DOE/CF-0053
Volume 7

Department of Energy
FY 2011 Congressional Budget Request

Nuclear Energy
Defense Nuclear Waste Disposal
Nuclear Waste Disposal

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FY 2011 Congressional Budget Request

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February 2010 Office of Chief Financial Officer Volume 7

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The Department of Energy's Congressional Budget justification is available on the Office of Chief Financial Officer, Office of Budget homepage at http://www.cfo.doe.gov/crorg/cf30.htm.

For the latest details on the Department of Energy's implementation of the Recovery Act, please visit: http://www.energy.gov/recovery

Department of Energy
Appropriation Account Summary
(dollars in thousands - OMB Scoring)

	FY 2009 Current Approp.	FY 2009 Current Recovery	FY 2010 Current Approp.	FY 2011 Congressional Request	FY 2011 vs. FY 2010	
					$	%
Discretionary Summary By Appropriation						
Energy And Water Development, And Related Agencies						
Appropriation Summary:						
Energy Programs						
Energy Efficiency and Renewable Energy	2,156,865	16,771,907	2,242,500	2,355,473	+112,973	+5.0%
Electricity Delivery and Energy Reliability	134,629	4,495,712	171,982	185,930	+13,948	+8.1%
Nuclear energy	791,444	0	786,637	824,052	+37,415	+4.8%
Fossil Energy Programs						
Clean Coal Technology	0	0	0	0	——	——
Fossil Energy Research and Development	863,104	3,398,607	672,383	586,583	-85,800	-12.8%
Naval Petroleum and Oil Shale Reserves	19,099	0	23,627	23,614	-13	-0.1%
Strategic Petroleum Reserve	226,586	0	243,823	138,861	-104,962	-43.0%
Strategic Petroleum Account	-21,586	0	0	0	——	——
Northeast Home Heating Oil Reserve	9,800	0	11,300	11,300	——	——
Total, Fossil Energy Programs	1,097,003	3,398,607	951,133	760,358	-190,775	-20.1%
Uranium Enrichment D&D Fund[1]	535,503	390,000	573,850	730,498	+156,648	+27.3%
Energy Information Administration	110,595	0	110,595	128,833	+18,238	+16.5%
Non-Defense Environmental Cleanup	261,819	483,000	254,673	225,163	-29,510	-11.6%
Science	4,813,470	1,632,918	4,903,710	5,121,437	+217,727	+4.4%
Energy Transformation Acceleration Fund	8,700	388,856	0	299,966	+299,966	N/A
Nuclear Waste Disposal	145,390	0	98,400	0	-98,400	-100.0%
Departmental Administration	155,326	42,000	168,944	169,132	+188	+0.1%
Inspector General	51,927	15,000	51,927	42,850	-9,077	-17.5%
Advanced Technology Vehicles Manufacturing Loan Program	7,510,000	10,000	20,000	9,998	-10,002	-50.0%
Innovative Technology Loan Guarantee Program	0	0	0	500,000	+500,000	N/A
Section 1705 Temporary Loan Guarantee Program	0	3,960,000	0	0	——	——
Total, Energy Programs	17,772,671	31,588,000	10,334,351	11,353,690	+1,019,339	+9.9%
Atomic Energy Defense Activities						
National Nuclear Security Administration:						
Weapons Activities	6,410,000	0	6,384,431	7,008,835	+624,404	+9.8%
Defense Nuclear Nonproliferation	1,545,071	0	2,136,709	2,687,167	+550,458	+25.8%
Naval Reactors	828,054	0	945,133	1,070,486	+125,353	+13.3%
Office of the Administrator	439,190	0	410,754	448,267	+37,513	+9.1%
Total, National Nuclear Security Administration	9,222,315	0	9,877,027	11,214,755	+1,337,728	+13.5%
Environmental and Other Defense Activities:						
Defense Environmental Cleanup[1]	5,656,345	5,127,000	5,642,331	5,588,039	-54,292	-1.0%
Other Defense Activities						
Health, Safety and Security	446,471	0	441,882	464,211	+22,329	+5.1%
Legacy Management	185,981	0	189,802	188,626	-1,176	-0.6%
Nuclear Energy	565,819	0	83,358	88,200	+4,842	+5.8%
Defense Related Administrative Support	108,190	0	122,982	130,728	+7,746	+6.3%
Office of Hearings and Appeals	6,603	0	6,444	6,444	——	——
Congressionally Directed Projects	999	0	3,000	0	-3,000	-100.0%
Total, Other Defense Activities	1,314,063	0	847,468	878,209	+30,741	+3.6%
Defense Nuclear Waste Disposal	143,000	0	98,400	0	-98,400	-100.0%
Total, Environmental & Other Defense Activities	7,113,408	5,127,000	6,588,199	6,466,248	-121,951	-1.9%
Total, Atomic Energy Defense Activities	16,335,723	5,127,000	16,465,226	17,681,003	+1,215,777	+7.4%
Power Marketing Administrations:						
Southeastern Power Administration	7,420	0	7,638	0	-7,638	-100.0%
Southwestern Power Administration	28,414	0	44,944	12,699	-32,245	-71.7%
Western area Power Administration	218,346	10,000	256,711	105,558	-151,153	-58.9%
Falcon & Amistad Operating & Maintenance Fund	2,959	0	2,568	220	-2,348	-91.4%
Colorado River Basins	-23,000	0	-23,000	-23,000	——	——
Total, Power Marketing Administrations	234,139	10,000	288,861	95,477	-193,384	-66.9%
Federal Energy Regulatory Commission	0	0	0	0	——	——
Subtotal, Energy And Water Development and Related Agencies	34,342,533	36,725,000	27,088,438	29,130,170	+2,041,732	+7.5%
Uranium Enrichment D&D Fund Discretionary Payments	-463,000	0	-463,000	-696,700	-233,700	-50.5%
Excess Fees and Recoveries, FERC	-23,080	0	-28,886	-29,111	-225	-0.8%
Total, Discretionary Funding	**33,856,453**	**36,725,000**	**26,596,552**	**28,404,359**	**+1,807,807**	**+6.8%**

[1] The Defense Environmental Cleanup/Uranium Enrichment Decontamination and Decommissioning Fund accounts reflect correctly the Administration's policy for the Department's FY 2011 request. These accounts include $47 million that was inadvertently omitted from the official Budget request. A budget amendment is expected to be forthcoming to formally correct for this error.

Nuclear Energy

Nuclear Energy

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Nuclear Energy

(including transfer of funds)

Proposed Appropriation Language

For Department of Energy expenses including the purchase, construction, and acquisition of plant and capital equipment, and other expenses necessary for nuclear energy activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion, and the purchase of not more than [36 passenger motor vehicles, including one ambulance]9 buses, all for replacement only, [$786,637,000] $824,052,000, to remain available until expended[: Provided, That, of the amount appropriated in this paragraph, $2,500,000 shall be used for projects specified in the table that appears under the heading ``Congressionally Directed Nuclear Energy Projects" in the joint explanatory statement accompanying the conference report on this Act]. (Energy and Water Development and Related Agencies Appropriations Act, 2010.)

Nuclear Energy
Office of Nuclear Energy

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Nuclear Energy Appropriation				
Integrated University Program	5,000	0	5,000	0
RE-ENERGYSE	0	0	0	5,000
Nuclear Power 2010	177,500	0	105,000	0
Generation IV Nuclear Energy Systems	178,649	0	220,137	0
Reactor Concepts Research, Development and Demonstration	0	0	0	195,000
Nuclear Hydrogen Initiative	7,343	0	0	0
Fuel Cycle Research and Development	142,652	0	136,000	201,000
Nuclear Energy Enabling Technologies	0	0	0	99,300
Radiological Facilities Management	66,146	0	72,000	66,818
Idaho Facilities Management	140,000	0	173,000	162,482
Idaho Sitewide Safeguards and Security	78,811	0	0	0
Program Direction	73,000	0	73,000	91,452
International Nuclear Energy Cooperation	0	0	0	3,000
Congressionally Directed Projects	2,854	0	2,500	0
Subtotal, Nuclear Energy Appropriation	871,955	0	786,637	824,052
Transfer from State Department	3,300	0	0	0
Use of Prior Year Balance	-5,000	0	0	0
Funding from Other Defense Activities	-78,811	0	0	0
Total, Nuclear Energy Appropriation	791,444	0	786,637	824,052

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Other Defense Activities (NE) Appropriation[a]				
Idaho Sitewide Safeguards and Security	78,811	0	83,358	88,200
Total Other, Defense Activities Appropriation	565,819	0	83,358	88,200
Total Nuclear Energy and Other Defense Activities (NE) Appropriations	1,357,263	0	869,995	912,252

Preface

The Office of Nuclear Energy (NE) supports the diverse civilian nuclear energy programs of the U.S. Government, leading Federal efforts to research and develop nuclear energy technologies, including generation, safety, waste storage and management, and security technologies, to help meet energy and climate goals. NE's longer-term, science-based nuclear energy research and development (R&D) complements the near-term strategy to support the revitalization of the nuclear industry through loan guarantees provided by the Department of Energy's (DOE) Loan Guarantee Program.

Within the Nuclear Energy Appropriation NE funds: RE-ENERGYSE, Reactor Concepts Research, Development and Demonstration (RD&D), Nuclear Energy Enabling Technologies (NEET), Fuel Cycle (R&D), Radiological Facilities Management (RFM), Idaho Facilities Management (IFM), International Nuclear Energy Cooperation, and Program Direction. The Idaho Sitewide Safeguards and Security program is funded under the Other Defense Activities Appropriation.

Mission

NE advances nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs by resolving technical, cost, safety, proliferation resistance and security barriers through research, development, and demonstration as appropriate.

