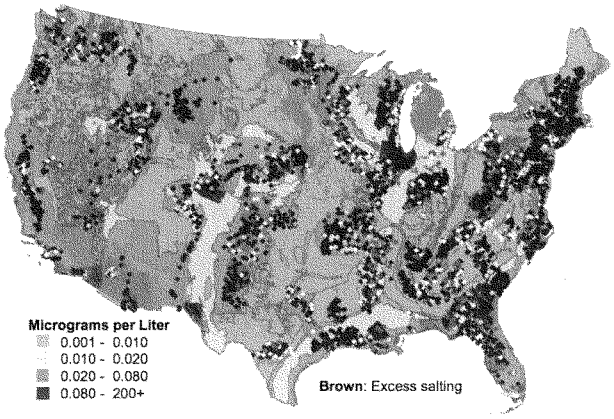
Critical research needs include: (i) assessment of interactions between different water use sectors (agriculture, livestock, mining, energy, domestic, and industry) on water use, conservation, and reuse, (ii) understanding the environmental impact of changing withdrawal, consumption, and discharge patterns on overall water systems, (iii) establishment of standards for potable and non-potable waters derived from these sources to maintain a safe water system, (iv) development of new technologies to reuse water from single user to large scale systems, with low-cost technologies for retrofitting buildings to use non-potable waters, and (v) development of energy and nutrient recovery reuse technologies.

Contaminant and Pathogen Detection, Decontamination and Removal

In the U.S., we have historically achieved water safety by brute force. We find a clean water source, often transport it long distances, treat it with chemicals, and pump it up to high pressure,

and then distribute it in large systems. Significant amounts of water are lost in transporting, treating, and distributing it. Evaporation in open transport channels and leakage from high-pressure distribution systems cause huge loss of water. With an aging and crumbling distribution infrastructure that has over 250,000 water *main* breaks a year, the U.S. loses a huge amount of water. Repairing and building new infrastructure to increase water efficiency is likely to cost hundreds of billions of dollars. AWWA estimates each American owes nearly $500 for infrastructure repair to our current system. Using new technologies to prevent leakage is an important step in stopping leakage losses, but it is expensive to retrofit the entire distribution system.

In addition to leakage losses, a new disturbing trend is the contamination of sourcewaters with pollutants that are difficult to remove even in centralized systems, such as pharmaceutical compounds and plasticizers. Toxic byproducts that occur during water treatment itself, such as disinfection, also are appearing in larger amounts in our water systems. As shown in the figure



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

above, aquifers are potentially being contaminated by critical pollutants. So, waters that were previously clean are being contaminated, thereby either reducing our available supplies, or requiring costly cleanup, or extensive treatment. If new technologies can be developed that efficiently and robustly detect and remove contaminants from water, we can more efficiently use the water we have without as much loss and expensive treatment.

Similar to chemical contamination, waterborne pathogens can sicken significant numbers of people if introduced to water systems naturally or deliberately, or via cross-contamination with waste systems, which can render even major water supplies unusable. Moreover, treatment for pathogens can also inadvertently introduce toxic compounds to water supplies. Disinfection technologies are needed that effectively deactivates known and emerging pathogens without producing toxic substances. A key unsolved problem in need of research is the detection and removal of new and/or evolving infective viruses, and pathogens resistant to standard chemical treatment. If disinfection can be robustly done without producing toxic compounds, more water can be made available for use.

Current treatment technologies are typically not contaminant or pathogen specific, resulting in excessive and inefficient use of energy and chemicals during treatment. Treatment often removes benign and healthy constituents such as calcium and magnesium, and generates excessive residuals or sludge that require further processing and disposal. However, new materials and technologies can be developed that can selectively and affordably remove contaminants and pathogen, making waters safe without adding toxic treatment byproducts. A promising approach to decontaminating and disinfecting waters while saving water from transport, distribution, and treatment loses is by providing point-of-use, source, and discharge systems in a distributed infrastructure. Similar to new reuse and desalination technologies, these systems can range from single homes to large central systems. They can be added to existing systems, thereby reducing the need to completely

rebuild aging systems, saving total system costs. In addition, due to the high need around the world for point systems, a huge potential market for these technologies exists, so U.S. businesses and workers can also benefit from this research.

Critical research needs include: (i) identification of classes of contaminants that need to be removed together and development of methods to detect them at the source and in distribution systems, (ii) development of standards and accepted modalities for determining infectivity of pathogens including viruses in water for near real-time detection, (iii) establishment of risk assessment and mitigation for treatment byproducts from current and new treatment methods, (iv) development of new selective contaminant removal and disinfection methods for priority and emerging pollutants, and (v) creation of new, robust, distributed point-treatment systems that do not create toxic treatment byproducts.

Technology Diffusion

The United States has the scientific and engineering capabilities in our universities, government, and national laboratories to make great discoveries and find solutions to our problems. But unless these advances move from the laboratory to production, these innovations will not be used. Many novel approaches to problems may not take into consideration the costs of mass production or implementation. For new technologies to diffuse into the marketplace, they need to be independently benchmarked against current and competitive technologies, tested and verified. In addition, the total life cycle costs must be estimated and be shown to be favorable. Moreover, with respect to potable water systems, a history of performance efficacy and costs of installation and operation must be available for water managers to select with confidence one technology over another. Because of its oversight role with respect to drinking water, wastewater and environmental quality, and conducting water technology verification, it is

appropriate for the EPA to provide independent testing and verification of new technologies developed to increase water use efficiency and conservation.

Perhaps just as importantly, the funding of basic R&D by the Federal government for new innovative and cost effective technologies in water purification that can diffuse into the marketplace can help position U.S. companies to compete in the rapidly expanding worldwide markets for water technology. Many nations around the world (China, India, Singapore, Switzerland, and many within the EU) are pouring money and resources into developing new science and technologies for increasing water supplies and for new purification methods. While the U.S. still leads in basic science, we are falling behind in technology diffusion into the marketplace. The *WaterCAMPWS* Industrial Affiliates and the signers of the U.S. Strategic Water Initiative are anxious to develop competitive new products to solve the critical problems facing the U.S. and world. Large numbers of jobs can be created in the water sector in the U.S. if the technologies can be diffused into the U.S. technology and industrial sectors. If we do not develop and market these technologies here, we will lose our edge and likely have to pay companies from the other countries that are investing in new water technologies.

Current Recommendations for Enhancing Water Conservation

There are already recommendations pending before the new EPA Administrator that can enhance current water sustainability efforts without the need to revise existing Federal environmental statutes and regulations.

The National Advisory Council for Environmental Policy and Technology Committee issued two reports regarding Sustainable Water Infrastructure (July 2007 and March 2009) as well as extensive advice (May 2006, May 2007 and April 2008) on enhancing environmental technology

programs, including improved coordination and funding across Federal agencies, State permitting agencies, and even local watershed management organizations.

The National Academy of Sciences – National Research Council, and the Water Environment Federation recently submitted to EPA a research proposal entitled, "Sustaining the Nation's Water Services," to investigate technological opportunities, and the financial, regulatory, and societal issues associated with long-term water sustainability. The estimated cost of the full study is $600,000, with $50,000 to come from the Water Environment Federation.

Creation of a National Water Research and Development Advisory Committee

The United States Strategic Water Initiative (USSWI) that I mentioned earlier includes stakeholders from federal, state and municipal research programs, academia, water technology developers, and major water users such as the agriculture and energy sectors. The goals of USSWI are to:

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

- Establish a cooperative research agenda including a prioritized list of gaps, needs, and opportunities in water science and technology.

Because a substantial water research and development effort already exists outside the federal agencies, we believe that input from this external community is essential to the successful development and implementation new water technologies. We therefore recommend that a standing National Water Research and Development Advisory Committee be established under the Federal Advisory Committee Act, to provide advice and counsel to the EPA Assistant Administrator for Research and Development, and to information on extra-mural water research and development activities to the Assistant Administrator.

National Interdisciplinary Water Research Centers

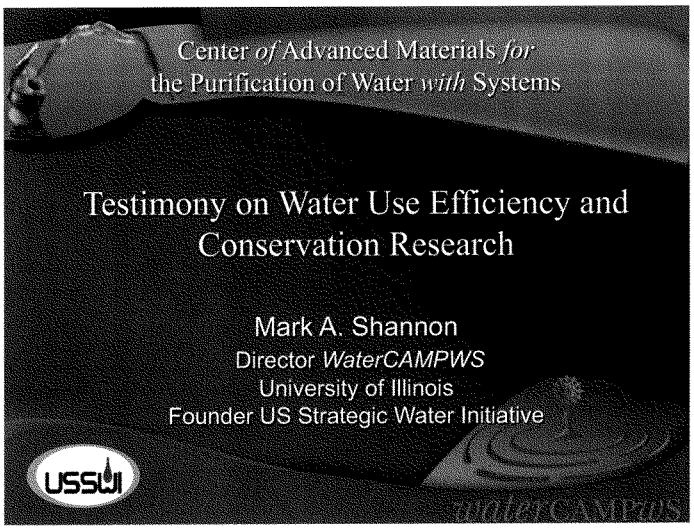
Finally, we strongly support the creation of national interdisciplinary research Centers with participation from U.S. universities, water associations and research foundations, and the private sector including technology companies, innovators, and finance, to accelerate the diffusion of new science and technologies from Federal, State, and local research laboratories, as well as university and foundation funded research, into the marketplace. The Centers should be independently managed with governing boards that include the participating stakeholders along with relevant agencies such as the EPA.

