

*U.S. Department of the Interior*

**Annual Report on Technology Transfer:  
FY 2011 Activities, Plans and Achievements**

**July 2012**

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# I. Overview of the Department of the Interior's Technology Transfer Activities

## Summary of Current Technology Transfer Objectives and Activities

The Department of the Interior defines technology transfer to include the range of activities that are designed to disseminate scientific and technical information and knowledge from within the Department to and from other federal and non-federal entities. It includes and is not limited to publications, exchange of scientific and technical information, protecting and licensing intellectual property rights, and sharing—or otherwise making available—for scientific or technical purposes the expertise and specialized scientific material and resources to which the Department has access. In general, technology transfer activities within the Department should be consistent with its mission. This mission encompasses protecting and managing the Nation's natural resources and cultural heritage; making available scientific and other information about those resources; honoring trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities; and supplies the energy to power our future.

Since the Department's bureau activities are geared to fulfilling their various missions, and solving problems associated with the management of the resources entrusted to them, they have varying levels of involvement with scientific and technical research and innovation, and technology transfer. Across this spectrum, the Department strives to ensure that its scientists, engineers and other technical personnel advance the state of knowledge related to the resources it manages, and that this information is accessible to resource managers, private industry, and the general public in order to identify and address problems or seize opportunities associated with those resources. Consequently, the vast majority of the Department's technology transfer activities use traditional technology transfer mechanisms such as publications of peer reviewed papers and reports, webpage postings, and giving presentations at meetings and conferences.

Bureaus that are active in research and development, or have research capabilities that complement U.S. commercial interests, may also utilize technology transfer agreements authorized by the Federal Technology Transfer Act of 1986 (FTTA) to join forces with non-federal partners. Such agreements allow Department bureaus and private sector industries, for instance, to pool their expertise and resources to jointly create and advance technologies that would help fulfill agency missions while helping U.S. industries innovate and commercialize technologies that can strengthen our national economy and create jobs.

## FY 2011 Accomplishments

In FY 2011, most of the technology transfer activity being reported within the Department under the FTTA was undertaken within the U.S. Geological Survey (USGS), the Bureau of Reclamation (Reclamation) and the Bureau of Safety and Environmental Enforcement (BSEE). Also, in FY 2011, the Department accomplished several actions to institutionalize technology transfer programs within the Department and enable all Department bureaus to more effectively and efficiently implement the Federal Technology Transfer Act of 1986 and related legislation. These actions include:

- Delegating the authority to enter into technology transfer agreements authorized by the Technology Transfer Act of 1986 from the Secretary to all bureau directors, with the authority for each bureau to further redelegate as needed.
- Initiating and leading an effort to draft a new Departmental Manual chapter that will establish Department policies and procedures for implementing and administering technology transfer agreements.
- Initiating a Departmental process to provide a consolidated response to the annual OMB Circular A-11 call for agency technology transfer reports. This report is the first product of this effort.

In addition, the Department developed and submitted a plan to OMB in April 2012, to implement the October 28, 2011, Presidential Memorandum — Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Business.

## Technology Transfer Agreements

Table 1 provides a summary of new and active technology transfer agreements undertaken within the Department in FY 2011. During this year, Reclamation, BSEE and USGS had such agreements in place. Between the three Bureaus, there were a total of 351 active Cooperative Research and Development Agreements (CRADAs) in FY 2011, of which 295 were newly executed. In addition there were 209 other collaborative R&D arrangements with various parties, including 155 that were new in FY 2011.

**Table 1: Collaborative Relationships for Research & Development (FY 2011)**

<b>FY 2011</b>	<b>Reclamation</b>	<b>BSEE</b>	<b>USGS</b>	<b>Total</b>
• <b>CRADAs</b> , total active in the FY <sup>(1)</sup>	7	10	334	351
- New, executed in the FY	4	8	283	295
▪ Traditional CRADAs, <sup>(2)</sup> total active in the FY	4	8	10	22
- New, executed in the FY	2	8	3	13
▪ Non-traditional CRADAs, <sup>(3)</sup> total active in FY	3	0	324	327
- New, executed in the FY	2	0	280	282
• <b>Other collaborative R&amp;D relationships</b>				
▪ (Collaborative Agreements), total active in the FY	2	8	199	209
- New, executed in the FY	2	5	148	155

CRADA = Cooperative Research and Development Agreement

(1) "Active" = legally in force at any time during the FY. "Total active" is comprehensive of all agreements executed under CRADA authority (15 USC 3710a).

(2) CRADAs involving collaborative research and development by a federal laboratory and non-federal partners.

(3) CRADAs used for special purposes -- such as, material transfer or technical assistance that may result in protected information. For USGS, Technical Assistance Agreements (TAA) and Facility Use/Service Agreement (FUSA) fit this category.