Benefits

NE is working to develop innovative and transformative technologies to improve the competitiveness, safety and proliferation resistance of nuclear energy to support its continued use in the United States and abroad. NE has established programmatic goals that reflect nuclear power's continuing role in satisfying the demand for clean energy. Those goals include exploring, through RD&D: technology and other solutions that can improve the reliability, sustain the safety, and extend the life of current reactors; improvements in the affordability of new reactors to enable nuclear energy to help meet the Administration's energy security and climate change goals; understanding of options for nuclear energy to contribute to reduced carbon emissions outside the electricity sector; development of sustainable

[a] Includes only the NE portion of the Other Defense Activities appropriation.

nuclear fuel cycles; and minimization of risks of nuclear proliferation and terrorism.
The suite of activities represented in this request are designed to support the development of advanced reactor designs and technologies, including reactors that could be capable of meeting electricity generation, co-generation of process heat, and performance demands beyond current base load nuclear power plants and advanced fuel cycle technologies. Additional activities in these programs will address barriers to the long-term operation of nuclear plants as well as the technical, cost, safety, proliferation resistance, and security issues associated with novel designs and innovative reactor concepts. A prominent influence on R&D direction is improving our understanding of proliferation risks as well as developing the technical means to mitigate them. To more effectively address these challenges, NE R&D programs have been restructured, as described below.

Beginning in FY 2011, the new Reactor Concepts RD&D program will carry on activities previously included under the Generation IV Nuclear Energy Systems (Gen IV) program, including the Next Generation Nuclear Plant project, R&D on Generation IV and other advanced nuclear reactor concepts, and R&D to support extending the life of the current Light Water Reactor fleet. In addition, the Reactor Concepts RD&D program scope will initiate work on Small Modular Reactors.

NE will lead future waste management activities including activities associated with the planned Blue Ribbon Commission and oversee ongoing responsibilities under the Nuclear Waste Policy Act. Through its Fuel Cycle R&D program, NE will continue to perform results-oriented, science based R&D on fuel cycle approaches and technologies, including exploration of new and advanced fuel types – such as high burn-up and inert matrix fuels – that may lead to improved performance in today's reactor technologies. The program will examine a full range of technologies and develop waste management options critical to the long term management of used fuel.

Complementing the RD&D activities carried out by the Reactor Concepts RD&D and Fuel Cycle R&D programs, the new NEET program will develop crosscutting and transformative technologies that directly support and complement NE's development of new and advanced reactor concepts and fuel cycle technologies. Within this program, activities will be carried out through directed research projects as well as through investigator-initiated projects selected through open, competitive solicitations. The investigator-initiated, peer reviewed program will be open to projects that relate to any aspect of nuclear energy generation—reactor and power conversion technologies, enrichment, fuels and fuel management, waste disposal, nonproliferation, and so forth—ensuring that good ideas have sufficient outlet for exploration. Also, the Energy Innovation Hub for Modeling and Simulation (HUB), previously included within the Gen IV program, is funded within the NEET program in FY 2011. The Hub's novel approach and products are prime examples of the crosscutting, transformative activities that will enhance many research areas within NEET.

Just as the scope of the NEET program is informed by key challenge areas associated with developing commercially-viable reactor and fuel cycle technologies, the outcomes of the R&D activities supported through the NEET program will yield important breakthroughs that may be applied to the specific technologies under development in the Reactor Concepts RD&D and Fuel Cycle R&D programs. This new program structure will advance current reactor designs and fuel cycle technologies, develop new reactor designs and technology, and encourage the identification and development of "outside the box" options in all aspects of the civilian nuclear energy program. All programs will be tightly coordinated and complementary to avoid duplication and spur innovation.

To help ensure the safe and secure deployment of civilian nuclear power world-wide, the new International Nuclear Energy Cooperation program will work cooperatively to share research results, and to strengthen officially approved international agreements and other relevant U.S. international commitments in civilian nuclear energy matters. This program will coordinate with the National Nuclear Security Administration and the Office of Policy and International Affairs in executing its activities.

In support of RE-ENERGYSE, a Department-wide effort to encourage students to pursue careers in science, engineering, and entrepreneurship related to clean energy, NE is requesting funds to support competitively-selected, merit-based one-year undergraduate scholarships and three-year graduate degree fellowships to M.S. and Ph.D. students enrolled in nuclear, science, engineering, and related fields at U.S. universities. NE will also continue to allocate up to 20 percent of funds appropriated for R&D to research conducted at universities and other higher-education institutions.

NE's infrastructure programs, including the IFM and RFM programs, ensure that the Department's nuclear facilities used for advanced nuclear energy technology R&D and the co-funded production (with National Aeronautics and Space Administration (NASA)) of power systems for space and national security needs are operated and maintained to support national priorities. Key activities conducted under these programs include ensuring NE facilities meet essential safety and environmental requirements and are maintained at user-ready levels as well as ensuring the safe and secure management of all special nuclear materials contained in these facilities.

NE's Research Reactor Infrastructure program will continue to provide fresh reactor fuel to and remove used fuel from, 26 operating university reactors that support nuclear energy R&D. In addition, the Department will initiate work to re-establish a domestic capability to produce plutonium-238 for use in radioisotope power systems (RPSs) required by certain NASA space missions and national security applications.

Performance

The Secretary has identified the following goals for DOE:

Goal 1: Innovation: Lead the world in science, technology, and engineering
Goal 2: Energy: Build a competitive, low-carbon economy and secure America's energy future
Goal 3: Security: Reduce nuclear dangers and environmental risks

NE supports Goal 2: Energy: Build a competitive, low-carbon economy and secure America's energy.

Nuclear energy is an important element of the diverse energy portfolio required to accomplish our national objectives. Nuclear power is a proven clean, affordable, domestic technology that is within the current U.S. energy portfolio. NE is charged with conducting the research, development, and demonstrations as appropriate required to address scientific and technical challenges associated with the continued and expanded use of this valuable energy resource. NE's R&D programs, through science discovery and innovation, support nuclear technology development activities designed to enhance America's energy future. NE's infrastructure programs, including the IFM and RFM programs, ensure that the Department's nuclear facilities used for advanced nuclear energy technology R&D and RPS production are operated and maintained such that they are able to support national priorities.

Basic and Applied R&D Coordination

Coordination between the Department's basic research and applied technology programs is a high priority for the Secretary of Energy. The Department has a responsibility to coordinate its basic and applied research programs to effectively integrate R&D by the science and technology communities (e.g., national laboratories, universities, and private companies) that support the DOE mission. Efforts have focused on improving communication and collaboration between federal program managers and increasing opportunities for collaborative efforts targeted at the interface of scientific research and technology development to ultimately accelerate DOE mission and national goals. Coordination between the basic and applied programs is also enhanced through joint programs, jointly-funded scientific facilities, and the program management activities of the DOE Small Business Innovation Research and Small Business Technology Transfer programs. Additionally, co-funding research activities and facilities at the DOE laboratories and funding mechanisms that encourage broad partnerships (e.g., Funding Opportunity Announcements) are also means by which the Department facilitates greater communication and research integration within the basic and applied research communities.

Facilities Maintenance and Repair

The Department's Facilities Maintenance and Repair activities are tied to its programmatic missions, goals, and objectives. Facilities Maintenance and Repair activities funded by this budget are displayed below.

Indirect-Funded Maintenance and Repair

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Idaho National Laboratory	16,417	17,078	17,768
Total, Indirect-Funded Maintenance and Repair	16,417	17,078	17,768

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Direct-Funded Maintenance and Repair

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Idaho National Laboratory	16,023	16,409	20,994
Total, Direct-Funded Maintenance and Repair	16,023	16,409	20,994

Nuclear Energy
Office of Nuclear Energy

Funding by Site by Program

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Argonne National Laboratory			
Fuel Cycle Research and Development	18,930	10,518	12,896
Generation IV Nuclear Energy Systems	1,563	14,692	0
International Nuclear Energy Cooperation	0	0	350
Nuclear Energy Enabling Technologies	0	0	4,240
Nuclear Hydrogen Initiative	213	0	0
Radiological Facilities Management	800	0	0
Reactor Concepts Research, Development and Demonstration	0	0	15,649
Total, Argonne National Laboratory	21,506	25,210	33,135
Brookhaven National Laboratory			
Fuel Cycle Research and Development	900	650	447
Generation IV Nuclear Energy Systems	75	125	0
Nuclear Energy Enabling Technologies	0	0	330
Reactor Concepts Research, Development and Demonstration	0	0	220
Total, Brookhaven National Laboratory	975	775	997
Chicago Operations Office			
Generation IV Nuclear Energy Systems	35	20	0
Nuclear Hydrogen Initiative	20	0	0
Total, Chicago Operations Office	55	20	0
Idaho National Laboratory			
Fuel Cycle Research and Development	39,130	40,859	61,108
Generation IV Nuclear Energy Systems	116,023	118,912	0
Idaho Facilities Management	135,185	159,272	155,082
Integrated University Program	4,450	0	0
International Nuclear Energy Cooperation	0	0	1,000
Nuclear Energy Enabling Technologies	0	0	18,310
Nuclear Hydrogen Initiative	3,108	0	0
Radiological Facilities Management	10,927	9,840	9,840

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Reactor Concepts Research, Development and Demonstration	0	0	105,118
Total, Idaho National Laboratory	308,823	328,883	350,458
Idaho Operations Office			
Congressionally Directed Projects	2,854	2,500	0
Fuel Cycle Research and Development	38,871	23,170	40,200
Generation IV Nuclear Energy Systems	48,013	54,425	0
Idaho Facilities Management	3,250	10,726	5,000
Integrated University Program	550	5,000	0
Nuclear Energy Enabling Technologies	0	0	29,539
Nuclear Hydrogen Initiative	1,864	0	0
Nuclear Power 2010	176,894	77,280	0
Program Direction	32,676	31,937	33,449
Radiological Facilities Management	6,496	10,500	4,818
RE-ENERGYSE	0	0	5,000
Reactor Concepts Research, Development and Demonstration	0	0	36,900
Total, Idaho Operations Office	311,468	215,538	154,906
Lawrence Berkeley National Laboratory			
Fuel Cycle Research and Development	825	1,195	2,196
Generation IV Nuclear Energy Systems	0	200	0
Total, Lawrence Berkeley National Laboratory	825	1,395	2,196
Lawrence Livermore National Laboratory			
Fuel Cycle Research and Development	2,940	3,395	3,699
Generation IV Nuclear Energy Systems	0	200	0
Nuclear Energy Enabling Technologies	0	0	450
Reactor Concepts Research, Development and Demonstration	0	0	220
Total, Lawrence Berkeley National Laboratory	2,940	3,595	4,369
Los Alamos National Laboratory			
Fuel Cycle Research and Development	13,431	16,595	24,795
Generation IV Nuclear Energy Systems	345	355	0
International Nuclear Energy Cooperation	0	0	450