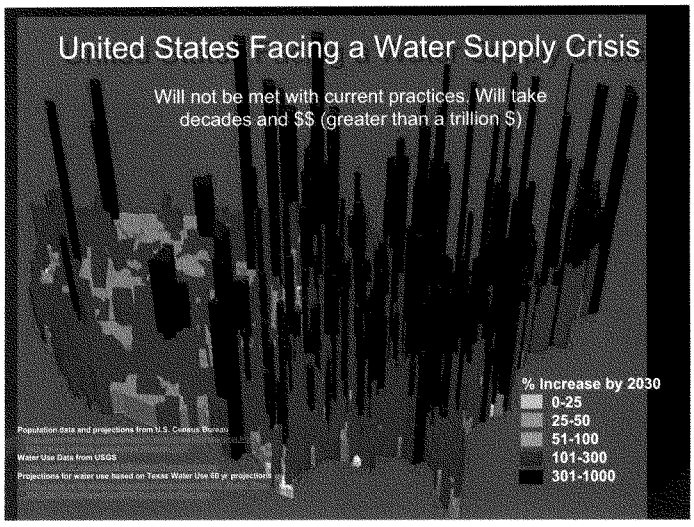
To create these new national research Centers additional funding will be needed. Other nations establishing such publicly-funded Centers, such as two in Singapore and one in the Netherlands, are funding them at $30 to $60 million per year per Center for periods of 5 to 10 years, with similar investments by the private sector. A greater amount is being expended in Switzerland (~$100 million/year) to develop new technologies to reduce water usage in the domestic and energy sectors. These efforts area also attracting private sector investment. For

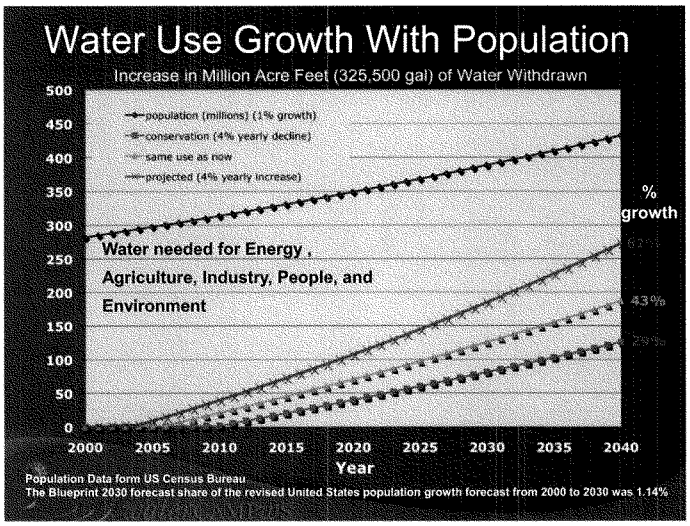
example, GE announced on March 19 that it will invest $100 million to establish a water technology research center at the National University of Singapore. It is likely that a greater level of funding will be needed to solve the larger problems the U.S. faces over several sectors and over disparate geographic regions. Basic research in water science and technology in the United States is funded at about $12 million/year at the NSF, EPA, and DoE. To rapidly increase water R&D, we recommend that Congress consider an increase in federal funding to a level of $100 million per annum beginning in FY 2010 with annual increases of 5% through 2019.

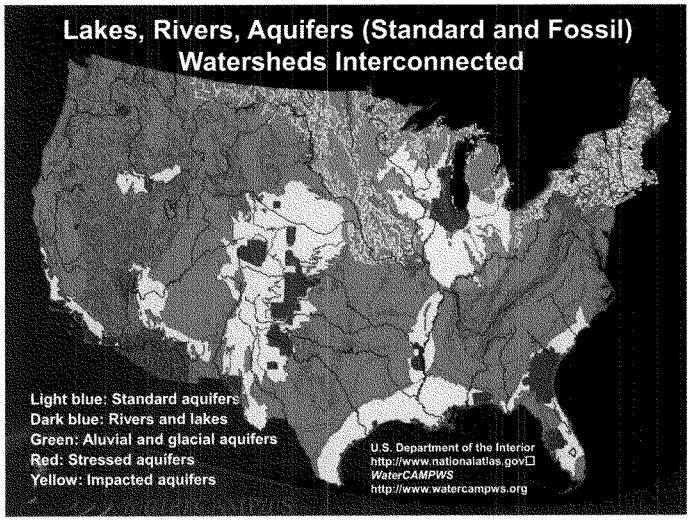
In closing, on behalf of the academic research community and the water technology sector commend the Committee for recognizing the need for coordination across the breadth of federal agencies conducting water-related research. For our part, we stand committed to assisting the EPA by expanding our existing partnership and in coordinating our own work in furtherance of the Agency's research agenda. It is our belief that R&D is essential for the United States to succeed in increasing water use efficiency and better conservation, which is essential to our future.

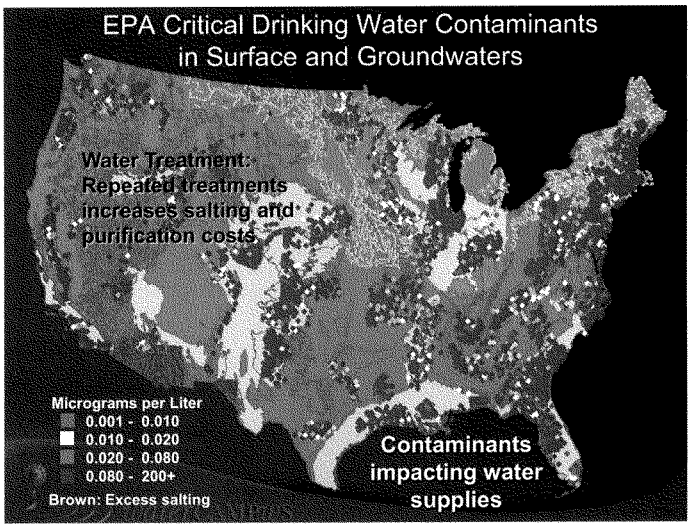
Thank you, Mr. Chairman and members of the Subcommittee for this opportunity to provide this testimony. I would be happy to answer any questions you may have.

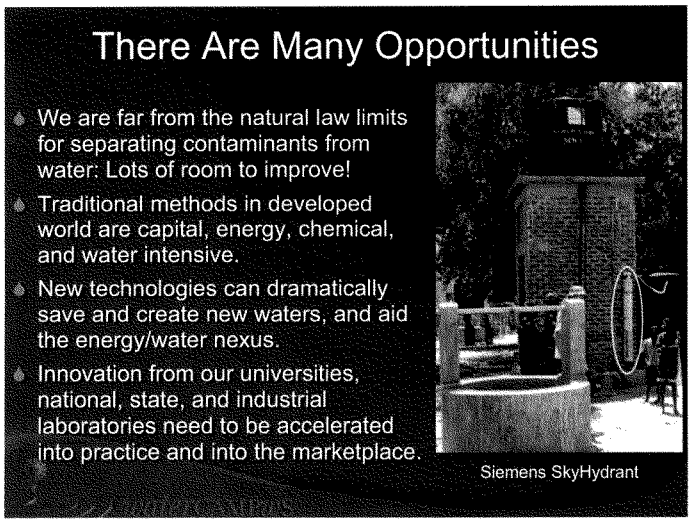

Center of Advanced Materials for
the Purification of Water with Systems
Testimony on Water Use Efficiency and
Conservation Research
Mark A. Shannon
Director WaterCAMPWS
University of Illinois
Founder US Strategic Water Initiative
USSWI


United States Facing a Water Supply Crisis
Will not be met with current practices. Will take
decades and $$ (greater than a trillion $)
% Increase by 2030
0-25
25-50
51-100
101-300
301-1000
Population data and projections from U.S. Census Bureau
Water Use Data from USGS
Projections for water use based on Texas Water Use 50 yr projection


Water Use Growth With Population
Increase in Million Acre Feet (325,500 gal) of Water Withdrawn
population (millions) (1% growth)
conservation (4% yearly decline)
same use as now
projected (4% yearly increase)
Water needed for Energy ,
Agriculture, Industry, People, and
Environment
% growth
62%
43%
29%
500
450
400
350
300
250
200
150
100
50
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
Year
Population Data form US Census Bureau
The Blueprint 2030 forecast share of the revised United States population growth forecast from 2000 to 2030 was 1.14%

