H.R. 1071, TO DIRECT THE SECRETARY OF ENERGY TO MAKE INCENTIVE PAYMENTS TO THE OWNERS OR OPERATORS OF QUALIFIED DESALINATION FACILITIES; AND OVERSIGHT ON "REDUCING POWER AND OTHER COSTS OF THE DESALINATION PROCESS."

LEGISLATIVE AND OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON WATER AND POWER

OF THE

COMMITTEE ON RESOURCES
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

FIRST SESSION

Tuesday, May 24, 2005

Serial No. 109-14

Printed for the use of the Committee on Resources

Available via the World Wide Web: http://www.access.gpo.gov/congress/house
or
Committee address: http://resourcescommittee.house.gov

U.S. GOVERNMENT PRINTING OFFICE

21-447 PS WASHINGTON : 2005

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2250 Mail: Stop SSOP, Washington, DC 20402–0001

COMMITTEE ON RESOURCES

RICHARD W. POMBO, California, *Chairman*
NICK J. RAHALL II, West Virginia, *Ranking Democrat Member*

Don Young, Alaska
Jim Saxton, New Jersey
Elton Gallegly, California
John J. Duncan, Jr., Tennessee
Wayne T. Gilchrest, Maryland
Ken Calvert, California
Barbara Cubin, Wyoming
Vice Chair
George P. Radanovich, California
Walter B. Jones, Jr., North Carolina
Chris Cannon, Utah
John E. Peterson, Pennsylvania
Jim Gibbons, Nevada
Greg Walden, Oregon
Thomas G. Tancredo, Colorado
J.D. Hayworth, Arizona
Jeff Flake, Arizona
Rick Renzi, Arizona
Stevan Pearce, New Mexico
Henry Brown, Jr., South Carolina
Thelma Drake, Virginia
Luis G. Fortuño, Puerto Rico
Cathy McMorris, Washington
Bobby Jindal, Louisiana
Louie Gohmert, Texas
Marilyn N. Musgrave, Colorado
Vacancy

Dale E. Kildee, Michigan
Eni F.H. Faleomavaega, American Samoa
Neil Abercrombie, Hawaii
Solomon P. Ortiz, Texas
Frank Pallone, Jr., New Jersey
Donna M. Christensen, Virgin Islands
Ron Kind, Wisconsin
Grace F. Napolitano, California
Tom Udall, New Mexico
Raúl M. Grijalva, Arizona
Madeleine Z. Bordallo, Guam
Jim Costa, California
Charlie Melancon, Louisiana
Dan Boren, Oklahoma
George Miller, California
Edward J. Markey, Massachusetts
Peter A. DeFazio, Oregon
Jay Inslee, Washington
Mark Udall, Colorado
Dennis Cardoza, California
Stephanie Herseth, South Dakota

Steven J. Ding, *Chief of Staff*
Lisa Pittman, *Chief Counsel*
James H. Zoia, *Democrat Staff Director*
Jeffrey P. Petrich, *Democrat Chief Counsel*

SUBCOMMITTEE ON WATER AND POWER

GEORGE P. RADANOVICH, California, *Chairman*
GRACE F. NAPOLITANO, California, *Ranking Democrat Member*

Ken Calvert, California
Barbara Cubin, Wyoming
Greg Walden, Oregon
Thomas G. Tancredo, Colorado
J.D. Hayworth, Arizona
Stevan Pearce, New Mexico
Cathy McMorris, Washington
Louie Gohmert, Texas
Vacancy
Richard W. Pombo, California, *ex officio*

Raúl M. Grijalva, Arizona
Jim Costa, California
George Miller, California
Mark Udall, Colorado
Dennis A. Cardoza, California
Vacancy
Vacancy
Nick J. Rahall II, West Virginia, *ex officio*

C O N T E N T S

LEGISLATIVE HEARING ON H.R. 1071, A BILL TO DIRECT THE SECRETARY OF ENERGY TO MAKE INCENTIVE PAYMENTS TO THE OWNERS OR OPERATORS OF QUALIFIED DESALINATION FACILITIES TO PARTIALLY OFFSET THE COST OF ELECTRICAL ENERGY REQUIRED TO OPERATE SUCH FACILITIES, AND FOR OTHER PURPOSES; AND AN OVERSIGHT HEARING ON "REDUCING POWER AND OTHER COSTS OF THE DESALINATION PROCESS."

Tuesday, May 24, 2005
U.S. House of Representatives
Subcommittee on Water and Power
Committee on Resources
Washington, D.C.

The Subcommittee met, pursuant to call, at 10:05 a.m., in Room 1334, Longworth House Office Building, Hon. George Radanovich [Chairman of the Subcommittee] presiding.

Present: Representatives Radanovich, Walden, Tancredo, Hayworth, Pearce and Napolitano.

Also Present: Representatives Gibbons and Davis.

STATEMENT OF THE HON. GEORGE P. RADANOVICH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. RADANOVICH. Good morning. Welcome to the Subcommittee on Water and Power, Committee on Resources hearing on H.R. 1071, a bill to direct the Secretary of Energy to make incentive payments to the owners or operators of qualified desalination facilities to partially offset the cost of electrical energy required to operate such facilities, and for other purposes; and a hearing on "Reducing Power and Other Costs of the Desalination Process." The hearing by the Subcommittee is now in order.

Today, we will examine ways to create new water through the promise of desalting. This growing alternative water supply should be a major piece of our water toolbox.

So far this Congress, we have looked at ways to improve our water supplies, to increase water storage, water recycling, and other mechanisms. We still need all these tools to meet growing population environmental demands, and we will continue to pursue them.

For years, desalting water has been a major focus in the Middle East, where cheap oil subsidizes the high power cost. The U.S. Navy extensively uses this process for its water needs. Just recently, however, desalting is now being considered on a large scale in our coastal and inland communities. Our Nation has come a long way in reducing desalting costs, but when the water is still two or three times more expensive than traditional sources, we can do better.

The purpose of today's hearing is to figure out the appropriate Federal role of this arena of "water world." H.R. 1071, authored by our distinguished colleagues, Jim Davis and Jim Gibbons, is one proposed way to reduce power costs. This bill is well-intentioned and has merit, but we should also look at what role the Federal agencies can play in limited research and development as well.

We should do something about permitting requirements, too. When almost a third of the construction costs of a proposed southern California desalting facility are related to Federal and State permits, it begs the question of the need to reduce this part of the cost equation. We ought to think about a one-stop-shop permitting provision—like Nancy Pelosi envisioned for Hetch Hetchy—to reduce these costs.

I welcome my colleagues and today's witnesses for their dedication in desalting and reducing costs, and I look forward to working with everybody on this important topic.

[The prepared statement of Mr. Radanovich follows:]

Statement of The Honorable George Radanovich, Chairman, Subcommittee on Water and Power

Today, we will examine ways to create new water through the promise of desalting. This growing, alternative water supply should be a major piece of our water toolbox.

So far this Congress, we have looked at ways to improve our water supplies through increased water storage, water recycling and other mechanisms. We still need all of these tools to meet growing population and environmental demands and we will continue to pursue them.

For years, desalting water has been a major focus in the Middle East, where cheap oil can subsidize the high costs of this process. The U.S. Navy extensively uses this process for its water needs. Just recently, however, desalting is now being considered on large scale in our coastal and inland communities. Our Nation has come a long way in reducing desalting costs, but when the water is still two or three times more expensive than traditional sources, we can do better.

The purpose of today's hearing is to figure out the appropriate federal role in this arena of "water world." H.R. 1071, authored by our distinguished colleagues, Jim Davis and Jim Gibbons, is one proposed way to directly reduce power costs. This bill is well-intentioned and has merit, but we should also look at what the role the federal agencies can play in limited research and development as well.

We should do something about permitting requirements too. When almost of third of the construction costs of a proposed southern California desalting facility are related to federal and state permits, it begs the question of the need to reduce this part of the cost equation. We ought to think about a one-stop-shop permitting provision—like Nancy Pelosi envisioned for Hetch Hetchy—to reduce these costs.

I welcome my colleagues and today's witnesses for their dedication to promoting desalting and reducing its costs. I look forward to working with everyone on this important topic.

Mr. RADANOVICH. I now recognize Mrs. Napolitano, as the Ranking Democrat, for any statement she may have.

Mrs. NAPOLITANO. Thank you, Mr. Chair. It is a pleasure to be here this morning to look at what role desalination plays and to hear from the witnesses, the experts on the various aspects of desalination.

You are very well aware that I strongly support and advocate the use of technologies to solve some of our water problems. As we are all well aware, putting technology to work on the water shortages can be expensive, but it can also provide new and less expensive ways as they fine-tune some of these technologies.

Some of the communities will find it impossible to build desalination plants or water recycling projects because they lack either the tax base or the seed money to construct and carry through some of their plans, or because the revenues from water sales are not enough to cover all those costs. Can or should we, Federal Government, step in to help committees and communities finance or operate desalination plants?

A strong case for the Federal assistance can be made in many cases, but we first must carefully consider exactly what the Federal role should be. We need to find out what the communities need, where they need it, how they need it, have a more clearly defined role in the Federal Government as a partner in these communities who wish to build these facilities, and is it in the areas of greater need where they are facing drought, continuing drought conditions that affect their economy and their ability to have growth potential.

I want to thank my Chair, a good friend, Mr. Radanovich for scheduling the hearing, and I look forward to Congressman Jim Davis' desalination bill explanation, H.R. 1071, and for working with us to line up the two excellent panels of witnesses of whom I have a ton of questions. Thank you, Mr. Chairman.

Mr. RADANOVICH. Thank you, Grace.

I now recognize the gentleman from Nevada, the co-sponsor, co-author of the bill, Jim Gibbons.

Mr. GIBBONS. Thank you, Mr. Chairman; and thank you for giving me an opportunity to testify here today and to discuss H.R. 1071, the Desalination Drought Protection Act of 2005.

I want to also welcome all our witnesses here today. I look forward to your testimony. I think it is going to be very insightful in helping us make a better informed decision.

I am actually a lead sponsor and quite proud to be a lead sponsor of this important bill; and, Mr. Chairman, while I do not serve on this Subcommittee as a member, our Nation's water supply is an issue of great interest to me and my constituents, especially in Nevada. I am pleased to be here today to discuss this bill which would give great hope for those of us out West where water is short. Mark Twain, a one-time Nevada silver prospector, once observed: Whiskey is for drinking, water is for fighting over. And that holds true today.

Seven States currently are competing for their share of the Colorado River. With potentially fierce battles over the distribution of the Colorado River looming, Nevada and the entire West must consider alternative sources of water to continue our growth and prosperity.

The West, home to the fastest-growing communities in the Nation, continues to face a prolonged drought. Now entering our sixth consecutive year of drought, Nevada must look for other sources of water. Desalination, the process through which seawater and brackish groundwater are converted into pure drinking water, is one such source. Desalination plants produce dependable supplies of fresh water at increasingly lower cost every year.

Given further advances in technology, desalination holds the promise of becoming a key component of a long-term solution to America's water shortage crisis. The development of a robust desalination industry in California, the largest user of the Colorado River water, could result in a more efficient allocation of that river water for Nevada and its neighbors.

It is my hope that through the passage of this legislation the Federal Government can help propel an industry that can become a vital part of our Nation's long-term solution to water shortage.

With that, Mr. Chairman, I thank you for the opportunity to be present here today and yield back the balance of my time.

Mr. RADANOVICH. Thank you, Mr. Gibbons.

Mr. Pearce.

Mr. PEARCE. Thank you, Mr. Chairman. I would also like to say thanks for having this hearing.

New Mexico just struggles continuously for water resources. Many parts of the State typically only get nine inches per year and in the last 3 and 4 years only two inches per year. So we are facing a water shortage that is unprecedented.

On the second panel, I would like to introduce a person from my district. I will be in and out of this Committee hearing, going to another one, but I would like to introduce Mr. Pat McCourt, who is the City Manager from the City of Alamogordo. The City of Alamogordo has estimates of about a billion acre feet underneath it, but it is pretty salty water. So in that area we have plenty of water, just not plenty of cheap water, and this bill should help us move a long way to beginning to have the alternative sources of water available where we do have the actual water there. So we are appreciative of his work and his testimony here today, and we look forward to the discussion on what we can do on this Committee to ensure the communities have the resource available that creates all life.

Thank you again, Mr. Chairman, for this hearing.

Mr. RADANOVICH. Thank you, Mr. Pearce.

Now if there is nobody else having an opening statement, we will introduce our first panel.

We have two panels here today. The first is Mr. David Garman, who is the Assistant Secretary For Energy Efficiency and Renewable Energy in the Department of Energy; Ms. Maryanne Bach, who is the Director of Research and Development at the Bureau of Reclamation; and Dr. Douglas Holtz-Eakin, Director of the Congressional Budget Office.

Ladies and gentlemen, welcome to the Subcommittee. What we will do in the course of the hearing is allow each one to testify for about 5 minutes. The clocks will guide you. If you keep in mind that your written testimony is included in the public record—and feel free to be extemporaneous in your remarks, if you would like.

We will go down for comments from each of the three panelists and then open it up for questions from the dais here.

Mr. RADANOVICH. Mr. Garman, welcome. You may begin.

STATEMENT OF DAVID GARMAN, ASSISTANT SECRETARY FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. GARMAN. Thank you, Mr. Chairman. We appreciate this opportunity to testify on the bill H.R. 1071, legislation directing the Department of Energy to help offset the cost of electrical energy required to operate desalination facilities.

To the narrow question as to whether or not the Department of Energy should directly subsidize electricity cost at desal facilities, we believe the answer is no, and therefore regrettably cannot support this legislation. It is our view that incentive payments are not the best means to remove the energy cost barriers to desalination. Instead, we feel that continued Federal support for desalination research and development as well as our ongoing efforts to reduce energy demand and increase supply through the adoption of comprehensive energy legislation will have a large impact in the long run on reducing desalination costs, perhaps a bigger impact than making incentive payments in the short run to owners and operators of individual facilities.

But, having said that, let me express the view that we share this view that members of this Subcommittee have that we have to develop innovative new approaches to dealing with the regional, national, and global challenges related to water availability and quality. This is an issue that is commanding significant attention at the highest levels of the Administration. The White House Office of Science and Technology Policy and the Office of Management and Budget have identified water as a top Administration research and development priority and called upon the National Science and Technology Council to develop a coordinated, multi-year plan to improve research and to understand the processes that control water availability and quality and to collect and make available the data needed to ensure an adequate water supply for the Nation's future.

Of course, the Water Desalinization Act of 1996 gave lead responsibility to the Department of the Interior to conduct, encourage, and assist in the financing of research to develop cost-effective and efficient means for converting saline water into potable water suitable for beneficial uses. We are looking at ways to better coordinate our efforts with those of the Department of the Interior and other agencies through the process under way in the STSC Subcommittee on Water Availability and Quality.

At the Department of Energy, we have also been engaging our national labs in serious discussions on what we call the ''water-energy nexus.'' the relationship between energy and water is not well understood by the public. It is surprising to many, for instance, that the amount of fresh water withdrawn nationally for electricity production is more than twice the amount of water used for residential, commercial, and industrial purposes and is comparable to the amount used for agricultural irrigation. Meanwhile, pumping, storing, and treating water also consumes huge amounts

of electricity. An estimated 7 percent of California's electricity consumption is used just to pump water.

So we understand that both our energy and our water supplies are interconnected, and my written statement goes into much greater detail into the work we have under way at the national labs and universities and in conjunction with the private sector.

So allow me to conclude my testimony by saying that, while we might oppose this specific legislation, the Department of Energy supports the overarching goal to make desalinated water more affordable for communities that need it. We will continue to work in support of the Department of the Interior and other Federal agencies in relevant research toward those ends, and we will look forward to working with this Committee and other committees of the Congress in that effort.

So that completes my prepared statements, and I am happy to answer any questions the Subcommittee might have either today or in the future.

Mr. RADANOVICH. Thank you, Mr. Garman.

[The prepared statement of Mr. Garman follows:]

Statement of The Honorable David Garman, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy

Mr. Chairman and Members of the Subcommittee, I appreciate the opportunity to testify today on H.R. 1071, the Desalination Drought Protection Act of 2005. This legislation would direct the Secretary of Energy to make payments to partially offset the cost of electrical energy required to operate desalination facilities, presumably in an effort to alleviate water supply issues now and in the future.

We share the view that we must develop innovative new approaches to dealing with the regional, national, and global challenges related to water availability and quality, and this is an issue that is commanding significant attention at the highest levels of the Administration.

For example, in August 2004 the White House Office of Science and Technology Policy (OSTP) and Office of Management and Budget (OMB) identified water as a top Administration research and development priority and called upon the National Science and Technology Council (NSTC) to "develop a coordinated, multi-year plan to improve research to understand the processes that control water availability and quality, and to collect and make available the data needed to ensure an adequate water supply for the Nation's future." The NSTC Committee on Environment and Natural Resources has formed a Subcommittee on Water Availability and Quality (SWAQ) comprised of 15 Federal Departments and Agencies who are now in the process of developing a comprehensive research plan. Their first report, "Science and Technology to Support Fresh Water Availability in the United States," was released in November, 2004. Among the points highlighted by this report are the following:

- We do not have an adequate understanding of water availability at national, regional, or local levels.
- Water, once considered a ubiquitous resource, is now scarce in some parts of the country—and not just in the West as one might assume.
- The amounts of water needed to maintain our natural environmental resources are not well known.
- We need to evaluate alternatives to use water more efficiently, including technologies for conservation and supply enhancement such as water reuse and recycling as a way to make more water available.
- We need improved tools to predict the future of our water resources to enable us to better plan for the more efficient operation of our water infrastructure.

The Water Desalination Act of 1996 (Public Law 104-298) gave lead responsibility to the Department of Interior to conduct, encourage, and assist in the financing of research to develop cost-effective and efficient means for converting saline water into potable water suitable for beneficial uses. We are looking at ways to better coordinate our efforts with those of the Department of the Interior and other agencies through the process underway in the NTSC's Subcommittee on Water Availability and Quality.

At the Department of Energy, we have been in serious discussions with some of our labs on what we call the ''energy-water nexus.'' The relationship between energy and water is not well understood by the public, and it is surprising to many, for instance, that the amount of fresh water withdrawn nationally for electricity production is more than twice as much as the water used for residential, commercial, and industrial purposes, and is comparable to the amount of water used for agricultural irrigation. Meanwhile, pumping, storing, and treating water consumes huge amounts of electricity—an estimated 7 percent of California's electricity consumption is used just to pump water.

We understand that our energy and water supplies are interconnected. In fact, as much energy is used for water and wastewater purposes as for other major industrial sectors of the U.S. economy such as paper and pulp and petroleum refining.

Although supplying and distributing water is largely a local responsibility, we believe there is a Federal role in providing appropriate scientific and technological support for these efforts. The legislation before the subcommittee this morning, however, poses a narrower question: Should the Department of Energy subsidize electricity costs at desalination facilities? We believe the answer is no.

While well intended, H.R. 1071 is not a comprehensive approach to the challenge we face. It would subsidize a narrow group of electricity users engaged in water desalination efforts, and could divert limited Federal funding from efforts to engage in a more comprehensive approach.

It is our view that incentive payments are not the best means to remove the energy cost barriers to desalinating water. Instead, we feel continued targeted Federal support for desalination research and development consistent with the Administration's Research and Development Investment Criteria, as well as our ongoing efforts to reduce energy demand and increase supply through the adoption of comprehensive energy legislation, will have a larger impact in the long-run on reducing desalination costs than will making incentive payments to the owners or operators of individual facilities.

Although the hearing today focuses on producing drinkable water through a technological process, the equally important aspect of the larger issue is finding ways to reduce water consumption and remove some of the demand pressure from regional water supplies. A prime place to start is the water intensive process of thermoelectric generation from fossil fuels such as coal, oil, and natural gas. For these systems, an average of 25 gallons of water is withdrawn to produce a kilowatt hour (kWh) of electricity of which nearly one-half gallon is consumed by evaporation. Overall, fossil-fuel-fired power plants require withdrawals of more than 97 billion gallons of fresh water each day, of which 2-3% is lost to evaporation.

The Department's Office of Fossil Energy is supporting numerous research projects aimed at reducing the amount of fresh water needed by power plants and to minimize potential impacts of plant operations on water quality. One project at West Virginia University is assessing the feasibility of using underground coal mine water as a source of cooling water for power plants. A North Dakota project is attempting to reduce the water consumption of power plants by recovering a large fraction of the water present in the plant flue gas. A project in New Mexico is exploring whether produced waters, the by-product of natural gas and oil extraction which often present a disposal issue, can be used to meet up to 25 percent of the cooling water needed at the San Juan Generating Station, as well as investigating an advanced wet-dry hybrid cooling system. In addition, the Department currently has a competitive solicitation on the street seeking additional innovative technologies and concepts for reducing the amount of fresh water needed to operate fossil-based thermoelectric power stations, including advanced cooling and water recovery technologies. The Department is also investigating whether a suite of specially selected, salt-tolerant agricultural crops or other plants can be used to remove sodium and other salts from coalbed methane produced water so that it can be safely discharged or used in agriculture.

One promising new approach to electricity generation, Integrated Gasification Combined Cycle (IGCC) technology that converts coal and other hydrocarbons into synthetic gas, offers significant environmental and water benefits compared to traditional pulverized coal power plants. Because the steam cycle of IGCC plants typically produces less than 50 percent of the power output, IGCC plants require 30 to 60 percent less water than conventional coal-fired power plants. The Department is supporting research, development, and demonstration on a number of advancements that will significantly drive down the costs of IGCC plants.

The Fossil Energy office is also supporting work at the University of Florida investigating an innovative diffusion-driven desalination process that would allow a power plant that uses saline water for cooling to become a net producer of fresh water. Hot water from the condenser provides the thermal energy to drive the

desalination process. Using a diffusion tower, saline water cools and condenses the low pressure steam and fresh water is then stripped from the humidified air exiting the tower. This process is more advantageous than conventional desalination technology in that it may be driven by waste heat with very low thermodynamic availability. In addition, cool air, a by-product of this process, can be used to cool nearby buildings.

The Department's Office of Energy Efficiency and Renewable Energy (EERE) is supporting R&D for innovative wind and solar electricity supply technologies that have attributes that may prove to be very beneficial to the desalination industry.

For example, wind power is now becoming a competitive, clean, bulk electric power supply option in many areas of the Nation, and places no further demand on water supplies for its operation. In addition, excellent offshore wind resources are available near many coastal areas facing water supply challenges. The role that wind could play in powering desalination could take a range of forms, from stand alone systems exclusively powered by wind, to desalination plants that receive the majority of their energy requirements from wind power delivered via electricity grid systems. In either case, the relative ease and low cost of storing desalinated water, in comparison with storing electricity, will allow operating flexibilities that will facilitate using inherently variable wind power as a primary energy source for desalination.

We are currently funding a concept design study which will set up engineering and economic models to examine viability of wind-powered reverse osmosis systems, looking at applications for coastal seawater, inland brackish water, and water produced during oil or gas recovery. A second project will model solar and wind resources for a desalination unit to determine the effects of variable loads on desalination, and perform pilot-scale testing to determine how renewable energy could reduce desalination costs.