Table 2 summarizes invention and patenting activity within the Department during FY 2011 broken out by Bureau. Such activity was limited to USGS and Reclamation. The table indicates that in FY 2011, there were five new inventions disclosed, two new patent applications filed and one new patent issued.

**Table 2: Invention Disclosure and Patenting (FY 2011)**

<b>FY2011</b>	<b>Reclamation</b>	<b>USGS</b>	<b>Total</b>
• New inventions disclosed in the FY <sup>(1)</sup>	2	3	5
• Patent applications filed in the FY <sup>(2)</sup>	1	1	2
• Patents issued in the FY	1	0	1

(1) Inventions arising at the bureau.

(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-part applications. Excludes: provisional, continuation, duplicate foreign, and Patent Cooperation Treaty (PCT) applications.

Additional data tables required by OMB Circular A-11 are contained in the Data Appendix to this report. These show that total income in FY 2011 from all licenses amounted to \$93,000 (from 25 active licenses).

Table 3 provides a summary of the scope and nature of technology transfer agreements and mechanisms that the various bureaus could or plan to implement. In addition to the three aforementioned bureaus, this table also outlines the capabilities of the National Park Service and the Fish and Wildlife Service in advancing technology transfer. Subsequent sections of this report provide more details on USGS, Reclamation and BSEE programs.

**Table 3: Scope of Activities and Plans Related to the Federal Technology Transfer Act of 1986, by Bureau**

Mission	Technology Transfer
<p><b>USGS.</b> The mission of the USGS is to serve the Nation by providing reliable scientific information to describe and understand the Earth, minimize loss of life and property from natural disasters, manage water, biological, energy, and mineral resources, and enhance and protect our quality of life.</p>	<p>The USGS serves the Nation as an independent fact-finding agency that collects, monitors and analyzes scientific and technical information to provide scientific understanding about natural resource conditions, issues, and problems. The USGS makes this information and knowledge readily available to decision makers and the public. Thus, one of the USGS main thrusts is knowledge transfer. In addition to its capabilities in knowledge dissemination, USGS also pursues technology transfer opportunities in a variety of ways.</p> <p><u>Principal tech transfer mechanisms:</u>            Cooperative R&amp;D Agreements (CRADAs)            Technical Assistance Agreements            Patents and licenses            Facilities Use/Service Agreements            Technical /Scientific Publications            Workshops</p>
<p><b>Bureau of Reclamation.</b> The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.</p>	<p>The Bureau of Reclamation has the lead Federal responsibility for water management and hydro power in the 17 western states. Its research program is highly applied towards development of solutions that benefit its operations and infrastructure reliability. The research programs use technology transfer fundamentals to help speed field deployment of new innovations.</p> <p><u>Principal tech transfer mechanisms:</u>            Technical publications            Workshops            Demonstration and integration of new tools and information into Reclamation’s operations            CRADAs            Patents and licenses            Facility use agreements</p>
<p><b>U.S. Fish &amp; Wildlife Service.</b> The mission of the U.S. Fish &amp; Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.</p>	<p>FWS Fish Technology Centers were established in 1965 to develop and improve fish culture technology and to provide assistance to federal and state agencies, Tribes and other nations interested in aquaculture research and solutions. Today there are seven such centers working with industry and government to improve aquaculture opportunities.</p> <p><u>Principal tech transfer mechanisms:</u>            Licenses</p>

**Table 3: Scope of Activities and Plans Related to the Federal Technology Transfer Act of 1986, by Bureau**

Mission	Technology Transfer
	Technical publications Seminars/Workshops
<p><b>National Park Service.</b> The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of current and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.</p>	<p>Consistent with the Final Benefits-Sharing Environmental Impact Statement (2009) and the Record of Decision (2010), the National Park Service has drafted benefits-sharing policy and procedures that will be issued and implemented following review in 2012. The policy addresses benefits-sharing and technology transfer.</p> <p><u>Proposed Principal tech transfer mechanisms</u>            Cooperative Research and Development Agreements            General Agreements            Cooperative Agreements            Material Transfer Agreements            Patents and licenses            Publications</p>
<p><b>Bureau of Safety and Environmental Enforcement (BSEE).</b> The BSEE works to promote safety, protect the environment, and conserve resources offshore through vigorous regulatory oversight and enforcement.</p>	<p>The BSEE R&amp;D program operates through the Technology Assessment and Research (TA&amp;R) and the Oil Spill Response Research (OSRR) Programs. BSEE research is associated with operational safety, pollution prevention, and oil spill cleanup technology.</p> <p><u>Proposed Principal tech transfer mechanisms</u>            Cooperative Research and Development Agreements            Interagency Agreements            Joint Industry Projects            Cooperative Agreements            Technical Publications            Seminars/Workshops            Web page postings of research deliverables            Facility use agreements</p>

The USGS, Reclamation and BSEE provide a short narrative discussion of their technology transfer programs and a few technology transfer project outcomes in Sections II, III and IV, respectively. The tabular data requested by OMB Circular A-11 is reported in Section V.

