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Bureau of Reclamation Activities Related to Desalination Research & Development
For Informational Purposes in Connection with H.R. 1071

Before the
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Committee on Resources
Subcommittee on Water and Power
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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 DESALNET, 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 $3.9m.

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.