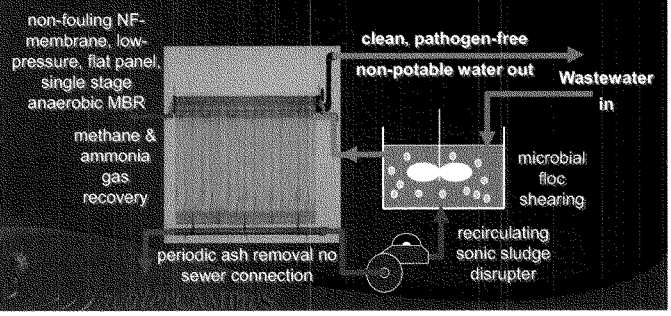

Lakes, Rivers, Aquifers (Standard and Fossil)
Watersheds Interconnected
Light blue: Standard aquifers
Dark blue: Rivers and lakes
Green: Aluvial and glacial aquifers
Red: Stressed aquifers
Yellow: Impacted aquifers
U.S. Department of the Interior
http://www.nationalatlas.gov
WaterCAMPWS
http://www.watercampws.org


EPA Critical Drinking Water Contaminants
in Surface and Groundwaters
Water Treatment:
Repeated treatments
increases salting and
purification costs
Micrograms per Liter
0.001 - 0.010
0.010 - 0.020
0.020 - 0.080
0.080 - 200+
Brown: Excess salting
Contaminants
impacting water
supplies

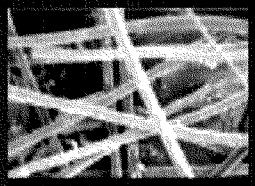

There Are Many Opportunities
We are far from the natural law limits for separating contaminants from water: Lots of room to improve!
Traditional methods in developed world are capital, energy, chemical, and water intensive.
New technologies can dramatically save and create new waters, and aid the energy/water nexus.
Innovation from our universities, national, state, and industrial laboratories need to be accelerated into practice and into the marketplace.
Siemens SkyHydrant

Recovery & Reuse of Water Creates a Resource

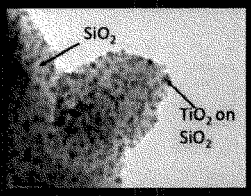
- Can be used for Point-of-Discharge to recharge aquifers or use locally in non-potable uses. Saves $$, energy, & chemicals.
- New technologies can generate energy when cleaning water, rather than consuming energy
- Membranes can ensures high quality and safety



Cleansing Water of Toxins with Sunlight



Ndiege, Chandrasekharan, Masel, and Shannon, UIUC



TEM micrograph of 2 nm diameter TiO_2 on 20 nm diameter SiO_2 particles

Can use low-cost specially treated silica (sand) to remove all organic compounds from water at high rates using free sunlight. Can remove carcinogens, toxic compounds, Pharma-products, endocrine disrupters, and pathogens too, all without using chlorine.

Removing Petroleum Byproducts and Minerals from Water

"Organic–Inorganic Hybrid Materials that Rapidly Swell in Non-Polar Liquids: Nanoscale Morphology and Swelling Mechanism," Burkett, Underwood, Volzer, Baughman, and Edmiston, Chemical Materials 2008. Absorbent Materials, Inc.

New low-cost absorbable glass can remove virtually all petroleum byproducts like benzene, MTBE, distillates, and oil from water. Can be used over and over again.

Energy and minerals in water have economic value. Lithium for car batteries alone can help pay for water needed.

The Innovation Imperative For Water

Need to increase water use efficiency and conserve supplies, while protecting public health and the environment. Need to recovery energy and minerals from waste and saltwaters, while increasing available water

There are many key questions that can be answered by U.S. scientists. Companies can generate lots of good jobs by providing solutions. Else we will import from overseas.

Global innovation is occuring in water technologies. The U.S. needs to lead this Innovation Imperative.

The Federal Government can reinvigorate water sectors if R&D can be funded AND research moved quickly out of the lab into practice with U.S. companies.

1. Other than the federal actions and funding mentioned in your testimony, what more can states, local public water agencies and the private sector do to promote water efficiency?

Response

Thank you for this question. It is my opinion that there are a great number of actions that states, local public and private water agencies and utilities, and the private sector can take to promote water efficiency at a variety of sizes of water systems, down to businesses, industries and individual buildings, such as hotels and apartment buildings. These actions can be group into several general categories: All-Waters management, financial incentives, and technology promotion.

All-Waters Management

While we have seen advances in water efficiency through smarter water management at scales ranging from regional water agencies to the individual consumer, these advances have largely remained within the traditional silos of water management – drinking water, wastewater, and stormwater. Unfortunately, considering these systems separately prevents substantial water efficiencies at competitive costs. Integrating these water management silos into an "All-Waters" strategy can provide opportunities to increase water efficiency through appropriate reclamation and reuse, and through reduced costs of producing water of appropriate quality for a variety of uses. When designed and implemented on a watershed scale, an All-Waters strategy can also ensure that ecosystem services are maintained. In Denver, Colorado for example, tertiary treated municipal wastewater is beginning to be reused for non-potable applications and for aquifer recharge. When completed, Denver's water reclamation facility will recover 17,000 acre-feet of water annually for irrigation, landscaping and industrial use. To facilitate wider adoption of such practices, states need to provide planning resources and watershed information to facilitate development and implementation of integrated water management strategies.

Commercial, industrial and even consumer water efficiency can be dramatically improved through informed decision-making and low-cost, on-site recovery options. In Chicago, Illinois, where the average annual rainfall is 30 inches, a single rain barrel can capture 2,400 gallons of water for landscaping or other outdoor applications. Local water agencies and private water utilities need to provide both awareness of efficiency opportunities and low-cost to no-cost technologies for consumer adoption. The main need is for legislation to promote conservation and water use efficiency between each type of traditional waters, as well as non-traditional sources to enhance overall efficiencies from all-water sources, at every size level and within the private sector.

Financial Incentives

More often than not, decisions to implement water efficiency in commercial, industrial and consumer settings are based on the bottom line and perceived cost-savings. When compared to other nations, the cost of water in the United States is unrealistically low; thus implementation of full cost pricing can be a powerful incentive for water efficiency. At present, most water and wastewater utilities set water and sewer rates based on operation, maintenance and replacement costs, relying on the hidden assumption that water itself is an infinite, valueless commodity. Utilities need guidance to develop pricing structures that value both freshwater and reclaimed water as finite and valuable commodities.

Additionally, utilities should consider incorporating capital costs into full cost pricing regimes rather than through separate bond, loan or grant financing, particularly where future capital projects are necessitated by increased demand in the absence of water efficiency efforts. Transparency in full cost pricing can thus become a powerful efficiency incentive.

Finally, water and wastewater utilities have considerable flexibility to implement tiered rate structures that incorporate progressive rate levels to deter inefficient water use. Similar to many electric and gas price rates, base line rates can be established to ensure affordability for low and fixed income customers.

Technology Promotion

While advances in water efficiency can be achieved through a variety of conservation and management practices, the largest gains will require adoption of newer, water-efficient technologies that can realize large increases in efficiency from utilizing all-waters. In addition, more saving can be realized from new technologies for low-flow plumbing and sanitation fixtures. Here again, states and local utilities can promote adoption through consumer awareness programs and through technology adoption incentives such as sales tax rebates and rate credits. Additionally, local governing and permitting authorities can change codes to permit the use of new technologies that conserve water and increase water use efficiencies, including the new cleantech technologies and green infrastructure that dramatically increase the amount of clean available water for a community. A role for the federal government can be to increase R&D into these technologies and infrastructure, and to test and verify so that state and local authorities, as well as the private sector that does not have the capability to do so, can all use these technologies with knowledge and confidence.

2. You mention in your testimony the difficulty with moving new technologies from the lab to the marketplace. I understand this frustration. The SDWA amendments of 1996 directed EPA to identify affordable technologies for each drinking water standard that the Agency finalizes. If the Agency is unable to identify a treatment technology that is affordable for small systems, it must identify a variance technology that is protective of public health. To date, EPA has not identified any variance technologies because it has not ruled that any standard is unaffordable for small systems. How can we work to bring these new, affordable technologies to the market?

Response

The water and wastewater sector is, for good reason, conservative and risk adverse. As a consequence, new and potentially more efficient or effective technologies often have difficulty penetrating the marketplace.

Technology developers and potential adopters often cite three key barriers to market penetration: lack of verification and performance data for emerging technologies; lack of demonstration funding; and unacceptable consequences for any failures, even ones that are not serious.

Lack of Verification Data

Emerging technologies obviously lack long-term performance data to satisfy the needs of the adopter community while manufacturers' marketing materials often lack the technical data to enable adoption. To address this gap, EPA operates the Environmental Technology Verification (ETV) Program through its Office of Research and Development. Under the ETV Program, technology developers can submit their environmental performance claims to EPA for verification by an independent (often contractor) testing laboratory. The costs of these evaluations are borne by developers and can often exceed $100,000 per evaluation. Upon completion of the verification testing, the successful developer receives an ETV Report that can be used to supplement marketing of the evaluated technology.