## II. U.S. Geological Survey – Technology Transfer Program

The United States Geological Survey (USGS) is a scientific bureau within the Department of the Interior whose mission is to serve the nation by providing reliable scientific information to describe and understand the Earth, minimize loss of life and property from natural disasters, manage water, biological, energy, and mineral resources, and enhance and protect our quality of

life. In FY 2011, the management structure of the USGS was realigned to form interdisciplinary mission areas outlined in the USGS Science Strategy: “Facing Tomorrow’s Challenges—U.S. Geological Survey Science in the Decade 2007-2017.” Science Strategy areas include: Ecosystems; Climate and Land Use Change; Energy, Minerals, and Environmental Health; Natural Hazards; Water Resources; Core Science Systems; Administration and Enterprise Information; and Facilities. These mission areas include expertise from several Earth Science disciplines (e.g. hydrology, geochemistry, biology) working together to address relevant issues of concern to people and other living things on the planet. Organization around these mission areas allows the USGS to better address the needs of customers and partners.

Since delivery of science information is a primary purpose of the bureau, technology transfer activities with the public sector and the private sector, including academia and non-profits, typically support the collection and transference of scientific data (knowledge dissemination). The USGS cooperates with its public and private collaborators to help them maintain necessary services, better understand the environmental consequences of their commercial and non-commercial activities, and to develop new products and services. The USGS has 35 major laboratories and several hundred field offices located around the country.

Within the USGS, the technology transfer function is housed in the Office of Policy and Analysis where staff service USGS Science Centers and offices throughout the country. In 2012, the USGS will continue negotiating and drafting Cooperative Research and Development Agreements (CRADAs), Technical Assistance Agreements, Facility Use Agreements, Material Transfer Agreements, and Patent Licenses. This office also manages the USGS intellectual property and inventions program; markets USGS technology opportunities and assistance to industry, non-profits, academic institutions, and State agencies; and provides training to USGS personnel on technology transfer and intellectual property protection. At the end of 2011, the USGS had a total of 56 active patents. During 2011, the U.S. Patent and Trademark Office accepted filings for two new USGS patent applications. USGS science and research contributes to a broad range of valuable collaborative projects in the private and academic sector. Since the implementation of its facility use program in 2003, the USGS has increased to 27 the number of specialty analytical laboratory services providing unique capabilities to U.S., foreign partners and academia. The total number of user agreements executed during 2011 was 280.

Following are examples of ongoing USGS technology transfer activities:

**Improving Earthquake Hazard Assessments.** The Pacific Gas and Electric Company (PG&E), a publicly regulated utility providing service within California, is engaged in a long-term, multi-element, action-based seismic risk management program to reduce the impact of future earthquakes on the performance of their gas and electric systems, and to maintain acceptable levels of customer service. To further this program, PG&E and the USGS have been involved in a series of CRADAs since 1992.

The USGS Earthquake Program, under the auspices of the National Earthquakes Hazards Reduction Program, undertakes a broad range of applied earthquake hazards research, data compilation and archiving, and distribution of earthquake information products and services. The PG&E CRADA complements the USGS Earthquake Program, and is carried out using the

capabilities of five USGS Science Centers (Earthquake, Geology and Geophysics, Pacific Coastal and Marine, California Water, and Geologic Hazards).

In 2009, the USGS and PG&E extended their CRADA for five years. In this period, PG&E seeks (1) the development and rapid application of data, methods, and technologies that improve earthquake hazard assessments in the regions where its electric power and natural gas facilities, service centers, and office buildings are located and where its customers live and work; and (2) the improvement of emergency response to earthquake occurrence by incorporating real-time earthquake hazard information. In one particular project under the CRADA, the USGS and PG&E produced new geophysical data as part of the Diablo Canyon Power Plant (DCPP) Long Term Seismic Program. Following identification of the Shoreline fault zone offshore and west of the DCPP in 2008, PG&E embarked on a two-year study on a more complete evaluation of the geologic and seismologic characteristics of the Shoreline fault zone and an assessment of the ground motion hazard at the DCPP that includes the Shoreline fault zone. The data and results were reported by PG&E to the U.S. Nuclear Regulatory Commission in 2011.

**Determining If Attic and Wall Insulation Is Contaminated.** The USGS owns a pending patent property entitled “Spectral Method for Determining the Source of Vermiculite Insulation in Attics and Walls” which may be used to determine both the source of vermiculite, an ore used in attic insulation (Patent Application Serial Number 13/247,682, filed September 28, 2011), and whether it is contaminated with fibrous amphiboles (which are types of asbestos). Approximately 1 million homes in the United States use expanded vermiculite attic insulation.