We are also undertaking a mapping project to overlay data such as fresh and brackish water resources, wind resources, water consumption, estimated growth, and electricity supply. Two maps will be developed, one of the United States, and one for the four-state region of Colorado, Utah, Arizona, and New Mexico, identifying locations that have the best economic and technical potential for using wind to power desalination

Even as we proceed with these activities, we are mindful that the energy intensive technique of reverse osmosis we use for desalination today may not be the membrane technology of tomorrow. But whether that breakthrough comes from a lab working specifically on desalination, or through an area of broader scientific research remains to be seen. The Department's Office of Science, for example, is studying microbes and smart membranes that may ultimately have relevance to desalination in the future.

Having said that, it seems certain that desalination will play an important role in maintaining and expanding our Nation's, and indeed the world's, water supply. Where fresh water aquifers are under pressure in many regions, over-drafted and subject to salt-water intrusion, brackish aquifers can be found throughout the country and the world, a ready source of new water. More than 120 countries are now using desalination technologies to provide potable water, most commonly in the Persian Gulf where energy costs are low. The desalination plants of the future must come in a range of sizes so that they can be installed where demand exists—smaller footprint facilities which can make use of smaller deposits of impaired water, at a price the community can afford. For American companies, the growing need for desalination will open new global markets.

While we oppose this specific legislation, the Department of Energy supports the overarching goal to make desalinated water more affordable for communities that need it. We will continue to work in support of the Department of the Interior and other Federal agencies in relevant research toward those ends.

This completes my prepared statement, and I am happy to answer any questions the Subcommittee may have.

Mr. RADANOVICH. Next is Ms. Maryanne Bach, the Director of Research, R&D, at the Bureau. Welcome, Maryanne. You may begin your testimony.

STATEMENT OF MARYANNE BACH, DIRECTOR OF RESEARCH AND DEVELOPMENT, BUREAU OF RECLAMATION, U.S. DEPARTMENT OF THE INTERIOR

Ms. BACH. Thank you, Mr. Chairman. I am Maryanne Bach. I am the Reclamations Director of Research and Development. Given that the testimony is submitted for the record, I will just highlight a few points.

You are familiar with the Bureau's mission. I would say, in order to manage, develop, and protect waters in a way that make them economically and environmentally available for use, our tools are storage, transfer, conservation, and technology. Those are the means by which western water is managed.

We have spent nearly a half a century advancing desal technology. That began in the Department of the Interior back in 1952. The Office of Saline Water was created. It came from the Saline Water Conversion Act. Until about 1982, the Department was spending on the order of $30 million a year in research. This was concurrent with the timeframe in which Reclamation was constructing storage facilities across the West. So the Department was focusing on desal technology; the Bureau was completing construction of many authorized projects.

The Office of Saline Water morphed into an office called the Office of Water Research and Technology, and it was about in 1982 that determination was made that the research facilities, the research institutes that were part of the Water Research and Technology Office would be then managed by USGS, and the desalinization research activity would be transferred to the Bureau of Reclamation.

There are some 1,200 Federal documents, sponsored documents, that were created, much of which has formed the basis for the technology that has been applied worldwide. I have noted in my testimony that there is an extensive set of CDs that relate to all of that technical work, plus the additional publications. I have one example, and I would be happy to submit the full set for the record. But they are known worldwide, and they are used extensively throughout the world as reference documents.

In the late 1970s and early 1980s, Reclamation developed the Yuma Desalting Plant. The Committee is familiar with the background on Yuma. With a 73 million gallon per day capacity of desalted water, the Yuma Desalting Plant was larger than the overseas desal plants then running.

What did the Yuma Desalting Plant have that those plants did not? It is an exhibit of the evolution of technology. It had large reverse osmosis elements, practical energy recovery and other technology applications that are still being in use today.

In 1992, the agency moved into an area of improved reliability and cutting costs for the water treatment technology research program and in certain cases or opportunities to test that internal on reclamation projects.

In 1996, Congress passed the Desal Act authorizing the agency to have a renewed effort at cutting desal costs through cooperative R&D, and the written testimony expands on that. Through that 1996 reauthorization, the desal and water purification research and development program is the line item in our budget that

Reclamation has used to fund desal. We have developed membrane bioreactors and other important advanced technologies. DWPR has widespread support outside of government, and I would note that that authority for that particular piece of legislation does expire at the end of 2005.

Technology transfer is another extremely important component of the desal work Reclamation does. We lead a Federal consortium and a task force with professional research organizations. Working with the American Waterworks Association, we have gathered desal literature that ties together a wealth of desal information.

Another product of our tech transfer effort is the desal roadmap. That was produced in partnership with—assisted with the national lab from Department of Energy of Sandia National Lab. We are now in our second edition of the desal roadmapping. We have convened an even larger set of interested parties and additional national lab perspectives. It is also worth noting that the desal roadmap was critiqued by the National Academy of Sciences, and their recommendations are also being considered.

The importance of the desal roadmap is that it is broad based. It is not specific about what research should be conducted in the Federal Government. It is much more comprehensive than that. It speaks to the full array of opportunities for research and how to make use of perspectives from State and local government, from industry and from the Federal Government.

I would want to also note that Congress has authorized the construction of the Tularosa Basin National Desal Research Facility. In fact, this is one of two research facilities that the Bureau of Reclamation has available to it to focus on desal activities. For Tularosa, its particular emphasis is on brackish water. It is going to be completed in construction in 2006. However, the first demonstration project is under way.

In closing, I would just like to say that our aim in water technology research is to accelerate new technologies, to reduce costs, and implement solutions to meet water supply challenges. This takes communication and coordination of existing efforts, pushing technology development and transfer, recognizing research gaps and pursuing those, and assessing new technologies. We do this through laboratory scale, through pilot and demonstration on a competitive process.

I am happy to answer any questions that you might have. Thank you.

Mr. RADANOVICH. Thank you, Ms. Bach, for your testimony.

[The prepared statement of Ms. Bach follows:]

Statement of Maryanne Bach, Director, Research and Development, Bureau of Reclamation, U.S. Department of the Interior

Mr. Chairman, my name is Maryanne Bach, Director of Research and Development (R&D) for the Bureau of Reclamation. I am pleased to provide information regarding the Department of the Interior and the Bureau of Reclamation's past and present involvement in activities related to desalination research and development that may be of use to the Committee in its consideration of H.R. 1071.

Introduction

The Bureau of Reclamation's mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. Historically, this has been accomplished in four major ways: 1) storing water for use in times of greater need; 2) transferring water

to places of greater need; 3) conserving water to reduce demand; and 4) applying technology to increase useable water supplies. In this latter area, over the course of half a century the Department of the Interior, and now the Bureau of Reclamation in particular, has developed a great deal of research data and technical expertise with regard to water desalination.

Implementation of the 1996 Desalination Act as amended

Desalination research by the Department of the Interior and Reclamation began in 1952 as a result of the Saline Water Conversion Act (P.L. 82-448). From that time until 1982, Department of the Interior funding for desalination research averaged approximately $30 million per year. Interior's Office of Saline Water (later, the Office of Water Research and Technology) subsequently coordinated much of this research and development. Some 1,200 federal government desalination reports were written during this time period, and are believed by many experts worldwide to have formed the basis of today's technologies. Membrane advances made by this program were responsible for some of the most significant reductions in the cost of desalination.

During the late 1970s and early 1980s, emphasis on research shifted to application with the design and construction of the Yuma Desalting Plant, as directed in the Colorado River Basin Salinity Control Act of 1974 (P.L. 93-320). This plant, with a design capacity of 73 million gallons per day of desalted water, was larger than the overseas demonstration-type plants that had been built previously. Technological advancements achieved during the construction of the Yuma plant included development of large reverse osmosis elements, electro dialysis stacks, a practical demonstration of energy recovery, and a number of other technology applications still being used today. The unit costs of desalination, however, remained high relative to other water supply alternatives.

In 1992, recognizing the need for more reliable and less costly technology for treating impaired waters, particularly in the West, the Bureau of Reclamation began a water treatment technology research program, supported by internal research funds. This research included both contracted work as well as research and development by staff at Reclamation's Technical Services Center in Denver, Colorado. The Reclamation-wide program has been focusing on water supply and quality issues in the 17 western states served by Reclamation. Research projects are mission oriented and related to Reclamation's project needs, such as membrane process development, chemical treatment processes, and other innovative treatment concepts. Through these research studies, pilot projects and other efforts, a number of localized, site-specific problems and needs in the areas of Native American and rural water supply have been addressed.

Current Reclamation Desalination Efforts

The Desalination Act

Public Law 104-298, the Water Desalination Act of 1996 (Desalination Act), authorized Reclamation to begin a renewed effort from 1997-2002, to lower desalination costs through cooperative research and development. The objective has been to determine and develop technologically efficient and cost-effective means by which useable water can be produced from saline or otherwise impaired or contaminated water sources. The program has developed advanced technologies to treat previously unusable sources of water, e.g. brackish groundwater, coastal waters, irrigation drainage, municipal wastewater, and other impaired waters, in order to increase usable water supplies. The program has focused on two primary efforts. The first has been to support cooperative research on desalination technologies and related issues to push the state-of-the-art forward. The second has been to conduct development and demonstration activities to field-test technological advancements, confirm economic feasibility, and gain public acceptance. Authority for these activities has been renewed through Fiscal Year 2005, and the program is funded in the FY 2005 Omnibus Bill.

Under the authority of the Desalination Act, Reclamation has been conducting the Desalination and Water Purification Research and Development Program (DWPR). It has produced important technical results, such as, membrane bioreactors, and has widespread support outside the Government.

Recent DWPR Program activities/accomplishments include: 1) demonstration of the effectiveness of membrane bioreactors in treatment of secondary sewage, 2) various advancements in membrane materials and technology, 3) new methods of membrane element cleaning, 4) improved means of energy recovery, 5) use of beach wells or river banks to pre-treat water prior to reverse osmosis desalination, 6) demonstration of the relative benefits of membrane filtration as a pre-treatment method, 7) selection of a standard diameter element size for use in large capacity reverse

osmosis and nano-filtration facilities, 8) an innovative, low-cost evaporation system, and 9) demonstrated application of the natural freeze-thaw process, which has considerable promise for industrial applications. On August 14, 2001, consistent with the Water Desalination Act of 1996, the Commissioner of Reclamation forwarded a report to Congress on the implementation of the Act.

Technology Transfer

Technology transfer has been an important part of the DWPR program as well. Reclamation currently leads a federal consortium and a task force with professional research organizations. In coordination with the American Water Works Association, Reclamation produced a collection of desalination literature that ties together the wealth of desalination and advanced water treatment technology developed since 1952. This collection, called Desalted, is a series of searchable CD ROMs containing full text reports of the Interior and Reclamation's desalination studies and projects and various desalination conference proceedings. I am submitting a copy of this collection to the Committee for the record.

Another result of Reclamation's technology transfer efforts is the Desalination and Water Purification Technology Roadmap, developed from funding provided in the FY 2004 Energy and Water Development Appropriations Bill. The Roadmap was produced through Reclamation's partnership with Sandia National Laboratories and an executive committee composed of multidisciplinary experts from across the country. Subsequent to its publication, Reclamation requested a National Academy of Science (NAS) review of the document. The intent of the Roadmap was to establish long-term goals for research and development in desalination and water purification to meet the nation's needs, research that could be undertaken by state, private, non-governmental, or federal entities; it is not a prospectus for federal desalination research. Other technology transfer efforts include a computerized desalination cost model, the Desalination Handbook for Planners, a manual on concentrate disposal, and over 100 final reports from the DWPR.

Tularosa Research Facility

Authorized initially in the Fiscal Year 2002 Energy and Water Development Appropriations Act, the Tularosa Basin National Desalination Research Facility is under construction and scheduled for completion in 2006. This facility has been designed to conduct research and development relating to: the desalination of brackish groundwater; the problems of concentrate treatment and disposal; renewable energy/desalination hybrids; and small desalination systems for rural and Native American applications. Development of the facility is the product of a partnership between Reclamation and an Executive Committee comprised of multidisciplinary experts from across the country. The facility is located on a 40-acre site in Alamogordo, New Mexico. The facility plan consists of a 16,000-square-foot research building, three external large pilot plant pads, evaporation ponds, an agricultural research area, a renewable energy applications research area, and a future expansion area.

Yuma Water Quality Improvement Center (WQIC)

The WQIC is a desalination R&D laboratory facility located on the site of the Yuma Desalting Plant (YDP). The WQIC implements the authority provided under Public Law 96-336 for the Colorado River Basin Salinity Control Project (Title I). Public Law 96-336, Sec 108 states: "In order to provide for the utilization of significant improvements in desalinization technologies which may have been developed since the Bureau's evaluation, the Secretary is directed to evaluate such cost effective improvements and implement such improved designs into the plant operations when the evaluation indicates that cost savings will result." The desalination research pursued at the WQIC is focused on technologies that can be applied to the YDP to improve and lower the cost of long term operations and maintenance of the plant. The WQIC uses a competitive, merit reviewed process to ensure that quality, performance, and relevance are integrated into the research investment decisions.

The WQIC also effectively implements Federal Technology Transfer Legislation in two important ways. First, the Technology Transfer Act of 1986 requires federal agencies to make their R&D facilities and expertise available to the private sector through Cooperative Research and Development Agreements (CRADAs). The WQIC is well utilized by municipalities and the private sector, through cost reimbursable CRADAs, for the conduct of desalination R&D. Second, the technology advancements achieved at the WQIC are made available and transferred to the industry for commercialization and applications by others.

Water 2025

In 2004, Secretary Norton announced the Water 2025 Initiative. In some areas of the West existing water supplies are, or will be, inadequate to meet the demands for water for people, cities, farms and the environment, even under normal water supply conditions. Water 2025 sets forth a framework to focus on meeting water supply challenges in the future, which includes six principles, five realities and four key tools (www.doi.gov/water2025/Water2025-Exec.htm)

One principle is to improve water treatment technology, such as desalination, to help increase water supply. The four key tools are: conservation, efficiency and markets; collaboration; improved technology; and removal of institutional barriers and increased interagency cooperation.

Desalination Funding

To date, Congress has appropriated $4.2 million under Water 2025 for focus on desalination research. Beginning in FY 2004, the Administration has redirected its efforts under Title XVI (P.L.102-575), the Reclamation Wastewater and Groundwater Study and Facilities Act, to complement the DWPR authority and Water 2025.

Under Title XVI of PL 102-575, Congress has authorized (PL 104-266) and appropriated funds for the Las Vegas Area Shallow Aquifer Desalination Research and Development Project and the Long Beach Desalination Research and Development Project. Total funding to date is $3.9 million.

Since passage of the original 1996 Desalination Act, $28.025 million has been appropriated to the Reclamation's Desalination and Water Purification program. Total appropriations to date for the Water Quality Improvement Center in Yuma for research and development is approximately $4.7 million.

In FY 2005, $12.6 million was appropriated for Reclamation desalination research and development, including $3.5 million to continue construction of the Tularosa Desalination R&D Facility. The FY 2006 budget proposes $4.85 million for desalination R&D.

Reclamation's Future Role in Desalination and Appropriate Federal Involvement

The Administration is currently evaluating federal research and development efforts in desalination, to clearly establish long-term goals and ensure that our efforts are carried out in accordance with the Administration's Research and Development Investment Criteria, and that these efforts represent the best investment of federal resources.

There are three broad standards against which R&D investment decisions are judged: 1) Relevance—Programs must be able to articulate why they are important, relevant, and appropriate for Federal investment. Research and Development efforts should focus on activities that enable high pay-activities that require a federal presence, support technological innovation to enhance economic competitiveness and new job growth. The Department's efforts in desalination, as with other Federal research, must have complete plans with clear goals and priorities, relevance to the needs of the nation, clearly articulated public benefits, and periodic prospective and retrospective reviews of relevance to program "customers". The program must also meet specific standards of, 2) Quality—Programs must justify how funds will be allocated to ensure quality; and 3) Performance—Programs must be able to monitor and document how well the investments are performing.

Reclamation's future role in water technology research may include activities that accelerate the development of new technologies to reduce costs and speed the implementation of solutions in order to meet the water supply challenges of the future, consistent with the broader Research and Development Investment Criteria framework. It may also include improving communication within the desalination research community, and coordination of research activities.

Mr. Chairman, this concludes my remarks, and I would be pleased to answer any questions at this time.

Mr. RADANOVICH. Next is Mr. Douglas Holtz-Eakin, who is the Director of the Congressional Budget Office.

Dr. Holtz-Eakin, welcome to the Subcommittee.

STATEMENT OF DOUGLAS HOLTZ-EAKIN, CONGRESSIONAL BUDGET OFFICE

Dr. HOLTZ-EAKIN. Mr. Chairman, members of the Committee, thank you for the chance for the CBO to be here today to talk about H.R. 1071.

Our written testimony falls into two broad areas. The first is a look at the bill itself in which $200 million are authorized over the window to provide incentive payments at a rate of 62 cents per thousand gallons of water produced, and the key features of this that we highlight in our testimony are the structure of this in terms of targeting. In contrast to a tradition of targeting subsidies on capital costs, this is an operating subsidy. That is a difference that is more in form than substance because it is targeted at new plants and, in the end, subsidizes all entrants in that form. However, the overall subsidy, which comes to a rate of about 30 percent for desalination plant, $200 per acre foot, is not targeted on energy despite the stated intent of the bill. It is tied only to the output of the water itself.

The second piece of the bill is an authorization of $10 million for R&D, and that leads directly to the broader part of our written testimony, which is to look at opportunities for improvements in the efficiency of water markets more generally. There is a natural role for the Federal Government in supporting research and development in those circumstances where the shared knowledge of R&D may not provide adequate incentives for the market to produce sufficient R&D, and the bill is consistent with that role by authorizing the R&D money.

More generally, water markets are characterized by the fact that users typically do not pay the full cost of the delivery and production of the water, and instead cost recovery gets shifted in large part to taxpayers to make up that difference. They are also characterized by the fact that water users pay quite disparate prices for the same water, and those prices may not be reflective of the underlying economic value of water in different uses.

Improving the efficiency of water markets and acknowledging at the outset that efficiency isn't the only criteria in public policy but improving the efficiency in water markets really has three prongs to the approach. The first would be to improve the legal infrastructure that characterizes water rights and water trades in the United States so as to produce improved pricing. This is a very difficult task in part because so much of the law that governs this is at the State level and not directly controlled by the Federal Government.

The second would be to reduce Federal subsidies both in the capital and operating costs areas, because these subsidies distort choices in the construction area, distort tradeoffs in types of technologies and preventive maintenance versus initial construction and in operating costs do not reflect the full cost of delivering water to the public.

Then the third piece would be to support R&D in a sufficient fashion that new technologies would be brought on line and supported by the market incentives, so a more efficient water, where users were charged more closely to the cost of the water that they consume and suppliers were able to recover costs more closely by using market incentives alone.

We are pleased to have a chance to talk both about the water market more generally and the bill in particular and look forward to your questions.

Mr. RADANOVICH. Thank you very much for your testimony.

[The prepared statement of Dr. Holtz-Eakin follows:]

Statement of Douglas Holtz-Eakin, Director, Congressional Budget Office

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to be here today to discuss H.R. 1071. H.R. 1071 directs the Secretary of Energy to make payments to the public or private owners or operators of new desalination facilities providing municipal water service to domestic customers. Those payments, for which $200 million is authorized for appropriation from Fiscal Year 2006 to Fiscal Year 2016, are intended to partially offset the energy costs of facility operations. The bill specifies that no more than 60 percent of the funds can be disbursed to facilities that obtain source water from the sea; the remainder must go to those using brackish groundwater or surface water. H.R. 1071 also authorizes for appropriation $10 million over the 10-year period to support research and development of novel technologies for desalination.

Specific Effect of H.R. 1071

As it is currently written, H.R. 1071 serves to subsidize facility operating costs in general, rather than energy costs specifically. Under the bill, eligible facilities would receive a payment of $0.62 (adjusted for inflation) for every 1,000 gallons of water produced and sold, regardless of the energy costs associated with their operations. Generally speaking, energy costs for desalination—which rise in conjunction with the salinity of feedwater—can account for more than one-third of operating costs, but the ratio is not fixed among facilities.

The proposed subsidy amounts to approximately $200 per acre-foot of water produced, which corresponds to about 30 percent of a new desalination facility's total costs of production. In 2002, new desalination plants were reportedly producing freshwater at a cost of about $655 per acre-foot. By comparison, in 2002, the average price for irrigation water from California's Central Valley Project was $17.14 per acre-foot, while Los Angeles residents paid $925 per acre-foot.

In the absence of federal support, the demand for water has already led to the establishment of new desalination facilities, including sites in Tampa, Florida, and Brownsville, Texas (drawing brackish groundwater from the Gulf Coast aquifer). In Texas alone, there are more than 100 desalination units using either brackish surface water or groundwater as their source. Municipal facilities account for roughly 60 percent of the state's desalination production, and the remainder is produced by industrial facilities. At the end of the 1990s, nearly 800 desalination plants in 46 states (many of which were inland and for industrial use) were in operation and provided desalinated water amounting to about 1.4 percent of domestic and industrial water consumption.

Traditionally, federal subsidies for water supply have primarily been designed to address capital costs—for example, federally financed Western water supply projects initiated by the Reclamation Act of 1902, financial assistance for construction of water reclamation and reuse facilities under title XVI of the Reclamation Projects Authorization and Adjustment Act of 1992, and the Drinking Water State Revolving Fund that finances infrastructure improvements. H.R. 1071 adopts the less-common approach of subsidizing operating costs. From an economic-efficiency perspective, however, the distinction between a capital- or operating-cost subsidy makes little difference in this case, because the only facilities eligible for the subsidy are those that begin operations during the 10-year period following the bill's enactment. Either approach reduces the overall costs of building and operating a new facility and improves the relative attractiveness of the subsidized-water-supply option compared with others.

Subsidizing Desalination: Implications for Economic Efficiency

In the area of desalination, past federal support has primarily been directed toward research and development. That funding began with the Saline Water Act of 1952; by 1982, when most federal funding for desalination research and development was discontinued, the United States had spent cumulatively more than $1 billion (in today's dollars). Under the Water Resources Research Act of 1984, desalination research was conducted by the U.S. Geological Survey as part of general research, rather than as a separate program. In 1996, the Congress passed the

Water Desalination Act, renewing support for research and development with the aim of determining the most technologically efficient and cost-effective means of purifying saline water. The Act created the Bureau of Reclamation's Desalination and Water Purification Research and Development Program, authorizing $5 million annually from Fiscal Year 1997 through Fiscal Year 2002 for research and $25 million per year for desalination demonstration and development projects. The Congress appropriated $28.1 million under that (extended) authority from 1998 through 2005 (see Table 1).

In addition to those instances of support, the 2004 Energy and Water Development Appropriations bill contained $3 million for desalination research at the Sandia National Laboratory in New Mexico and authorized the design, construction, testing, and operation of the $5 million Tularosa Basin National Desalination Research Facility in Almogorda, New Mexico. That facility, which is currently under construction, will focus on inland brackish groundwater from sources that have widely varying degrees of salinity.

An economic-efficiency argument can be made for federal investment in research and development, because when multiple states and private-sector entities face a similar problem, each balances the potential cost of research against only its own expected benefits, rather than the benefits that could accrue to all parties. Federal support counteracts the resulting tendency for nonfederal entities to invest too little in research and development.

Table 1.