While the ETV Program seems straightforward enough, technology developers have offered several recommendations for improving program effectiveness, which can be adopted by the EPA if this program is to gain more prominence and acceptance by technology developers.

In addition to gaining more acceptance and use from technology developers, in some cases state permitting and funding agencies either do not accept ETV Program evaluations as demonstrative of technology capability or they impose additional or alternative testing requirements. To address inconsistencies among the states, EPA could assume a greater coordinating role to ensure maximum use of ETV Program evaluations at all levels of government to enhance adoption of new technologies by both the public and private sectors.

Finally, ETV evaluation costs can be significant, particularly for smaller start-up developers. To address this barrier, EPA should be authorized to provide partial, or even full funding for ETV evaluations for emerging technologies that appear most promising through a structured EPA screening process.

Lack of Demonstration Funding

Again, because of the conservative nature of the water and wastewater sector and regulatory compliance demands, permitting authorities and funding agencies often prefer mature over emerging technologies. Technology diffusion can be facilitated by establishing explicit national and state policies that encourage adoption of emerging technologies and by establishing minimum funding requirements for demonstration projects. Because of the high potential for public benefit from emerging water technologies, we recommend that State Revolving Loan Programs designate a minimum funding level of 20 percent for advanced technology demonstration projects. With the increasing adoption of competing technologies and more competing companies, the marketplace can rapidly sort out the best technologies that work for enhancing water conservation and efficient use strategies.

Unacceptable Failure Consequences

Finally, regulated water and wastewater utilities report a hesitancy to adopt emerging, potentially beneficial technologies for fear of regulatory consequences of system failure. Under the Clean Water Act, EPA and state-issued construction and operating permits must include explicit penalty provisions. While technology adopters should not expect carte blanche to violate regulatory standards, EPA and state permitting authorities can encourage new technology adoption by mitigating failure consequences through a so-called "soft landing" that can include a commitment to install mature technologies in the event the new technologies fail to adequately perform and meet regulatory or permit requirements. This no-failure-allowed barrier is especially acute when moving across traditional water sectors to make use of all-waters for increasing water use efficiency at a lower cost. Indeed, the no-failures-allowed practice acts to increase water costs and decrease supplies for most of the nation. Reducing the no-failures-allowed barrier to entry for water technology providers can dramatically improve diffusion of new technologies into the marketplace.

Senator CARDIN. We have. Thank you very much. Appreciate it. Mr. Mehan.

STATEMENT OF G. TRACY MEHAN, III, PRINCIPAL, THE CADMUS GROUP, INC.

Mr. MEHAN. Thank you, Mr. Chairman.

My name is Tracy Mehan. I am Principal with the Cadmus Group, an environmental consulting firm. Prior to that, I was Assistant Administrator for Water at EPA through 2003.

Before I start, in my written testimony I mention the classic paradox of diamonds and water that Adam Smith identified, that we view diamonds, which are purely for adornment and decorative use, as priceless, but water we hardly put a value on it. That paradox as to the value or lack of value we place on water is something we need to address, and which I think everyone's testimony here is part of that response or that answer.

When I was at EPA, we came out with the Four Pillars of Sustainable Infrastructure, which included full-cost pricing and water efficiency, which will be the focus of my testimony today. I am pleased to see the progress on the water efficiency front. Mary Ann Dickinson is here with the Alliance, which is part of the fruits of that effort, as is the WaterSense program, both efforts of which I am big fans and supporters and urge your continued support of all those efforts.

I am here basically just with one message to sort of supplement all the tremendous things we have heard here today and all the worthwhile ideas for research priorities at EPA relating to water efficiency, and that has to do with the economics and other social sciences which can basically provide drivers or incentives to adopt all these wonderful new water efficiency technologies, as well as traditional low-tech responses such as taking a shorter shower or not watering your lawn all night.

It seems to me that in order to really drive these projects, these practices, these technologies into the water sector, pricing and water rates are important part of this process. At the most basic level, the impetus for water efficiency and conservation comes either from just absolute scarcity in the real world, or from pricing structures which go beyond just mere replacement costs of the hard, grey infrastructure.

In truth, both full-cost pricing for infrastructure and water conservation pricing can be complementary or mutually reinforcing. Scarcity, of course, is usually the result of human need, but we can also experience scarcity in terms of ecological function. We can be meeting human needs while destroying ecological functions because of unsustainable water use.

So again, these are the kinds of issues I think we can address through some economic techniques and certainly through rate and price design.

Many water managers traditionally, and for understandable reasons given their professional training, emphasize demand management as an engineering problem, rather than economic one. They tend to resort to non-price options as they should, in many cases, to reduce water use, rather than looking at the rate structure or the price increases.

Again, this is understandable, but not necessarily sufficient, and again I think both responses, the engineering and the economic, are required. And of course, one barrier we have to adopting something like conservation-based pricing of demand-based pricing is the fact that we are not really doing a cost recovery just for the hard infrastructure right now. Our price structure is well below where it should be just to put in capital structure, maintain it, operations and maintenance, as well as replace it. My paper deals with that issue in some detail.

Traditionally, demand management focused on restrictions such as water uses, rationing, promotion of water-efficient technologies and fixtures, all of which will continue, all of which is important. And these non-price demand management actions were favored, again as I say, because managers did not believe that consumers necessarily changed their water consumption habits in response to changing prices.

Without spending a lot of time on it, my paper gets into greater detail regarding the economic literature on the whole issue of the elasticity or inelasticity of response to prices in the water realm. I think it is sufficient to say that it is an issue that has to be addressed and it is an area for fundamental and increased research, again in the economics profession and the social sciences generally.

It comes down to the sophistication of the design of the rates, and we get into that in much more detail in the paper. Again, a lot of economists will note that all things being equal, price elasticity can be expected to be greater under higher prices. In other words, behavior will change in relation to higher prices.

Although it is difficult to estimate, elasticities are higher with non-linear increasing block prices or pricing than they are under linear uniform prices. It has been estimated that as of 2000, and this is the last study I have been able to find, one-third of residential water customers were already under an IBP regime, but that is really a far cry from where we need to get as a Country.

IBPs may simply make prices more salient to consumers. In other words, they see it and they feel it in their pocketbook. Improvements in the presentation of water price information on water bills has shown to increase consumers' price responsiveness, and IBPs seem to provide a similar signal.

That said, price structure, income, demographics, rainfall and weather, seasonal factors including evapotranspiration rates appear to influence price responsiveness. That is, again, the elasticity of demand. Thus, when setting conservation prices or rates, it is important to use background elasticity information from local studies, regional studies and the like.

All this is to say a lot more research is required for this to make sense. Of course, equity must be reconciled with efficiency. The sophistication of these new price structures must deal with poor people, low income people. We need to guarantee a household what they need to survive and to prosper as a household. But when you move up the scale to greater consumption, you know, watering your lawns with electronic devices, using swimming pools, drought conditions, the price should reflect the scarcity of the resource.

Thank you for your time, Mr. Chairman.

[The prepared statement of Mr. Mehan follows:]

TESTIMONY OF
THE HONORABLE G. TRACY MEHAN, III[1]
BEFORE THE
SUBCOMMITTEE ON WATER AND WILDLIFE
OF THE
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
ON
EPA'S ROLE IN PROMOTING WATER USE EFFICIENCY

MARCH 31, 2009

Mr. Chairman, Ranking Member and Members of this Subcommittee, I am G. Tracy Mehan, III, formerly Assistant Administrator for Water at the United States Environmental Protection Agency (EPA). I am presently a Principal with The Cadmus Group, Inc., an employee-owned environmental consulting firm.

I am testifying today in my individual capacity, and my views expressed here today are entirely my own and not those of my company, its clients or the EPA.

Good morning and thank you for the opportunity to discuss EPA's role in promoting water use efficiency.

In discussing public policy relating to water efficiency and conservation, we do well to recall the great Scottish economist, Adam Smith, who described the paradox of diamonds and water, in his classic book, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776) published the same year as the signing of America's Declaration of Independence:

> Nothing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it.[2]

Thus, diamonds, which are for mere adornment, are valued more highly than water, which is essential for life on this planet. It is this paradox which we need to address in considering the range of policy options for better stewardship of our nation's water resources.

---

[1] Formerly Assistant Administrator for Water at the U.S. Environmental Protection Agency, 2001-2003; Director of the Michigan Office of the Great Lakes, 1993-2001; Director, Missouri Department of Natural Resources, 1989-1992; and presently Principal at The Cadmus Group, Inc. (www.cadmusgroup.com) in its Arlington, Virginia office and adjunct professor at the George Mason University School of Law.
[2] See Book 1, Chapter 4, paragraph 13, "Of the Origin and Use of Money."

