Statement of the Honorable David Garman
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U.S. Department of Energy

Subcommittee on Water and Power
Committee on Resources
U.S. House of Representatives

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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 waterInstead, 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.