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Nuclear Energy Enabling Technologies	0	0	4,680
Radiological Facilities Management	25,550	32,030	27,030
Reactor Concepts Research, Development and Demonstration	0	0	1,094
Total, Los Alamos National Laboratory	39,326	48,980	58,049
NNSA Service Center			
Generation IV Nuclear Energy Systems	1,944	0	0
Total, NNSA Service Center	1,944	0	0
Oak Ridge National Laboratory			
Fuel Cycle Research and Development	11,025	10,365	11,902
Generation IV Nuclear Energy Systems	6,774	8,283	0
International Nuclear Energy Cooperation	0	0	400
Nuclear Energy Enabling Technologies	0	0	11,490
Radiological Facilities Management	18,085	15,160	5,160
Reactor Concepts Research, Development and Demonstration	0	0	15,656
Total, Oak Ridge National Laboratory	35,884	33,808	44,608
Oak Ridge Operations Office			
Program Direction	1,290	1,353	1,620
Total, Oak Ridge Operations Office	1,290	1,353	1,620
Pacific Northwest National Laboratory			
Fuel Cycle Research and Development	4,350	6,118	8,979
Generation IV Nuclear Energy Systems Initiative	0	500	0
Nuclear Energy Enabling Technologies	0	0	810
Reactor Concepts Research, Development and Demonstration	0	0	656
Total, Pacific Northwest National Laboratory	4,350	6,618	10,445
Radiological and Environmental Sciences Laboratory			
Idaho Facilities Management	585	0	0
Program Direction	2,899	5,163	5,498
Total, Radiological and Environmental Sciences Laboratory	3,484	5,163	5,498

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Sandia National Laboratories			
Fuel Cycle Research and Development	4,510	8,515	21,403
Generation IV Nuclear Energy Systems	1,275	1,500	0
Nuclear Energy Enabling Technologies	0	0	530
Nuclear Hydrogen Initiative	890	0	0
Radiological Facilities Management	1,350	1,300	0
Reactor Concepts Research, Development and Demonstration	0	0	656
Total, Sandia National Laboratories	8,025	11,315	22,589
Savannah River National Laboratory			
Fuel Cycle Research and Development	2,100	4,290	7,900
Generation IV Nuclear Energy Systems	0	160	0
Nuclear Energy Enabling Technologies	0	0	330
Nuclear Hydrogen Initiative	1,188	0	0
Total, Savannah River National Laboratory	3,288	4,450	8,230
Washington Headquarters			
Fuel Cycle Research and Development	5,640	10,330	5,475
Generation IV Nuclear Energy Systems	2,602	20,765	0
Idaho Facilities Management	980	3,002	2,400
International Nuclear Energy Cooperation	0	0	800
Nuclear Energy Enabling Technologies	0	0	28,591
Nuclear Hydrogen Initiative	60	0	0
Nuclear Power 2010	606	27,720	0
Program Direction	36,135	34,547	50,885
Radiological Facilities Management	2,938	3,170	19,970
Reactor Concepts Research, Development and Demonstration	0	0	18,831
Total, Washington Headquarters	48,961	99,534	126,952
Total, Nuclear Energy	793,144	786,637	824,052

Site Description

Argonne National Laboratory
Introduction
Argonne National Laboratory (ANL) is one of the Department of Energy's (DOE) scientific research laboratories and is the Nation's first national laboratory, chartered in 1946. ANL is located approximately 25 miles southwest of the Chicago Loop, occupies 1,500 acres, and is surrounded by a forest preserve.

Fuel Cycle Research and Development
ANL supports electrochemical separations and waste form development activities. ANL has the lead for key systems analysis activities and contributes to used nuclear fuel disposition research and development (R&D) and modeling and simulation activities.

Generation IV Nuclear Energy Systems
ANL continues to play an important role in conducting key R&D in support of the Generation IV Nuclear Energy Systems (Gen IV) program. ANL participates in system design and evaluation activities for the Gen IV systems, makes important contributions to Gen IV fuels and materials efforts, and leads or participates in joint projects with France, Korea, Canada, Euratom, and Japan. ANL is responsible for staffing one of two U.S. experts for the Generation IV International Forum Experts Group. ANL also supports the Idaho National Laboratory (INL) on the Next Generation Nuclear Plant (NGNP) in the area of reactor cavity cooling system modeling.

International Nuclear Energy Cooperation
ANL will provide technical assistance in the development of the Department's international nuclear technology strategies. ANL will also assist in the development of workshops to engage industry and foreign governments as well as provide technical support for key international R&D and nuclear energy activities in areas of mutual interest, leveraging U.S. funding, and exchanging technical information related to innovative reactor concepts, fuel cycle technologies, and other nuclear technologies.

Nuclear Energy Enabling Technologies
ANL provides technical support to various cross-cutting reactor technologies including fast reactor safety, system and components testing, and innovative materials development. ANL evaluates innovative reactor concepts and assesses integrated system performance, including the development of integrated performance and safety codes to support modeling and simulation.

Nuclear Hydrogen Initiative
ANL supported the program until its completion at the end of FY 2009 by conducting laboratory analyses of thermochemical hydrogen production methods, specifically alternative cycles other than sulfur-based cycles.

Radiological Facilities Management
ANL funding supports activities associated with the certification of Type-B shipping containers. These shipping containers are a critical part of the Department of Energy's program infrastructure that enables DOE to provide radioisotope power systems for use in national security applications and space exploration missions.

Reactor Concepts Research, Development and Demonstration
ANL provides essential support to advanced reactor concepts, particularly in the area of fast reactors. ANL participates in system design and evaluation activities for the Gen IV systems, makes important contributions to Gen IV fuels and materials efforts, and leads or participates in international collaborative projects. ANL is responsible for staffing one of two U.S. experts for the Generation IV International Forum Experts Group. ANL also supports the INL on the NGNP in the area of reactor cavity cooling system modeling.

Brookhaven National Laboratory
Introduction
The Brookhaven National Laboratory (BNL) is a multi-program laboratory located in Upton, New York. DOE's BNL conducts research in the physical, biomedical, and environmental sciences as well as in energy technologies. Brookhaven builds and operates major facilities available to university, industrial, and government scientists. BNL also performs a prospective benefits analysis of DOE's nuclear energy R&D portfolio.

Fuel Cycle Research and Development
BNL will provide support to systems analysis, material protection, and advanced fuels R&D.

Generation IV Nuclear Energy Systems
BNL provides support to the Proliferation Resistance and Physical Protection Working Group under the Generation IV International Forum.

Nuclear Energy Enabling Technologies
BNL will provide support to the proliferation risk assessment activities and under the Nuclear Energy Enabling Technologies (NEET) program.

Reactor Concepts Research, Development and Demonstration
BNL will provide support to Advanced Reactors Concepts by participating in expert groups on proliferation resistance.

Chicago Operations Office
Introduction
The Chicago Operations Office provides procurement, contract, cooperative agreement, and grant support.

Generation IV Nuclear Energy Systems
The Chicago Operations Office supports distribution of certain Gen IV funding.

Nuclear Hydrogen Initiative
The Chicago Operations Office supported distribution of certain Nuclear Hydrogen Initiative funding in FY 2009.

Idaho National Laboratory
Introduction
The INL is an extensive research and engineering complex that has been the center of nuclear energy research since 1949. It occupies 890 square miles in southeastern Idaho along the western edge of the

Snake River Plain, 42 miles northwest of Idaho Falls, Idaho. The INL consists of three main engineering and research campuses: (1) the Reactor Technology Complex at the site, (2) the Materials and Fuels Complex (MFC) at the site, and (3) the Research and Education Campus in Idaho Falls. As INL Landlord, NE also operates the Central Facilities Area at the site that provides support to all the compounds and campuses at the site. The Office of Nuclear Energy (NE) has Lead Program Secretarial Office responsibility for the Idaho Operations Office (ID). INL is the center for NE's strategic nuclear energy R&D enterprise. INL has a central role in Gen IV nuclear energy systems development and fuel cycle R&D, and space nuclear power and propulsion applications. While focused on its role as the center for nuclear R&D, as a multi-program national laboratory, INL also continues to pursue national security, and homeland security activities.

Fuel Cycle Research and Development

INL leads the Fuel Cycle R&D Technical Integration Office. INL has assembled a unique set of expertise across all technical areas important to fuel cycle programs. This expertise enables INL to fully integrate the range of information necessary to set requirements for all elements of the program. INL will be a key contributor in the development of a detailed program plan for the Department's fuel cycle R&D effort. INL has developed the VISION code and coordinated development of related databases used to analyze various fuel cycle scenarios, supports R&D on transmutation fuel and electrochemical separations techniques, and can perform the irradiations of transmutation fuels. Related facilities are concentrated at the MFC and at the Advanced Test Reactor, and include a complete suite of gloveboxes, hot cells, and dedicated equipment.

Generation IV Nuclear Energy Systems

INL is the lead laboratory for the NGNP program and conducts the program's technical integration activities, as well as integration activities for all Gen IV R&D activities. INL, together with Oak Ridge National Laboratory (ORNL), is the principal laboratory responsible for the development of advanced gas reactor fuel and materials R&D. INL is responsible for staffing the Technical Secretariat for the Generation IV International Forum. INL serves as the technical integrator of research for Light Water Reactors.

Idaho Facilities Management

INL is a multi-program national laboratory that employs R&D assets to pursue a wide range of nuclear power R&D and other national energy security activities. The purpose of the Idaho Facilities Management (IFM) program is to operate and maintain the INL infrastructure required to support mission needs and priorities in a manner that is in compliance with environment, safety and health rules and regulations. NE is responsible for 890 square miles of land west of Idaho Falls (the site) and numerous laboratory and administrative facilities located in the town of Idaho Falls. NE operates and maintains buildings, nuclear and radiological facilities, and associated support structures; a full complement of site wide utilities, including power, communications and data transmission systems; 800 miles of paved and unpaved roads; 61 miles of high voltage electrical transmission lines; and 14 miles of railroad track.

Integrated University Program

In FY 2009, INL supported the Integrated University Program by administering Investigator-Initiated R&D awards through the Center of Advanced Energy Studies.