Annual Appropriations for Desalination Research and Development

Fiscal Year	Appropriation (Millions of dollars)
1998	2.7
1999	1.5
2000	0.7
2001	1.3
2002	4.0
2003	4.0
2004	7.4
2005	6.5

Source: Congressional Budget Office.

H.R. 1071's proposal to subsidize new facilities that provide local water supplies would be similarly appropriate from an economic-efficiency perspective if it targeted a market failure. The underlying market issue connected with desalination technologies, however, is that in many U.S. water markets in general, the prices charged do not reflect the full cost of providing water. Allowing the prices charged and received to more fully reflect the cost of supply is an alternative approach to enhancing the viability of desalination.

Because water users tend not to pay prices that reflect the full cost of provision, their demand is higher—in some cases, much higher—than it would be otherwise. Water supply problems in the United States are typically driven by high demand associated with underpricing rather than by physical shortages. In agriculture, for example, Bureau of Reclamation facilities provide about 32 percent of surface water withdrawals used for irrigation, but the water supply charges recover for the government only a fraction of the cost of providing the water. Since the beginning of the reclamation program in 1902, irrigators' interest-free payments—due over a 40- or 50-year horizon—have been based only on recovering the associated nominal costs for capital and operations and maintenance, neglecting the opportunity costs of federal expenditures. At a federal borrowing cost of 4 percent annually, over a 40-year repayment period, the government recovers only 49 percent of its total cost. The problem is not unique to agriculture: municipal and industrial users served by public water systems (those that furnish water to at least 25 people or have a minimum

of 15 connections) are responsible for about 13 percent of freshwater withdrawals from surface and groundwater sources, and they also generally obtain water at less-than-full-cost prices. Over time, providers have failed to take in revenues adequate for procuring and treating supplies as well as for operating, maintaining, and replacing their water infrastructure. [1]

On the demand side of the market, consumers respond to the incentives they face. The lower the marginal price (the price for the next unit of water consumed) that water users face, the weaker their incentive for efficient water use. Rate structures with fixed charges for an initial volume and higher charges for use above that volume can provide for basic water use while encouraging efficient water-use choices.

Such structures are rare among Bureau of Reclamation-supplied irrigation districts. In a 1986 survey of 196 of those districts, which account for more than 70 percent of total irrigated acreage in Bureau-supplied districts, 48 percent of the districts assessed their members a fixed charge per acre that was independent of the amount of water delivered. Fourteen percent of the districts used a purely quantity-based rate structure, and almost all (96 percent) had a constant per-unit price. Thirty-eight percent coupled a fixed charge for an initial volume with a quantity-based rate for water use in excess of the initial volume that was typically not triggered in normal years (and for 86 percent of those districts, the quantity-based rate was constant or decreasing). When the districts were revisited in 1997, the situation was largely the same.

Most municipal water rate structures are made up of a service charge—a fixed fee per billing period—and a unit consumption charge for set quantities of water (or "blocks"). Under decreasing block rates, the per-unit charge for water declines as the consumption volume increases. Under a uniform structure, the unit rate for water is constant, or flat, regardless of the amount of water consumed. Under increasing block rates, the unit rate for water rises as the consumption volume increases. Although the proportion may be somewhat higher now, only about 20 percent of the systems surveyed a decade ago were using increasing block-rate structures.

Conclusion

Appropriate pricing would reflect the marginal cost of water supply, maximizing economic efficiency in allocating water among competing uses by ensuring that the marginal value per unit of water was equal for all uses. Encouraging the efficient production and use of freshwater would imply a greater reliance on its marginal value than is currently seen in the United States. Subsidies for new desalination facilities would most likely not improve the overall economic efficiency of water supply and use because such subsidies would compound the distortion of price signals. An alternative means of improving the viability of desalination would be to allow prices charged to water users and received by water producers in general to more fully reflect the cost of supply.

One could argue that the pace of the evolution of water treatment technologies, and thus their suitability for more widespread use, has probably been impeded by the historically low price of water in the United States. Nevertheless, the need for such technologies has already attracted private as well as federal interest, and the level of interest seems to be growing. At the end of the 1990s, industry was adding an estimated $5 million to $10 million annually to the federally supported research and development efforts for water purification technologies. Recently, global demand for freshwater has prompted increased interest in research and development of more efficient means of desalination by companies such as General Electric, ITT Industries, Siemens, and Tyco International. Sandia National Laboratory's Desalination and Water Purification Technology Roadmap, issued in January 2003, asserts that exploration of alternative technologies will yield the greatest advances in desalination.

With that combined support for research and development of new, more energy-efficient desalination technologies as well as efforts to improve price signals in water markets so that users face charges that more accurately reflect the marginal costs of water supply, desalination may become an important source of freshwater in some markets.

Mr. RADANOVICH. I will start off in questioning, just by a general question for all three witnesses regarding the one-stop-shop permitting. It kind of pauses me or concerns me that one-third of the cost

[1] Congressional Budget Office, Future Investment in Drinking Water and Wastewater Infrastructure (November 2002).

of some of these desal projects are through the permitting. Would anybody care to enlighten me about what type of—how is it the Federal Government might be getting in the way of streamlining this process? What kind of restrictions are these? Are these ESA requirements? Are they just general paperwork requirements of filing? You know, where is it? Where is the source of the delay? Or is it local and State that are generally the ones that are getting in the way or assuming such a large part of establishment costs for these desal facilities?

If anybody would be interested in commenting.

Mr. GARMAN. I would be hesitant to offer a blanket comment, not being an expert myself on permitting. It is certainly—you know, to the extent that there is a major Federal role, that would trigger some NEPA requirements that might not necessarily be triggered if it was solely a local community affair. But I cannot offer the Committee much input on that and would be happy to comment for the record, if that is appropriate.

Mr. RADANOVICH. You would be happy to comment for the record?

Mr. GARMAN. Yes, sir.

Mr. RADANOVICH. Please do so, if you would like.

Mr. RADANOVICH. Maryanne?

Ms. BACH. Yes. Mr. Chairman, our experiment, to the extent that it is of value to the community we—when we were building Tularosa, we did have to go through a State permitting process. But being that mostly our involvement is in the R&D area, we have less experience in terms of the intricacies of the permitting process.

Mr. RADANOVICH. Generally, these are State projects, desal projects, or are they local water agency projects? I can't imagine them being Federal projects.

Ms. BACH. In the case of if something is a pilot or demonstration project, that is frequently federally sponsored, and the funds are matched, that is, to test to be sure that the technology has efficacy, that it has a high potential. When plants are actually constructed, that is of a different nature when that goes into operations. That is generally operated under a State permitting processes.

Mr. RADANOVICH. Very good. Thank you.

Dr. Holtz-Eakin?

Dr. HOLTZ-EAKIN. We would also prefer to get back to you on the record with better details. I mean, this is the intersection of State and local permitting and often environmental considerations, and I am not sure a single answer is appropriate but would be happy to work with you on that.

Mr. RADANOVICH. But I suspect if there is Federal funding involved, too, that that is the hook that brings in the Federal Government on some of this stuff, I gather. Thank you.

Mr. RADANOVICH. Mrs. Napolitano.

Mrs. NAPOLITANO. Thank you, Mr. Chairman.

First of all, Mr. Chairman, may I request that we remind and impress upon the panelists the need to have those reports to us 48 hours as requested by the Committee? I got one of my reports this morning. I have not read it, so I cannot ask intelligent or semi-intelligent questions to follow up on what the testimony is given. So

I would really appreciate if you would follow that procedure, please.

Mr. Garman, the reports that are going to be generated by the White House Office of Science and Technology Policy with the 15 agencies that are forming the Committee on Environmental and Natural Resources, the Subcommittee on Water Availability and Quantity, where are those reports going to go? Are they going to go to the Energy Department or are they going to come here also for us to review?

Mr. GARMAN. These will be public reports. They have generated one report thus far in November, which I will be happy to—we will be happy to share with the Committee and make sure the Committee has a copy. It acknowledges I think the problem and the challenge that we face. Please understand that we differ from the proponents of this bill not in the goal but in the method of getting to that goal.

Mrs. NAPOLITANO. Understood. But I don't know if this Committee has seen that report or if we have any idea what it contains as relates to the job that we are doing on specifically desalination and recycling water and those areas. I certainly would like to have the Committee have a copy of that report, Mr. Chairman.

Mr. RADANOVICH. Without objection.

Mrs. NAPOLITANO. The second one is, in your testimony you are referring to: The Department is also investigating whether a suite of specially selected, salt-tolerant ag—that is in your page 3. How will that affect aquifers? In other words, do salt-tolerant ag crops or other plants used to remove sodium and other salts from the coalbed methane-produced water, how will that affect the aquifers of the nearby residents or the rivers or whatever is available in those areas? I have a concern in how that might ecologically affect other areas.

Mr. GARMAN. Correct. The development of coalbed methane is a concern to many communities because, in addition to the methane produced, water is also produced with the methane, co-produced. So as you are pulling the methane out of the coal seams, you are also pulling out water; and sometimes the water is of very poor quality. So the challenge is, what do you do with that water that you have co-produced with the methane? You need the methane for energy, but what do you do with the water?

The opportunities include putting the water back in the ground where it came from, or trying to clean it up and put it to a beneficial use. So we are looking at a variety of methods of using that co-produced water to see how it might be cleaned up and put into beneficial use.

One of the ideas that we have been thinking about is using wind power. Wind has some real advantages and some disadvantages. One of the disadvantages is you can't necessarily predict when the wind is going to blow and thus produce dispatchable power. But, on the other hand, if the purpose is to generate electricity that you are going to use on an intermittent basis to clean up water, you really don't mind. So wind can—there may be a terrific opportunity to employ wind technology to clean up water that takes care of or allows you to sidestep one of the disadvantages of wind-generated electricity.

Mrs. NAPOLITANO. But that would only be used in limited areas where you have the ability to have wind.

Mr. GARMAN. Correct. You have to have a situation where you have a good wind resource close to the point of cleanup to help the economics work.

Let me also say that one of the primary R&D activities of the Department of Energy is, of course, to lower the cost of some of these alternative methods of generating electricity so that you can make projects such as this more affordable and financeable.

Mrs. NAPOLITANO. Well, the other question I have is your mapping project. You limited it to an overall United States map and then one covering the regions of Colorado, Utah, Arizona and New Mexico. Would you explain why it is limited to those?

Mr. GARMAN. It is partially as a method of putting the resources where we think the greatest need is. However, we are happy to take comments from the public and the Subcommittee. If there is an activity that we are not mapping that you believe we should be mapping, we will be happy to take that back and consider getting that in the queue.

Mrs. NAPOLITANO. I would certainly like that advantage.

Thank you very much, Mr. Chairman. I would like to have a second round when we are done.

Mr. RADANOVICH. Not a problem.

I ask unanimous consent that our colleague from Florida, Mr. Davis, be allowed to sit on the dais today and participate in today's hearing.

Hearing no objection, I welcome the gentleman from Florida; and we will be with you on questions in just a minute.

Welcome, Jim. Mr. Gibbons.

Mr. GIBBONS. Thank you very much, Mr. Chairman; and again, to our witnesses, thank you for your testimony.

In Nevada, of course, listening to my colleagues talk about water rainfall in New Mexico, we have an average of about six inches a year, and when it is in a drought stage it is down to two. So we do have similar problems in Nevada.

There are limitations on what we in Nevada get from the Colorado River for our highest-growth area in Nevada, which is Las Vegas, the fastest-growing city, I believe, in the United States. Our limitation, of course, is an original decree of the amount of water we get out of the Colorado River. There are some restrictions within the law of the river—of the law of the Colorado River which prohibit wheeling, which is the transfer of water rights from an up-State user to a lower State user.

My question is, do you feel—and maybe I should just leave this as an open question. Do you feel that a proposal to acquire water rights of downstream users by the creation of desalination is an affordable alternative for the acquisition of their water rights before they have to be wheeled downstream?

In other words, California. If Las Vegas, Nevada, decided to assist Los Angeles or some southern California community with the desalination plant in exchange for a water right off the Colorado River, do you feel that that is a reasonable alternative to other means of acquiring water that are in even more short supply and going against the legal status?

Ms. BACH. Mr. Gibbons, I will be happy to answer that question from the Bureau of Reclamation.

The heightened interest in desal in California and also from inland States that are associated and receive their supply from the Colorado River has certainly grown, and the interest in technology and technology breakthroughs is to get desal into a more affordable range. So that, in fact, does become another tool to be used in water supplies.

Mr. GIBBONS. May I ask what your assessment is on the cost of per acre foot of water from a desalination plant today?

Ms. BACH. The discussion of today's cost is between $600 and $650 per acre foot. If desal can be brought down to the $400 to $450 ranges, that is considered to be more of a competitive tool, more of an opportunity and an option to be put into the portfolio of water managers in the West.

Mr. GIBBONS. Mr. Chairman, I don't want to take up much more of your time. I would like to submit written questions for this panel to be answered and submitted back to us. And I appreciate the time. I have another obligation.

Mr. RADANOVICH. Very good. Thank you, Mr. Gibbons.

Mr. RADANOVICH. Mr. Davis, any questions?

Mr. DAVIS. Mr. Chairman, again, I really appreciate your hospitality to be here as part of the bill that Congressman Gibbons and I were doing.

I just wanted to comment, and perhaps there may be a comment from the panel, that something was brought up just before I got here. I remember you start on time, Mr. Chairman. We don't do that over in the Energy and Commerce Committee.

The question was raised whether there were problems with the permitting process; and I just wanted to say that, as far as the desal facility is concerned in the Tampa area, there was not a problem with permitting; it was mostly State permitting. I am not aware there are representatives here today from that entity, but I think they would be happy to answer any further questions that members of the Committee might have about whether there is some lessons learned about the Florida permitting process. Maybe the Florida permitting process could offer some good examples other States could be following as well.

Mr. RADANOVICH. Thank you, sir.

Mr. Walden.

Mr. WALDEN. Mr. Chairman, I really don't have any questions at this point.

Mr. RADANOVICH. Mr. Tancredo?

Mr. TANCREDO. Mr. Chairman, I have a question, although I apologize for not having been here earlier and perhaps much of this has already been determined. But I just wonder if you could help me understand, what are those new—or what are the ideas that are being bandied about so that we may look forward to some time in the near future when desalination becomes economically viable in terms of the technologies? What are we thinking about? What is happening in that area that we can be excited about?

Ms. BACH. Mr. Tancredo, I will address some of those. The disposal cost is one that needs addressing.

There are different—first of all, let me distinguish there are different issues if you are dealing with seawater and if you are dealing with brackish water. When it comes to brackish, the disposal issue is a significant one and how perhaps to address reuse of that material.

The reason why the Department of Energy and, in fact, our Tularosa facility in New Mexico will be able to bring people onsite, the reason why people are looking at whether plants can uptake salt or brine matter or whether that byproduct is capable of being used in construction or what have you is associated with the cost of disposal.

There is continued effort in membrane technology and testing going on in terms of both cleaning of membrane and the use of membrane and the types of membrane and the efficiency of membrane. A membrane that is merely to remove salt is different than a membrane that is dealing with water that has been once used in a community and now is looking to be reused.

So those are just some examples, and we can certainly submit others for the record.

Mr. TANCREDO. And what are the implications for returning it, the salt, to the ocean?

Ms. BACH. In fact, that is one approach presently used with some of the smaller plants that exist. How that is released is being explored, because there is nuances and some sensitivities environmentally about how it is released in terms of also ensuring that the material breaks up.

Hopefully, that answers your question.

Mr. TANCREDO. Anybody else want to?

Mr. GARMAN. I would just add that—because you answered specifically in the short term, and the Department of Energy does not have a great deal to offer in the short term. In the longer term, we are working on some very basic technologies, for instance, in the area of biological membranes, as one example of something that might produce a breakthrough technology for the more distant future, particularly as this problem becomes more pronounced and aware.

Our national labs tend to be involved in more basic fundamental science of a kind where we don't often understand—it is serendipitous at times. We may be working on one problem and simultaneously solve another. And I think that is the importance. That speaks to the importance of interagency cooperation and coordination in these areas, so that the Department of the Interior, which has the lead responsibility for this activity, is aware and knowledgeable of some of the things we have under way at the national labs, at the Department of Energy; and that is what we hope to build upon and improve as we go ahead.

Mr. TANCREDO. Is it the case that there really is little progress being made anywhere else in the world simply because where desalination is an ongoing project it is usually in an area where there is a plentiful supply of oil and therefore the costs are offset? It is cheap enough to do it, I suppose is what I am trying to say, to use the oil to create the energy to desalinate?

Mr. GARMAN. Clearly, that is where—my understanding—large desalination efforts, folks find it affordable or possible to do it

because of energy subsidies. But let me say that there has been reverse osmosis membrane technology and other technologies that have come perhaps in pursuit of other markets. I mean, even very small-scale markets such as so-called water makers aboard sailboats and some of these technologies where small-scale water, these kinds of prices are very affordable for smaller scale applications. There are some things that we are learning in the smaller scale applications that may have utility in larger scale, newer plants, but I would defer to the Department of the Interior.

Ms. BACH. Congressman, the U.S. would be seen internationally as having led the way on a number of technologies that really resulted in construction overseas; and the reason why construction occurred overseas is because, in fact, there were limited alternatives available. So, for seawater communities in the Middle East, for instance, there were not the kind of alternatives as the United States had.

Where we do presently have more to demonstrate to help overseas with is in brackish, which—inland water. The technology that we have gone on to develop inland is not as readily advanced overseas, and so that is a further opportunity for the United States.

Mr. TANCREDO. Thank you, Mr. Chairman.

Mr. RADANOVICH. Mr. Pearce.

Mr. PEARCE. Thank you, Mr. Chairman.

Ms. Bach, how many people do you have working in your research department, and what is the budget annually?

Ms. BACH. The water treatment and engineering research group is our focus on desal.

Mr. PEARCE. How many people do you have working in the research? You are the head of the research.

Ms. BACH. I am the head of research, and I just immediately have five people working for me. But I use the technical service center, which is approximately 600 individuals.

Mr. PEARCE. And your budget?

Ms. BACH. They are not appropriated. They have, I believe, a $3 million operating budget. But that is paid-off budget, not through appropriations.

Mr. PEARCE. So 600 people that are available cost $3 million? How many—in other words——

Ms. BACH. If I could verify that for the record, sir. But what occurs is those research engineers—they are scientists and engineers.

Mr. PEARCE. So you have 600 available?

Ms. BACH. Yes.

Mr. PEARCE. And how much do they cost? Just more or less. What kind of budget figure are we looking at? I just want to know how much we are spending per year in the Bureau of Reclamation to research water issues.

Ms. BACH. I am sorry. Off the top of my head, I can't pull the number. But I will be happy to provide it for you.

Mr. PEARCE. OK. You mentioned in your testimony that you have been working for a half century to understand desalination or the expertise that would be required to treat water. Now you are saying currently the costs are about $650 per acre foot. What does that amount to per gallon of water? Most of us don't consume acre feet, we consume gallons. So what is $650 per acre foot?

Ms. BACH. It is about $2 per thousand gallons.

Mr. PEARCE. OK. And at what point does water get economic?

Ms. BACH. If you can bring it closer to a dollar.

Mr. PEARCE. A dollar?

Ms. BACH. Break that in half.

Mr. PEARCE. So when you all started your research, how much was the—if we were to equate it to current costs, how much was the cost of water when we first started our research and how much have we lowered that cost?

Ms. BACH. In the 1950s, that would have been about $16.

Mr. PEARCE. The equivalent of today's $16?

Ms. BACH. That is correct.

Mr. PEARCE. In today's dollars. And so what has been the great reduction from $16 to $2?

Ms. BACH. Much of that has been in membrane technology, breakthrough in membrane technology.

Mr. PEARCE. The membrane technology is probably going to—is that going to—if we are considering brackish water from zero parts per million and the Tularosa basin is about 1,700 parts per million——

Ms. BACH. That is about right.

Mr. PEARCE.—something in that range. We will put it wherever we want to put it, but then seawater is at 25,000 parts per million. Are membranes effective at 25,000 parts per million?

Ms. BACH. To some extent, and——

Mr. PEARCE. We can take 25,000 parts per million down to about what level?

Ms. BACH. I think maybe to 100 parts——

Mr. PEARCE. About 200 parts per million.

Ms. BACH. About 100.

Mr. PEARCE. And at that level are those membranes effective or do they have to be discarded so often that the process bogs down?

Ms. BACH. Well, there are certainly important costs associated with membranes and their longevity as well as the type of water you are passing through, if you just take seawater that is several miles out versus if you were closer inland where you may have it mixed with other pollutants.

Mr. PEARCE. Dr. Eakin, on page 3, you talk about the water market and you point out that agriculture users don't really repay the costs of providing water to them. Is your recommendation that—is it your observation that all Federal projects have an opportunity cost replacement, and that water is—to irrigators somehow deficient, that it is handled differently than other programs? So the near estimation—when you give us this evaluation on page 3, is it your estimation that water to irrigators is somehow unusual?

Dr. HOLTZ-EAKIN. The observation is simply that the cost is subsidized to irrigators, and that——

Mr. PEARCE. And your findings then would be that we should be—that we should correct that? I think you mentioned then that opportunities cost should be recovered by the user.

Mr. HOLTZ-EAKIN. For water markets to operate more efficiently, you would want a price closer to those full costs.

Mr. PEARCE. And is the same calculation used for highways? Do we have some way to recapture the cost of highways, for instance? In other words, is there a public good?

Dr. HOLTZ-EAKIN. In highways, there are also many potential improvements in efficiency which would come from better pricing congestion, for example, and where the roads——

Mr. PEARCE. So there are Federal functions that go beyond the recapture of the dollars that are used?

Dr. HOLTZ-EAKIN. There are functions which go beyond pure market efficiency, certainly; and the testimony is targeted on efficiency. There are often other objections for public policy, which are to promote a particular activity for either fairness or other——

Mr. PEARCE. When you analyzed the use of water, did you calculate the potential security risk for the Nation of giving up our agriculture base and also then the cost of—the increasing cost to the consumer in higher food costs? In other words, there is a national public benefit to lower food prices. Were those calculations added into your equations?

Dr. HOLTZ-EAKIN. We don't have a specific calculation. The cost will be borne one way or the other whether they come in the form of higher food prices or whether they come in the form of a subsidy via the Tax Code or whether they are costs to be borne by the Nation of a whole. The question is whether—what is the most efficient way to allocate those costs and to minimize them where possible. That is the focus of the testimony.

Mr. PEARCE. Thank you, Mr. Chairman.

Mr. RADANOVICH. Thank you, Mr. Pearce.

As you know, we have one vote—I think a vote on the previous question now. I would like to go to Ranking Member Napolitano and then to Mr. Hayworth for questions. So perhaps, if that is agreeable——

Mrs. NAPOLITANO. Do you want to defer? You can go vote and come back. Because I am going to take some time.

Mr. RADANOVICH. Well, we can keep this hearing going.

Mr. HAYWORTH. Well, Mr. Chairman, I thank you, and I thank the Ranking Member, and I will make this very quick. It is a very specific area of concern that I have.

Welcome to all our witnesses.

Specifically, Ms. Bach, what is the status of the Bureau of Reclamation report on operating the Yuma Desalting Plant?

Ms. BACH. The status is that it is anticipated that the report will be delivered to Congress next month.