My basic message today is that any research agenda for water efficiency and conservation would be enhanced by a focus on the *economics of water rates, pricing and their impacts on water use or consumption.* There are many ways to reduce water use or use it more efficiently. You can invest in sophisticated technologies or you can simply take a shorter shower, but you must have an incentive to do so. Effective pricing strategies can be a useful demand management technique, subject to many variables and issues which I will address in my testimony today. Well-designed water rates can provide the incentive for greater water efficiency and conservation.

EPA, water efficiency and infrastructure finance

In 2003 EPA's Office of Water released its Four Pillars of Sustainable Infrastructure which included better management (e.g., asset management, EMSs), full-cost pricing, efficient water use and the watershed approach.

This quartet was primarily driven by the Office's desire to identify cost-effective means of addressing America's infrastructure investment needs over time in order "to reduce the potential gap between funding needs and spending at the local and national level."[3] Saving water, or using it more efficiently, can avoid or defer major capital expenditures for a water utility. Certainly, protecting water resources and aquatic habitat for both human health and wildlife were important considerations, but the focus was primarily on sustainable infrastructure financing.

This is important to recall because the last thing the agency wanted was to become embroiled in arguments over state and federal roles relating to water supply and allocation. The Office of Water tethered its interest in water efficiency and conservation to water and wastewater utilities specifically, a sector very much a part of its statutory mandates.

Since that time the prevailing view of a truly sustainable water system or utility has expanded throughout the industry and EPA, going far beyond the Four Pillars of Sustainable Infrastructure. For instance, energy management is now a crucial issue, including the nexus between water and energy efficiency. I once referred to this as the Fifth Pillar.[4]

EPA's Office of Water, in collaboration with industry and professional associations, has now, quite properly, expanded its view of sustainable infrastructure to the "Ten Attributes of Effectively Managed Water Sector Utilities"[5] which comprise a framework

---

[3] See EPA's website on Sustainable Infrastructure for Water and Wastewater at http://www.epa.gov/waterinfrastructure/basicinformation.html.

[4] G. Tracy Mehan, III, "Energy Management: The Fifth Pillar of Sustainable Infrastructure?" Water Environment & Technology, August 2007, p. 10.

[5] See the document issued by EPA in collaboration with AMWA, APWA, NACWA, NAWC and WEF entitled, *Effective Utility Management: A Primer for Water and Wastewater Utilities* (June 2008), pp. 3-5.

encompassing operations, infrastructure, customer satisfaction, community welfare, natural resources stewardship and financial performance.

Returning to the matter of water efficiency and conservation, EPA's promotion of the new not-for-profit, the Alliance for Water Efficiency[6], based in Chicago and the development of its expanding WaterSense[7] initiative can trace their origins back to the Four Pillars of Sustainable Infrastructure.

I would like to discuss an area for further research and study which might otherwise escape the Subcommittee's attention given that it does not relate to technology or engineering.

I believe that further research in *economics and other social sciences* will shed more light on drivers or incentives for water use efficiency, thereby encouraging the adoption of both low-tech and high-tech approaches, by individuals, households, businesses and water utilities.

At the most basic level, the impetus for water efficiency and conservation comes from either scarcity of supply in the real world or pricing structures which do more than simply recover infrastructure investments, replacement costs and ongoing operations and maintenance (O&M). Full-cost or cost-recovery pricing can be viewed as complementary to conservation or demand-side pricing.

Scarcity is usually experienced as a human need. However, ecological functions might suffer while human needs are being satisfied through unsustainable water management in any given watershed or basin. Thus, conservation or demand-management pricing can serve to encourage better stewardship in such cases where basic drinking water and economic demands are being met.

However, many water managers view water management "as an engineering problem, rather than an economic one."[8] They tend to resort to non-price options to reduce water use rather than price increases. This professional preference may also contribute to the challenge of establishing adequate rate structures to allow both for financial sustainability and efficient or reduced use of water. In truth, both approaches are necessary.

One barrier to conservation pricing is the fact that the United States water sector has not optimized or attained full-cost pricing for purposes of basic infrastructure support, including replacement costs and O&M.

---

[6] www.allianceforwaterefficiency.org
[7] http://www.epa.gov/WaterSense
[8] Sheila M. Olmstead and Robert N. Stavins, "Managing Water Demand: Price v. Non-Price Conservation Programs." White Paper No. 39 (Pioneer Institute, July 2007), p.4

An August 2002 General Accountability Office (GAO) report[9] on its survey of several thousand drinking water and wastewater utilities indicated that 29 percent and 41 percent, respectively, were not generating enough revenue from user rates and other local revenue sources to cover their full cost of service. Roughly one-third of the utilities deferred maintenance because of insufficient funding, had 20 percent or more of their pipelines nearing the end of their useful life, and lacked the basic plans for managing their capital assets.

During my tenure as Assistant Administrator for Water at EPA, we calculated that American households spent an average of $707 annually on soft drinks (carbonated) and other non-carbonated beverages compared to an average of $474 per year on water and wastewater charges.[10] Basically, American households are paying only 0.5-0.6 percent of income, on average, for water and sewer bills.[11]

The U.S. has experienced an average water pricing increase of 6.1 percent in 2007, one of the largest in recent memory. Nevertheless, *the U.S. average cost is the lowest price per unit (cubic meter) of all 14 countries recently surveyed* in Europe, Africa, America and Australasia by the International Water Report and the NUS Consulting Group in New Jersey.[12]

We would not be engaged in our current public dialogue over an investment "gap" for water infrastructure if water and wastewater utilities were recovering all their costs, including replacement costs and O&M, in their rates.

Conservation pricing

Traditionally, demand management focused on restrictions on water uses, rationing, and promotion of water-efficient technologies or fixtures (e.g., low-flow toilets) to conserve water. These "non-price" demand management actions were favored because many managers did not believe that consumers change their water consumption in response to changing water prices.[13]

Sometimes non-price approaches are sometimes disappointing in their results. Customers may take longer showers with low-flow showerheads, flush twice with low-flow toilets,

---

[9] U.S. General Accounting Office, *Water Infrastructure: Information on Financing, Capital Planning, and Privatization,* GAO-02-764 (August 2002), available at http://www.gao.gov/new.items/d02764.pdf.

[10] For detailed calculations, see footnotes 3 and 4, G. Tracy Mehan, III, Assistant Administrator for Water, U.S. Environmental Protection Agency, "Investing in America's Water Infrastructure," Keynote Address to the Schwab Capital Markets' Global Water Conference, Washington, D.C., April 15, 2003, viewed at http://www.epa.gov/water/speeches/041503tm.html on January 8, 2008.

[11] Congressional Budget Office, *Future Investments in Drinking Water and Wastewater Infrastructure,* November 2002, ISBM 0-16-01243-3.

[12] Laura Hodges, "Rising prices reflect increasing awareness of global water shortages," World Water and Environmental Engineering, January/February 2008, p. 21-22.

[13] Olmstead, S.M., W.M.Haneman, and R.N. Stavins, "Water Demand Under Alternative Price Structures." Journal of Environmental Economics and Management 54 (200&), pp. 181-198.

and water lawns longer under day-of-the week or time-of-day restrictions, observe Olmstead and Stavins.

"Conservation pricing"—the increase in water rates to promote decreased or more efficient water usage—is an important tool of water management. There is some evidence that it is best used in combination with non-price demand-management actions for optimal results.[14]

Setting conservation prices is a critical task given its inherent relationship with questions of affordability, full-cost recovery, potential revenue loss due to decreased water demand, and the no-profit constraints on many utilities. Yet, carefully setting water rates can actually decrease customer water bills (rate increases offset by decreased consumption) and also reduce long-term utility costs since water efficiency and conservation can become the low-cost alternative to supply augmentation.

Critical to the proper setting of water rates, for the purposes of efficiency or conservation, is the concept of *price elasticity of demand*, i.e., how water consumption responds to changes in water pricing.

Certainly, numerous empirical studies have shown that residential water demand is relatively *price inelastic*. Because there is no substitute for water, this inelastic response is characterized by relatively small changes in the amount of water purchased and used given an increase in its price.

Yet, *inelastic is not the same thing as unresponsive*. Rather, it means that the degree of demand response is less than proportionate to the price change. For instance, a 10 percent increase in price, water demand can be expected to decrease by 3 percent.

Olmstead and Stavins note that, all else being equal, price elasticity can be expected to be greater under higher prices.

Although difficult to estimate, elasticities are higher with non-linear, increasing block prices or pricing (IBP) than under linear, uniform prices.[15]

It has been estimated that, as of 2000, one-third of residential water customers were under an IBP regime.[16]

---

[14] Georgia Environmental Protection Division, "Conservation-Oriented Rate Structures." EPD Guidance Document, August 2007.

[15] The Georgia EPD describes an Increasing or Inclining Block Rate Structure as follows: "This option targets conservation at peaking and average use within customer classes. All customers in the same class (residential, commercial, industrial, etc.) pay a base rate per unit of water used, under a certain threshold of water use. For any use above the set threshold, a higher rate per unit of water used is charged. Additional volume blocks can be defined where higher rates are charged…Three or more pricing tiers are recommended." Some communities will offer decreasing block prices (DBPs) for the benefit of industry.