International Nuclear Energy Cooperation
INL will support the development of the Department's international nuclear technologies strategies and international engagement with foreign countries. INL will also assist in coordinating government-to-government international bilateral and multilateral activities. In support of INEC's International R&D and Technical Coordination activities, INL will provide technical support to key international R&D and nuclear energy activities in areas of mutual interest, leveraging U.S. funding, and exchanging technical information related to innovative reactor concepts, fuel cycle technologies, and other nuclear technologies.

Nuclear Energy Enabling Technologies
INL provides technical support for cross-cutting technologies including advanced fuels, fabrication and construction methods, and proliferation risk assessment. INL has the lead on the development of advanced instruments and sensors for the existing light water reactor fleet.

Nuclear Hydrogen Initiative
INL provided leadership in executing the NHI through the completion of the program at the end of FY 2009.

Radiological Facilities Management
INL is responsible for maintaining facilities and equipment for the assembly, testing, and delivery of radioisotope power systems. This capability focuses on the assembly of the encapsulated Plutonium 238 (Pu-238) into heat sources, insertion of heat sources into generators, testing of the assembled generators, and delivery of the generators to customers. Activities also include the transfer of neptunium-237 (Np-237) inventory from the Savannah River Site (SRS) to the INL for use in the future for Pu-238 production. In FY 2008, INL began providing fuel for university research reactors including fuel for conversions from highly enriched uranium to low enriched uranium, and shipped spent fuel from university reactors to DOE's SRS.

Reactor Concepts Research, Development and Demonstration
INL is the lead laboratory for the NGNP program and conducts the program's technical integration activities, as well as integration activities for the Light Water Reactor Sustainability program. INL, together with ORNL, is the principal laboratory responsible for the development of advanced gas reactor fuel and materials R&D. INL is responsible for staffing the Technical Secretariat for the Generation IV International Forum.

Idaho Operations Office
Introduction
The ID provides procurement, contract, cooperative agreement, and grant support. This office also provides support for contractor security investigations conducted by the Federal Bureau of Investigation and the OPM for DOE Federal employees and contractors. ID provides procurement and management support for NE university funding activities. A potion of the funds allocated to ID will be competitively awarded for support of both mission-specific and mission-related activities. Recipients may include industry, national laboratories, universities, research institutions.

Fuel Cycle Research and Development
ID provides procurement support for the Fuel Cycle R&D program.

Generation IV Nuclear Energy Systems
ID provides procurement support for the NGNP program. ID is responsible for executing partnership agreements with industry to complete the conceptual design of the NGNP in FY 2010.

Idaho Facilities Management
ID provides procurement and management support for various community regulatory support to meet obligations defined in the following cross-cutting agreements: S.M. Stoller, Payment in Lieu of Taxes, Shoshone-Bannock Tribes, and the National Oceanic and Atmospheric Administration.

Integrated University Program
In FY 2010, ID will award competitively solicited scholarships and fellowships to graduate, post graduate, minority, and minority-serving institutions.

Nuclear Energy Enabling Technologies
ID provides procurement support and assists in developing competitive solicitations and cost-sharing arrangements to support cross-cutting reactor technologies. ID will provide procurement support to Headquarters for a competitively-awarded Energy Innovation Hub for Modeling and Simulation that will support validated advanced modeling and simulation tools through the virtual modeling of an existing, operating reactor.

Nuclear Hydrogen Initiative
ID managed a contract with General Atomics to perform R&D on the sulfur-iodine thermochemical cycle in FY 2009.

Nuclear Power 2010
ID provides procurement, contract, cooperative agreement and grant support for the Nuclear Power 2010 program.

Radiological Facilities Management
ID provides procurement, contract, cooperative agreement and grant support for the Research Reactor Infrastructure program

RE-ENERGYSE
ID will support and administer scholarships and fellowships awarded through the Department's RE-ENERGYSE initiative.

Reactor Concepts Research, Development and Demonstration
ID provides procurement support for the NGNP program and administers industry cost sharing arrangements.

Lawrence Berkeley National Laboratory
Introduction
Lawrence Berkeley National Laboratory (LBNL) has been a leader in science and engineering research for more then 70 years. Located on a 200 acre site in the hills above the University of California's Berkeley campus, adjacent to the San Francisco Bay, Berkeley Lab holds the distinction of being the oldest of the U.S. DOE's National Laboratories.

Fuel Cycle Research and Development
LBNL provides key support for generic repository performance due to the unique qualification of the laboratory's staff.

Generation IV Nuclear Energy Systems
LBNL supports the development of Gen IV reactor concepts.

Lawrence Livermore National Laboratory
Introduction
Lawrence Livermore National Laboratory (LLNL) is a multi-disciplinary R&D laboratory focused on national defense, which has two noncontiguous geographic locations in northern California. LLNL is approximately one square mile and is located 40 miles east of San Francisco. LLNL conducts research in advanced defense technologies, energy, environment, biosciences, and basic science.

Fuel Cycle Research and Development
LLNL provides expertise on the impact of separation technologies on the geologic repository and advanced computer simulations and modeling efforts.

Generation IV Nuclear Energy Systems
LLNL supports the development of Gen IV reactor concepts.

Nuclear Energy Enabling Technologies
LLNL provides support to the proliferation risk assessment activities under NEET.

Reactor Concepts Research, Development and Demonstration
LLNL supports the development of advanced reactor concepts.

Los Alamos National Laboratory
Introduction
Los Alamos National Laboratory (LANL) is a multi-disciplinary research facility located on approximately 28,000 acres near the town of Los Alamos in northern New Mexico. LANL is engaged in a variety of programs for DOE and other government agencies. LANL's primary mission is to engage in research and technical activities supporting the Nation's defense. LANL also supports DOE missions related to arms control, non-proliferation, nuclear material disposition, energy research, science and technology, and environmental management. R&D in the basic sciences, mathematics, and computing have a broad range of applications, including: national security, non-nuclear defense, nuclear and non-nuclear energy, atmospheric and space research, geoscience, bioscience, biotechnology, and the environment.

Fuel Cycle Research and Development
LANL is leading safeguards activities, and provides major support as the lead organization for oxide fuel research. LANL has unique facilities to measure and evaluate the nuclear data that are critical for the analyses of nuclear systems. LANL also provides expertise in the areas of advanced fuels, materials and accelerator-driven systems.

Generation IV Nuclear Energy Systems
LANL provides technical support in the modeling of various aspects of advanced reactor concepts.

International Nuclear Energy Cooperation
LANL will provide technical expertise in support of INEC activities and assist in coordinating international bilateral and multilateral activities. Activities include technical assistance in the development of the Department's strategies and international engagement with foreign countries.

Nuclear Energy Enabling Technologies
LANL leads activities associated with developing new tools and techniques to assess proliferation risks. LANL also provides technical support to several cross-cutting technologies to be developed under NEET, including transformational fuels and materials development.

Radiological Facilities Management
At LANL, the facilities at Technical Areas (TA) -3, -35, -48 and -55 provide unique national actinide capabilities in the areas of analytical chemistry, materials characterization, chemical diagnostics, radiochemistry, and applied spectroscopy. A portion of the Plutonium Facility-4 at the TA-55 is dedicated to Pu-238 activities and is used to purify and encapsulate Pu-238 used in radioisotope power sources for the National Aeronautics and Space Administration (NASA) space exploration missions and national security applications. LANL capabilities were expanded to include establishing a Pu-238 scrap recovery capability to recycle Pu-238 scrap for use in future missions.

Reactor Concepts Research, Development and Demonstration
LANL provides technical support in the precision measurement of nuclear data to support advanced reactor concepts.

NNSA Service Center
Introduction
The National Nuclear Security Administration (NNSA) Service Center provides procurement, contract, cooperative agreement, and grant support for the Gen IV program.

Generation IV Nuclear Energy Systems
In FY 2009, through contracts administered by the NNSA Service Center with General Atomics and Russian contractor, OKB Mechanical Engineering, engineering services and technical support were funded to perform R&D for the Gas Turbine Modular Helium Reactor development program in Russia.

Oak Ridge National Laboratory
Introduction
The ORNL is a DOE scientific research laboratory located in Oak Ridge, Tennessee. ORNL also maintains the DOE computer code system, software, and documentation at the Radiation Safety Information Computational Center (RSICC) and serves as a repository for DOE computational research activities, including computer software that is developed by the Nuclear Engineering Education Research (NEER) projects. The RSICC computer software is made available to nuclear engineering departments, Nuclear Energy Research Initiative and NEER awardees.

Fuel Cycle Research and Development
ORNL provides key support for fuels, separations and waste form R&D. ORNL also conducts safeguards and nuclear data research. ORNL provides materials expertise.

Generation IV Nuclear Energy Systems
ORNL and INL are the principal laboratories responsible for the R&D of advanced gas reactor fuel suitable for NGNP. ORNL also leads the development of the Gen IV Materials handbook efforts, conducts much of the materials testing in support of the Gen IV, and chairs the Project Management Board for the Very High Temperature Reactor Materials Project Arrangement under the Generation IV International Forum.

International Nuclear Energy Cooperation
ORNL will provide technical support for key international R&D and nuclear energy activities in areas of mutual interest, leveraging U.S. funding, and exchanging technical information related to innovative reactor concepts, fuel cycle technologies, and other nuclear technologies. ORNL will also assist in the implementation of the INEC bilateral and international R&D and policy engagement in the area of reactor technical evaluations and support.

Nuclear Energy Enabling Technologies
ORNL leads the advanced materials development activities and provides crosscutting technical support in the areas of advanced fuels, proliferation risk assessment and advanced methods for fabrication and construction.

Radiological Facilities Management
The Radiochemical Engineering Development Center (REDC) at the ORNL is the Department's production, storage, and distribution center for the heavy-element research activities with advanced hot cell capabilities. REDC along with the Irradiated Fuels Examination Laboratory and Irradiated Fuels Examination and Testing Facility provide experimental capability in support of advanced fuel and structural material examination and testing and advanced aqueous flow sheet development and testing activities for advanced reactor research. ORNL provides the unique capabilities for fabricating carbon insulator and iridium heat source components for radioisotope power sources used for NASA space exploration missions. These sophisticated heat source components are necessary for the safe operation of these power systems during normal operation and during launch, re-entry or other deployment accidents. ORNL, in cooperation with INL, is playing a key role in establishing the domestic capability to produce Pu-238 for use in NASA and national security missions. Facilities at ORNL could potentially be used to support the production effort.