Mr. HAYWORTH. We are happy to hear that news, Ms. Bach. That report was due last summer, and we are getting it a year late. That is your government in action. What is the status on starting the Yuma Desalting Plant?

Ms. BACH. There are no immediate plans for starting the desalting plant. What I envision you will see, Congressman, is that with the Sid Wilson report that was recently available, it does offer a number of options for consideration and that those options are being taken into account in the report that the Department is completing. So at this point there are no immediate plans for starting up the Yuma Desalting Plant.

Mr. HAYWORTH. Could a revamped Yuma desalter help provide a solution to the challenges internationally confronting water problems between the United States and Mexico?

Ms. BACH. The Yuma Desalting Plant has, in fact, been maintained in City/State status so that there is an opportunity to exercise it under the right circumstances if it is appropriate under certain policy considerations.

Mr. HAYWORTH. Ms. Bach, you mentioned the Sid Wilson report——

Ms. BACH. Yes.

Mr. HAYWORTH.—and I am not sure it is the same report as the Yuma Desalting Plant work group released last month.

Ms. BACH. Yes, it is.

Mr. HAYWORTH. OK, good. Well, I understand it describes options for utilizing the Yuma Desalting Plant and meeting water delivery obligations to Mexico while helping to preserve wetlands in that nation. Among the recommended options, I think it is important to voice and to make part of the record, included using Yuma area groundwater for Mexican deliveries, using the desalting plant to treat Yuma area groundwater for municipal and industrial water uses, and developing a voluntary forbearance program. Will Reclamation use the work group's recommendations in their final decision? And, as you mentioned it I think in the affirmative in your previous answer, will you undertake a public process in doing so?

Ms. BACH. In fact, the Commissioner did respond to a letter from Senator Kyl just last month, and we can provide that for the record, in which the Commissioner did commit to a public process for an opportunity for public comment on the report that the Bureau will be sending up next month.

Mr. HAYWORTH. Well, Ms. Bach, that is very encouraging news. We look forward to the public process. We look forward to that report and reviewing what those perhaps closest to the situation have evaluated. I thank you for your answers.

Again, my thanks to the other panelists; and, Mr. Chairman, I yield back the balance of my time.

Mr. PEARCE. [presiding.] Thank you, Mr. Hayworth.

Mr. Davis.

Mr. DAVIS. I would like to ask unanimous consent to submit my statement for the record, if I could, in support of the bill Congressman Gibbons and I have introduced which is the subject of the hearing.

Mr. PEARCE. Without objection, it would be submitted.

STATEMENT OF THE HON. JIM DAVIS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF FLORIDA

Mr. DAVIS. Mr. Chairman, I would like to take a minute or two just to put the bill in context. It is not in the form of questions to the witnesses, but I just want to start by saying, first of all, in the next panel Dr. Michael Max from St. Petersburg, who is one of my constituents, will be here, who is probably one of the more knowledgeable people in the room, if not the country, on the whole desalination technology.

I wanted to say that one of the reasons I introduced this bill with Congressman Gibbons is based on the experience and lessons that

my community has had. The State of Florida, like many States that we represent, is experiencing explosive growth, about 900 residents per day. No matter how much it rains in Florida, and it rains a lot in the summertime, our water level is about the same or has slightly decreased over the last 10 to 15 years. In Florida, as in many States in the West coast and increasingly in between, we are looking at ways through conservation, recycling, reclamation and reuse to deal on the front end as opposed to the back end with this problem, and potentially a crisis at some point, in terms of the availability of potable and nonpotable water. Just in Florida alone we estimate over the next 20 years potentially $500 billion to a trillion dollars in expense to keep up with our shortage of water.

Mr. DAVIS. H.R. 1071, which is the subject of this hearing, which I have introduced with Congressman Gibbons and others, is an attempt to stimulate further development as well as research for environmentally sound and economically feasible desalination prosecution throughout the country by subsidizing—which has been discussed, and I think very prudently analyzed by many of the witnesses today—the operating cost of desal facilities that have proven on a performance basis to achieve the desired result.

There is also an appropriation of $10 million for research and development. The ultimate goal behind the legislation is to stimulate the market to move more quickly than it might otherwise move to make this technology more available and encourage inventors like Dr. Max to work more closely with the private sector to explore various forms of technology.

I want to point out that the facility in Tampa that is currently operating has had some problems. They are still working through those problems. Even when the problems are resolved, the estimates right now still call for producing water at a level that will not exceed what was originally expected, which was $2.50 to $3 per 1,000 gallons.

So even with the glitches that have occurred in one of these earlier facilities, which is bound to occur, the ultimate result is still expected to be a very positive one for my area. I also want to point out that in Florida, as in many States, we are very environmentally conscious, and there are a lot of legitimate concerns raised about the impact of disposal in terms of the salinity content of Tampa Bay, which is an estuary and a very fragile ecosystem.

I am pleased to report, with respect to this particular facility, we have had success. There have been some questions, and there have been some adjustments made along the way. But at the end of the day, the salinity levels have been acceptable to the vast majority of stakeholders who have been concerned about the environmental impact.

So I think, on balance, the experience in Tampa has been a positive one. There are some lessons to be learned for Florida and other States. I certainly commend you, Mr. Chairman, and the witnesses and the staff to help us identify what we can be doing on more of a short-term basis to encourage more effective and rapid development of desalination facilities and further research and development.

Again, I would like to submit a more detailed statement for the record and appreciate your consent to that, Mr. Chairman.

[The prepared statement of Mr. Davis follows:]

Statement of The Honorable Jim Davis, a Representative in Congress from the State of Florida

Mr. Chairman and Members of the Subcommittee,

Thank you for holding this hearing on H.R. 1071, the Desalination Drought Protection Act of 2005. Although I am not a member of this Committee, I appreciate the opportunity to participate and join you at the dais. I am very pleased to welcome Dr. Michael Max, from St Petersburg, Florida, which I have the pleasure of representing. Dr. Max is here today to share with us his recent advances in the area of desalination through the use of hydrates—a cutting edge technology that I will let him explain at the appropriate time.

As all of you are aware, communities all over the country are struggling to meet the demands of exploding populations. My home state of Florida greets 900 new residents per day. We are witnessing the continuing trend of population growth despite the fact that water supplies have remained at the same level or even decreased over the last ten to fifteen years.

Water conservation and the emergence of water recycling as a tool for meeting non-potable demands have stretched available supplies farther and farther. The South West Florida Water Management District (Swiftmud) has already laid more than 900 miles of pipelines for delivery of reclaimed and reusable water. Estimates for meeting our municipal water and wastewater needs over the next 20 years range anywhere from $500 billion to $1 trillion. Investments in water and wastewater systems pay substantial dividends to public health, the environment, and the economy.

Citizens in the Tampa Bay area have been leaders in finding comprehensive solutions to the problems facing our state's water supply issues. Tampa Bay Water is a regional agency responsible for supplying the needs of a population of approximately 1.8 million. With the demand on the area's aquifers steadily increasing, Tampa Bay Water decided to investigate alternative water sources, including desalination.

Because of my work with constituents like Tampa Bay Water, I have begun to look for opportunities to share the successes found in some of our solutions with other communities around the country and have introduced H.R. 1071. The Desalination Drought Protection Act of 2005 will encourage the development of environmentally sound and economically feasible desalination projects by providing energy assistance grants to qualified entities, such as local water agencies and public utilities, in the amount of 62 cents per thousand gallons for the initial ten years of a projects operation. This bill encourages innovation and does not favor any particular technology to be used for desalination—basing incentives on performance. By focusing on how much water is produced rather than providing incentives for the construction of these new facilities, we have created a competitive system of incentives.

Recognizing the vast importance of developing new technologies and lowering the cost for future endeavors in desalination, a new section was added to H.R. 1071. This provision authorizes $10 million over the same period for the Secretary of Energy to support research and development of novel technology approaches for cost-effective desalination.

Tampa Bay's Big Bend desalination plant was designed to produce an initial 25 million U.S. gallons of water per day into the water system, with planned expansion that will add capacity, enabling the plant to reach 34 million gallons a day as needs continue to grow. Located adjacent to Tampa Electric's Big Bend 2,000MW Power Station, it is currently the largest of its kind in the United States. Construction began in August 2001 and the first water was produced in March 2003. The Tampa Bay Seawater Desalination plant will provide the Tampa Bay region with 10 percent of its drinking water.

Tampa Bay has faced unique obstacles—it's tough to be first, and because of the high salinity and unusual water temperatures in the Golf of Mexico they had to make some design adaptations that later led to other learning curves. Knowing what we know today, our community would have still built the facility that we see today. When planning the cost allocations in 1996, expected water costs were estimated to be between $3.50 and $4.50 per 1,000 gallons of water "with all of the design alterations water coming out of the Big Bend facility will not exceed $2.50 to $3.00 per 1,000 gallons of water produced, still lower in cost than the original expectations.

Organizations and citizens concerned with protecting Tampa Bay, including the Agency on Bay Management, the Hillsborough County Water Team, the Audubon Society, the Tampa Baywatch and Tampa Estuary Program, also reviewed and

commented on submitted materials throughout the permitting and planning process. None of the groups is opposed to the Big Bend seawater desalination facility.

Although the plant's discharge is roughly twice as salty as Tampa Bay, it does not increase the bay's salinity because it is diluted in the cooling water from Tampa Electric's Big Bend Power Station before being discharged back into the bay. Salinity in the plant's discharge is, on average, only 1.0 to 1.5 percent higher than Tampa Bay's. This slight increase in salinity falls well within the natural, yearly salinity fluctuations of Tampa Bay, which vary from 16 to 32 parts per thousand, or by up to 100 percent, depending on the weather and the season.

I urge the Subcommittee to complete consideration of this bill and proceed with a mark-up of the Drought Protection Act of 2005. This grant system and the Research and Development section will add another tool for states and local governments to use for providing affordable and drinkable water to their communities. Mr Chairman, again, I thank you and the Members of this Subcommittee for the opportunity to address you today and look forward to working with you on this and many other issues in the future.

Mr. PEARCE. [presiding.] Thank you, Mr. Davis.

The Chair would recognize himself to ask a couple more questions.

Mr. Garman, we pursued the same line of questions that we did with Ms. Bach, how many people do you estimate in DOE are working on water cleanup?

Mr. GARMAN. Exclusively very few. Our budget, as allocated toward water, will vary greatly. I believe the GAO report did an analysis looking back at expenditures of the Federal Government.

Mr. PEARCE. If you gave me an estimate, how much would that be?

Mr. GARMAN. It would vary from $300,000 to $7.7 million a year, depending on the work——

Mr. PEARCE. That is all the facilities nationwide, $7.7 million total.

Mr. GARMAN. That is correct, sir.

Mr. PEARCE. Ms. Bach, if I took your figure of 600 people, would a scientist working on researching be making $100,000, more or less, $50,000, $60-something? If we took $100,000, it would be about $60 million annually. If we took $50,000, we could just go to $30 million annually.

So, then, Dr. Holtz-Eakin, we come back at some point to your analysis of what things are being paid for and not being paid for—if you were to look at the $30 million a year and the decrease from $15 to around $2 per gallon. If we had $30 million that, since the 1950s, I think Ms. Bach said, is that the sort of return on capital that you all would consider is sufficient? Or is that something that would concern you that we are spending upwards of $30 million a year from just one agency, and maybe there are more agencies? Would you like to comment on that?

Dr. HOLTZ-EAKIN. I don't have a comment on the particular number, which we would be happy to analyze and get back to you on the rates of return. But I think you are on the mark in trying to identify whether there are social rates of return which merit R&D investment. That is exactly the right way to do——

Mr. PEARCE. If you would scoot closer to the mike, please.

Dr. HOLTZ-EAKIN. I don't know specifically on numbers whether that particular rate of return is satisfactory or not, although we would be happy to work with you on that. I think that your question is right on the mark, which is, this a rate of return which

broadly accrues to the Nation as a whole, which is satisfactory for the kinds of investments we are making. These are the broad R&D investments that are the appropriate role for the government. We would be happy to work with you on the number itself.

Mr. PEARCE. Ms. Bach, if we were to pursue that line of questioning then with you, if you were to estimate the total operating cost—now we are not talking about research, we are going to estimate that at about $30 million or maybe a little bit more. But if you are looking at that time total operating cost of all of your different research facilities, what would those costs per year—and, again, the end result of what I am trying to get at is the actual benefit that we are getting from your research?

Ms. BACH. The operating budgets for the two research facilities that we presently have, I would estimate that to be about $3 million a year, for the two facilities. We estimate Tularosa will be an O&M budget of about $2 million. And the facility at Yuma, the research facility there, is under $1 million.

Mr. PEARCE. Do you have any estimate? You were saying that you think the cost of $1 is when you get to be economic. So do you have any estimates of when you are requesting that your research staff—do you have goals set out there when you would like that cost estimate of $1 to be reached?

Ms. BACH. Well, in fact, the research agenda is even more comprehensive than the Reclamation or even the Federal Government. There is a consensus amongst those in the research community that is what the roadmap is about, is how to tackle the—where the costs are, so the research opportunities are and then to distinguish what industry should do versus what the Federal Government should do.

Mr. PEARCE. So we are spending $30 million a year to find out where the costs are and not to find out how to solve the costs. I mean, at some point—I will just tell you, when I look closely at the operating structure, particularly the facility in Tularosa, I get concerned that it is nondirectional and that I really—I don't see where the real intent is to get the cost down to where it is economic, that instead we are more concerned with the research.

Even in DOE, I read in your report, Mr. Garman, it just doesn't feel like we are really aggressively attacking the cost structure of water with an outcome that we can be proud of at the end of the day.

Ms. BACH. Mr. Chairman, if I may just comment. I certainly didn't want to leave the Committee with a misunderstanding. The 600 scientists and engineers that Reclamation have, I think you realize that those are on a whole variety of water issues, not just on desal.

Mr. PEARCE. I understand that, but the whole purpose of water research should be how to keep it cleaner and how to use it and have it available when it is not available.

Ms. BACH. Absolutely.

Mr. PEARCE. Having said that, we are being passed a memo that there is just 3 minutes to vote, and I am still the only one here. We can either—OK. They say that I probably should go on to recess and go cast my vote on the Floor. So with everyone's consensus, we will stand in recess till the Chairman comes back.

[Recess.]

Mr. RADANOVICH [presiding]. The Subcommittee is back in order, and I recognize Grace Napolitano for some further questioning of the first panel.

Mrs. NAPOLITANO. Thank you, Mr. Chairman.

Starting off with Ms. Bach, Bureau of Reclamation. You state, in 2004, Bureau of Reclamation redirected efforts under Title XVI, the Reclamation Wastewater and Groundwater study, et cetera, et cetera, to complement the DWPR 40 Water 2025 number 1, what does it mean under what direction—what Congressional authority was this, does a redirection of the efforts of Title XVI occur? Was Congress notified?

Finally, I understand that the eligibility on the Floor today will zero out 2025 water funding. So would you please answer those.

Ms. BACH. Yes, Congresswoman, a couple of questions that you had with respect to Title XVI, the authority to invest in desal activities is included in Title XVI. In fact, Title XVI is quite broad in what it considers to be impaired waters. In fact, essentially, if the water cannot be used for consumptive uses, then under Title XVI, it would be considered impaired.

With respect to the redirection of Title XVI activities toward desal, that would have been described to Congress in the justification of the budget.

And then your third question is, yes, with respect to the markup from the House Appropriations Committee, it is my understanding—I have reviewed the bill that is going to the Floor, and that, in fact, does zero out the Water 2025 funding. That is correct. So for desal activities, that is a reduction that would be a cut of $1.8, almost $2 million from their request.

Mrs. NAPOLITANO. As you probably have heard in the past, I have been very vocally opposed to the Bureau of Reclamation reducing the funding to recycle water, because it has helped California, specifically, and other States, from what I am learning to be able to deal with the issues of whether it is drought or contaminated water or water that they can recycle.

Yet we continue to forge forward and based on the fact that it is part of the original Act. There was a demonstration project, I was told by Commissioner Keys, a while back.

I just do not understand why there is such a reluctance to include recycling along with desal and other objectives, because this is what has helped California. In answer, I believe, to Mr. Gibbons is that California has now met the 2016 objective of reducing the Colorado River take, which means then that they are already going to have that additional water coming from the Colorado River, because California has managed, through recycling water projects and other programs, been able to cut their take. So I am very concerned about the continued effort to cut the recycling funding.

The other question that I have for you, and it was partly addressed, oh, Mr. Gibbons answered the question about the cost of the acre-foot of water. If you could bring it down to the range of 400 to 500, the research, what about recycling. What is the cost of recycling versus the desal?

Ms. BACH. You know, I am sorry, I apologize for not having that information readily available. But I think what you are asking me is, what is the distinction between the reuse process and desal?

Mrs. NAPOLITANO. The cost of the reuse process and the desal process.

Ms. BACH. If you might allow me to submit that for the record. Let me verify that, because I don't have it available to me.

Mrs. NAPOLITANO. Can your staff probably give you a ballpark figure?

Ms. BACH. Well, let me—I don't know that this is going to be a complete answer, but the technology—technologies that are available for desal and technologies that are available for reuse sometimes can, in fact, be similar to it, is the ability to have one technology breakthrough with two different applications.

Mrs. NAPOLITANO. That still doesn't answer my question.

Ms. BACH. I will get to your question. I believe it can be demonstrated that the reuse costs would be less than the desal. But I will be happy to get more information.

Mrs. NAPOLITANO. Would you explain that in writing, please?

Ms. BACH. Yes.

Mrs. NAPOLITANO. Also, the fact that there needs to be an infrastructure for the recycled water that may have more extended use to communities that actually can cut down the use of pure water. That is my point.

Ms. BACH. Yes, I am aware that there is a difference of philosophy within the Administration and the views that you have pressed about what role Reclamation should be playing with respect to——

Mrs. NAPOLITANO. You might add to that report, if you will, whether or not communities have voiced their concern about their ability to obtain assistance in expansion of the recycled water projects to use for economic reasons, whether it is for commercial—actually, industrial use, as well as agricultural use.

Ms. BACH. I can expand upon that. I can also indicate that the type of proposals that we are seeing coming in for competitive funding in the research arena would include those that are looking for industrial applications.

Mrs. NAPOLITANO. Great.

Ms. BACH. I will expand.

Mrs. NAPOLITANO. You have already answered the questions why the Administration favors. But I would certainly want to make clear that the Title XVI has been very favorably received by communities throughout the United States, has helped immeasurably in some areas. And why the continued reluctance to include or work with this Committee on continuing to see how that can continue to help bring potable water to the communities or increase the water by utilization of recycled water?

Ms. BACH. Well, again, I understand that it comes down to a distinction of maybe a difference of philosophy in that the Administration recognizes that there are broad authorities in Title XVI, and as I pointed out, in fact, does allow for us to conduct research, including desal, because of that broad understanding of how it defines impaired water. But when it comes to the actual funding of

the construction of the facilities, that is where you see a differentiation in policy.

Mrs. NAPOLITANO. OK. Well, I visited the sanitation district where millions of gallon per minute are dumped into the ocean. And that is a concern if it can be recycled and put back into good use whether it is for ag or industrial uses, and that is why I am pursuing that, one of the reasons.

Dr. Holtz-Eakin, I have a question in regard to your report on page 1 where you are referring to the third paragraph on the California Central Valley Project, being $70.14 per acre-foot versus LA residents, $925. Where did you obtain the $925 figure? How did that come about? Is it current figure?

Dr. HOLTZ-EAKIN. It is a 1992 figure, ma'am.

Mrs. NAPOLITANO. 1992. Do we have any better update than that?

Dr. HOLTZ-EAKIN. We will certainly work on getting one for you.

Mrs. NAPOLITANO. Would you submit that to this Committee?

Dr. HOLTZ-EAKIN. Happily.

Mrs. NAPOLITANO. For the record, please. Then I can look at page 2 of your report, paragraph one. In discussing the H.R. 1071, adopting a less commonsense approach of subsidizing operating costs, and you go into the facilities eligible for subsidy. Are those to begin operation, during, now? I would like to get this clear. Is it newly built operations?

Dr. HOLTZ-EAKIN. Yes, ma'am.

Mrs. NAPOLITANO. Not existing desalination operations that you are hoping to help with this bill.

Dr. HOLTZ-EAKIN. The bill is targeting new facilities being built.

Mrs. NAPOLITANO. Isn't that discriminating against those that are already in operation and have been doing work?

Dr. HOLTZ-EAKIN. It is a targeted subsidy on new facilities and, by definition, discriminates against those who don't qualify.

Mrs. NAPOLITANO. So it is just for new. Does that take into consideration the amount of time that those facilities would have to be up and running, operating?

Dr. HOLTZ-EAKIN. It takes about three years to construct one, if that is your question. But the funding is not conditional upon a period operation.

Mrs. NAPOLITANO. Is it during the 10-year period following the bill's enactment, the subsidy? They are eligible only during that 10-year period, so you lost three years, for instance, if it took three years to build.

Dr. HOLTZ-EAKIN. The authorization is for a 10-year window and not beyond that, but that is true.

Mrs. NAPOLITANO. But the enactment of this bill——

Dr. HOLTZ-EAKIN. The authorization is for a 10-year period and then expires at the end of that. That is the nature of the bill, not the nature of the operation of the plant. Not that a plant is by definition only going to get 10 years of funding and lose 3 during the startup. It is simply the bill itself only has that period, and that is the nature of the budgeting process.

Mrs. NAPOLITANO. So that would affect the ability of plants to be able to have an extended period time of return?

Dr. HOLTZ-EAKIN. It certainly would affect the calculations that go into thinking about startup construction and the planning process involved in a facility, yes.

Mrs. NAPOLITANO. So, in essence, it probably would affect their cost?

Dr. HOLTZ-EAKIN. Most certainly.

Mrs. NAPOLITANO. OK. Then, I think you did answer the one referring to Sandia National Lab in New Mexico in the third paragraph of the same page. The one under construction—I believe somebody had a question on that. I didn't quite get the answer because I was walking out. When will it be finished and what technology does it use?

Ms. BACH. I think this is about Tularosa with respect to New Mexico.

Mrs. NAPOLITANO. Tularosa, yes.

Ms. BACH. Right. The facility will be finished in 2006, and it will focus on brackish, brackish inland.

Mrs. NAPOLITANO. What new technology? Is this the membrane?

Ms. BACH. It is actually a research facility set up to test technologies of all kinds, not just water but also energy.

Mrs. NAPOLITANO. OK. Going back to the statement about R&D dollars appropriated from 1998 to 2005, a 7-year span, there have been $28.1 million for R&D. Is that small, large?

Ms. BACH. That is specific just to one authority. That is for the DWPR program, and then there would have been another $5 million under Title XVI for the two demonstration projects that Congress authorized, one in Las Vegas and one Long Beach, which you will be hearing on the next panel.

Mrs. NAPOLITANO. I still want to bring up the fact that agricultural water is subsidized for municipal water, and the assistance water is not—yes, all you want is true.

OK. I think—I have a couple of questions, but I will defer and come back and rethink what I have.

Thank you, Mr. Chair.

Mr. RADANOVICH. Mr. Davis.

Mr. DAVIS. Thank you, Mr. Chairman. I think you have raised a legitimate point about the quality incentive. It could be, in fact, 7 years, and I think it is a legitimate point for discussion, whether it is sufficient incentive for someone to factor into the subsidy the operating costs as opposed to the feasibility of the entire project. So I am sure that is something we can discuss. Thank you for raising the point.