[16] Olmstead, Hanemann, and Stavins cite the OECD and Raftelis Environmental Consulting for this statistic.

IBPs may simply make prices more salient to consumers. Improvements in the presentation of water price information on water bills has been shown to increase consumers' price responsiveness, and IBPs seem to provide a similar signal.

That said, price structure, income, demographics, rainfall/weather, and seasonal factors (including evapotranspiration rates) appear to influence price responsiveness (elasticity of demand). Thus, when setting conservation prices or rates, it is important to use background elasticity information from local studies, or from regional studies with similar demographic, geographic, and price if possible.

Conservation pricing may be more effective and efficient if winter and summer demands are addressed separately. Epsy, Epsy, and Shaw found in their study that summer demand was more elastic. Therefore, imposing water conservation pricing at that time would be more effective. Prices would not have to be raised as much to achieve a given percentage reduction in water use. Other researchers have noted that aggregate demand was 25 percent more price responsive in summer months, reflecting the more discretionary nature of outdoor water use.[17] Households can exercise greater discretion at that time relative to activities such as filling swimming pools, washing cars, and watering lawns. This is especially significant in light of present and predicted impacts from a variable climate on flow regimes, i.e., less water available in reservoirs in summertime due to a decrease in snow pack and an increase in precipitation in the spring.

Price policies appear to be effective during periods of drought, changing behavior and reducing consumption when used with other non-market policies.

The impact of conservation pricing on revenues

A utility manager looking to implement conservation pricing must recognize the likelihood of short-term declines in revenue. Moreover, short-term or emergency responses to scarcity or conservation programs may result in revenue declines for which there is no compensation and may not result in permanent or long-term changes in customer water use patterns.

In order to assure revenue neutrality or stability, the effects of conservation pricing must be factored into the rate-making process. Attaining the same level of revenue entails imposition of a higher rate per unit of water on the anticipated sales volume, taking conservation into effect.

Yet, it is imperative that a utility manager not focus too narrowly on short-term revenue effects of conservation pricing. Otherwise, he or she will overlook the lessening of the variability of costs in the short-term and a reduction of fixed costs in the long run.

[1717] Renwick, M., and R.D. Green, "Do Residential Water Demand Side Management Policies Measure Up? An Analysis of Eight California Water Agencies." Journal of Environmental Economics and Management 40, pp. 37-55 (2000).

Revenue instability imposes direct costs of its own on water suppliers through increased cost of borrowing and more complicated planning to ensure adequate supply for current and future customers.

There is clearly a premium on being able to model the seasonal fluctuation in demand with as much precision and accuracy as possible in order to minimize uncertainty about water utility revenues in the near-term. Since the different rate structures can have very significant impacts on revenue stability, there is a serious need for empirically-based research that maps out the extent of the instability and investigates managerial techniques to cope with the increase uncertainty in revenue. It is critically important to develop the quantitative tools needed to explicitly depict the tradeoffs between revenue sufficiency, revenue stability, equity, and the incentives necessary for efficient resource use.

Water efficiency and conservation can help reduce the variable costs of operations, particularly in the areas of energy and chemicals. And the same approaches can allow the utility to avoid both fixed capital and variable operating cost resulting from inappropriate investments in unnecessary capacity to meet inflated demand for water services. The aim is to lower a utility's long-term cost structure and thereby reduce its revenue requirements. This will result in lower utility bills over time. The challenge is an educational one—to educate customers about the long-term benefits of water conservation.[18]

Decoupling revenue from volume sales of water

Traditional rate design ties utility revenue directly to the volume of the commodity, i.e., water, which it sells. Obviously, this can directly conflict with the goal of water efficiency or conservation. Ideally, rate structures need to change to reward utilities for making more economically and environmentally efficient resources decisions.[19]

Decoupling revenue or profits from delivery of the commodity will make the utility "financially indifferent to its volume of sales" while encouraging it to focus on policy goals.[20]

For investor-owned utilities (IOUs), and even public utilities in a few states, this matter of decoupling will be within the jurisdiction of state public utility commissions (PUCs) which would also benefit from further study of and research on this concept as applied to the water sector.

---

[18] Thomas Chesnutt and Jan Beecher, "Revenue Effects of Conservation Programs: The Case of Lost Revenue." White Paper, A&N Technical Services (October 2004), p. 3.
[19] S. Carter, "Breaking the Consumption Habit: Ratemaking for Efficient Resource Decisions." The Electricity Journal, Vol. 14, Issue 10 (2001), pp. 66-74.
[20] Rutgers Center for Energy, Economic and Environmental Policy. Strategic Issues Forum, Decoupling Whitepaper #1, October 25, 2005.

Decoupling is also referred to as a revenue cap or revenue-per-customer mechanism, revenue-indexing, and statistical recoupling. The concept was pioneered in the gas and electric utility sector which can, no doubt, provides some lessons for the water sector.

Decoupling may apply to all or only some rate classes. Revenues might also be linked to something other than sales on a class-specific or system-wide basis. Adjustments could be made at regular intervals or through periodic regulatory proceedings.

Conclusion

Since the issue of conservation pricing requires, in the majority of cases, a political decision by a utility or local community, issues of effective communication, civic education and public outreach are critical in the quest to address America's infrastructure investment "gap." Explaining long-term benefits (both economic and environmental) versus short-term costs is always a difficult task.

Finally, issues of social and environmental justice, and the fair treatment of low-income customers, or those on fixed incomes, must be addressed in order to maintain the equity and political legitimacy of full-cost and conservation programs. Carefully designed IBPs, rebates, and other creative techniques, which assure that basic household needs are met, must be investigated and implemented to keep faith with those who merit our help and concern.

Thank you for your attention to what is, admittedly, very dense material on matters of pricing and water rates. I hope this overview of the many and diverse issues relating to conservation or demand-management pricing gives you a sense of the importance of further research, study and evaluation of the critical functions these concepts can play in our quest for water efficiency, conservation and stewardship.

G. TRACY MEHAN, III
501 John Marshall Drive, N.E.
Vienna, VA 22180
703-247-6106 (office)

April 29, 2009

Heather Majors
Majority Staff
U.S. Senate Environment and Public Works Committee
410 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Ms. Majors,

Here are my responses to questions from Senator Inhofe, following up on my recent testimony of March 31, 2009.

Question no. 1

Other than federal actions and funding mentioned in your testimony, what more can states, local public water agencies and private sector do to promote water efficiency?

Answer: There is nothing to prohibit local communities from pursuing numerous technical, engineering and economic techniques to conserve or use water more efficiency. Indeed, many progressive communities are pursuing these opportunities already, especially in the arid western states. Differential pricing in the summer months is one technique already utilized in many communities. As I stated in my testimony, a significant percentage of utilities are already utilizing increasing block water rates, although the number is small relative to the total universe. Education and outreach programs which encourage more water efficient fixtures or toilets are another. Local building codes might offer another opportunity. Moreover, basic asset management, maintenance and replacement can reduce water losses through replacement of leaking water mains, pipes, etc.

Question no. 2

You testified about your desire to see full-cost pricing for water users...What, then, are your ideas on how to create fair pricing for water, given that not everyone will be able to afford the consequences? How would you propose residents of rural

areas, or those on limited income, or the working poor, be treated? How can the least able to pay still be given access to this indispensable substance?

Answer: There are approximately 52,000 community water systems in the U.S., but just 8 percent of those systems (4,132) serve 82 percent of the people.[1] Compare this to England, Wales and Scotland which, together, have only 11 utilities.[2] Absent substantial consolidation or aggregation of smaller U.S. water systems, it is hard to see how they can achieve anything like independent, financial sustainability, i.e., full-cost pricing. That said, the majority of America's population can be served more efficiently through techniques such as increasing block rates say.

Nevertheless, the water sector could learn much from the energy sector where "Lifeline" rates are very common. In other words, a robust rate structure can be used to subsidize low-income customers without distorting the integrity of the overall rate structure. Basically, subsidies should be focused on people in need, not systems as a general rule. Moreover, seasonal water rates would seem to be a reasonable thing to implement even in low-income communities given water shortages.

Focusing on the 8 percent of water systems, serving 82 percent of the population, is probably the place to start.

Thank you for your interest in my testimony. Please contact me if I can be of any further assistance.

Sincerely,

s/ G. Tracy Mehan, III

---

[1] U.S. Environmental Protection Agency, *Factoids: Drinking Water and Ground Water Statistics for 2008*, EPA 816-K-08-004, November 2008, www.epa.gov/safewater/date

[2] Michael Rouse, *Institutional Governance and Regulation of Water Services: The Essential Elements*, IWA Publishing, 2007

Senator CARDIN. Thank you very much.

We will start this round of questioning with Senator Whitehouse.