Before 1990, there were four primary sources of vermiculite in the world, in (1) Enoree, South Carolina, (2) Louisa, Virginia, (3) Libby, Montana, and (4) Palabora, South Africa. Health studies in Libby, Montana, showed that fibrous amphibole was present in significant quantities in the vermiculite taken from the Libby mine but was not found in significant quantity at the other major vermiculite sources. A strong connection was found between the presence of fibrous amphibole in vermiculite and incidences of asbestos-related lung disease. Prior to its closing in 1990, the Libby mine supplied up to 80 percent of the world's vermiculite.

Greater awareness of the potential health risks posed by exposure to fibrous amphiboles in connection with preparing for home improvements or maintenance has engendered increasing interest in determining the personal risk of asbestos exposure. The method currently in use involves taking vermiculite samples to off-site laboratories for analysis. This is time-consuming (results take a week or more to obtain), costly, and generates hazardous waste that must be disposed of properly. The USGS invention addresses these shortcomings by employing portable field spectrometers to measure the wavelengths and intensities of a material's radiation spectrum. Such measurements can reveal, on the spot, the source of the analyzed vermiculite as well as the presence of any asbestos contamination. This is a significant improvement over the current method.

**Borehole Geophysical Logging for Ground and Surface Water Monitoring of an Ecologically Sensitive Aquifer.** In 2010, the USGS' Fort Lauderdale Water Science Center entered into a Technical Assistance Agreement (TAA) with Florida Power & Light Company (FPL) to collaborate on a study of salinity intrusion into groundwater at FPL's Turkey Point

Nuclear Plant in southeastern Florida. This power plant uses a recirculating cooling system. The salinity of the cooling water is greater than natural groundwater salinities in the highly permeable carbonate Biscayne aquifer located in the area. Aquifers in terrain with landforms and hydrology created from the dissolution of soluble rocks, also known as karst aquifers, are highly vulnerable to contamination due to the hydrogeology of the landscape. In the U.S., about 40% of the groundwater used for drinking comes from such aquifers. Because of this vulnerability of the Biscayne aquifer near the Turkey Point plant, a monitoring plan for groundwater was implemented.

Recirculating cooling systems at thermoelectric power plants are of considerable interest to USGS because engineered cooling systems are common in populated areas. Power plants are the third largest consumptive users of water, after irrigation and industry. The Turkey Point site is important because the facility is located several miles away from public water supply well fields and is adjacent to sensitive ecological areas. As the primary Federal science agency for water-resources information, the USGS is responsible for monitoring the quantity and quality of water in the Nation's rivers and aquifers and assessing the sources and fate of contaminants in aquatic systems. The goal of the TAA was to study the effect of salinity and temperature differences and aquifer heterogeneity on density-driven convection, and the combined impact on surface water, groundwater, and ecologic conditions at the Turkey Point Nuclear Plant.

A primary task in the TAA was the construction of 14 groundwater monitoring well sites in and around the power plant. USGS staff used geophysical logs and observations of rock core to identify the base of the Biscayne aquifer and zones of higher permeability within the aquifer, and to plan the construction of several additional monitoring wells.

In FY 2011, the TAA was amended to include applied research involving near-surface geophysical methods. The information collected using these methods will allow collaborators to determine which combinations of methods provide the type of information required for developing the surface geophysical monitoring strategy. This will add to the overall scientific knowledge on density-driven interaction between surface water with elevated salinities and fresh groundwater in a karst carbonate aquifer, and will help monitor, design and plan for the future construction of closed-loop cooling-canal system facilities for power plants.

**Study of Juvenile Lampreys.** The lamprey species is an important link in the foodweb of the Columbia River Watershed. The lamprey is also considered as one of the First Foods, which the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) deem to be the minimum ecological products necessary to sustain their culture. The CTUIR, a federally recognized Indian tribe acting through its Department of Natural Resources Fisheries Program, entered into a Technical Assistance Agreement with USGS' Western Fisheries Research Center, Columbia River Research Laboratory, to study how well various types of irrigation diversion screens work for the safe and effective passage of juvenile lampreys.

Despite several species of lampreys being petitioned for protection under the Endangered Species Act in 2003 and continued population declines of Pacific lampreys, little is known about the effects of fish screens on juvenile lampreys. Developing hydraulic and design criteria specific for juvenile lampreys and understanding the effects of current screen types on lamprey

populations would be an important step towards their recovery, and toward maintaining the culture of the CTUIR.