Mrs. NAPOLITANO. Yes, Dr. Holtz-Eakin, the Chair has been kind enough to allow me to continue because he has more questions. How would the private sector react if we reallocated more money for private research and development? And would private industry be encouraged or discouraged from doing research with their own money? Any one of you.

Dr. HOLTZ-EAKIN. The broad lesson of history, not just in water but elsewhere, is, to the extent that the Federal Government devotes funds to R&D, it does reduce the incentives for both the private sector and for both State and local governments to do the same activity. And there is, on net, some crowding out of the total funding.

Mr. GARMAN. As a general proposition, we at the Department of Energy like to engage in public/private partnerships where we require cost share from our private partners, or nonFederal partners, I should say. That cost share depends on the nature of the research. If it is of a very fundamental nature, we require smaller cost share. If it is demonstrating technology, closer to commercialization, we would require a larger cost share. That approach is codified in the Energy Policy Act of 1992.

Ms. BACH. Along similar lines, what I would say as a general philosophy is that high-risk, long-term basic research has been long recognized as being an important function of the Federal Government. That which is more applied is generally subjected to a cost share. And in fact, Reclamation, similar to the Department of Energy, we have a 50/50 cost share, and we generally see that cost share increasing on outside partners as we go from pilot to demonstration.

Mrs. NAPOLITANO. Thank you for those answers.

Dr. Holtz-Eakin, your testimony emphasizes the importance of pricing and the effects of how water is used. What do we know about the use of water in response to changes in pricing?

Dr. HOLTZ-EAKIN. From the limited research evidence that we have, it is evident that residential users will respond to higher prices with more judicious use of water. A 10 percent price increase could decrease their consumption by 2 to 4 percent. Commercial and industrial users are a bit more responsive. The same kind of price increase might move their consumption down from 5 to 8 percent.

That builds off a survey that really operates on a limited range of prices. We don't know how much people respond to a greater range of price variation.

Mrs. NAPOLITANO. Thank you. I was interested in your statement or your testimony about, there is a disincentive for people to save water, conserve water, because of the pricing structure?

Dr. HOLTZ-EAKIN. It is certainly the case that the pricing structure affects all aspects of water use. The price sensitivity is about choices in using water. The price has the same incentives on sources of water. Whether it would be recycled, whether it would be desalination, whether it would be some other source, those prices that provide incentives for new technologies, those which are deemed to be meeting the market test, depend ultimately on the prices that are in place. So things which are not meeting the market test now might very well meet a private market test if prices were closer to the full cost of production.

Mrs. NAPOLITANO. Thank you.

Mr. Chair, I probably have a ton of others. I would like to have the ability to submit them to the panel for answers to this Committee.

Mr. RADANOVICH. Absolutely. We will be making that statement at the close of the hearing.

I want to thank the members of the panel for being here. You provide valuable information to the Committee, and we do appreciate it.

With that, I will call up the next panel, which is Mr. Bernie Rhinerson of the San Diego Water Authority on behalf of the U.S.

Desalination Coalition; Mr. Kevin Wattier, who is the General Manager of the Long Beach Water Department; Mr. Colin Sabol, Chief Marketing Officer at General Electric Infrastructure; Mr. Pat McCourt, City Manager for Alamogordo, New Mexico; Dr. Michael Max, Marine Desalination Systems, L.L.C.

Mr. RADANOVICH. Ladies and gentlemen, welcome to the Subcommittee. As in the last panel, we will allow each member to speak. Please keep in mind that your written testimony is included in the full record. Feel free to be extemporaneous in your comments. We will start with each and then open up to the dais for questions.

Mr. Rhinerson, welcome to the Subcommittee, you may begin.

STATEMENT OF BERNIE RHINERSON, BOARD MEMBER, SAN DIEGO COUNTY WATER AUTHORITY, ON BEHALF OF THE U.S. DESALINATION COALITION, SAN DIEGO, CALIFORNIA

Mr. RHINERSON. Thank you, Chairman Radanovich and members of the Subcommittee. My name is Bernie Rhinerson, I am here this morning representing the United States Desalination Coalition where I serve as a member of The Board of Directors and as the past chairman of that organization. I am also immediate past chairman of the San Diego Water Authority, and I serve as a member of the Board representing the City of San Diego on that agency.

I very much appreciate the opportunity this morning to be here to testify in support of H.R. 1071, the Desalination Drought Prevention Act of 2005.

A few comments about my agency and some clarifications about previous testimony. Our agency provides wholesale water service to 3 million people in San Diego County. The authority's charge is to deliver a safe and reliable water supply to businesses and residents that we serve providing water that fuels a $1.6 billion economy.

We are planning a desalination plant in Carlsbad that will produce 50 million gallons a day which represents about 5 percent of San Diego County's water supply. We are currently doing an EIR. We are hope to have that plant in operation in 2008 and 2009 expandable up to 100 million gallons a day.

To correct a comment made in earlier testimony, we anticipate that the cost of water from that facility will be in the $800 to $900 range, based on a power cost of about $0.06 per kilowatt. The $600 range mentioned earlier is a cost that we wish we could achieve, but we are more in the $800 range.

My agency, like water agencies throughout the country, is continually struggling to identify long-term water supplies because of drought, increasing population, competing demands from business and agriculture. So it is these challenges that brought us here today and led us to lead the U.S. Desalination Coalition which brought together agencies and utilities in Florida, Texas, California, New Mexico and Hawaii, all agencies that are struggling with the same problem, finding long-term water supplies. So we are very encouraged to be here to hopefully have the Federal Government create a program that can help us with financial assistance to bring these desalination plants into reality.

I want to thank the sponsors of the bill, Congressman Gibbons, Congressman Davis, for their support and leadership, and you, Mr. Chairman, for having this hearing.

Mr. RHINERSON. H.R. 1071 is a bill that is a little bit different in that it provides energy assistance grants based on performance, and that is a very important difference by design.

In our opinion, we cannot afford to continue to wait for more research. We need to get these plants on line and built and producing water. It takes a long time to plan them, get through the environmental permit process, as you have talked about earlier, and to get these plants built. So the approach in H.R. 1071 is, rather than providing construction grant funds, it is to focus on plants that are built by local agencies that are the best plants that are actually producing water.

I would like to encourage the Committee to consider a couple of changes that have been mentioned before to this bill. One is the one-stop-shopping environmental permitting process that is similar to what is used in highway construction. That would help us with the major challenge that we face. It is the cost of permitting and the delays and the processing that we have, and a one-stop-shop process could help speed up the approval process and therefore save money on building these plants.

Second, we would like to ask that you consider adding language to the bill where the Secretary of Energy would evaluate applications that are based on the best available technology. Those are the plants that have designed into them energy-efficiency units and things that are as advanced as possible. With those two changes, we are very much in support of this bill.

Once again, I want to reiterate that we very much appreciate the Federal Government's support for research from Reclamation and the Department of Energy. But we need to think beyond research and actually building plants that will produce water for the people of my region and in other areas of the country where water supply is something that we have to start working on now, because it takes a long time to build these plants.

I would be happy to answer any questions during your question-and-answer period, and I appreciate your support for this bill.

Mr. RADANOVICH. Thank you, Mr. Rhinerson.

[The prepared statement of Mr. Rhinerson follows:]

Statement of Bernie Rhinerson, Member of the Board of Directors, San Diego County Water Authority on behalf of the U.S. Desalination Coalition

Chairman Radanovich and Members of the Subcommittee, my name is Bernie Rhinerson. I am before the Committee this morning representing the U.S. Desalination Coalition, where I serve as a member of the Board of Directors and am the immediate past Chairman. I also serve as a member of the Board of Directors of the San Diego County Water Authority as a representative of the City of San Diego. I very much appreciate having the opportunity to testify today in support of H.R. 1071, the Desalination Drought Prevention Act of 2005.

The San Diego County Water Authority serves as the wholesale water supplier to more than 2.95 million people and 23 member agencies in San Diego County. The Authority's charge is to provide a safe and adequate supply of high quality water to the communities, businesses, and residents that we serve.

Like water resource managers throughout the United States, we are struggling to address the long-term challenges posed by drought, increasing population, and competing demands from business, agriculture, and the environment. These challenges led us to join together with water agencies and utilities from other States

including Florida, Texas, Hawaii, and New Mexico to form the U.S. Desalination Coalition, a group dedicated to advocating an increased Federal role in advancing desalination, both seawater and brackish groundwater, as a viable long term tool for meeting our Nation's water supply needs.

The goal of the U.S. Desalination Coalition is to encourage the Federal government to create a new program to provide financial assistance to water agencies and utilities that successfully develop desalination projects that treat both seawater and brackish water for municipal and industrial use. The Desalination Drought Prevention Act of 2005, introduced by Representative Jim Davis and Representative Jim Gibbons, will achieve this goal in a fiscally responsible way. Similar legislation has been introduced in the United States Senate by Senator Mel Martinez of Florida. I am delighted to be here today in support of this legislation and tell you how it will positively affect the San Diego County Water Authority.

Despite the tremendous advances in desalination technology that have reduced the costs of desalinating water, energy costs remain quite high and are responsible for more than 30% of the overall cost of desalinated water. H.R. 1071 directs the Secretary of Energy to provide incentive payments to water agencies or utilities that successfully develop desalination projects. This would be a competitive, performance-based program that will help to offset the costs of treating seawater and brackish water. Under the proposed program, qualified desalination facilities would be eligible to receive payments of $0.62 for every thousand gallons of fresh water produced for the initial ten years of a project's operation. The legislation would also insure that there is a balance in the amount of money going to seawater and brackish water projects in any one year.

The rationale for this approach is that while the cost of desalinating water has dropped dramatically over the last decade, the energy costs associated with desalination are still quite high. Most experts believe that these costs will continue to come down over time and that desalination will eventually be widespread. But waiting for this to occur is a luxury that, in my opinion, we cannot afford. A modest investment to jump-start the development of these projects today is the smart thing to do.

It is true that the approach suggested in H.R. 1071 to encourage the development of seawater and brackish groundwater desalination projects is different from the traditional approach of providing construction grant funds. That difference is by design. First, while the availability of energy assistance grants will encourage the development of desalination projects, these grants will be performance based. In other words, the Federal government will not be betting "on the come" that these projects will be technically and economically sound and will actually get built. Only the very best projects will get built by local sponsors and only those will receive financial support.

San Diego County is literally at the end of the pipeline. In order to ensure water supply reliability for our region, we have instituted a multi-faceted water supply diversification strategy that includes imported water, increased conservation, water recycling, agriculture to urban water transfers and the development of a new, drought-proof, local water supply—the Pacific Ocean. Toward that goal, the Water Authority has instituted one of the most ambitious seawater desalination programs in the country. Our water supply diversification plan calls for the development of up to 125 million gallons per day of seawater desalination capacity over the next 20 years. We expect that by 2020, six to fifteen percent of our water supply will come from the ocean. Environmental review is expected to be completed this year for a 50 million gallon per day seawater desalination plant in Carlsbad, California.

Development of this high quality reliable water supply will address two vital federal interests; it will ensure that the economic health of a $142 Billion a year economy is maintained, and it will offset the need to provide water to a growing population by seeking additional imported supplies from environmentally sensitive sources in Northern California such as the San Francisco- San Joaquin Bay Delta.

Mr. Chairman, as you and the Subcommittee consider this legislation, I would respectfully suggest two modifications to improve the legislation.

First, we would encourage the Committee to consider establishing a "one stop shop" to coordinate the environmental review process required for these projects similar to the process used in highway construction and embodied in statute at 23 U.S.C. 109. This would help public water agencies address one of the biggest problems we face in developing desalination facilities, navigating through an overly complex, time consuming and expensive permitting process involving numerous Federal and State agencies.

Second, we would encourage the Subcommittee to include language that would require the Secretary of Energy in the evaluation of applications for assistance under

the Act to give priority to projects that utilize the best available technologies to conserve energy or utilize renewable energy in the desalination process.

In conclusion, thank you again for holding this hearing on this important legislation. We very much appreciate your leadership on this important issue.

Mr. RADANOVICH. Mr. Wattier.

STATEMENT OF KEVIN WATTIER, GENERAL MANAGER, LONG BEACH WATER DEPARTMENT, LONG BEACH, CALIFORNIA

Mr. WATTIER. Good morning, Mr. Chairman, members of the Committee. Thank you for the opportunity to speak before this distinguished Subcommittee today.

My name is Kevin Wattier. I am the General Manager of the Long Beach, California, Water Department. My verbal testimony today will summarize the development and current status of the Long Beach Seawater Desalination Project, currently the largest federally authorized project of its kind in the United States.

The Long Beach Desalination Project represents the Federal Government's current investment in seawater desalination research and development. In full partnership with the U.S. Bureau of Reclamation, through work at a 300,000 gallon-per-day prototype desalination facility, we are attempting to optimize a unique and extremely innovative membrane technology, which was developed by engineers at our agency, that has indicated several advantages over traditional reverse osmosis methods on a small scale.

Development of this research facility is also being made possible by the generous assistance from the Los Angeles Department of Water and Power.

Additionally, together with the United States Bureau of Reclamation, we will construct an Under Ocean Floor Intake and Discharge Demonstration System, a project we believe is among the first of its kind in the world, that will effectively demonstrate an alternative to traditional ocean intake and discharge practices.

The two parts of this large research and development program are aimed at fulfilling the intent of the U.S. Congress put forth by this Committee in its 1996 funding authorization for the Long Beach Desalination Project, which is to drive down the cost of seawater desalination through advancements in technology.

The work being done in Long Beach is consistent with the recommendations on pursuing seawater desalination contained in the Department of Interior's recent publication entitled, Water 2025: Preventing Crisis and Conflict in the West.

In Long Beach, the reliability of our future water supply rests on four pillars of critical investment: conservation, reclamation, conjunctive use and seawater desalination. Increased implementation of aggressive conservation programs, expansion of our recycled water distribution system, innovative and increased utilization of our groundwater basin and seawater desalination, as a package, for the foreseeable future, will mitigate variable constraints on imported and groundwater supplies, significantly restrengthen our water supply reliability, and keep water rates low.

Seawater desalination has indeed emerged as one of several alternatives for stronger water supply reliability. In fact, we believe that early in the next decade seawater desalination could help

meet 10 percent of our customers' annual water demands. However, we believe significant opportunities to further reduce the operating costs of seawater desalination exists, making it an even more affordable option for water reliability. Long Beach has chosen to pursue these opportunities prior to moving forward on construction of a full-scale production facility.

Using a small 9,000 gallon-per-day pilot scale desalter since 2001, Long Beach water has significantly reduced the overall energy requirement of seawater desalination using a relatively low-pressure, two-pass nanofiltration process, which has come to be known as the Long Beach method. Testing at this scale has estimated this new technology to be 20 to 30 percent more energy efficient than traditional reverse osmosis.

This technology, among other critical processes, will now be tested on a larger scale. A Federal funding agreement with the U.S. Bureau of Reclamation was signed in September of 2002 to design and construct a 300,000 gallon-per-day prototype seawater desalination research and development facility. This funding agreement provides for 50 percent, or up to $20 million, of the total cost of the Long Beach project. Total cost of design, construction and operations for this 300,000 gallon-per-day prototype facility is $8 million. To date, approximately $4 million have been appropriated by the Federal Government starting in 2002.

The Long Beach prototype seawater desalination facility will be operational in August of this year. Once operational, Long Beach Water and Bureau of Reclamation officials will conduct 18 months of research. The research conducted at this facility will be among the most advanced seawater desalination research being undertaken anywhere at this time. With the data we gather, we will verify energy savings of the two-pass nanofiltration method and optimize the process so that it can be easily duplicated.

Among the research being conducted in Long Beach will be a full-scale, side-by-side comparison of the two-pass nanofiltration and single-pass reverse osmosis methods, the only full-size energy use comparison of these two processes being conducted at this time. The Long Beach project will also test many of the newest energy recovery devices being made available on the market.

We will extend our efforts beyond optimization of the two-pass nanofiltration process and seek out other innovative and affordable ways to develop other components of a full-scale desalination facility, while looking ahead at some of the common operational challenges faced by other desalination facilities around the world. Issues such as seawater intake, pretreatment and brine disposal affect both the two-pass nanofiltration and the reverse osmosis processes.

In partnership with the Bureau of Reclamation, we are currently planning the design, construction and subsequent research activity of an Under Ocean Floor Intake and Demonstration System, among the first of its kind in the world. We believe this research will demonstrate an alternative and an environmentally responsive method of seawater intake and brine discharge using slow sand filtration and that existing beach sand under the ocean floor can be a viable pretreatment method for seawater desalination.

Mr. Chairman, I would like to thank this Committee, the Congress and the Bureau of Reclamation for your continued support and confidence in the partnership between the Federal Government and the City of Long Beach. We continue to strive to provide you with a tangible return on your investment in seawater desalination research and development. We look forward to sharing our research with this Committee and other stakeholders in the months ahead.

Along with my written testimony, I have submitted recent photographs of the Long Beach prototype desal facility and graphic renderings of the Under Ocean Intake Project.

I would be happy to answer any questions you might have.

Thank you, Mr. Chairman.

Mr. RADANOVICH. Thank you, Mr. Wattier.

[The prepared statement of Mr. Wattier follows:]

Statement of Kevin Wattier, General Manager, Long Beach Water, Long Beach, California

Mr. Chairman, thank you for the invitation to speak before this distinguished Subcommittee today.

My name is Kevin Wattier and I am General Manager of Long Beach Water, an urban municipal water supply agency located in Long Beach, California. I am a licensed Professional Engineer and Grade 5 Water Treatment Operator.

My verbal testimony today will summarize the development and current status of the Long Beach Seawater Desalination Project; currently the largest Federally authorized project of its kind in the United States.

The Long Beach Desalination Project represents the Federal government's current investment in seawater desalination research and development. In full partnership with the United States Bureau of Reclamation, through work at a 300,000 gallon-per-day prototype desalination facility, we are attempting to optimize a unique and extremely innovative membrane technology, which was developed by engineers at our agency, that has indicated several advantages over traditional reverse osmosis methods when tested on a small scale.

Development of this research facility is also being made possible by generous assistance from the Los Angeles Department of Water & Power.

Additionally, together with the Bureau of Reclamation, we will construct an Under Ocean Floor Intake and Discharge Demonstration System, a project we believe is among the first of its kind in the world, that will effectively demonstrate an alternative to traditional open ocean intake and discharge practices.

The two parts of this large research and development project are aimed at fulfilling the Intent of The Congress, put forth by this Committee in its 1996 funding authorization for the Long Beach Desalination Project, which is to drive the cost of seawater desalination down through advancements in technology.

The work being done in Long Beach is consistent with the recommendations on pursuing seawater desalination contained in the Department of Interior's recent publication entitled, "Water 2025: Preventing Crises and Conflict in the West."

Today, I will give you a progress report on this project, in which you all are a partner.

By way of background, Long Beach Water currently meets the annual water demand for the 500,000 people living in and around the City of Long Beach through a broad resource portfolio, 42 percent of which is water imported into Southern California by the Metropolitan Water District via the State Water Project and the Colorado River Aqueduct; 38 percent is groundwater which is pumped and treated locally; and the final 20 percent of demand is met through conservation and use of recycled water.

Long Beach believes implementation and management of a diverse water supply portfolio is the most effective way to mitigate variable constraints inherent with imported and groundwater supplies.

By the beginning of the next decade, Long Beach Water's supply portfolio will resemble that of an experienced and successful investor's: smart, balanced and most importantly productive, while maximizing flexibility.

In Long Beach, the reliability of our future water supply rests on four pillars of critical investment: Conservation, Reclamation, Conjunctive Use and Seawater Desalination. Increased implementation of aggressive conservation programs, expansion of recycled water distribution systems, innovative and increased utilization of

our groundwater basin and seawater desalination, as a package, for the foreseeable future, will mitigate variable constraints on imported and groundwater supplies, significantly strengthen water supply reliability and keep water rates low.

We recognize conservation as a top priority in our water resource management strategy. As a City, we are using the same amount of water that we did in 1987, even though our population has increased by over 100,000 people.

Major components of Long Beach's water conservation program include: aggressive system maintenance; participation in the Metropolitan Water District's Regional Conservation Credits Programs; implementation of Conservation Best Management Practices; use of economic and financial incentives to encourage efficient water use; implementation of water use regulations through local ordinances; and extensive public relations and community education programs to teach and encourage the community how to use water wisely.

Long Beach is aggressively expanding its reclaimed water system with the construction of 84,000 feet of new reclaimed water pipeline, new pump stations, and the conversion of two existing water reservoirs into reclaimed water storage. The expanded reclaimed water system will provide 4,000 to 9,000 acre-feet a year of reclaimed water to the populations living in and around the City of Long Beach.

In addition, Long Beach Water has partnered with the Water Replenishment District of Southern California in constructing a water treatment facility capable of producing 3,000 acre-feet per year of treated reclaimed water. This water replaces potable water that is currently being injected into the existing Alamitos Seawater Intrusion Barrier to prevent seawater from contaminating the groundwater supply. Again, through rigorous conservation and water reclamation, Long Beach Water has been able to reduce approximately 20 percent of its total water demand from ground and imported water sources.

Long Beach Water has a conjunctive use program in place for drought years. The Long Beach conjunctive use program allows us to capture excess water during wet years and store up to 13,000 acre-feet or 4.2 billion gallons in the Central Groundwater Basin for use during dry years.

Seawater desalination has indeed emerged as one of several alternatives for stronger water supply reliability. In fact, we believe that early in the next decade, seawater desalination could help meet 10 percent of our customer's annual water demand. However, we believe significant opportunities to further reduce the operating costs of seawater desalination exist, making it an even more affordable option for water reliability. Long Beach has chosen to pursue these opportunities prior to moving forward on construction of a full-scale production facility.

Using a small 9,000 gallon-per-day pilot scale desalter since 2001, Long Beach Water has significantly reduced the overall energy requirement of seawater desalination using a relatively low-pressure, two-pass nanofiltration process, which has come to be known as the Long Beach Method. Testing at this scale has estimated this new technology to be 20 to 30 percent more energy efficient than reverse osmosis.

This technology, among other critical processes, will now be tested on a larger scale. A Federal funding agreement with the U.S. Bureau of Reclamation was signed in September of 2002, to design and construct a 300,000 gallon-per-day prototype seawater desalination research and development facility. This funding agreement provides 50 percent, or up to $20 million, of the total cost of the Long Beach Seawater Desalination Project. Total cost of design, construction and operations for this 300,000 gallon-per-day prototype facility is $8 million. To date, total Federal appropriations of $4 million have been received since FY'02.

The Long Beach Prototype Seawater Desalination Facility will be operational in August of this year. Once operational, Long Beach Water and Bureau of Reclamation officials will conduct 18-months of research. The research conducted at this facility will be among the most advanced seawater desalination research being undertaken anywhere at this time. With the data we gather, we will verify energy savings of the two-pass nanofiltration method, and optimize the process so that it can be easily duplicated.

Among the research being conducted in Long Beach will be a full-scale, side-by-side comparison of the two-pass nanofiltration and single-pass reverse osmosis methods of desalination, the only full-size, energy-use comparison of these two processes being conducted at this time. The Long Beach project will also test many of the newest Energy Recovery Devices being made available.