Senator WHITEHOUSE. Thank you, Mr. Chairman.

And let me thank you on being the first of our class out of the block to chair a subcommittee hearing and get it organized and together. It is an honor to be here with you and I salute you on being the first to go.

[Laughter.]

Senator WHITEHOUSE. For the witnesses, my question is about bottled water. When you are talking about the waste associated with water use, it is hard to overlook the extraordinary waste of energy and oil and everything associated with bottle water. Many people will walk by a tap that at the flick of a wrist will produce better quality water than the water that has been sitting in that plastic bottle for however long, or at least as good.

How is it that we begin to attract Americans back to the tap, assure them that the quality of water that they are drinking is as good, if not better than the bottled water, and reduce the energy waste associated with bottled water?

I am told that every time you pick up a bottle of water, if you can imagine it being one-quarter filled with oil, that is about how much it takes to get that water to you in order to drink that bottle of water.

I would be interested in hearing the panel's thoughts on that question.

Ms. DAVIS. It is an extraordinary phenomenon and an interesting marketing question. The United States, the water quality here, is the envy of the world.

Senator WHITEHOUSE. I am the son of a Foreign Service family. I grew up in places where you actually couldn't drink the water, so it is particularly astounding.

Ms. DAVIS. Exactly. And yet, what we have developed in the United States is a market of convenience where the bottled water has met a need in the sense that people that are, oh, I want a glass of water, will then go to the market and buy something that is cold. And I don't think they realize the full cost of that water, both in terms of the cost of the bottling of the water, which is no different.

It is just tap water that has in most cases been put in the bottle. There is no difference in quality. It is the same quality, except for the fact that you do have issues related to when you open up the plastic bottles and then you get heat and that kind of a thing. You can end up with some water quality issues.

I think at the end of the day, there is an interesting campaign going on in California where a citizen group is now distributing the new special water bottles that don't have any kind of degradation problem. And they are distributing it and calling it Take Back the Tap, with the notion that if it is a matter of convenience, we can supply that convenience by the right container and trying to get the container in the hands of people so they can refill them easily and therefore have the convenience of having drinking water when they want it.

Senator WHITEHOUSE. Anyone else, in a minute and a half?

Ms. DICKINSON. Yes, I would like to comment on that. I think the phenomenon of bottled water has arisen primarily because of two

reasons. One, the consumer doesn't necessarily trust the taste factor coming out of the tap. It is the chlorine residual that often is not very attractive from a taste perspective. And when I worked for a water utility in Connecticut, near Rhode Island, we did a bottle-your-own campaign where we actually encouraged people to take the glass bottles that we gave them and refrigerate the water, because once the water was refrigerated over a period of time that chlorine residual would no longer be noticeable in a taste.

And that was one factor, was the taste issue that we noticed. That was why people were drinking a lot of bottled water.

But the second one is really very simple. We have lost the public drinking fountain. It has become, you know, a scuzzy disgusting facility that, for the most part, people will not want to drink from anymore. And from a technology perspective, there are ways to fix that problem and we should think about how we can make public water supplies available on a public fountain basis that is sanitary, that is going to provide the measure of comfort level to the user.

I am a tap water drinker and I struggle to find public fountains in airports and other public places. They are just disappearing, largely disappearing from our buildings. And so I think that is part of what we need to also look at, is how we provide the substitute for the consumer that wants to make that switch.

Senator WHITEHOUSE. More infrastructure, Mr. Chairman. Infrastructure.

[Laughter.]

Senator WHITEHOUSE. I thank the witnesses.

Senator CARDIN. Senator Udall.

Senator UDALL. Thank you, Chairman Cardin, very much. And congratulations to you also for being the first in your class to hold a hearing. I served with you in the House and we have always known you were a great leader, and you are once again leading out, and you beat Sheldon to the punch. That is the thing I like.

Senator CARDIN. Your class is coming soon.

Senator UDALL. OK, OK, as soon as you get me one of those chairmanships.

Senator CARDIN. Right.

Senator UDALL. But I'd like to put my opening statement in the record and just go directly to questions.

[The referenced material was not received at time of print.]

Senator CARDIN. Without objection, all Members of the Committee will have the opportunity to include opening statements. We have heard from Senator Inhofe who had planned to be here, will not be able to be here, and his opening statement will also be included in the record.

Senator UDALL. There was some discussion early on about through the panel, and thank you all for being here; we very much appreciate your testimony, on the issue of desalination. And that is a big issue in the west, because we are seeing an interest in getting into these brackish underground aquifers and bringing them up and desalting them.

And developers are looking at different ways to get water supply there. But it is my understanding there are several concerns. First, the process is very energy intensive, so in order to desalinate water

on large scales, we would be forced to consume large amounts of new power, the equivalent of several very large power plants.

Second, these inland saline aquifers, unlike freshwater aquifers or the ocean, are nonrenewable and may not recharge naturally. As a result, the price for desalinated water is much higher than from freshwater resources.

I would like to ask you, any of you, to comment on this. If all the desalination research we talked about, the projects, the research, we push the envelope on it, how realistic are the efforts on a large scale in the near term, say 5 years? And how much can we expect to bring the costs down, if you talk about where the cost is now and how far we would bring it down?

Mr. SHANNON. OK. I would like to weigh in on this. I think this is a fantastic question you asked, Senator, and it is something that we spend lots of our time thinking about.

Right now, there are efforts around the world to bring the cost of energy use and desalinization way down. In fact, we are being funded by groups out of the EU and Saudi Arabia to do just this, to be able to use solar-powered desalination of both sea water and inland.

And so there is a group that is now working on cogenerating energy, generating energy at the same time you are generating water, and having the brine so concentrated at near zero discharge that you can get at that inland issue. There are key issues that one can do there, and I think the costs can be brought down considerably from where it is currently at.

That is one of the things that we talk about. We are not near the natural law limits, and when people think about it, they think about known technologies. And known technologies are very energy intensive that are currently being used.

The other issue is that if you are trying to transport water long distances, this is one of the things that people don't really compare, as discussed, taking the water over the Tehachapis. That takes just as much energy as it takes to desalinate water from sea water, so one needs to compare those two costs.

But there is research going on. Unfortunately, not a lot in this Country, but a lot of research going on overseas and large companies are looking at developing new technologies. We should see the energy drop by a factor of two to four over current technologies, and being able to do this recovery.

If you couple it with the reuse factor, where you can then, after it has been desalinated and use the non-potable water, you can then drop the total water needed by a factor of four as well.

So I think it does become quite possible in these arid regions to be much more efficient about use of water. These deepwater aquifers that you are referring to, many places are already getting to that point. Outside of El Paso, Texas, the water is so deep that they are now desalinating and spending a lot of water to re-inject it down into the deep oil wells.

So the technologies are here, but they can be made much better, I guess, is the take-home message.

Mr. MEHAN. Mr. Chairman, I would associate myself with Dr. Shannon's remarks completely. I would also maybe call your attention, Senator, to a recent report by the National Research Council

on desalt technologies. It is a very good report. It does point to just the cost dropping like an anchor, and that is going to continue. But there are residuals. There are issues that require further research.

I think there are some good American companies working in this area like G.E. and Dow, and they would be very pleased to come in and tell you how the technologies are improving and the costs are dropping.

So it is part of the solution. I am not one that thinks that technology will save us. That is why I believe in full cost pricing and conservation pricing and water efficiency. But it is definitely a bright spot on the horizon. And when you look at the application of those same technologies to water reuse and recycling, tremendous opportunities.

Ms. DAVIS. If I might add just one point, I agree with the foregoing comments, and I just would add that desalination, particularly in the interior areas, needs to be looked at. And an integrated water management strategy, which is exactly what we are doing within the Chino Basin. We have two desalters that are operating now that are helping us to reclaim water that otherwise would not be usable. We are integrating that water supply into treated water into our water supplies.

So we are generating right now about 26,000 acre feet of new water supplies from the treatment of brackish groundwater that otherwise would not be available. We were able to integrate the project with renewable energy development of biogas from a digester. We actually did a partnership with the agricultural community. So we are taking dairy manure and treating it and producing the biogas that then runs the generation at the desalter.

And then we are also looking at recharge strategies with recycled water, where because we are taking the salts out of the groundwater basin, our regional board under the Clean Water Act is enabling us to go ahead and use recycled water as part of the replenishment cycle, along with stormwater and imported water, to manage the groundwater basin.

So in a bigger picture, how do we fit all of these different water strategies together? And I would also concur that we are really very low on the learning curve of really how to do this and to figure out ways in which our local water supplies can be optimized, maximized in order make these strategies really work and drought-proof our economies.

Senator UDALL. Thank you, Chairman Cardin.

We have, as you know, hearings at the same time. I would love to stay at this the entire time, but I am going to have to get over to the Commerce Committee.

Senator CARDIN. We appreciate your being here.

Senator UDALL. Thank you.

Senator CARDIN. We certainly understand that.