Reactor Concepts Research, Development and Demonstration
ORNL and INL are the principal laboratories responsible for the R&D of advanced gas reactor fuel suitable for the NGNP. ORNL leads efforts related to Small Modular Reactor development and supports Reactor Concepts Research, Development and Demonstration (RD&D) activities in the area of advanced materials.

Pacific Northwest Laboratory
Introduction
Pacific Northwest Laboratory (PNL) is a multi-program laboratory located on approximately 640 acres of the Department's Hanford site. PNL also monitors a marine science lab in Sequim, Washington.

Fuel Cycle Research and Development
PNL has a key role in waste form activities by leveraging its history and expertise. PNL provides

technical support in the areas of advanced separations, fuels, materials, safeguards and nonproliferation analysis, and systems analysis.

Generation IV Nuclear Energy Systems
PNL supports the development of Gen IV reactor concepts.

Nuclear Energy Enabling Technologies
PNL provides support to the proliferation risk assessment activities under NEET.

Reactor Concepts Research, Development and Demonstration
PNL supports the development of advanced reactor concepts.

Radiological and Environmental Sciences Laboratory
Introduction
The Radiological and Environmental Sciences Laboratory is a DOE-owned and operated Federal reference laboratory with core mission capabilities in radiation measurement and calibrations, and analytical chemistry.

Idaho Facilities Management
The laboratory conducts measurement quality assurance programs to assure that key DOE missions are completed in a safe and environmentally responsible manner.

Sandia National Laboratories
Introduction
Sandia National Laboratories (SNL) is a research and development facility located on approximately 18,000 acres on the Kirtland Air Force Base reservation near Albuquerque, New Mexico and has smaller facilities in Livermore, California and Tonopah, Nevada. The mission of SNL is to meet national needs in the nuclear weapons and related defense systems, energy security, and environmental integrity.

Fuel Cycle Research and Development
SNL support to Fuel Cycle R&D increases in FY 2011 due to the expansion of the used nuclear fuel (UNF) disposition technical area. SNL was the lead laboratory that coordinated and organized scientific work for the repository program. It will now provide that technical expertise to support UNF disposition.

SNL also provides systems analysis support, particularly in the area of transportation analysis. SNL also has the lead for certain nuclear safeguards and security activities.

The laboratory has also developed widely used computer codes and models to analyze reactor safety. These codes have been validated and verified, and have been integrated into the nuclear industry's regulatory infrastructure. In this context, extensive databases have been developed to support probabilistic risk assessment modeling and analyses.

Generation IV Nuclear Energy Systems
SNL R&D is focused on development of advanced gas turbo-machinery with helium or supercritical carbon dioxide as the working fluids.

Nuclear Energy Enabling Technologies
SNL provides support to the proliferation risk assessment activities under NEET.

Nuclear Hydrogen Initiative
SNL served as the technical integrator for NHI until the program's completion at the end of FY 2009, responsible for coordinating the participation of all laboratories in the development and conduct of the NHI R&D program. In FY 2009, SNL also conducted R&D on the sulfur-iodine and Hybrid Sulfur thermochemical processes.

Radiological Facilities Management
SNL continues to maintain the nuclear system safety basis and develop risk assessment tools in support of DOE responsibilities for public safety under the Atomic Energy Act and in fulfillment of DOE's role in the Presidential Launch Approval Process under Presidential Directive National Security Council Memorandum 25 (PD/NSC-25).

Reactor Concepts Research, Development and Demonstration
SNL provides support to advanced reactor concepts in the areas of gas turbo-machinery, reactor safety and proliferation resistance.

Savannah River National Laboratory
Introduction
The Savannah River National Laboratory (SRNL) is an extensive material production and engineering complex that has been a nuclear site since 1951 when construction began supporting the U.S. strategic weapons program. The SRS is now a multi-program operational site covering 310 square mile site near Aiken, South Carolina. Because of its Cold War nuclear legacy, there is a significant level of environmental management cleanup work being performed at the site. In addition to supporting NE programs, the SRS workforce continues to support NNSA's weapons disposition program. SRNL is a multi-program laboratory located on approximately 34 acres within the SRS.

Fuel Cycle Research and Development
SRNL conducts research on advanced aqueous separations, systems analysis, advanced safeguards, and waste form development. SRS provides engineering analysis support as well.

Generation IV Nuclear Energy Systems
SRNL was provided limited funding in FY 2010 to archive valuable equipment and data related to non-electric applications of nuclear energy.

Nuclear Energy Enabling Technologies
SRNL provides support to the proliferation risk assessment activities under NEET.

Nuclear Hydrogen Initiative
SRNL coordinated hybrid sulfur thermochemical cycle R&D activities until the completion of the NHI program at the end of FY 2009.

Washington Headquarters
FY 2009, FY 2010, and FY 2011 include funding for SBIR and other small business initiatives. A potion of the funds allocated to Washington Headquarters will be competitively awarded for support of

both mission-specific and mission-related activities. Recipients may include industry, national laboratories, universities, research institutions.

Fuel Cycle Research and Development
HQ provides management of certain research activities and competitive solicitations.

Generation IV Nuclear Energy Systems
HQ provides overall oversight and management of R&D activities and serves as the interface with the NRC.

Idaho Facilities Management
Headquarters funds cross-cutting departmental activities such as DCAA audits, NRC certificates and fees, and NE's share of DOE corporate infrastructure management systems. Funding also supports NE-owned material storage fees at BWXT and waste generator fees at the Nevada Test Site.

International Nuclear Energy Cooperation
In FY 2011, INEC activities at headquarters include technical expertise in support of international bilateral and multilateral engagement and civil nuclear energy R&D with countries that are established as significant participants in the commercial nuclear sector; energy supply, nonproliferation and fuel cycle assessments; and reviewing the legal and financial liability implications of proposed strategies and options. Work may also include the creation of workshops to engage industry and foreign governments.

Nuclear Energy Enabling Technologies
In FY 2011, HQ will provide oversight of a competitively-awarded modeling and simulation Hub for the development of validated advanced modeling and simulation tools through their application to an existing, operating reactor.

Nuclear Hydrogen Initiative
MPR is a highly regarded technical services company in the commercial nuclear industry. In FY 2009, MPR provided independent technical reviews of NHI deliverables.

Nuclear Power 2010
Includes funding for closing out activities on the NuStart combined Construction and Operating License demonstration project.

Radiological Facilities Management
In FY 2011, the Department plans to initiate a project to restart the production of Pu-238 for the Space and Defense program. Activities will include: National Environmental Policy Act (NEPA) documentation and other safety and design actions necessary to meet the DOE O 413.3A requirements to obtain CD-1 in early FY 2011.

Reactor Concepts Research, Development and Demonstration
HQ provides overall management of reactor research and development activities and serves as the primary interface with the NRC. HQ develops competitive solicitations and industry cost-sharing arrangements to support Small Modular Reactors, NGNP, and other reactor concepts.

Integrated University Program

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Integrated University Programrm	5,000	0	5,000	0

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriations Act (2009)
P.L. 111-85, Appropriations Act (2010)

Mission

In FY 2009, the Integrated University Program provided fellowship grants and investigator-initiated research and development (R&D). In FY 2010, the Program provided scholarship and fellowship grants to support nuclear science and engineering research. No funding is being requested for this program in FY 2011.

Commencing in FY 2011, the Department's energy technology education efforts will be focused through its Regaining ENERGY Science and Engineering Edge (RE-ENERGYSE) program, a broad educational effort that cuts across program offices to inspire students and workers to pursue careers in science, engineering, and entrepreneurship related to energy. The Office of Nuclear Energy (NE) will be supporting the initiative through competitive awards at universities and educational research institutions focused on advancing nuclear energy technologies.[a]

Benefits

In order to leverage educational support efforts conducted elsewhere in the Department and to avoid duplication of these efforts, nuclear energy-related fellowships and scholarships will be funded through NE's support of the Department's RE-ENERGYSE program starting in FY 2011. In FY 2010, the Integrated University Program will provide approximately 30 three-year fellowships and 88 one-year scholarships. 100 percent of funding for multi-year awards is included within the FY 2010 appropriation.

Annual Performance Results and Targets

The Integrated University Program has **c**ontributed to the Secretary's Goal of *Innovation: Lead the World in Science, Technology, and Engineering* and to the National Nuclear Infrastructure GPRA Unit Program Goal. The program has supported nuclear energy R&D conducted at laboratories and

[a] In FY 2011 the Office of Nuclear Energy (NE) will provide funding through RE-ENERGYSE for scholarships and fellowships. This activity will be coordinated with RE-ENERGYSE activities funded within the Office of Energy Efficiency and Renewable Energy (EERE). NE and EERE funds are requested in separate accounts; RE-ENERGYSE funds requested within NE will only support nuclear technology education.

universities across the Nation, as well as university nuclear engineering programs through scholarships and fellowships.

Means and Strategies

The Integrated University Program has used various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

To end the program in FY 2010, the Department will implement the following means:

- Provide scholarships and fellowships as directed by statutory requirements.

To end the program in FY 2010 the Department will implement the following strategies:

- Issue scholarship and fellowship grants according to statutory requirements in a manner that ensures awards are fully funded within available FY 2010 funds.
- Follow the path set forth in FY 2009 to determine university needs and best categories of university grant investments to support nuclear science and engineering education.

These strategies will result in efficient and effective management of the program and productive use of the taxpayers' dollars.

In carrying out it's mission, the program performs the following collaborative activities:

- Coordinate with the NRC and the Defense Nuclear Nonproliferation (DNN) to support nuclear science and engineering education without duplication.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its support for university programs.

Integrated University Program

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Integrated University Program	5,000	5,000	0

Benefits

In order to leverage educational support efforts conducted elsewhere in the Department and to avoid duplication of these efforts, nuclear energy-related fellowships and scholarships will be funded through NE's support of the Department's RE-ENERGYSE program starting in FY 2011. In FY 2010, the Integrated University Program will provide approximately 30 three-year fellowships and 88 one-year scholarships. 100 percent of funding for multi-year awards is included within the FY 2010 appropriation.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Integrated University Program	**5,000**	**5,000**	**0**

In FY 2009, the Integrated University Program funded 9 three-year investigator-initiated nuclear science research projects and 3 three-year fellowships. In FY 2009, the scope of this program was planned in collaboration with the NRC and DNN programs.