We will extend our efforts beyond optimization of the two-pass nanofiltration process and seek out innovative and affordable ways to develop other components of a full-scale desalination facility, while looking ahead at some of the common operational challenges faced by other desalination facilities around the world. Issues

such as seawater intake, pre-treatment, and brine disposal affect both the two-pass nanofiltration and reverse osmosis processes.

In partnership with the Bureau of Reclamation, we are currently planning the design, construction and subsequent research activity of an Under Ocean Floor Intake and Discharge Demonstration System, among the first of its kind in the world. We believe this research will demonstrate an alternative and environmentally responsive method of seawater intake and brine discharge using slow sand filtration, and that existing beach sand under the ocean floor can be a viable pre-treatment method for seawater desalination.

Mr. Chairman, I would like to thank this Committee, The Congress and the Bureau of Reclamation for your continued confidence in the partnership that the Federal government has with Long Beach. We continue to strive to provide you with a tangible return on your investment in seawater desalination research and development. We look forward to sharing our research with this Committee and other stakeholders in the months ahead.

I will be happy to answer any questions you might have.

Thank you.

LONG BEACH

Seawater Desalination Research & Development Project

White Baker Tanks, designed to hold treated water once research commences, are shown on May 17, 2005 as work continues at the site of Long Beach Water's Seawater Desalination Research & Development Facility.

WWW.LBWATER.ORG

LONG BEACH
Seawater Desalination Research & Development Project

Chemical Feed Pumps, designed to provide chemicals for desalination research and development, are shown on May 17, 2005 at the facility's chemical feed area. The area will store chemicals in a safe, specially-designed container, all part of Long Beach Water's Seawater Desalination Research & Development Facility.

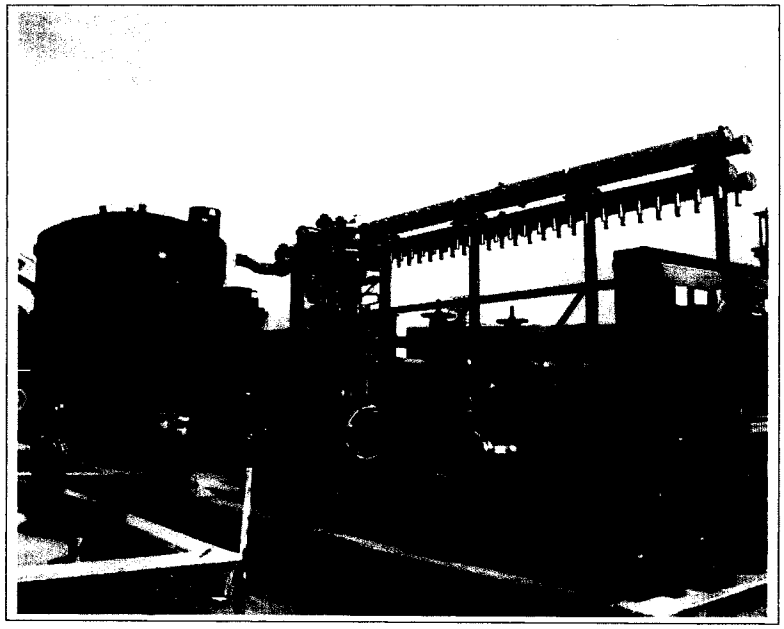
WWW.LBWATER.ORG

LONG BEACH
Seawater Desalination Research & Development Project

White Clean-In-Place Tanks, designed to hold chemicals that will periodically clean membrane systems housed in the fully-built **Nanofiltration Units**, also shown above, as seen on May 17, 2005 while work continues at the site of Long Beach Water's Seawater Desalination Research & Development Facility.

WWW.LBWATER.ORG

LONG BEACH
Seawater Desalination Research & Development Project



The **Microfiltration Pretreatment System**, shown on May 17, 2005 at Long Beach Water's Seawater Desalination Research & Development Facility, is designed to remove suspended materials in seawater utilizing microfiltration membranes. It will serve to pre-treat seawater prior to undergoing the two-pass nanofiltration process.

WWW.LBWATER.ORG

LONG BEACH
Seawater Desalination Research & Development Project

The **Motor Control Center's Electrical Panels**, shown on May 17, 2005, will measure, supply and record the energy consumption of various parts of the research and development system at Long Beach Water's Seawater Desalination Research & Development Facility.

WWW.LBWATER.ORG

Mr. RADANOVICH. Mr. Sabol, welcome to the Subcommittee. You may begin.

STATEMENT OF COLIN R. SABOL, CHIEF MARKETING OFFICER, GE INFRASTRUCTURE, TREVOSE, PENNSYLVANIA

Mr. SABOL. Thank you, Mr. Chairman and members of the Committee, for allowing me to appear before you today.

GE invests $3 billion in research and development annually, and our Water and Process Technologies business is a leading global supplier of water treatment systems and services.

Water is the lifeblood of industry, and our products and services conserve billions of water gallons per year for our industrial customers. Our water scarcity solutions create safe, affordable water for millions of people living in water-scarce regions throughout the world.

A picture is worth a thousand words, and I have a few slides on the easel over here that will help. They are also part of my written statement.

Global water stress is spreading throughout the world——

Mr. RADANOVICH. If I can interrupt you—we won't hold you on the time—but if you could bring those slides a little closer that would be helpful for us. Is there more than one slide, or is that it, sir?

Mr. SABOL. There are several. They are in the written testimony, if you happen to have it in front of you. If not, we will bring them forward.

Mr. RADANOVICH. It is in our testimony. Maybe during the questioning we can go through the slides.

Mr. SABOL. Great.

Global water stress is spreading throughout the world. Today, there are about 4 billion people in the world that are living in a water stress area. That number is going to increase to 6 billion people by 2025. These water scarcity issues are also occurring here in the United States on the west coast, on the east coast, as well as here in Washington, D.C. Where we have lead in the drinking water.

Many regions in high-stress situations have abundant water supplies nearby, but they are not in a usable form. Water in the form of seawater, brackish water, and wastewater can be sources of new water to relieve water scarcity. There is a slide that is in your written testimony that also shows the various sources of new water. These various sources include seawater desalination, but they also include brackish water desalination and the recovery of wastewater for reuse in industrial and agricultural purposes.

It is important to note that desalination of seawater is much more expensive than it is to reuse water from wastewater sources or from brackish water sources, on the order of magnitude of two times more expensive to desalinate seawater.

The technologies that are developed to desalinate seawater are translatable into brackish water desalination and into reuse, so it is important to invest in technology, but I hope this Committee focuses not just on seawater desalination but also creating new sources of water from reuse and brackish water.

Desalination costs are driven by a couple of things: one, the lifetime of plants, the capital costs of these plants, contributes greatly to the overall cost of running a plant; and, second, energy, as we have talked about today.

This chart depicts—the two bars on the left are thermal desalination, the technology of choice in the Middle East. The chart on the bar on the right is reverse osmosis, or membrane-based, desalination. You can see reverse osmosis or membrane-based desalination is the least expensive alternative for desalinating seawater and brackish water today.

Technology advances have driven the cost of desalinating seawater down dramatically over the past couple of decades. Our figures show that the cost of desalinating seawater back in 1980 was as high as $20 per 1,000 gallons. The industry is manufacturing seawater desalination at a cost of $3 to $4 per 1,000 gallons reliably today. We think this number can be driven even lower.

The technologies that we are focused on at GE in driving this cost even further down are as follows: number one, high-rejection energy efficient membranes; number two, chlorine-resistant, long-

life membranes; number three, energy recovery devices; number four, the combination of energy and water systems and designing them in a way such that the total system is optimized; and high-efficiency pretreatment systems to enable longer life of plants.

In conclusion, subsidies can create a means to encourage investment in desalination technologies. They can help build and install a base today. So, for that purpose, they can be very valuable. We can learn from that installed base.

But we believe that long-term solutions lie in advanced technologies that create economical water scarcity solutions. A broad research and development program that is focused on membrane advancements and improved energy efficiency could lead to a 30 percent reduction in operating cost and a 25 percent reduction in capital cost, encouraging industry and potable water providers to reduce their reliance on surface water.

As a leader in the industry, GE looks forward to working with policymakers, users, and the technical community to continue to improve technologies that address water scarcity solutions.

I thank you for the time, and I look forward to answering your questions.

Mr. RADANOVICH. Thank you, Mr. Sabol.

[The prepared statement of Mr. Sabol follows:]

Statement of Colin Sabol, Chief Marketing Officer, GE Infrastructure

Introduction

Chairman Radanovich, respected members of the Committee, thank you for inviting me to appear before you today. It is my honor to address the topic of clean water scarcity and to share our views on how advanced technologies can reduce the cost of providing clean water and increase long-term water availability in an economically sustainable way.

Background

GE is a global leader in diverse technologies and one of the world's most recognized brands. We invest over $3 billion on R&D annually and provide our customers with advanced technologies that reduce emissions, increase energy efficiency, enhance safety and security, and improve health care. GE Water & Process Technologies is a leading global provider of water treatment systems and services. Water is the lifeblood of industry, and our products and services conserve billions of gallons of water annually for our industrial customers. Our treatment systems also create safe, affordable water for millions of people living in water-scarce regions of the world from many sources, including brackish water, sea water and recovered water. GE does this using multiple technologies, including reverse osmosis, electrodialysis, and treatment systems that remove impurities and improve water quality.

Water Scarcity is Spreading

As population increases and industrial development expands, the stress on water resources will continue to increase. According to the World Meteorological Organization, the number of people living in regions defined as "stressed": and "high stress" will increase from 4 billion in 1995 to nearly 6 billion in 2025 B an increase of 50% in 30 years. (Figure 1).

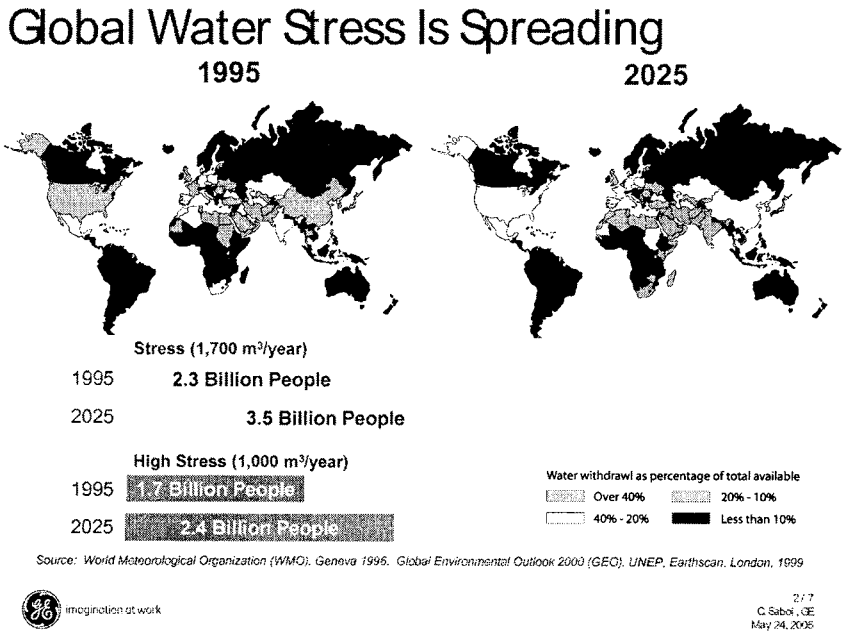


Figure 1: Global Water Stress

This is a global trend that can also be felt in the U.S. due to shifts in population and impairment of existing water resources. For example:

- Increasing populations and high demand are depleting freshwater aquifers in the southwest US;
- Groundwater contamination is a growing problem in New England;
- Competition for water access in the Colorado river basin have created far-reaching economic and political tensions in that region;
- Lead and bacteria contamination have affected drinking water supplies in areas, including here in Washington DC.

Paradoxically, many regions of high stress have abundant water supplies nearby. The problem is one of access to clean, usable water. There are technology solutions to this problem. GE and other companies are able to provide technologies to convert seawater, brackish water and recovered water into useful water supplies. As demand increases, it will become increasingly important to reduce the cost of water by reducing capital cost, energy cost, and operating maintenance cost.

Economics of Water Treatment and Desalination

Water treatment costs vary by the amount of salt removal, type of technology, cost of energy, and size of plant. As shown in Figure 2, different water resources require different treatment technologies, and higher salinities have higher costs.

Desalination costs are dominated by capital investment, energy and maintenance costs. (Figure 3) Reverse osmosis systems, which utilize membrane technology for water treatment, have the lowest cost of operations, especially in areas with high power cost.

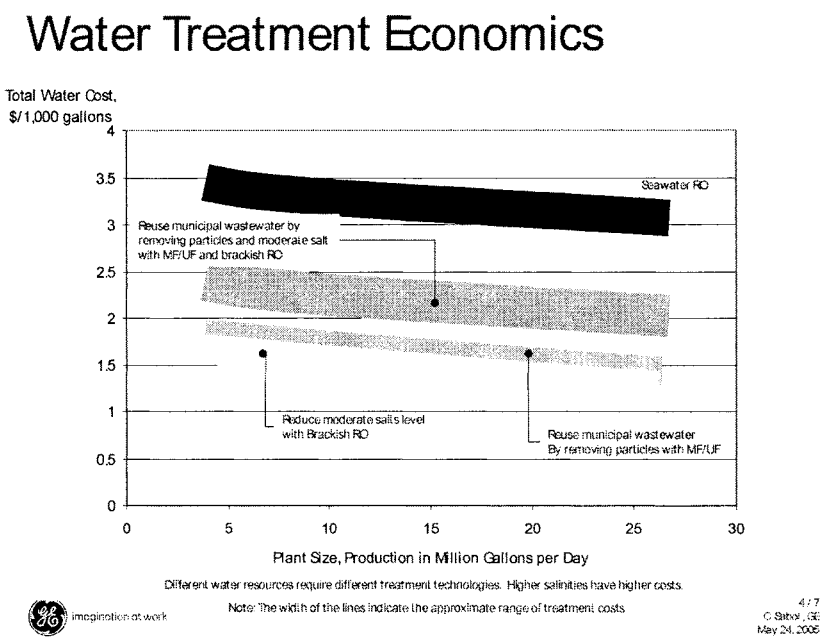


Figure 2: Desalination Costs by Method

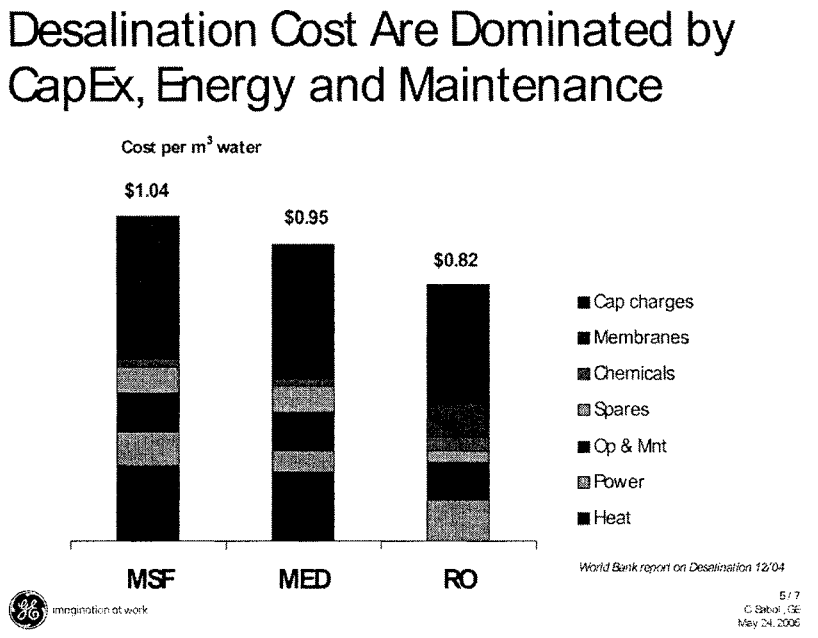


Figure 3: Desalination Cost Breakdown

Technology Advances Have Reduced Cost of Clean Water

GE and others have made great strides in reducing the cost of desalinating seawater using membranes, from over $20/K-gal in 1980 to under $4/K-gal today (Figure 4).

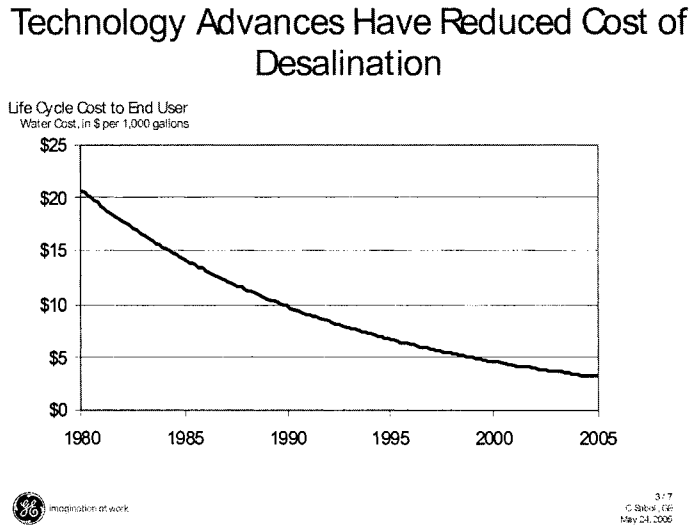


Figure 4: Reduction in Desalination Costs Over Time

While membrane technology advances have resulted in significant cost reductions, energy still accounts for up to 60% of the operating cost (Figure 5). Further improvements in energy efficiency will deliver sustainable reductions in operating cost. Along with improvements in energy efficiency, improvements in membrane performance and membrane life through integrated treatment systems can reduce capital cost and life cycle cost.

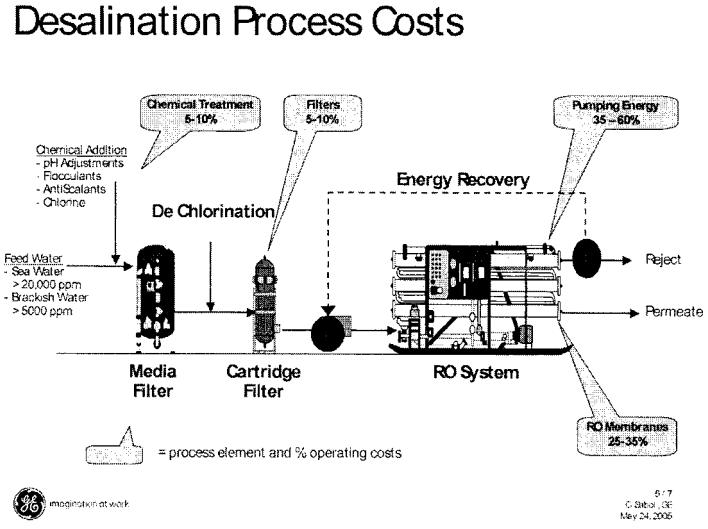


Figure 5: RO Desalination Process Costs

Roadmap for Sustainable Reduction in Clean Water Costs

Membrane-based treatment solutions are essential to creating new water sources such as brackish water aquifers, seawater, and even wastewater. Membrane based desalination is a proven solution, but a broader application of these technologies to create meaningful new water sources requires investment to further reduce the energy consumption associated with the operation of membrane systems.

Significant improvements in clean water cost can be achieved by investing in the development of:

- New membrane systems with improved energy efficiency;
- Higher flux membranes with increased capacity and lower capital costs;
- Higher efficiency of energy recovery systems to reduce energy costs;
- Integrated treatment systems and longer life membranes with higher resistance to chlorine that increase efficiency and reduce maintenance costs.

In addition, innovative financing models and tax incentives can reduce first cost and help accelerate the deployment of these new technologies.

GE is already investing in research to develop membranes that have lower energy consumption, improved life, and innovative integrated treatment systems. Furthermore, through government support, GE is looking at new systems such as the integration of membrane-based desalination and energy generated from wind turbines. We are committed to continuing our efforts in these areas, but government support will facilitate and accelerate these developments.

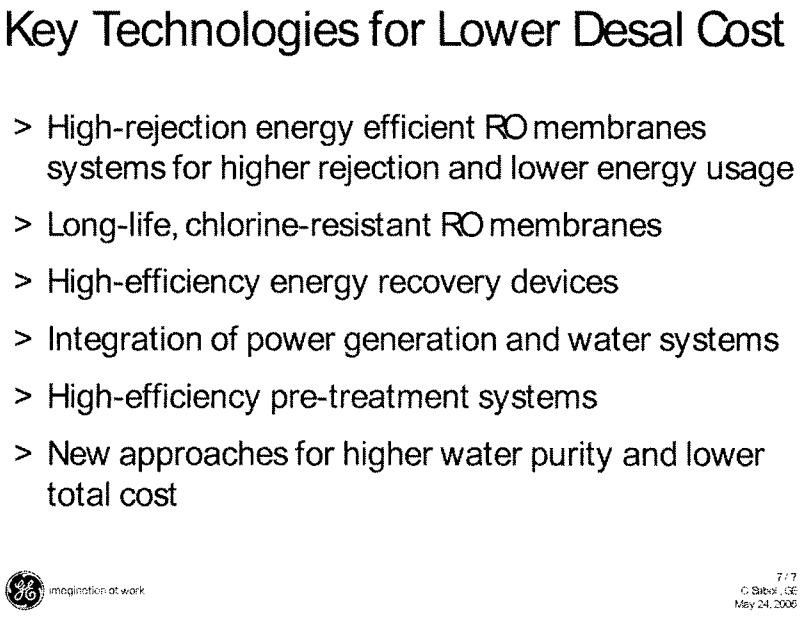


Figure 6: Technologies for Reducing Desalination Cost

Recommendations

We recognize the value of subsidies as effective means to encourage early adoption and deployment of solutions. Technologies exist today that are effective at removing salts and contaminants from water. Short-term assistance with energy cost will help communities in need put solutions in place faster.

However, we think that the long-term solution lies in advanced technologies that make clean water economical and sustainable. A broad research and development program focused on membrane advancements and improved energy efficiency could lead to a 30% reduction in operating costs, and a 25% reduction of capital costs. Additional efforts to develop integrated treatment programs and innovative financing can further reduce the cost of clean water. This would encourage industry and pota-

ble water providers to reduce their reliance on surface water sources by fulfilling their demand with new water sources.

As a leader in the industry, GE looks forward to working with policymakers, users, and the technical community to continue to improve desalination technologies and increase the availability of clean water. Thank you Mr. Chairman and members of this Committee for your time.