One of the things that is different between the Senate and the House that Senator Udall and I both experienced. In the House, we serve on one or two committees. In the Senate, they put us on four or five committees. So I think they try to keep you out of trouble by having you at hearings all day long.

Professor Shannon, you pointed out in your charts and in your comments the benefits from research in the area of water effi-

ciency. Could you just comment how the Federal Government compares in its commitment to supporting research for water efficiency with perhaps what is happening in other countries or in the private sector?

You heard EPA testify earlier. We do have research programs. They are not centered only on water efficiency, but they do cover water efficiency. How do we compare to what is happening around the universe on water efficiency research?

Mr. SHANNON. Well, thank you very much.

I actually have been traveling the world trying to answer this exact question. I went to Switzerland because Switzerland, you know, is a country of 7.7 million people. And they are spending about $400 million a year on it right now. And you are saying, well, why would they be doing this? This is a water-rich country. It is beautiful.

It is because they are a net-exporting energy nation in electricity and their snowpack storage and glacial storage is decreasing. And so they have decided to become very efficient about water, and moved to a lot of reuse, looked at low water footprint technologies for energy and other applications, so that they can become self-sustaining when this snowpack storage disappears.

Singapore is investing some $300 million over 5 years and getting concurrent investments by, unfortunately, U.S. companies. On March 19, G.E. just announced they are investing $100 million in the effort in Singapore. And unfortunately, it is not coming to the United States.

The Netherlands, a country of 16 million, also invests on the order of $100 million a year on water reuse and conservation technologies. China, it is very difficult to tease where China is, but China is spending lots of money at this point, as well as India.

So we are seeing this resurgence around the Country. And so much so that our students that we are graduating with Ph.D.s are being literally taken away and given great salaries, and we are seeing a reverse brain drain, leaving this Country, which is very disturbing to me, particularly when one thinks about it and projects it out into our future.

So, you know, in comparison, our investments are quite modest in total, not even comparing against population. I think our needs, actually, are quite high. So I think there is a mismatch in our investments versus other countries.

Senator CARDIN. One of the strategies we have tried to use on energy efficiency and renewables is that it is good economic sense for Americans. Our technology and jobs should stay here. I think same thing is true with water efficiency, that we are losing an economic opportunity here that we need to figure a strategy to deal with.

That leads me, Mr. Mehan, to your point about pricing of water, which would be a rather controversial issue if we tried to put the true cost of water on the users. It wouldn't be a popular decision by those who have to run for office locally.

But you raise a very good point. I want to take it to a different level, though. You say you then reward water efficiency, which I agree. Use less, you are rewarded on the price structure. But it

seems to me that with volume purchases, you might work counter to that.

Have you thought about how you deal with the volume issue, with efficiency, so that we use less, but still have a pricing mechanism that reflects true cost?

Mr. MEHAN. Absolute key issue, Senator. Unfortunately, I didn't have time to get to it in my testimony, my oral testimony. But in my paper testimony submitted, I discuss the whole issue of decoupling, which is not a new issue in the energy field, but it is still a new issue in the water sector. Decoupling, in other words, pricing of revenue for the water system from volumetric sales.

Certainly, California I think has done this I think on energy, and ahead of that. But we haven't really begun to explore the kinds of price structures that would allow us to take the incentive out of selling a lot of water. I don't know how many corporate environmental officers I have talked to who have said you know, we have put in this really wonderful water efficiency program in our plant. We cut our water use, and then our water rates went up. And as I remember, one officer from Coca-Cola in particular said that sends a very mixed signal.

And I think that points to the problem and the need to explore decoupling between volumetric sales and a legitimate rate of return for the water system. Key issue, and one that could use a lot of research work, and I cite my written testimony.

Senator CARDIN. Well, I appreciate that. I think that can be very helpful to us.

Ms. Davis, what are the major obstacles in the way of utility companies adopting water efficiency types of improvements?

Ms. DAVIS. You know, for a long time, they have been willing to move along with programs that supported their customers in being more efficient. And so it has been dominated over the last decade or so with a focus on provision of rebates for more water efficient devices, like the ultra-low flow toilets. And quite frankly, they have been very successful.

The city of Los Angeles today announces that it is using the same level of water supplies as they did in 1990, even though their population has grown by over 1.5 million to 2 million people. They credit back to simply the programs of switching out toilets and putting in, building in structural water efficiency.

What is happening in California and I think some of the, you will see the same issues carrying across the Nation, is how do you take the next step in building in efficiency? And I think there has always been a fear factor that in part in asking people to be more efficient, that maybe you are asking them to change their lifestyle or to make choices that they don't want to make.

And I think we see this debate in the outdoor sector very visibly exposed, where people are saying, if you ask me to reduce my outdoor landscaping, does that mean I get to keep a lawn?

And I think what we are seeing now emerging, but there is a lot more work to be done on it, is how we can encourage people to have very attractive outdoor landscaping that is water efficient, that has these other benefits.

And for most water agencies, it is a new frontier of getting into recommendations that would go so foundationally into the way that people have structured their landscapes and their communities.

Senator CARDIN. Thank you for that.

Ms. Dickinson, I appreciated your comments on the WaterSense program. You did something which is kind of unusual. You gave us a specific number, $10 million. I am curious how you arrived at that number.

Ms. DICKINSON. Well, I came up with $10 million because I wanted to at least get within shooting range of the Energy Star funding. So that is one-quarter of the Energy Star funding. It would be wonderful to have even more than $10 million, but that is already a fourfold increase over their current levels, and I thought maybe more than $10 million might not be easily justified.

But clearly, I believe that additional investment in the WaterSense program will yield a lot more results, which will be positive in the marketplace.

Senator CARDIN. Well, I agree. We are going to have to take a look at that. I don't think there is any disagreement about the need to center in on greater acknowledgment of water efficiency issues and WaterSense helps us in that. We need more research. We certainly need to concentrate on the cost-benefits of water efficiency that the pricing issues, I think, point out.

The difficulty is do we take it out of existing, reprioritize, or do we add additional resources? And in a tough economic period that we are in now on budgets, it is going to be very difficult to see new funds made available.

So one of the challenges to all of us is whether we can reprioritize within the resources that are currently being used. That may be a matter for another day's discussion, but I think you all have made a very convincing case that we need to get the right public attention on water use and the concerns about water supply in America and international, and the fact that we can do a much better economic job for our Nation in better use of energy and better use of our natural resources.

Our challenge will be how the U.S. Senate and Congress can work with this Administration to develop policies that will move these issues forward. Your testimony here today has certainly helped us in giving us the information necessary to move forward. So I thank all of you for your testimony. This will be a continued interest for our full Committee. I know Chairman Boxer is very interested in moving forward in this area, and we will take the information from today and move forward.

Thank you all very much.

Our Subcommittee will stand adjourned.

[Whereupon, at 11:18 a.m. the subcommittee was adjourned.]

[An additional statement submitted for the record follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR
FROM THE STATE OF OKLAHOMA

Today we are focusing on a very small piece of a very large issue: water efficiency. Our Nation currently has hundreds of billions of dollars of needs in both clean water and drinking water infrastructure. Many of our systems are reaching the end of their lifetimes and are going to need replacement and repair in the future. Using water more efficiently is one way we can help extend the life of current systems and

is important for planning for the future. Additionally, we can help address this need through a continued commitment to infrastructure. I am looking forward to working with Chairman Cardin and Ranking Member Crapo on the water infrastructure bill.

Consumers understand the importance of saving energy. Energy prices have risen around the Country and many people have chosen to cut their energy costs by purchasing products that save them money, such as more energy efficient appliances. EPA's Energy Star program has been a great example of a public-private partnership that relies on market based principles to drive technology forward. EPA is working to do the same thing with its Water Sense program. Using the market and public-private partnerships along with education, water efficiency programs can be widely successful in saving water for communities and money for consumers.

Using water more effectively helps reduce strain on existing water treatment plants and can help areas like Oklahoma, which has had to deal with drought conditions for several years, better use the water that is available. In addition to helping stretch our water resources further, water savings also saves energy. EPA estimates that 4 percent of the Nation's electricity consumption is used moving or treating water and wastewater. In homes with electric water heaters, 25 percent of their electricity consumption is used to heat water for cleaning and cooking.

I know there is a great interest in using water more efficiently. Currently, my home State of Oklahoma is doing a comprehensive State water plan. One of their main objectives is to focus on ways to improve water efficiency and water conservation. Additionally, the State legislature created a grant program last year to assist communities to implement pilot water conservation projects in Oklahoma communities. These projects will serve as models for other communities and result in significant water efficiency improvements and water savings. I believe that projects like these will demonstrate new cost-effective technologies and help spur new markets.

I am looking forward to hearing from EPA what they are currently doing to promote and improve water use efficiency, what research and development initiatives they have begun and how they are reaching out to the public to educate them about opportunities to improve their water efficiency. I am also interested in discerning what some of the current barriers are with assisting and encouraging people to become more water efficient and if there is a role for Congress to play.

○