### III. Bureau of Reclamation – Technology Transfer Program

The Bureau of Reclamation (or “Reclamation”) is a water management agency whose mission is to help provide water and power to the 17 Western States and numerous Tribes while protecting the environment and the public’s investment in the infrastructure it has constructed and operates. It is the largest wholesaler of water in the country. It brings water to 31 million people, and one out of five Western farmers, who produce 60% of the nation’s vegetables and 25% of its fruit and nut crop. Reclamation is the second largest producer of hydroelectric power in the western United States. Its 58 powerplants annually provide more than 40 billion kilowatt hours of electricity, enough to power 6 million homes, generating a billion dollars in revenues.

*Reclamation R&D* – Reclamation’s R&D is primarily focused on applications to identify and develop solutions related to the broad spectrum of water and hydropower related issues. Reclamation’s R&D Office emphasizes collaborative R&D with stakeholders, universities, non-profit organizations, the private sector, and other local, state, and Federal agencies with water and water-related roles and capabilities. This allows Reclamation to meet the greatest number of needs at the least cost, and in the least amount of time.

Reclamation conducts both programmatic and project-specific R&D. Programmatic R&D is competitively selected based on the ability to meet priority needs that have broad application across Reclamation and the West. Project-specific research is typically driven by the necessity to improve solutions and processes at a particular Reclamation facility or project, and is done as part of the technical studies and engineering work associated with operating, updating, and maintaining a specific Reclamation facility or project operational responsibility. In either case, expert Reclamation engineers and scientists typically lead or are heavily involved in the effort.

*Reclamation Technology Transfer* – Although Reclamation’s R&D focus is on water issues specific to the arid and variable climates characteristic of the Western U.S., the new solutions, tools, and information developed can have broad applicability regardless of location. Accordingly, the transfer of Reclamation’s technology and knowledge across the national and international communities of practice maximizes public benefits of Reclamation’s R&D investments.

The majority of Reclamation’s technology advancements are transferred through public dissemination, while others require the capabilities and know-how of the private sector to mature, mass produce and otherwise commercialize the technology into market-ready products. Reclamation’s research nexus with industry is typically in the area of hydroelectric power generation, water infrastructure, water conservation, and desalination/water purification technologies.

If an industry partner is needed to ultimately transfer the technology into a market-ready product, Reclamation utilizes the authorities available under federal technology transfer legislation to

protect intellectual property, as needed, and form research and licensing partnerships with U.S. manufacturing industries. Reclamation's R&D Office implements these authorities on behalf of Reclamation. It also serves as a surrogate for an Office of Research and Technology Applications (ORTA) as required by 15 USC 3710(b). The R&D Office also utilizes a funded interagency agreement with the USDA Agricultural Research Service (ARS) Office of Technology Transfer to have access to the full range of expert skills needed to implement technology transfer authorities (e.g. experienced technology transfer specialists, patent advisors, license specialists, CRADA specialists,) on a project-by-project basis. This arrangement benefits the government since it avoids the need to build similar capabilities within Reclamation or the Department. In FY 2011 Reclamation also began utilizing partnership intermediaries as authorized by 15 USC 3715, to facilitate and broker research partnerships with industry via its interagency agreement with USDA-ARS.

Consistent with the October 28, 2011 Presidential Memorandum on *Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Business*, Reclamation started to explore new ways to better engage U.S. Industry at the early stages of federal discovery. This would allow the commercial value for such discoveries to be identified early in the research process, and foster industry partnerships to more effectively and rapidly pull the technology forward in order to fulfill Reclamation's mission while more widely disseminating the resulting technologies. In addition, Reclamation also plans to create more awareness across U.S. industries and other non-government organizations about the specialized research resources (people, lands, and facilities) that they can access through technology transfer agreements authorized by 15 USC 3710a. In addition to physical research laboratories, Reclamation's R&D assets include engineering and scientific expertise, and extensive water storage, water delivery and hydropower facilities that offer unsurpassed living laboratories for field tests, evaluations, and demonstrations of new technologies and processes related to water and hydropower.

*FY 2011 Reclamation Technology Transfer Project Highlights* – Ensuring access to the quantity and quality of water needed to support growing economies, societies, and overall quality of life is a national and international challenge. New and improved desalination technologies are central to meeting this challenge. U.S. industries are currently world leaders in manufacturing desalination technologies. Desalination technologies are not only tools to convert seawater into useable waters, but also to treat traditional and non-traditional sources of inland waters for a variety of uses. Pooling the know-how and research capacity of federal and U.S. private sector companies is vital to maintaining and growing the U.S.'s world-wide leadership position in this vital area, and meeting the growing needs for water in the U.S. and abroad.