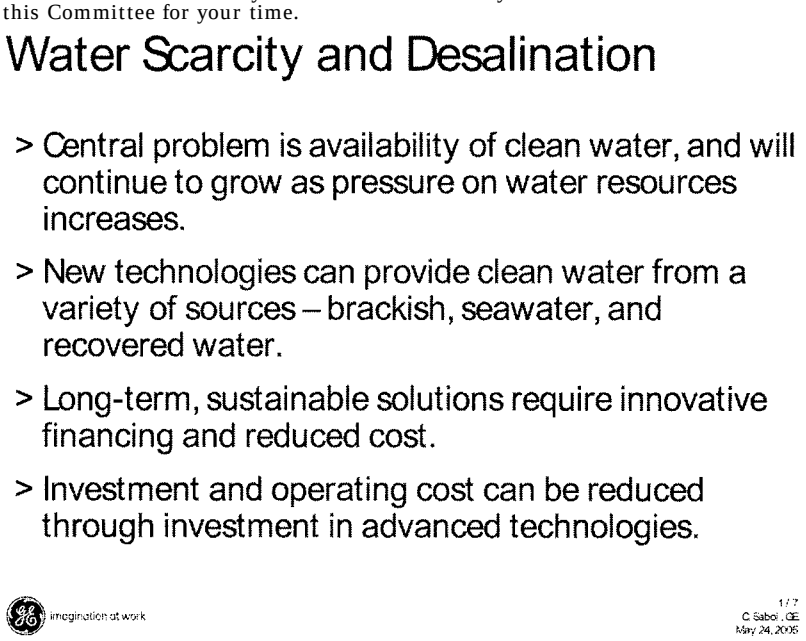


Figure 7: Summary

Mr. RADANOVICH. Mr. McCourt, welcome to the Subcommittee; and you may begin your testimony.

STATEMENT OF PAT McCOURT, CITY MANAGER, ALAMOGORDO, NEW MEXICO

Mr. MCCOURT. Mr. Chairman, members of the Committee, thank you for this opportunity to appear before you today.

I am City Manager for the City of Alamogordo, New Mexico.

Mr. RADANOVICH. Mr. McCourt, would you mind pulling your microphone a little bit closer there? Make sure it is on. That is better.

Mrs. NAPOLITANO. Would you repeat that statement?

Mr. MCCOURT. It is not empirical, we didn't do a scientific study, but what we have found out was that people use a certain amount of water for their basic needs; therefore, pricing did not have a large effect on the lower quantities. As we moved into larger users of water, we found it to be very sensitive with consumers, and so that worked out. We do have a tiered system, as I mentioned in my written testimony. It has significant impact on water conservation.

We have done quite a bit of research. We have been working on developing a new water source approximately 10 years in our

Tularosa basin area. The potable water is essentially used up. We are now looking at nonpotable water. That water will require some type of treatment. Unlike seawater, ours is a variable quality. It goes all the way from about 2,000 parts to, as you heard mentioned by Representative Pearce, about 17,000 parts per million. So our goal is to tap into the best of the bad water at this particular point in time to supply our needs.

The energy cost is a significant factor in any type of desalination project that you do. It has risen very rapidly in recent years. Our initial incremental costs over our other water was at 65 cents per thousand. It has now jumped to 90 cents per 1,000 in the last couple years. So we feel that that is a very important area.

This really sticks in my throat, but I have to say that I don't support the subsidy for operating cost. We think a long-range energy policy which would stabilize energy prices would be more beneficial. Now, having said that, I want you to know if you do choose to pass this bill we will be happy to get in line to help you demonstrate its usefulness.

We do try to keep our costs of operation down as much as possible. We, again, use conservation, as has been mentioned, a very important part. We see desalination not only for our own community but throughout the United States and the world. Inland desalination we see is an extreme area, an area of very large growth coming up in recent years. We face some somewhat unique problems in that. In the brine disposal in the coastal cities, they tend to have an easier concern with that. In the inland cities, we find that to be a much more difficult environmental concern to address.

We—in the case of the major metropolitan areas in Phoenix, they would literally be generating tons of waste products, solid waste product, from desalination projects. We are a little smaller than them, so we don't generate quite that much. But we still do it, generate it.

The Tularosa desalination facility we would strongly encourage. One of the prime functions of that is to look for ways to use the waste product from desalination in an economical manner and, therefore, reduce the overall cost of disposal and protect the environment.

We strongly support the continued funding for research activities.

I will be happy to answer any additional questions you may have. Thank you for this opportunity.

Mr. RADANOVICH. Thank you very much, Mr. McCourt.

[The prepared statement of Mr. McCourt follows:]

Statement of Pat McCourt, City Manager, City of Alamogordo

Honorable Members of Congress, I appreciate the opportunity to address the Subcommittee on Water and Power regarding this important issue of desalination research and water resource management. As you know, this topic is highly relevant in the southwest. I am Pat McCourt, City Manager in Alamogordo, New Mexico, a city of approximately 37,000 citizens. Cultivating reliable and long-term water availability has been one of my most important and challenging tasks since I arrived in Alamogordo.

In the late 1990s, The City of Alamogordo recognized the need for a new long-term, reliable, and cost efficient water source for current and future residents. Our region has a dwindling supply of readily-potable water for a growing population. This problem is exacerbated by a severe, prolonged drought. We have sought many

avenues to protect our most elusive resource. We have taken two approaches for addressing the challenge of providing an adequate water supply. The first step has been to conserve our existing supply, and the second step was to seek a new long-term and dependable water source.

To conserve water, the City of Alamogordo has undertaken proactive, innovative, costly, and some difficult techniques. We have covered and lined all of our potable water reservoirs and treated waste-water reservoirs to prevent leakage and evaporation. To our knowledge, we are the only community in New Mexico and one of very few nationally to have completed such a task. The cost to our City was almost $2,000,000. The combined effect of this program has been a loss prevention of up to 1.44 million gallons a day during the summer months, and up to 600 acre-feet per year. The City has instituted an ongoing repair and replacement program that is designed to keep the delivery system in a good state of repair. This is essential to minimizing unnecessary losses from the system and to assuring that the maximum amount of water is delivered to the users. The City has adopted a very extensive reclaimed water program to reuse available water and maintain a quality of life in the community beyond bare subsistence. The City has routed reclaimed water to all major city green space, the high school athletic fields, one junior high athletic field, city ball fields, two cemeteries, the landscaping on city buildings, and the zoo. Additionally, the City requires the construction industry to use reclaimed water for construction purposes (dust control and settlement). Reclaimed water is sold to contractors. They must sign up for a meter with the Utility Billing Department. The City uses reclaimed water in the Public Works yard for cleaning of equipment and for any City repair work on streets. The net result has been to shift from potable water to reclaimed water—approximately 499 million gallons of reclaimed water were used in 2004. Recent updates to the reclaimed water system include the addition of a one million gallon storage tank. This will increase our storage capacities to 2.5 million gallons. This extensive reclaimed system has been highlighted in a water conservation documentary regarding the drought situation in New Mexico. The City has spent over $4 million constructing 16.2 miles of pipeline, two booster stations, and storage for this reclaimed system.

In 2004, the Department of Public Safety/ Fire Services implemented innovative methods to conduct required equipment testing. They built a pump test facility and installed an in-ground tank to re-circulate fire truck testing water. A modified surplus tanker is used for hydrant flushing. Water is captured by the tanker, released into the sewer system, and used in our reclaimed water program. The Department contracted a consultant to conduct a computer analysis of hydrant flow capabilities throughout the City, which provided an accurate gallons-per-minute measurement of each hydrant's capacity. These testing methods save tens of thousands of gallons per year.

The City Commission has adopted a Water Conservation and Rationing Ordinance, which has been updated several times, to establish community values for appropriate uses of water and to allocate the available resources when they are in short supply. The City uses a tier rate structure, reviewed yearly, to encourage the prudent use of water by each customer. Our average daily use has declined steadily, and reached a low measure of 4.82 million gallons per day (MGD) in 2003. This amount is down from as much as 7.73 MGD in 1992. The City has provided education and incentives to assist citizens in reducing usage of water while maintaining a reasonable lifestyle. We use a broad-based program that incorporates the customer's freedom of choice, economics, and good stewardship of the water resource to provide a high quality water delivery system in Alamogordo. Our water conservation success has gained Alamogordo national attention from entities such as the National Municipal League and the Ash Institute for Democratic Governance and Innovation.

Unfortunately, water conservation alone is not enough to ensure a future supply for even our current residents, or to provide the water necessary for the continued growth of our community. During periods of low storage, we have had to enact emergency stages of rationing. In our approach towards securing a new, long-term, reliable potable water source, several options were researched in great detail. Consulting engineers looked at current and future feasible sources for the City. Current water sources include Bonito Lake, canyon flows, and well fields. In March 2003, at the time of the development of the 40-Year Water Plan, our water rights totaled to a consistent, firm supply of 4,500 acre-feet/ year, but we were using over 6,000 acre-feet/ year. Research, and the resulting 40-Year Water Plan, provided suggestions for making the current supply last as long as possible. These suggestions were agreed to and accomplished; such as expansion of the reclaimed water system and restoring two dilapidated wells in a well field southwest of the community. The following alternatives for a future supply were investigated and considered not

feasible: a Sacramento River pipeline, flood control recharge, fresh ground water south of Alamogordo, Salt Basin water pipeline, Three Rivers water pipeline, and agricultural water conversion.

After considering all available alternatives, the study concluded that desalination of brackish water was the most feasible way to produce a quality and quantity of "wet" water to cover future demands. The Tularosa Basin sits atop a vast aquifer of brackish water. The City is also involved in an associated national desalination project. The Tularosa Basin Desalination Research Facility is a joint project managed by the U.S. Bureau of Reclamation. A Naval Research Unit is currently conducting the research at the facility. The City of Alamogordo has provided the land for the facility. This is a research facility designed to look at the growing shortage of potable water at inland sites. Desalination research which has been conducted in the past has focused on the techniques needed to operate desalination facilities on ocean front areas. Inland sites face unique problems in operation that are not faced by ocean-site facilities. These problems include how to dispose of the brine waste product in an environmentally acceptable manner. Ideally, solutions will be developed to use the brine waste product in not only an environmentally acceptable manner but also in an economically advantageous manner. The City of Alamogordo will integrate the results of this facility's studies into our desalination project.

The City of Alamogordo's plan is to utilize desalination to provide potable water to residents in Alamogordo and the surrounding area. This method will allow other potential users, such as Holloman Air Force Base, the Villages of Tularosa and possibly La Luz, to utilize the expanded water supply. Alamogordo is currently in a legal process to obtain water rights necessary for the project at the most appropriate location, north of Tularosa. Alamogordo is also undergoing a NEPA study to determine if there will be any significant impact to the environment and if so, how to best avoid potential impacts. Mineral by-product disposal management is just one of the issues that this in-depth environmental study is considering.

Research has brought down the cost of desalination by providing standardized equipment. There are several methods of desalination, all of which were considered during our feasibility phase. Two such methods are ion exchange and reverse osmosis membrane filtering. The City of Alamogordo has chosen to use a membrane to treat brackish water because it is the most cost effective for our use, as we are utilizing gravity pressure to save on electricity costs. In 2001, during our water plan development and the desalination feasibility study, it was estimated that the costs associated with the desalination method would be approximately $34 million to construct the plant and delivery system, and $0.65 per 1000 gallons in operating and maintenance costs. The May 2005 estimate is $0.90 per 1000 gallons. This increase is due mainly to power and chemical costs, which have risen since the 2001 estimate. Our production, or operating and maintenance expenses, will also vary depending upon the method chosen for disposal of concentrate. These figures will be above and beyond our current system's delivery costs. Currently, the cost to deliver water to a residential customer averages about $2.93 per 1000 gallons.

Alamogordo submits our rates to the State of New Mexico every year by survey for a community comparison. The State compares communities by looking at a consumption rate of 6,000 gallons per month. We are right in the middle of the State's average range, which for 2003 was between $17 and $20 billed for 6,000 gallons consumed. Our current water rates for 6,000 gallons run $18.05. Desalination will raise customer rates, and the capital costs for completing the project are still being acquired as each phase is initiated. However, research and a careful review of our available resources makes us confident in the decision that desalination is the only method which can provide the quality and quantity of water that Alamogordo will need in the very near future.

The permitting process in New Mexico is a lengthy and sometimes difficult process. The State of New Mexico along with 18 other western states have water laws based upon the doctrine of "prior appropriation" with beneficial use being the basis, the measure, and the limit of the right to use water. The water in New Mexico does not belong to the surface owners, but to the people of the State of New Mexico. To appropriate these waters, an application must be filed that states the intended points of diversion, place, and purpose of use. This application must be advertised, per statute, and is subject to protest. If no protests are filed the application is reviewed by the New Mexico State Engineer's Office Water Rights Division to assure that there is water available for appropriation that the appropriation will not impair existing rights, and that granting of the application will not be contrary to conservation or public welfare in the State. If the application is protested, as was the case for the City of Alamogordo, the application goes to an administrative hearing process where the Protestants are provided an opportunity to present evidence that the application should be denied based upon the aforementioned criteria. The Water

Rights Division is also a party and presents their evidence. The applicant is faced with the burden of proof and presents its case in favor of the application. This process involves hydrologic analysis, engineering assumptions, supply and demand analysis, and the legal presentation of those tasks and results. All evidence is presented to a hearing officer representing the State Engineer. After weighing the evidence, a determination on the application is made. Based upon the outcome of the hearing process, the State Engineer either approves the application to appropriate water and issues permits to drill at pre-described locations and depths, or he denies the application. Alamogordo's application was approved at less than the amount requested, and this allocation has been appealed to the judicial system. We are still in a legal battle to be able to utilize the rights approved by the Office of the State Engineer in 2004.

What Congress can do to further bolster our efforts is to recognize the urgent need for alternative, non-traditional water supplies, to continue funding support through sources such as the Environmental Protection Agency, the Corps of Engineers, and the Department of Interior—Bureau of Reclamation, and to assist entities with identification of potential sources by supporting research and development. Alamogordo truly appreciates the funding and technical assistance we have received on this project. We have utilized Federal, State, and local dollars to come this far. We have completed a pilot project, a feasibility study, infrastructure improvements, planning stages, and are in the middle of our NEPA study and water rights allocation process. I look forward to the opportunity of updating you with the good news that we have begun construction within the next two years. Thank you again distinguished Members of Congress for your interest in this important issue of affordable, clean water, and for the opportunity to share my community's story with you.

Mr. RADANOVICH. Mr. Max, welcome to the Subcommittee; and you may begin, as well.

STATEMENT OF MICHAEL D. MAX, CEO, MARINE DESALINATION SYSTEMS, L.L.C., ST. PETERSBURG, FLORIDA

Mr. MAX. Thank you, Mr. Chairman. Thank you for this opportunity to testify.

I request that my written statement be included in the record.

In your letter of invitation to me to present testimony on the issue of desalination, you noted that ensuring a continual supply of affordable, clean water is vital, and the process of desalination is one direction policymakers can pursue. I strongly agree with the identification of clean water supply as a national issue and with desalination as being a principal solution to the emerging problem.

There is a national as well as an international shortage of water now, and the problem is getting worse daily. The problem is national because States share water resources. In fact, the water problem is international because we share water with our continental neighbors.

The combination of increasing demands and degrading natural fresh water supplies is moving us toward the tipping point where, without new sources of clean, fresh water, severe water restrictions and steeply elevating water costs will become inevitable.

New fresh water sources are required. More efficient water distribution of the national water might be done by building a national water grid but at a huge expense; and, even then, the natural water supplies would not be sufficient, even with conservation. The only long-term solution to new water sources is large-scale desalination of seawater.

Provision of water from the sea makes sense, because over 70 percent of our population lives within 100 miles of the sea. The fresh water produced from the sea could be delivered at relatively low transport costs. This would reduce the demand on water

resources further inland, which now have to share water with the thirsty and more heavily populated coastal areas.

I talk about seawater desalination from the viewpoint of a scientist who felt that the impending worldwide water crisis was important enough to try to make a difference by developing a promising new technology. I left my post at the Naval Research Laboratory and established a small company. My intention is to try and perfect a chemical engineering method of seawater desalination that will be large-scale, inexpensive, and more environmentally friendly than any other technology.

I have over 250 scientific publications. My company, Marine Desalination Systems, has initiated and carried out sustained research and development of industrial crystallization in the field of chemical engineering, and we presently have over 12 patents. We have identified two different approaches and are pushing toward development of practical industrial processes. We have designed, fabricated and carried out experiments in unique apparatus; and we believe that we are in the last stages of perfecting a new desalination technology.

The water crisis in the United States presents us with two distinct problems: first, desalination needs to be encouraged to meet existing and immediately looming water shortfalls; and, second, research needs to be carried out that has the possibility of dramatically lowering the cost of seawater desalination.

The United States needs to initiate a two-pronged attack on the problem of water shortage. Immediately, it is necessary to encourage existing desalination production. This can be achieved by providing incentive payments to producers of any desalination technology that would have the effect of reducing the cost of energy consumed for desalination. Incentivization of the cost of energy should be regarded as a temporary measure, required only to bridge the transition to more efficient desalination. In other words, the incentivization should be fixed on the energy component of desalination and not on the cost of desalinated water as a whole.

The overall aim, however, should be to develop new desalination technologies that will achieve sufficient improvement in energy cost of desalination so that the energy incentive payments no longer become necessary and in as short a time as possible.

Investing in research will broaden the technological base in a way that mitigating current production costs cannot. The promotion of innovative research into new and more efficient technologies should be embedded in the bill.

Innovative research is required, rather than incremental improvements to existing technology that only constitutes improvement of mature technologies. That, I am afraid, constitutes the majority of present desalination funding. Only increased-risk research and development can produce the great result of a downward step-function in the energy cost of desalination and to a new fresh water provision paradigm for all of us.

Currently, seawater desalination is targeted at what I would call make-up water. That is, desalinated water now bridges the gap between the amount of water that can be produced between existing fresh water sources and actual demand. Our intention should be to carry out seawater desalination at costs that make the new

methods of seawater desalination the new major supply of fresh water. We need rivers from the sea.

In closing, I would like to add that government sponsorship of new desalination technologies and combinations of new and conventional technologies is the one critical factor that may result in the establishment of a new seawater desalination paradigm that has the potential to radically alter the present situation of an intensifying shortage of water situation.

I look forward to answering questions.

Mr. RADANOVICH. Thank you very much, Mr. Max.

[The prepared statement of Mr. Max follows:]

Statement of Michael D. Max, Chief Executive Officer, Marine Desalination Systems, L.L.C.

Mr. Chairman, in your letter of invitation to me to present testimony on desalination, you noted that, "Ensuring a continual supply of affordable clean water is vital, and the process of desalination is one direction policy makers can pursue". I agree strongly with the identification of clean water supply as a national issue and with desalination as being a principal solution to the emerging problem. The situation in the United States is a reflection of an impending world water crisis, as the combination of increasing demands and degrading natural fresh water supplies move us toward the tipping point where without new sources of fresh water, severe water restrictions and steeply elevating water costs will become inevitable. The impending water crisis is a national issue now because States share water resources. When large scale desalination becomes a reality, more than one state is likely to use the water produced by any coastal state. This sharing of resources will continue to be important as some current net water importing states may assume the role of water exporters. Thus, water supply is and will continue to be a national issue.

My background is extensive in a number of areas of scientific investigation and in the development and execution of basic and applied research. I talk about desalination not from the viewpoint of an established technology or company but from the viewpoint of a scientist who felt that the impending worldwide water crisis was important enough to try to make a difference by developing a promising new desalination technology. So, I left my post at the Naval Research Laboratory in 1999 and established a small research and development company with the help of a small group of visionary investors. My intention was to try and develop a chemical engineering method using industrial crystallization practices that would result in a new method for the large scale, inexpensive, more environmentally friendly, desalination of seawater. In this effort, I have become acquainted with the broad range of desalination and water treatment issues, with researchers improving existing technologies and with the development of new technologies.

I have over 250 scientific publications, with many in the field of gas hydrate, which is the industrial mineral we have identified to be used in the chemical engineering/industrial crystallization process that we believe has an excellent chance to become a new method for large scale, inexpensive seawater desalination. I am involved in the field of gas hydrate in a number of areas including the recovery of natural gas from oceanic and permafrost hydrate, industrial applications of gas hydrates including two technologies for desalination, and the planetary science aspects of gas hydrate. My edited introductory book on gas hydrate is being used as a course textbook by universities not just in the United States but also across the world. An industry-standard book on the exploration and extraction aspects of hydrate natural gas is currently about to go into press for publication in the autumn. My company holds over 10 patents in the field of chemical engineering for desalination and has more applications under examination and in preparation to make applications.

The one thing that is no longer a matter of debate is that a national shortage of fresh water exists in the United States. To some extent, the problem is parallel to any couple, which has not saved or invested enough to allow them leisure in their retirement. Their problem is not understanding how to manage their money better, for no matter how they manage it, there will not be enough to confer what they want. Their problem is that they do not have enough money. Similarly, the world's water problem can be mitigated somewhat by conservation and better water use but the widespread impending water shortage can only be fully resolved by finding new and inherently artificial sources of fresh water. The only available source of large quantities of fresh water potentially lies in the world's oceans. But this fresh water

must be removed from the seawater by a process called desalination. We must find both better and new ways to produce new fresh water.

Currently, desalination is targeted, mainly because of its high cost, at what could be called, "make-up water". That is, desalinated water is now intended to bridge the gap between the amount of water that can be produced from existing natural fresh water sources and the actual demand. Our intention should be to be able to carry out seawater desalination at costs that make it competitive with natural fresh water sources. When this can be achieved, some, if not most of the water that is currently being extracted from natural sources, can be allowed to remain in the natural cycle. Our aim should be not only to produce adequate volumes of fresh water from seawater, but also to restore the environment as a natural outcome of achieving the technology required for this new paradigm.

There is a national shortage of water now and the problem is intensifying. In addition, where there is overuse of natural water sources this leads to environmental damage. It is therefore prudent to initiate a two-pronged attack on the problem of water shortage through desalination. Immediately, it is necessary to encourage existing desalination production. This can be achieved by providing incentive payments to producers (of any desalination technology) that would have the effect of reducing the cost of energy consumed for desalination. The aim should be, however, that new technology developments should achieve sufficient improvement in energy cost of desalination so that the new or sufficiently improved technology can be implemented without the energy incentive payments required for the existing technology. In other words, the incentivization should be fixed on the energy component of desalination and not on the cost of the desalinated water as a whole. incentivization of the energy cost should be regarded as a temporary measure required only to bridge the transition to more efficient desalination. While making incentive payments to lower the energy costs of conventional desalination, it is mandatory to also support research that would lead to enabling new technologies. Investing in research will broaden the technological base in a way that mitigating current production costs cannot. The promotion of innovation and research into new and more efficient technologies should be embedded into the Bill.

In order to make real progress on developing new and more efficient desalination technologies, research and development into new desalination technologies should be undertaken as a matter of urgency. Very little innovative research in new technologies is presently being funded. Commercial companies are making insufficient investment to move any new technologies. American industry has enough other issues that developing enabling new technologies is low on their priority list. Increasing research funding for breakthrough and new technologies has the potential to accelerate a solution. Unfortunately, much of the research and development is being spent on "safe" development, which involves incremental improvements to existing technology, which is actually process optimization, not research. This is happening because of the natural, but unintended operation of research funding where only projects that achieve well-designated goals are regarded as fully successful. Funders have become very conservative because the achievement of the goals identified in proposals and statements of work are the basis of "grading" of the program managers, even though the actual achievements may be very limited and the improvement small. Innovative research, where the fully identified solution is inherently unknown and where the actual framing of the research path itself depends on results produced during the course of the research, is almost unknown today. Therefore, where research is supported as the second prong of the attack on this water problem, it must be vectored toward speculative research and development or it will simply be consumed while producing no great result. Only increased-risk research and development can produce the great result of a downward step-function in the energy cost of desalination and the new fresh water provision paradigm.