In FY 2010, the Integrated University Program scope is focused entirely on supporting nuclear education by funding approximately 88 one-year scholarships and 30 three-year fellowships for students enrolled in nuclear energy-related fields of study or disciplines at U.S. universities and two-year colleges. 100 percent of funding for multi-year awards is included within the FY 2010 appropriation.

Total, Integrated University Program	**5,000**	**5,000**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Integrated University Program	
In FY 2011, no funding is being requested for this program. The Department is undertaking a broad educational effort (RE-ENERGYSE) that cuts across DOE programs to coordinate, standardize, and evaluate Science, Technology, Engineering, and Mathematics education programs within DOE. Therefore, NE is requesting funding under the RE-ENERGYSE Initiative to support the continuation of nuclear energy-related education and research.	-5,000
Total Funding Change, Integrated University Program	**-5,000**

RE-ENERGYSE
(Regaining our Energy Science and Engineering Edge)

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
RE-ENERGYSE	0	0	0	5,000

Mission

The mission of RE-ENERGYSE (Regaining our Energy Science and Engineering Edge) is to provide the education and training necessary to build a highly skilled U.S. clean energy workforce dedicated to solving the world's greatest energy challenges.[a]

Benefits

RE-ENERGYSE supports scientific discovery and innovation at universities across the United States. This program will provide important educational support to bolster nuclear engineering and science programs at U.S. universities, which supports continued use of nuclear power. A robust nuclear industry and infrastructure will result in multiple benefits for our Nation: clean, secure energy supply and lower greenhouse-gas emissions.

Annual Performance Results and Targets

RE-ENERGYSE contributes to the Secretary's Goal of *Innovation: Lead the World in Science, Technology, and Engineering* and to the National Nuclear Infrastructure GPRA Unit Program Goal. RE-ENERGYSE supports university nuclear engineering programs through scholarships and fellowships. These fellowships will complement existing Federal efforts and will help ensure that the next generation of scientists and engineers are available to support existing and future nuclear energy generation capacity and provide necessary innovation.

Means and Strategies

RE-ENERGYZE will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

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[a] In FY 2011, the Office of Nuclear Energy (NE) will provide funds through RE-ENERGYSE for scholarships and fellowships. This activity will be coordinated with RE-ENERGYSE activities funded within the Office of Energy Efficiency and Renewable Energy (EERE). NE and EERE funds are requested in separate accounts to be consistent with appropriated intent; RE-ENERGYSE funds requested within NE will only support nuclear technology education.

The Department will implement the following means:

- Provide scholarships and fellowships to support nuclear engineering university programs through RE-ENERGYSE.

The Department will implement the following strategies:

- Strategically plan and implement activities by coordinating with experts in education, the Department of Energy's (DOE) Office of Science, the Department of Labor, the Department of Education, the National Science Foundation (NSF), and the American Academy of Community Colleges, to ensure that this program fills educational gaps and does not duplicate efforts;
- Leverage the capacity of universities, the DOE National Laboratories, educational foundations, and industry to offer educational and research opportunities that will make a critical difference in informing and inspiring students to pursue careers in clean energy;
- Reach out broadly to universities, community colleges, and other relevant institutions to encourage widespread involvement of diverse communities, as well as constructive competition to stimulate the development of outstanding programs;
- Develop the outreach infrastructure necessary to communicate and disseminate curricula and other programs materials and importantly enable collaboration and feedback;
- Issue competitive solicitations to ensure that high quality institutions have the means and interest to create and sustain education and training efforts;
- Dedicate up to 10 percent of each subprogram for metric driven program evaluation activities and peer reviews;
- Create energy-specific materials at the school grade K-12 levels to engage, excite, and educate;
- Provide direct channels feeding energy-accredited and up-to-date materials into K-12 schools and communities; and
- Attract qualified candidates to competitive higher education programs.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

In carrying out the program's mission, the program performs the following collaborative activities:

- Work closely with RE-ENERGYSE to implement the means and strategies and ensure a well coordinated, efficient, effective program.

Validation and Verification

The NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its Research and Development (R&D) and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts RD&D and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques. NE will work closely with RE-ENERGYSE verify and validate the impacts of the program through a variety of means, such as assembling an expert panel to review and accredit program materials, using effective performance and effectiveness evaluation processes, and conducting workshops to inform priorities. A wide range of education and science organizations (e.g.,

NSF, National Center for Education Statistics, National Science Board, Department of Education, and National Science Teachers Association) will be consulted to provide data for the development of program priorities.

RE-ENERGYSE

Funding Schedule by Activity

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
RE-ENERGYSE	0	0	5,000

Benefits

NE is providing funds for scholarships and fellowships through RE-ENERGYSE to support the development of future nuclear researchers, scientists, and engineers. Strengthened university nuclear programs will help support the Nation's current and future nuclear energy needs.

Detailed Justification

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
RE-ENERGYSE	**0**	**0**	**5,000**
In FY 2011, the RE-ENERGYSE program plans to fund approximately 88 one-year scholarships and 30 three-year fellowships to students enrolled in nuclear energy-related fields of study of disciplines at U.S. universities and two-year colleges.			
Total, RE-ENERGYSE	**0**	**0**	**5,000**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
RE-ENERGYSE	
In FY 2011, new funding is being requested for this program to support the Department's broad educational effort that cuts across DOE programs to coordinate, standardize, and evaluate Science, Technology, Engineering, and Mathematics education programs.	+5,000
Total Funding Change, RE-ENERGYSE	**+5,000**

Nuclear Power 2010

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Nuclear Power 2010	177,500	0	105,000	0

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriation Act (2009)
P.L. 111-85, Appropriation Act (2010)

Mission

The Nuclear Power 2010 (NP 2010) program is a joint government/industry cost-shared effort established in 2002 to demonstrate untested NRC regulatory and licensing processes. The program will accomplish its intended purpose in FY 2010 and will be brought to conclusion.

Benefits

The NP 2010 program has provided funding to industry to achieve notable milestones including the issuance of three NRC-approved Early Site Permits (ESP), which establish that a site is suitable for possible future construction and operation of a nuclear power plant, and the submission to the NRC of two construction and operating license (COL) applications for two reactor designs. In addition, the program has placed the certification of the AP 1000 and Economic Simplified Boiling Water Reactor (ESBWR) reactor designs on a successful path to completion. The program has promoted industry interest in the deployment of the first new nuclear plants in 30 years[a] and will enable industry to make decisions to build plants in 2010. The NP 2010 program will achieve a prioritized set of its performance goals on one licensing project in FY 2010.

Annual Performance Results and Targets

The NP 2010 program's performance measure aligned to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the GPRA Unit Program Goal of New Nuclear Generation Technologies. The performance measure aligned to these goals by tracking progress on supporting industry in completing COL and design certification efforts. FY 2010 will be the final year for tracking this performance measure.

[a] To date industry has submitted a total of 17 COL applications to NRC covering 26 new nuclear reactors: http://www.nrc.gov/reactors/new-reactors/new-licensing-files/expected-new-rx-applications.pdf

Annual Performance Targets and Results

Secretarial Goal: Energy

GPRA Unit Program Goal: New Nuclear Generation Technologies

FY PY-3	FY PY-2	FY PY-1	FY PY	FY CY	FY BY	FY BY+1	FY BY+2	FY BY+3	FY BY+4
FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015

Efficiency Performance Measure: *Maintain total administrative overhead costs in relation to total R&D program costs of less than 8 percent.*

T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A:	T: NA A:	T: NA A:	T: NA A:	T: NA A:	T: NA A:

FY 2010: Enable industry to make a decision to build a new nuclear power plant by 2010 by continuing to support the completion of construction and operating license and design certification efforts.

FY 2009: Enabled industry to make a decision to build a new nuclear power plant by 2010 by supporting New Nuclear Plant Licensing Demonstration Projects within the planned scope, schedule, and budget of the program, and by administering the Department's standby support program.

FY 2008: Enabled industry to make a decision to build a new nuclear power plant by 2010 by supporting New Nuclear Plant Licensing Demonstration Projects and by administering the Department’s standby support program.

FY 2007: Completed NP 2010 engineering and licensing activities, focusing on the resolution of reactor certification and design issues and the preparation and review of Construction and Operation License (COL) applications, to enable an industry decision in 2010 to build a new nuclear power plant.

FY 2006: Completed engineering and licensing demonstration activities necessary to implement the NP 2010 program in accordance with the principles of project management, to help ensure that program performance goals are achieved on schedule and within budget.

T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A:	T: NA A:	T: NA A:	T: NA A:	T: NA A:	T: NA A:

Means and Strategies

As the program is closed out in FY 2010, it will use various means and strategies to continue to achieve its GPRA Unit Program goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

As the program is brought to closure in FY 2010, the Department will implement the following means:

- Close out joint government/industry cost-shared effort to support one combined COL for the NuStart Consortium.

As the program is brought to closure in FY 2010, The Department will implement the following strategies:

- Close out all partnerships with the private sector, national laboratories, universities, and international partners to support advanced Light Water Reactor (LWR) technologies.
- Lead the international community in pursuit of advanced LWR technologies (Generation III+) that will benefit the United States with enhanced safety and improved economics.

These strategies and other efforts will result in the efficient and effective management of the program, thus putting the taxpayer's dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- Ultimately, the decision to build new nuclear power plants rests with industry alone. This decision depends in part on power demand and economic and environmental factors beyond the scope of the Department's research and development (R&D) programs. In the near term, it depends on complex economic decisions made by industrial partners.

In carrying out the program's mission, the Office of Nuclear Energy (NE) performs the following collaborative activities:

- In FY 2010, the Department will work with industry to wrap up remaining activities and close out cost-shared partnerships established under NP 2010 originally to conduct demonstrations of untested Federal regulatory and licensing processes.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts Research, Development and Demonstration and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

NE has engaged its stakeholders to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals.

NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee and National Academy of Sciences.