For several years, Reclamation has been conducting research on next-generation desalination membranes and process technologies in partnership with Separations Systems Technology, Inc (SST). SST is a small, but internationally recognized private sector research business focusing on desalination membrane separation technologies located in San Diego, CA. The collaboration brings together unique capabilities that catalyze the innovation process. The collaboration is further enhanced and leveraged through Department of Defense (DoD) research grants that have been awarded to SST to develop these technologies for DoD applications. Reclamation funds its research chemists and chemical engineers to team up with research chemists at SST to formulate

and synthesize new chemistry targeted at improving the performance of desalination membranes and lowering the overall cost of desalination/water purification processes. Once new promising chemical formulations are identified and synthesized, SST develops new membrane materials for bench and small pilot scale testing. Reclamation tests these materials at the Water Quality Improvement Center, a desalination and water purification technology testing and demonstration facility co-located with Reclamation's Yuma Desalting Plant in Yuma, AZ. Based on this testing, the more promising membrane alternatives are patented, and the search begins for partners among U.S. membrane manufacturers who might help develop and, ultimately, commercialize the technology.

In FY 2011, the U.S. Patent and Trademark Office issued one patent to the Reclamation/SST team for chlorine resistant polyamides and their associated desalination membranes. An additional related patent application was pending. These technologies also include the University of Denver as a third collaborating inventor as they were able to bring additional chemical expertise to the research team that contributed to the invention. Polyamide desalting membranes are the backbone of the desalination industry because of their unsurpassed ability to process and purify higher volumes of water contaminated by salts and other substances. Unfortunately, polyamide membranes deteriorate rapidly when exposed to chlorine, yet chlorine disinfection is essential upstream of the desalination process to control microorganisms to prevent both water-borne diseases and to reduce the possibility that these microorganisms would biofoul and clog the membrane. Consequently, a polyamide desalination membrane that tolerates chlorine exposure without sacrificing water production capacity has been long sought by the global desalination industry. Such a material might revolutionize the economics of desalination.

Also in FY 2011, with patent advice from USDA-ARS under an existing interagency agreement, the Reclamation/SST team submitted two additional patent applications to the US Patent and Trademark Office. One is for a more effective cellulose acetate desalination membrane. While polyamide membranes are the dominant today, about 25% of desalination plants utilize cellulose acetate membranes. The latter allow more salts to pass through the membrane and require higher operating pressures than polyamide membranes. While improving water supply technologies is Reclamation's objective, a more effective cellulose acetate membrane could also have broad application in the commercial sector, e.g., the beverage processing industry.

A fourth Reclamation/SST patent application involves advances made in the area of forward osmosis, which is a candidate for the next-generation of desalination technology that utilizes a natural osmotic process instead of the energy-intensive, high pressure, reverse osmosis process.

Reclamation, through a formal agreement with its patent partners has the responsibility to transfer the technology to U.S. industries for commercialization. In FY 2011, under the consultation and assistance from the USDA-ARS Technology Transfer Office, and TechComm, which is part of the network of partnership intermediaries used by ARS and DoD, Reclamation conducted a series of initial outreach efforts with U.S. Industries. By the end of FY 2011, Reclamation had entered into two material transfer agreements with two separate U.S. industry representatives. One agreement involves the chlorine resistant polyamide membrane and the other agreement involves the new cellulose acetate membrane. Under each agreement, the

companies will evaluate these new membrane technologies, including manufacturing full scale “operational ready” membranes for side-by-side testing against the standard industry products in actual field conditions at Reclamation’s Yuma Desalting Plant and at the U.S. Navy’s seawater desalination test facility at Port Hueneme, CA. Reclamation anticipates completing the testing program in FY 2012 and, if appropriate, entering into license agreements with industry to ensure faster and greater utilization of the technologies.

#### IV. Bureau of Safety and Environmental Enforcement – Technology Transfer Program

BSEE works to promote safety, protect the environment, and conserve resources offshore through vigorous regulatory oversight and enforcement.

Within BSEE, the Offshore Regulatory Program develops standards and regulations to enhance operational safety and environmental protection for the exploration and development of offshore oil and natural gas on the U.S. Outer Continental Shelf (OCS).

The Oil Spill Response division is responsible for developing standards and guidelines for offshore operators’ Oil Spill Response Plans (OSRP) through internal and external reviews of industry OSRPs to ensure compliance with regulatory requirements and coordination of oil spill drill activities. It also plays a critical role in the review and creation of policy, guidance, direction and oversight of activities related to the agency’s oil spill response. The division oversees the Unannounced Oil Spill Drill program and works closely with sister agencies such as the U.S. Coast Guard and Environmental Protection Agency to continually enhance response technologies and capabilities.

BSEE operates the National Offshore Training and Learning Center (NOTLC) with specially developed curriculum focusing on keeping our experienced inspectors current on new technologies and processes and ensuring that our new inspectors are given the proper foundation for carrying out their duties rigorously and effectively. The NOTLC works cooperatively with industry and academia to provide the specialized training needed. The bureau also operates the Oil and Hazardous Materials Simulated Environmental Test Tank (Ohmsett) in Leonardo, N.J., serves as the National Oil Spill Response Research and Renewable Energy Test Facility. Ohmsett is available for use by industry and government.