Each technology for desalination has its own particular inherent costs and benefits, inhibiting factors and opportunities. Because of this, the different technologies are usually compared through their cost structure. Of these, energy is the primary cost element, although construction costs can vary considerably for different technologies. Desalination technologies fall into two different categories; conventional and unconventional. Conventional technologies for seawater desalination today consist of thermal and membrane processes. These technologies are termed "conventional" because they are regarded as working, industrially practiced technologies that have low risk. With respect to the difficulties commonly encountered in some of these conventional technology desalination installations, for instance the Tampa reverse osmosis facility, substantial risk factors remain even in what is considered conventional technology by industrial proponents. It must be pointed out that sequentially newer conventional technologies only become recognized as conventional after they are implemented in a number of commercial installations. The only way

for a potential new desalination technology to emerge is for adequate research to be undertaken. There is no methodology for evaluating the likelihood of success of potential desalination technologies other than doing enough applied research and development to establish operating parameters and cost factors.

Of the conventional desalination techniques, thermal processes or distillation, for instance, is characteristically the most energy expensive because of the energy cost of boiling water. Modern multi-stage, multi-flash distillation technology is much more efficient than simple boiling, but it still is generally the most expensive method. Thermal methods are the oldest of the desalination technologies and their development has been carried the farthest. There is less potential for development in this technology than any other. Membrane filtration desalination methods, principally reverse osmosis, has its main energy requirement in pumping the source water to high pressures necessary to force it through the membrane filters. Improvements in membranes and membrane technology, and in energy recovery techniques, have vastly improved performance over the last ten or 15 years, but it is still relatively energy expensive. Unless there is some breakthrough in membrane technology that will vastly reduce the energy cost, there is again potentially very little gain to be expected, no matter how much R&D funding is applied. Development of conventional desalination technologies concerns the incremental improvement of existing technologies. As a technology matures, increasingly large investment in product improvement tends to increase performance in only smaller and smaller increments. Both of these conventional methods extract all or most of the water and produce considerable volumes of environmentally potentially harmful brine that has to be safely collected, transported and disposed of in an environmentally acceptable manner. This produced brine must be mixed with seawater.

Because of the limited scope for reaching the new desalination paradigm with further development of existing technology, focused research is required on new methods that have potential for seawater desalination. These methods are mainly in the fields of electrical and chemical engineering applications. A common attribute of electrical methods is that while they may work efficiently with brackish water, the currently practiced methods do not work efficiently with full-salinity seawater. Current developments in capacitive deionization, however, show promise for being able to desalinate seawater. Desalination through chemical engineering, where the formation of a crystalline substance incorporating water and rejecting salt from the crystallized material, is an attractive option.

Principal among the chemical engineering methods for seawater desalination is the use of gas hydrate in an industrial crystallization process. Gas hydrate is a solid crystalline material formed from a cage of water molecules hosting hydrate forming gas molecules within voids in the cages; the entire structure being stabilized by weak electrical bonding forces. It is a special type of clathrate, or inclusion compound. Common hydrate forming gases on Earth are the hydrocarbon gases (methane, ethane, propane, and butane), carbon dioxide, sulfur di- and trioxide, amongst others. At higher pressures and/or colder temperatures, virtually all gases will form hydrates. Although gas hydrate has often been regarded as a type of freeze desalination because of the apparent similarity of gas hydrate to water-ice, the differences between them are far more important. Water-ice (freeze desalination, which has limited scope for seawater desalination as part of an industrial process) is essentially isobaric and the control of temperature alone is available for freezing and melting the water. In contrast, the stability of gas hydrate can be controlled by varying both temperature and pressure. When gas hydrate forms, it is known for strongly rejecting dissolved solids (salts). Gas hydrate occurs commonly in nature, although not at pressure-temperature conditions where it can be easily observed. Natural gas hydrate, which is only now being recognized as potentially one of the major energy reserves of the planet, occurs in both oceanic marine sediments along continental margins and in permafrost regions. Understanding how natural gas hydrate forms has led to research to use gas hydrate as an industrial crystallization product for large scale, inexpensive desalination.

My company, MDS has initiated and carried out sustained research and development of gas hydrate industrial crystallization. MDS is now recognized as one of the leading gas hydrate research laboratories in the world, and the only one regularly growing large volumes of gas hydrate in short periods of time. We have designed, engineered, and fabricated unique experimental apparatus and are currently in what we believe are the last stages of perfecting the hydrate desalination method as an industrial technology. We have identified two different sub-technologies for hydrate formation that each have particular attributes for controlled hydrate formation and are pushing toward development of practical industrial processes. The main one of these is intended to produce very large volumes of fresh water very inexpensively, with very low energy costs.

The water matrix or buoyant hydrate separation process is intended to operate in the sea or in shafts nearby the sea using cold, relatively pure deep seawater. In this process, the hydrate is formed at depth where pressure is provided by the weight of water using natural gas that forms positively buoyant hydrate. No water is pumped to pressure and the cost for injecting the hydrate forming material can be very low where certain common supply conditions can be utilized. Once the hydrate is formed, under counter-flow conditions that hold the crystallizing hydrate in the deep hydrate formation region for a desired period of time, the hydrate is allowed to float upward under its own buoyancy. As it rises in the column or shaft, it passes with insignificant mixing from a region of seawater in the lower part of the shaft to a region of fresh water in the upper part of the shaft. Within this fresh water region, it naturally is subject to decreasing pressure as it rises and becomes unstable at a certain pressure and begins to dissociate. Dissociation is a process similar to melting where the structure at the margin of solid hydrate breaks down and releases the constituent gas and water. The gas and water naturally separate. The gas is drawn off for reuse or use elsewhere, such as in the generation of power, and the fresh water is available to be drawn off. Once the startup period for an apparatus is complete, the amount of water drawn off is directly related to the formation of hydrate. It is intended that very large volumes of hydrate be crystallized and that very large production of water take place. Because no artificial pressurization of water or thermal energy costs of the water are required, it is possible to economically remove only a small portion of fresh water from the whole of the seawater, which results in an environmentally friendly residual cooling water (the process of hydrate formation is exothermic and the water is naturally heated) that will require no mixing with seawater to make it tolerable for marine organisms.

In the course of the MDS research, considerable spin-off technology has emerged in the field of being able to carry out desalination using negatively buoyant gas hydrate and where the source water is too warm for hydrate to form spontaneously as it will in the colder water but whose bulk does not have to be refrigerated, in artificially pressurized apparatus, dewatering industrial process water effluent, such as the settling ponds of phosphate fertilizer factories, removing water from complex fluids such as water and ethylene glycol mixes, separating different gases, such as SOx from exhaust or natural gas, food processing, and the removal of water vapor from gas.

I regard it as likely that in the new desalination paradigm, different technologies can complement rather than replace existing technologies. This is known as a treatment train, the aim of which is to improve overall efficiency and performance. One of the main negative features of new technology development is that existing technology adherents inherently regard the development of new technologies as a threat their desalination technology. It is more likely, however, that bringing hydrate industrial crystallization to the desalination marketplace will actually stimulate the greater use of existing desalination technology, principally membranes or some other desalination methods suitable for brackish water. Future large scale, inexpensive desalination may involve the use of more than one technology, each removing salt within the operating conditions in which each offers best performance. For instance, thermodynamic and process modeling of a chemical engineering process for industrial crystallization using gas hydrate indicates that the process is most efficient at rendering salt from raw seawater of almost any oceanic salinity down to the level of lightly brackish water. Operated less efficiently (with respect to rate of water removal as a function of product salinity), the method may be capable of producing water of potable dissolved solids standards. Even at this level, however, the product water almost certainly will need polishing. When a conventional desalination technology such as reverse osmosis can operate within its most efficient energy/cost region to both polish and produce final product water as part of a multi-system approach, this should remove the need for incentive payments for energy.

MDS has identified Southern California as the first place that we would like to establish a major desalination facility. The deep, cold water necessary for the water matrix hydrate process to operate efficiently is available immediately off the narrow continental shelves of California, particularly southern California. There is no doubt that a market for competitively priced, new sources of fresh water exists. We are presently carrying out a site survey for an artificial island on the Coronado Bank off San Diego, which imports over 95% of its fresh water. And there is no doubt that if our production targets can be achieved that substantial reduction in water extraction for southern California may be achieved, with a consequent beneficial effect for the environment and for the water availability situation in the upstream basin of the Colorado River. Our intention is to develop a desalination installation based on our new technology that will not only provide for all the potable water for San Diego

but to also allow San Diego to export desalinated water inland. Other sites for this MDS technology are also possible to the north along the coast.

In closing, I would like to add that government sponsorship of new desalination technologies and combinations of new or new and conventional technologies, is the one critical factor that may result in the establishment of a seawater desalination paradigm that has the potential to radically alter the present situation of an existing, and intensifying shortage of fresh water.

Mr. RADANOVICH. I have a question for probably both Mr. Sabol and Mr. Wattier. Both of you are doing the research on bringing down the costs and efficient production of water from desalination. One of you is a public agency, the other is private business, and we are talking about a bill that is talking about public financing of this type of technology. I am assuming, Mr. Wattier, that Long Beach would be the beneficiary of something like a subsidy where perhaps GE would not be. Is that the case?

Mr. SABOL. Well, I think, in some ways, GE and other companies that manufacture equipment and provide services into this market could be a short-term beneficiary of a energy subsidy as proposed in the bill. The method of GE's benefit would be that it would spur the market to buy more systems. We would, therefore, sell more equipment into the marketplace.

Mr. RADANOVICH. But as far as doing the research, you would not be applying for a grant to continue the research, would you?

Mr. SABOL. GE invests its own money in research. We oftentimes partner with the government. Several of the previous panel members have worked with GE in the past.

We are working currently on a desalination solution that combines wind power with membrane technology to provide alternative energy sources of desalinating water. So we do frequently use government funding and combine it with our own funding to accelerate the pace of development.

Mr. RADANOVICH. Is there a difference between the type of research you would do, Mr. Sabol, as opposed to what kind you would do, Mr. Wattier? Does public financing have a more appropriate role in one place or the other, or do you just view it as research is good, no matter what.

Mr. WATTIER. I would agree with your latter statement, that research is good. And certainly the private sector can move the technology a long ways forward. Certainly the connection with wind energy and membranes is a very interesting one that Mr. Sabol has mentioned. I think that is a very interesting area of opportunity.

Mr. RADANOVICH. Can you, either one of you, or anybody else want to tell me about the future efficiencies that are going to be gained by further research? Is it just by perfecting the membrane? You know, just more work on the membrane? Or is it in new types of technology, that they are still kind of in its infancy?

Mr. WATTIER. I think they are both. What we have developed in Long Beach is a process application. We have not developed any new membranes. We are using existing off-the-shelf membranes from several manufacturers and using them in a different method. So we haven't developed any new membranes.

But the cost of membranes continues to come down. You may have been aware that the Chinese recently started manufacturing membranes. So there will be Chinese membranes on the market.

There are Korean membranes on the market, which we have tested, which work very well. So the private sector, both in the U.S. And worldwide, is continually improving the efficiency of the membranes and the cost of the membranes.

So there are really two things going on. The private sector is really spurring the development of more efficient, cost-effective membranes; and then what we are doing in Long Beach is using them in a different method.

Mr. RADANOVICH. And economics is bringing the price down.

Mr. WATTIER. Yes.

Mr. SABOL. At GE, we are working on a variety of technologies. I mentioned some in my earlier statement. It is focused primarily around membrane technology developments, allowing more salt removal with less energy. There is a lot of advancement that can be made there through materials changes and the fabrication techniques around membranes. We are also looking at making much larger membranes, much larger systems that enable more efficiency.

We are also focused very heavily, because of GE's interest in the energy markets as well, on the combination of energy and water. The optimization of that system provides a lot of benefit as well. So that is another area of focus for us.

Mr. MCCORT. Mr. Chairman, relative to research, I think membrane technology is the area that there has been the major increases in cost reduction in recent years, and I think that is going to continue. That is an incremental step, and we will continue to work on research in that area. It is not the type of research that my unit of government would perform. We would look for that to occur either in the private sector or be funded at the Federal level.

I think we also have to recognize that the research needs to occur in breakthrough technology. Unfortunately, these are the areas with the highest failure rate, new innovative ideas, and the—but they have the highest potential, also, to cause us to leap forward in technology.

I think there are two different types of research that goes on.

Mr. RADANOVICH. Very good. Thank you.

Mr. McCourt, you had mentioned studying an environmentally acceptable manner to dispose of brine waste. Can you give me an idea of what those possible economic solutions might be?

Mr. MCCOURT. Mr. Chairman, the normal methods for inland brine disposal at this time involve two basic methods. One is to do deep well injection. That would be where you actually drilled deep wells and injected the now concentrated brine water into a layer that is even more concentrated, because it is so far down into the ground, hopefully improve it. The theory being that at some future date when we now tap into that, technology will have advanced and we will recover that water and reuse it again.

Mr. RADANOVICH. Be able to use it?

Mr. MCCOURT. Yes. The second method involves basically an evaporation-type method, where the waste product is put in large evaporative lined ponds. The water then evaporates off. The waste product is then captured, and there is methods used to—well, we are looking for methods to try and see how we can use that waste product in an economically feasible way.

Some of the research going on now, though, is to take that very brine water and see if there aren't other agricultural crops that can be grown with the brine water, for example, and use it economically in that manner.

Mr. RADANOVICH. Thank you very much.

Mr. McCourt, you mentioned about the cost of energy and how it relates to the affordability of this desalinized water. Is there a threshold that you would go through to the point where, if energy costs increased so much, that desalination costs go up too high to be reasonable?

Mr. MCCOURT. Mr. Chairman, I am sure there is. The effect that would have where we live—we live in the desert. We don't have any alternate sources. So what will happen is, as the cost of water, in this case, desalination water that we are going to use to augment our other supply sources, continues to increase, it will just basically squash any economic growth that may be able to occur in our community.

Mr. RADANOVICH. Thank you. Thank you, gentlemen.

Grace.

Mrs. NAPOLITANO. Thank you, Mr. Chairman.

Mr. Max, I was very interested in listening to your testimony in regard to the different types of technology that you have evolved with or have been working with. Does the desal process that you are applying use membranes?

Mr. MAX. No, except in that we use them to infuse a gas into the seawater that we need for the process to work. But that is not the same. And those membranes are not—it is gas moving through membranes into the water, so there is no——

Mrs. NAPOLITANO. Since you advocate this increased risk research, you make a distinction between research and process optimization. The desal research is not doing innovative speculating, so you want more innovative. How can we better direct desal research toward that, and does your proposal also include addressing contaminated and brackish water or just desal?

Mr. MAX. We are primarily focused on desalination, but we also are looking at water treatment in general. But, as Mr. McCourt said, the greater the risk, the greater the reward. This is something where, you know, if you want to play very safe you have no chance of making a breakthrough, even in membrane research. You know, in order to get new membranes, you have to try and do new things; and it is not always possible to predict exactly what the outcome of your investment is. Sometimes it is going to work; sometimes it is not going to work. It is a matter of risk taking.

But we are in a very—what I would regard as a very desperate situation, and a little bit of extra risk for a relatively small amount of money is pretty good.

$3 billion a year on research has brought us one percentage improvement in the price of water just from one company. $3 billion, that is a lot of money. I don't think there has been that much improvement in the last year for the $3 billion, because it is focused on conventional technology.

Mrs. NAPOLITANO. That then brings another question to my mind, is that we have found sources of water, but they are not—we are not able to use them. In other words, we have contaminated

water aquifers; we have brackish water in others. The cost of water has, at least when I was serving on sanitation, gone from 200 an acre foot now to I am hearing 600 and 800 in San Diego being proposed. Where do you see this ending? Considering what we are looking at now in new technology, do you think the water cost per acre foot will be lower, or are we looking at an escalation because of the cost? Because—because—because——

Mr. MAX. It is a complicated thing. For instance, the cost of membranes is going to go up because they are made out of petroleum and gas; and as that cost goes up, the cost of those materials go up. And I think that it is not just—energy hits everything. It hits transport, it hits the cost of materials, and it hits the actual cost of process.

On the cost of process, I think that with reverse osmosis, at the moment, it is basically the best way we can think of energy cost for any process, is in kilowatt hours rather than dollars. Because dollars can be an Enron accounting process sometimes, although I don't expect anybody here does that.

But if you go in kilowatts, at the moment, the reverse osmosis has an energy cost of about 16 kilowatt hours a thousand gallons. That is going to drop with energy recovery down to around 12, I think. Some people say they can get it down to 10. Then, at that point, you are into the second law of thermodynamics, and there is just not more you can do. That is why you need to go to a different technology.

One of the reasons why reverse osmosis is being thought of as brackish groundwater is that when you have the lower dissolved—volume of dissolved solids in the water, it is a much more efficient—a much more energy efficient process. Work on brackish water reversed osmosis is really not very expensive at all. When you get into full seawater, then it can become very, very expensive for a whole lot of different reasons. But our focus in our chemical engineering process is for full salinity seawater.

Mrs. NAPOLITANO. Thank you, sir.

Mr. McCourt, how can we decide how much Federal support is appropriate for research and how much funding should go to direct support of projects?

Mr. MCCOURT. Mr. Chairman, madam, I am glad I don't have to make that decision; and I am glad you are up there to do that. From where I sit, the more the better.

Mrs. NAPOLITANO. Thank you, sir.

Mr. Wattier, how will brine disposal be handled in your desal plant, and if you would explain what ocean floor plan is.

Mr. WATTIER. Let me clarify. What we are building now in Long Beach is a large research facility. And a lot of people get confused. It is not for potable consumption. It is research.

So what we are essentially doing is taking water out of an existing channel, taking it apart, measuring it and putting it back together and putting it where it came from. So there is no brine discharge issue with regard to the 300,000 gallon-per-day project that is currently under construction.

The project that we have proposed to move forward on next, the Under Ocean Intake and Brine Discharge Project, which would be a $5 million research project jointly with the Federal Bureau of

Reclamation, would be testing two things. It would be testing an under ocean intake, where you would have a series of perforated pipes under the ocean floor which would allow the water to percolate down through the sand and then provide some pretreatment for your membranes. Pretreatment of the membranes as they found out in Tampa, is a very, very important process. And so that is how—what we would be testing over the next couple of years.

In addition, we would be testing, running that system backwards, putting the brine out underneath the ocean floor and percolating it up through the ocean floor to eliminate any concerns of the brine discharge.

Mrs. NAPOLITANO. There is a contaminated area in the Long Beach area. I think it is Palos Verdes Point. The DDT contamination that EPA has been watching with the sanitation district, would that have any effect on your project?

Mr. WATTIER. No, I don't believe so. That is further west, and I don't think there is any impact of that on our quality in Long Beach.

Mrs. NAPOLITANO. But water migrates. You have storms. You have the ability for some of that to spread.

Mr. WATTIER. Well, obviously, those are things we will be testing fully during this multi-year research effort. But, again, I don't expect that to be a problem because of the way the oceans currents run in southern California.

Mrs. NAPOLITANO. But that is a concern for the whole area.

Mr. WATTIER. Sure. Anybody that needs to fully analyze. And we have done some of this with our other partners in southern California, the quality of the ocean water, analyzed for all the constituents, including things like DDT.

Mrs. NAPOLITANO. Thank you, sir.

Mr. Rhinerson, in the San Diego desal plant, what is the total project capital cost and how would it be financed?

Mr. RHINERSON. The 50 MGD plant that we are planning, off the top of my head, I think is in—around the 200, $250 million range. It would be financed by the water authority with revenue bonds and, hopefully, receive some financial support from the Metropolitan Water District that has talked about support and, hopefully, through H.R. 1071 that is before you today.

As I said, the cost of the water that we are projecting there is about $800 at the fence. That is before we transport it into our distribution system. We are today paying about $450 an acre foot for water for Metropolitan. So you can see the cost differential of desalinated water is almost twice—you know, it is up there.

So in order to stimulate the market for building desalinated water plants that will actually produce water—and this plant is projected to produce about 5 percent of San Diego County's needs. We can do that because we will then blend that water with the other less expensive water that we are buying from Metropolitan. Our water transfer and those things and the overall cost is then disbursed over the 2,000,000 people customer base that we have.

So, in general, that is the capital cost and the pricing structure that we envision.

Mrs. NAPOLITANO. Well, there is another question that I would have, because San Diego gets most of its water from the Met. Was

the San Diego agreement to receive water transferred from farms in Imperial Valley seen as somewhat of a threat by MWD? And, along that, are your plans for the new project a further threat to the finances of the Met, because it will reduce the water sales to San Diego?

Mr. RHINERSON. At this point, I find Metropolitan to be very supportive of desalination. They are a member of the U.S. Desalination Coalition. I think the view of all of us in southern California is looking at a diversified water portfolio and identifying new supplies that we will have in the future. Because the Colorado River is a limited resource, and we know we are in the sixth year of a drought. Lake Mead is at 50 percent, Lake Powell is way down, and certainly the State water project is a limited resource.

We in southern California need to identify new water supplies as we look out 20, 30 years and beyond; and desalination plays an important part of that picture. I think that our relationship with Metropolitan is very positive and we are on the same page in that regard.

In San Diego, our long-range facilities master plan looked at changing San Diego's portfolio from about 80 to 90 percent of our water from Metropolitan and the Colorado River and the State water project to a more diversified portfolio where seawater desalination by the year 2030 can deliver about 15 percent of San Diego's water needs. The ag-to-urban water transfer is another slice of that pie. That delivers about 20 to 30 percent.

Water conservation is extremely important, and we are very aggressive about that. Water reclamation is very important, and then certainly the continued supplies from Metropolitan. With that strategy of identifying new water from desal and diversifying our water portfolio, we believe that San Diego can have a safe and reliable water future. But desal is very critical, and this bill is very important to help stimulate the market and encourage agencies like mine to go forward with actually building a plant that will produce water on a large scale for our urban population.

Mrs. NAPOLITANO. Thank you, sir.

Last question and I will quit.

Mr. Sabol, your statement mentions possible tax incentives for the desalination industry. Can you explain how this would work?

Mr. SABOL. There is a variety of potential options. The point of including it in my written testimony is to say that it is another form of incentive that could be provided to manufacturers of equipment or builders of desalination facilities to enable them to get over the hurdle of the incremental cost.

I think it is important to recognize that we don't have an unlimited supply of water at a dollar a thousand gallons. That is the issue we are facing. That is why we are all here. We need to bring to bear conservation strategies, investment technology, tax incentives potentially, subsidies, other things to make a new industry come to life to provide relief to that strain that we have on our dollar a thousand gallon water supply. So tax incentives could be one way to do that.

Mrs. NAPOLITANO. Thank you.

And the last statement, Mr. Chair, is that, hopefully not only will the different industries and the different organizations that are

interested in providing new technology and working with us, that they and the Federal agencies that are involved sit at the table and talk to each other. Many times, we do not. The right hand doesn't know what the left hand is doing. Unfortunately, that effects how we are able to deal with some of the issues that come up before this Committee; and I have very grave concerns about how we may be spending money where we shouldn't be and not spending it where we should.

With that, thank you, Mr. Chair. Thank you very much.

Mr. RADANOVICH. Thank you, Mrs. Napolitano; and I want to thank the panel for being here and the valuable information that you provided on this issue. Thank you very much.

This does conclude our hearing today. The meeting is adjourned. Thank you.

[Whereupon, at 12:30 p.m., the Subcommittee was adjourned.]

○