Nuclear Power 2010

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Nuclear Power 2010			
Cost-shared Program with Industry	177,000	105,000	0
Standby Support Program	500	0[a]	0
Total, Nuclear Power 2010	177,500	105,000	0

Benefits

The NP 2010 program has provided funding to industry to achieve planned milestones including the issuance of three NRC-approved ESP, which establish that a site is suitable for possible future construction and operation of a nuclear power plant, and the submission to the NRC of two COL applications for two reactor designs. The program has promoted industry interest in the deployment of the first new nuclear plants in 30 years[b] and will enable industry to make decisions to build plants in 2010. The NP 2010 program will achieve a prioritized set of its performance goals on one licensing project in FY 2010.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Cost-shared Program with Industry	**177,000**	**105,000**	**0**

As part of the program's cost-shared efforts, NP 2010 has supported technology engineering and design for Generation III+ advanced LWRs. These new designs offer advancements in safety and economics over the Generation III designs licensed or certified previously by the NRC. To reduce the regulatory uncertainties and, thereby, enable the deployment of new nuclear power plants in the United States, the program helped demonstrate the untested Federal regulatory processes for the new plant siting (called ESP), and construction and operation of new nuclear plants (called combined COL), and design certification.

To demonstrate the untested regulatory process for obtaining NRC approval for constructing and operating new nuclear power plants, in FY 2005 the Department established competitively selected, cost-shared cooperative agreements with industry teams. Additionally, the agreements originally included the completion of design certification and detailed standardized plant designs for Westinghouse's AP 1000 and General Electric Hitachi's (GEH) ESBWR. By the end of FY 2010, all on-going design certification and COL project activities will be completed. The program will have fully achieved its goals and industry will have more than sufficient information and incentive to proceed on its own. Proof of this success is evident in the work that is currently being performed for the first

[a] Standby Support Program funding moves to the program direction account in FY 2010.
[b] To date industry has submitted a total of 17 COL applications to NRC covering 26 new nuclear reactors: http://www.nrc.gov/reactors/new-reactors/new-licensing-files/expected-new-rx-applications.pdf

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

domestic AP 1000 nuclear plant at Southern Company's Vogtle site under an NRC Limited Work Authorization.

In FY 2009, the project teams (NuStart, Dominion, GEH, and Westinghouse) continued activities with NRC to resolve COL application questions. Resolution resulted in issuance of Safety Evaluation Reports and Environmental Impact Statements (EIS) by the NRC. Reactor vendor activities continued to focus on design certification for the AP 1000 and ESBWR standard plant design.

In FY 2009, the Department:

- Continued industry interactions with NRC on the ESBWR and the AP 1000 reference COL applications including responses to NRC Request for Additional Information, meetings with the Advisory Committee on Reactor Safety (ACRS), and issuance of Safety Evaluation Reports (SER) and Draft EIS.
- Resolved open AP 1000 amended and ESBWR certification items to allow the NRC to issue SERs for design certification.
- Continued First-of-a-Kind Engineering design finalization activities for the standardized AP 1000 and design and preparation of the engineering analyses and calculations, design criteria documents, and design technical information.
- Accelerated standard AP 1000 design finalization activities necessary to complete vendor component/equipment procurement specifications and allow the utilities to issue contracts to initiate fabrication of modular plant components and other long lead equipment.

In FY 2010, the Department is:

- Providing final funding for the design finalization of the AP 1000 technology, design certification of the ESBWR technology, and close-out work on the NuStart COL reference application to complete support of industry interactions with NRC on the NuStart COL application including meetings with the ACRS, issuance of the Final Safety Evaluation Report and the Final EIS, and initiating hearings by the Atomic Safety Licensing Board.

Supporting one application project in FY 2010 will provide sufficient support for industry decisions to deploy new nuclear plants. By FY 2010, sufficient momentum will have been created by the cost-shared programs that all partners will have adequate incentive to complete any additional work through private funding and sufficient work will have been completed to demonstrate the new NRC design-centered licensing approach.

Standby Support Program	**500**	**0**	**0**

Standby Support is a form of insurance protection from certain delays in nuclear plant operation beyond the control of the power company owner. In FY 2010 and FY 2011, the Department will fund staff to perform related analyses and modeling as appropriate.

In FY 2009, the Department:

- Reviewed requests for conditional agreements from sponsors of new nuclear power plants.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
▪ Updated cost models and underlying analyses by working with financial and technical subject matter experts to support the development of estimated costs for individual requests.			
Total, Nuclear Power 2010	**177,500**	**105,000**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Cost-shared Program with Industry	
The decrease from $105,000 to $0 results from conclusion of the program.	-105,000
Total Funding Change, Nuclear Power 2010	-105,000

Generation IV Nuclear Energy Systems

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Generation IV Nuclear Energy Systems	178,649	0	220,137	0[a]

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriation Act (2009)
P.L. 111-85, Appropriation Act (2010)

Mission

Beginning in FY 2011, all Generation IV Nuclear Energy Systems (Gen IV) program activities will be carried out under the new Reactor Concepts Research, Development, and Demonstration (RD&D) program. The mission of the Gen IV activities is to address critical unanswered questions about advanced nuclear reactor technologies through research and development (R&D) to help meet tomorrow's needs for reliable electricity production and non-traditional applications of nuclear energy.

Benefits

Through scientific R&D and international collaboration, Gen IV supports the R&D of next-generation nuclear reactor technologies that could result in improved performance in sustainability, safety, economics, security, and proliferation resistance.

Annual Performance Results and Targets

Gen IV's performance measure aligned to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the GPRA Unit Program Goal of New Nuclear Generation Technologies. The performance measure aligned to these goals by tracking progress on milestones that must be met to inform the Secretarial decision on whether to proceed with the Next Generation Nuclear Plant (NGNP) project. The NGNP is being developed for economical production of electricity and other desirable products derived from high quality heat, which may increase contributions from nuclear energy to greenhouse gas abatement efforts. In FY 2011, Nuclear Energy (NE) will continue to track progress on the NGNP performance measure under the Reactor Concepts RD&D program.

[a] FY 2011 funding is requested in the Reactor Concepts Research, Development and Demonstration budget.

Means and Strategies

As the Gen IV program is incorporated into the Reactor Concepts RD&D program in FY 2011, it will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- Continue R&D on advanced, next-generation reactor systems that offer the most sustainable, cost-competitive, reliable, and secure means of generating electricity including participation by the national laboratories, industry, and university research communities as well as the international research community represented by the Generation IV International Forum (GIF).
- International cost sharing is in place for the R&D on Gen IV technologies under the GIF reactor technologies and industry cost-sharing will be pursued for the design and the construction of the NGNP at the Idaho National Laboratory (INL).

The Department will implement the following strategies:

- NE's R&D programs will partner with the private sector, national laboratories, universities, and international partners to develop advanced nuclear technologies.
- Programs will also engage the international community in pursuit of advanced nuclear technology that will benefit the United States with enhanced safety, improved economics, and reduced production of wastes.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- Deploying new nuclear power is ultimately an industry decision. Whether new nuclear plant technology is deployed depends on power demand and economic and environmental factors beyond the scope of DOE R&D programs. In the near term, it depends on complex economic decisions made by industrial partners.
- Industry is inclined to focus on near-term deployment using proven technologies. Industry may not immediately support or be supportive of longer-term development of better technologies.
- All nuclear energy research programs rely heavily on data produced through collaborations with foreign nations. Should vital data from foreign partners prove unavailable, U.S. efforts would need to be re-evaluated.

In carrying out the program's mission, the program performs the following collaborative activities:

- The program will support ongoing international collaboration on Sodium Fast Reactor (SFR) technology, to include fuel and material development and reactor design.
- The Department and the NRC coordinate program planning to assure that their R&D activities are complementary, cost effective, and not duplicative.
- The program is receiving broad international cooperation and support, consistent with the objectives of the program. The GIF, composed of representatives from 12 governments and the European Union, provides guidance for executing R&D activities focused on these next-generation nuclear energy systems.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts RD&D and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

NE has engaged its stakeholders in a number of recent evaluation activities to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals. NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee and National Academy of Sciences.

Generation IV Nuclear Energy Systems

Funding Schedule by Activity

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Generation IV Nuclear Energy Systems			
Generation IV R&D	1,956	28,321	0
Next Generation Nuclear Plant R&D	176,693	164,268	0
Energy Innovation Hub for Modeling and Simulation	0	21,384	0
SBIR/STTR	0	6,164	0
Total, Generation IV Nuclear Energy Systems	178,649	220,137	0

Benefits

Beginning in FY 2011, all Gen IV program activities will be carried out under the new Reactor Concepts RD&D program. This new program consolidates reactor related R&D to improve information sharing, minimize duplication, and increase transparency. Gen IV activities provide technical advancements and anticipated benefits including creating an international network of user facilities for nuclear R&D, and reduce the technical uncertainties to support the deployment of new nuclear reactor technologies. These advancements will help nuclear energy to compete economically with other technologies.

NE programs allocate R&D funding to those entities (e.g., industry, laboratories, and universities) that are best qualified to carry out the work in support of NE's mission. Consistent with NE's commitment to supporting R&D activities at university and educational research institutions, NE programs competitively award funds that support both mission-specific and mission-related activities. NE designates up to 20 percent of funds appropriated to its R&D programs for work to be performed at university and research institutions, through open, competitive solicitations for investigator-led projects. Further, the national laboratories are encouraged to partner with universities to conduct R&D.

Detailed Justification

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Generation IV R&D	**1,956**	**28,321**	**0**

In FY 2011, Gen IV R&D will be executed under the Reactor Concepts RD&D program. In FY 2010, the Gen IV R&D program focuses on crosscutting R&D in materials science and in codes and methods. Also in FY 2010, Congress appropriated $10,000,000 for R&D activities to support Light Water Reactor (LWR) life extension activities. Gen IV R&D activities are coordinated with foreign researchers through GIF and with the DOE Office of Science. Gen IV R&D also includes an examination of supercritical carbon dioxide as a working fluid for a more efficient method of producing electricity. R&D to support a domestic SFR prototype reactor has been discontinued. Longer term R&D on Gen IV reactor concepts, including the SFR, with international GIF partners will continue. Finally, Gen IV R&D provides secretariat support for the international policy and

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

experts groups of the GIF and supports the establishment of common evaluation methodologies of economics, safety, and proliferation resistance and physical protection of Gen IV reactors.