BSEE R&D operates through the Technology Assessment and Research (TA&R) and the Oil Spill Response Research (OSRR) programs. The former supports research associated with operational safety and pollution prevention (including renewable energy). It was established in the 1970s to ensure that industry operations on the Outer Continental Shelf incorporated the use of the Best Available and Safest Technologies (BAST) subsequently required through the 1978 OCSLA amendments and Energy Policy Act of 2005. The OSRR program was established through the Oil Pollution Act of 1990 to research oil spill response technology. Its Ohmsett facility is available to provide independent and objective performance testing of full-scale oil

spill response equipment and marine renewable energy devices, and improving technologies through research and development.

BSEE's R&D focus is on offshore operational oil/gas and renewable energy issues. The majority of the Bureau's technology advancements are transferred through public dissemination. BSEE's primary research synergy is with international government organizations and the oil/gas and renewable energy industry. It is typically in the area of ensuring that the best available and safest technology is used in the US Outer Continental Shelf. Additional information and research deliverables are available at:

<http://www.bsee.gov/Research-and-Training/Technology-Assessment-and-Research.aspx>.

BSEE is also a member of the International Committee on Regulatory Authority Research and Development (ICRARD), which focuses on transferring knowledge worldwide between governmental entities in the area of health, safety and environment in the petroleum sector. Although membership is only available to government entities, ICRARD cooperates with industry to coordinate and transfer technology.

## V. DATA APPENDIX

### Required Tables under OMB Circular A-11

#### Collaborative Relationships for Research & Development

<b>FY 2011</b>	<b>Reclamation</b>	<b>USGS</b>	<b>BSEE</b>	<b>Total</b>
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CRADA = Cooperative Research and Development Agreement

(1) "Active" = legally in force at any time during the FY. "Total active" is comprehensive of all agreements executed under CRADA authority (15 USC 3710a).

(2) CRADAs involving collaborative research and development by a federal laboratory and non-federal partners.

(3) CRADAs used for special purposes -- such as, material transfer or technical assistance that may result in protected information. For USGS, Technical Assistance Agreements (TAA) and Facility Use/Service Agreement (FUSA) fit this category.)

#### Invention Disclosure and Patenting

<b>FY2011</b>	<b>Reclamation</b>	<b>USGS</b>	<b>Total</b>
• New inventions disclosed in the FY <sup>(1)</sup>	2	3	5
• Patent applications filed in the FY <sup>(2)</sup>	1	1	2
• Patents issued in the FY	1	0	1

NOTE: Data is only provided for Bureaus with relevant activity.

(1) Inventions arising at the bureau.

(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-part applications. Excludes: provisional, continuation, duplicate foreign, and Patent Cooperation Treaty (PCT) applications.

## Licensing

### Profile of Active Licenses

<b>FY 2011</b>	<b>Reclamation</b>	<b>USGS</b>	<b>Total</b>
• <b>All licenses</b> , number total active in the FY <sup>(1)</sup>	5	20	25
▫ New, executed in the FY		2	2
▪ <b>Invention licenses</b> , total active in the FY	3	20	23
▫ New, executed in the FY		2	2
- Patent licenses, <sup>(2)</sup> total active in FY		19	19
▫ New, executed in the FY		2	2
- Material transfer (inventions), tot active in FY		n/a	
▫ New, executed in the FY		n/a	
- Other invention licenses, total active in FY		n/a	
▫ New, executed in the FY		n/a	
▪ <b>Other IP licenses</b> , total active in the FY	2	n/a	2
▫ New, executed in the FY		n/a	
- Copyright licenses (fee bearing)		n/a	
▫ New, executed in the FY		n/a	
- Material transfer (non-inv.), total active in FY		n/a	
▫ New, executed in the FY		n/a	
- Other		n/a	
▫ New, executed in the FY		n/a	

NOTE: Data is only provided for Bureaus with relevant activity.

Multiple inventions in a single license are counted as one license. Licenses that include both patents and copyrights (i.e., hybrid licenses) are reported as patent licenses -- and not included in the count of copyright licenses.

(1) "Active" = legally in force at any time during the FY.

(2) Patent license tally includes patent applications which are licensed.

n/a = data not currently available

**Profile of Active Licenses (cont.)**

<b>FY 2011</b>	<b>Reclamation</b>	<b>USGS</b>	<b>Total</b>
<b>• All income bearing licenses, number</b>	3	19	22
◦ Exclusive		3	3
◦ Partially exclusive		0	0
◦ Non-exclusive	3	16	19
<b>▪ Invention licenses, income bearing</b>		19	19
◦ Exclusive		3	3
◦ Partially exclusive		0	0
◦ Non-exclusive		16	16
- Patent licenses, income bearing		18	18
◦ Exclusive		3	3
◦ Partially exclusive		0	0
◦ Non-exclusive		15	15
<b>▪ Other IP licenses, income bearing</b>		n/a	
◦ Exclusive			
◦ Partially exclusive			
◦ Non-exclusive			
- Copyright licenses (fee bearing)			
◦ Exclusive			
◦ Partially exclusive			
◦ Non-exclusive			
<b>• All royalty bearing licenses, number</b>	3	19	22
<b>▪ Invention licenses, royalty bearing</b>	3	19	22
- Patent licenses, royalty bearing		18	18
<b>▪ Other IP licenses, royalty bearing</b>		n/a	
- Copyright licenses (fee bearing)			
NOTE: Data is only provided for Bureaus with relevant activity. n/a = data not currently available			

## Licensing Management

FY 2011	Reclamation	USGS	Total
• <b>Number of licenses</b>			
▪ <b>Invention licenses</b> , total active in the FY	5	20	25
▫ New, executed in the FY	0	2	2
• <b>Elapsed execution time</b> , licenses granted in FY			
▪ <b>Invention licenses</b>		2	2
▫ average (months)		12	12
▫ minimum (months)		12	12
▫ maximum (months)		12	12
- Patent licenses		1	1
▫ average (months)		12	12
▫ minimum (months)		12	12
▫ maximum (months)		12	12
• <b>Licenses terminated for cause</b> , in the FY			
▪ <b>Invention licenses</b>		0	0
- Patent licenses		0	0
NOTE: Data is only provided for Bureaus with activity in this area. n/a = data not currently available			

## License Income

FY 2011	Reclamation	USGS	Total
• <b>Total income</b> , all licenses active in FY <sup>(1)</sup>	\$11,000	\$81,708	\$92,708
▪ <b>Invention licenses</b>	\$11,000	\$81,708	\$92,708
- Patent licenses <sup>(2)</sup>	\$11,000	\$77,822	\$88,822
▪ <b>Other IP licenses</b> , total active in the FY			
- Copyright licenses		\$0	\$0
• <b>Total Earned Royalty Income (ERI)</b> <sup>(3)</sup>		\$81,708	\$81,708
▪ <b>Invention licenses</b> , total ERI		\$81,708	\$81,708
- Patent licenses, <sup>(2)</sup> total ERI		\$77,822	\$77,822
▫ Median ERI		\$ 4,578	\$ 4,578
▫ Minimum ERI		0	0
▫ Maximum ERI		\$21,940	\$21,940
▫ ERI from top 1% of licenses		\$21,940	\$21,940
▫ ERI from top 5% of licenses		\$21,940	\$21,940

▫ ERI from top 20% of licenses		\$21,940	\$21,940
<b>▪ Other IP licenses, total ERI</b>		\$0	\$0
▫ Median ERI			
▫ Minimum ERI			
▫ Maximum ERI			
▫ ERI from top 1% of licenses			
▫ ERI from top 5% of licenses			
▫ ERI from top 20% of licenses			
<b>- Copyright licenses, total ERI</b>		\$0	\$0
▫ Median ERI			
▫ Minimum ERI			
▫ Maximum ERI			
▫ ERI from top 1% of licenses			
▫ ERI from top 5% of licenses			
▫ ERI from top 20% of licenses			

NOTE: Data is only provided for Bureaus with relevant activity.

(1) Total income includes license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(2) Patent license tally includes patent applications which are licensed.

(3) "Earned royalty" = royalty based upon use of a licensed invention (usually, a percentage of sales or of units sold). Not a license issue fee or a minimum royalty.

n/a = Data not available from agency at time of this report.

### Disposition of License Income

<b>FY 2011</b>	<b>Reclamation</b>	<b>USGS</b>	<b>Total</b>
<b>• Income distributed <sup>(1)</sup></b>			
<b>▪ Invention licenses, total distributed</b>	\$6,715	\$81,708	\$88,423
- To inventors	n/a	\$56,404	\$56,404
-To other	n/a	\$25,304	\$25,304
<b>- Patent licenses,<sup>(2)</sup> total income distributed</b>	\$6,715	\$77,822	\$84,537
- To inventors	n/a	\$52,518	\$52,518
-To other(2)(Lab, TT Office)	n/a	\$25,304	\$25,304

NOTE: Data is only provided for Bureaus with relevant activity.

Data in this table (intentionally) addresses only invention licenses -- with patent licenses distinguished as a subclass.

(1) Income includes royalties and other payments received during the FY.

(2) Patent license tally includes patent applications which are licensed.

n/a = Data not available from agency at time of this report.