In FY 2009, the Department:

- Developed the fundamental scientific basis to understand, predict, and measure changes in materials, systems, structures, and components as they age.
- Applied this fundamental knowledge in collaborative public-private partnerships to develop and demonstrate methods and technologies that support safe and economical long-term operation of existing LWRs. Researched new technologies to address enhanced plant performance, economics, and safety.

In FY 2010, the Department is:

- Continuing development of advanced materials, such as oxide dispersion strengthened, alloys for use in structural system, fuel claddings and high temperature applications.
- Completing initial testing (mechanical, creep fatigue, thermal aging) of structural alloy candidate materials.
- Developing design methodology for long-term materials performance.
- Incorporating reactor core structural models into advanced reactor simulation methods.
- Performing validation studies for advanced reactor simulation methods.
- Continuing efforts on advanced modeling techniques utilizing the Department's high-speed, parallel computers for the development of close-coupled neutronic and thermofluid codes.
- Continuing R&D on the technical and economic viability of an advanced Brayton-cycle energy conversion system using supercritical carbon dioxide as the working fluid.
- Continuing phenomenology testing (e.g., sodium plugging) for compact heat exchangers.
- Participating in the work of the Proliferation Resistance and Physical Protection Working Group.
- Participating in the Economics Modeling and Reliability and Safety Working Groups.
- Investing in research aimed at revolutionary improvements to LWR technology.
- Performing reviews of innovative and novel reactor concepts for potential future R&D support.
- Providing critical Secretariat and meeting facilitation support for two international policy group and two international expert group meetings.

In FY 2011, funding for Gen IV R&D and LWR Sustainability activities are requested in the Reactor Concepts RD&D budget. Funding for new crosscutting technology activities is requested in the Nuclear Energy Enabling Technologies budget.

Next Generation Nuclear Plant	**176,693**	**164,268**	**0**

The Department's NGNP program collaborates with industry and other governmental organizations to conduct activities necessary to demonstrate a gas-cooled reactor technology in the United States. This includes development of a licensing strategy with the NRC, design, and R&D sufficient to support a licensing application submittal to the NRC. This project covers a range of activities from R&D to construction that are subject to cost-sharing requirements outlined in section 988 of EPAct 2005. Near-term emphasis is on results that will support key decisions by the Secretary of Energy on the future of the program. Important considerations include the availability of a licensable fuel for the reactor, qualification of nuclear grade graphite, design of high project-risk components such as

steam-generators and heat exchangers, the form and content requirements for a gas-cooled reactor licensing application, and other factors.

In FY 2010, the Department will cost-share with industry to complete the conceptual design of the NGNP. The Department continues to work with the U.S. private sector to identify industrial end-user requirements, produce trade studies reviewing the potential for integrating NGNP into various industrial applications. Similarly, the Department's collaboration with the NRC is supporting the development of a framework for licensing gas-cooled reactors in the United States. Key issues include the establishment of gas-cooled reactor specific requirements for emergency planning zones, containment design, and the quantification of potential radioactive releases. Finally, the Department is working with universities, national labs and the international community to develop analytical tools and conduct tests on fuel, metals and graphite to support the data needs of the reactor designers, regulators, and end-users. The INL coordinates NGNP R&D on behalf of the Department.

In FY 2009, the Department:

- Continued to successfully irradiate TRistructural ISOtropic coated gas reactor particle fuel in the INL Advanced Test Reactor (ATR) as part of the Advanced Gas Reactor (AGR-1) test.
- Completed the design of the test train for simulating severe fuel damage.
- Completed the Advanced Graphite Creep (AGC-1) test train and attained ready to insert status for the ATR testing of nuclear grade graphite.
- Continued the support of industry code committees in qualifying high-temperature materials and analytical methods.
- Worked collaboratively with NRC on high temperature gas reactor licensing technical issues including required R&D, Quality Assurance, containment and emergency planning issues, many of which are generically applicable to other advanced reactor concepts.
- Completed environmental experiments and mechanical property tests for potential IHX alloys.
- Completed test plan for water-cooled Reactor Cavity Cooling System experiments in Natural Convection Shutdown Heat Removal Test Facility at Argonne National Laboratory (ANL).
- Continued conceptual design activities for high project-risk systems and components.
- Issued a Funding Opportunity Announcement to partner with industry on the development of conceptual designs for NGNP.
- Continued analytical method and code development for benchmarking pebble-bed and prismatic cores in both physics and heat transport.
- Conducted cost-shared research in GIF Very High Temperature Reactor (VHTR) Projects for Design, Safety, and Integration; Computational Methods and Benchmarks; Materials; and Fuel and Fuel Cycle.
- Continued international collaborative projects on composites and high-temperature metallic materials testing, thermal-hydraulic analyses and experiments, and zirconium-carbide fuel particle coatings.
- Continued advanced modeling techniques utilizing the Department's high-speed, massively parallel computers for the development of close-coupled neutronic and thermofluid codes.

(dollars in thousands)

FY 2009	FY 2010	FY 2011

- Continued, in collaboration with international partners, the development of crosscutting benchmarking methodologies (economics, proliferation resistance and physical protection, and reactor safety).
- Maintained the *Generation IV Materials Handbook* to support code case development and arranged for other GIF organizations to contribute new materials data and access to all data.
- Continued collaboration with France on nano-structured ferritic alloys and initiated collaborative projects with France and the Republic of Korea on mechanical and corrosion testing of nickel-based alloys for VHTR applications and thermal-hydraulic analyses and experiments for VHTR safety.
- Continued collaboration with Japan on zirconium-carbide fuel particle coatings.
- Co-chaired the GIF VHTR Steering Committee and provided critical Secretariat and meeting facilitation support for two GIF Policy Group and two GIF Expert Group meetings.

In FY 2010, the Department is:

- Cost-sharing with industry to complete the conceptual design of one or two gas-cooled reactor concepts for the NGNP. In addition to conceptual design, industry partners will update project cost and schedule estimates and develop business plans for financing and managing the final design, licensing, and construction of the NGNP.
- Continuing advanced modeling techniques utilizing the Department's high-speed, parallel computers for the development of close-coupled neutronic and thermofluid codes.
- Maintaining the *Generation IV Materials Handbook* and arranging for other international partner organizations to share existing data and add new materials data.
- Commencing irradiation in the INL ATR of the first VHTR fuel produced in commercial scale production equipment (AGR-2).
- Preparing for and performing post-irradiation examination of the AGR-1 fuel removed from the ATR.
- Irradiating the first AGC-1 test experiment to provide data for nuclear graphite qualification.
- Continuing mechanical and chemical property characterization of high-temperature metals.
- Establishing an NRC approved Appendix B quality assurance program for all work performed on gas-cooled reactors that is related to design or licensing of future commercial gas-cooled reactors.
- Continuing development of national and international consensus codes and standards, including the qualification of high-temperature materials and the development of analytical methods.
- Preparing documentation on the technical and economic benefits and challenges of co-generation energy systems.
- Collaborating with NRC on scale reactor tests to be performed at Oregon State University and at ANL to benchmark thermal-fluid reactor system modeling tools.
- Submitting white papers to NRC on key licensing topics and respond to their review comments, topics include "Defense in Depth," "High Temperature Materials," "Fuel Qualification," and "Mechanistic Source Term."

In FY 2011, funding is requested in the Reactor Concepts RD&D budget.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Energy Innovation Hub for Modeling and Simulation	**0**	**21,384**	**0**

The national priorities for NE include working with industry and the existing reactor fleet to safely uprate power and to extend the reactors operating life. In addition, NE undertakes R&D to advance new nuclear energy technologies. This includes the Generation III+ and IV reactor systems as well as the development of small modular reactors. Advanced modeling and simulation is an essential tool to improving our scientific understanding of these systems to safely increase the pace of innovation and reduce costs.

One of the greatest challenges facing the designers and engineers for the Generation III+ and Generation IV reactors in using advanced modeling and simulation is the "user interface" required to access greater computing power. The current user interface for these tools and computers was created for work in the discovery sciences domain; a domain characterized by a small number of highly educated users, running a limited number of jobs for long periods on very powerful computers. In contrast, the applied domain of designers and engineers is characterized by a large variety of users running a plethora of jobs for short periods on very low power computers (e.g. desktops).

The focus of the Energy Innovation Hub for Modeling and Simulation (Hub) will be on dramatically changing the user environment for advanced modeling and simulation and high performance computing. The result will increase the pace of innovation, lower costs, and reduce uncertainty and risk for the design of reactors. The Hub will integrate and simplify the use of a wide range of technologies needed to use high performance advanced modeling and simulation by employing a cross-disciplinary team of nuclear engineers and scientists, computer scientists, mathematicians, verification and validation experts and sociologists and psychologists.

To achieve the highest degree of success the Hub will be mission driven. The mission focus of the Hub is to create a "virtual" model of an operating reactor with the potential coupling of a physical reactor for validation and verification purposes. This will involve the use of existing appropriate capabilities, the integration of existing and new modeling and simulation capabilities via an interoperability framework, the development of additional modeling and simulation capabilities as needed, and the validation of the capabilities using data obtained from the operating reactor. This will allow the creation of advanced user environments to provide interface with the virtual model. Also, where needed, the Hub will develop new 3D science based modeling and simulation capacities that are usable on advanced computing architectures. The Hub will also provide opportunities for fundamental and applied research that will combine experiments, theory and modeling and simulation to better understand nuclear energy technologies. The exact scope of work to be performed by the Hub will, however, be defined by the successful applicant.

(dollars in thousands)

FY 2009	FY 2010	FY 2011

To achieve the highest degree of success the Hub will be mission driven. The mission focus of the Hub is to create a "virtual" model of an operating reactor with the potential coupling of a physical reactor for validation and verification purposes. This will involve the use of existing appropriate capabilities, the integration of existing and new modeling and simulation capabilities via an interoperability framework, the development of additional modeling and simulation capabilities as needed, and the validation of the capabilities using data obtained from the operating reactor. This will allow the creation of advanced user environments to provide interface with the virtual model. Also, where needed, the Hub will develop new 3D science based modeling and simulation capacities that are usable on advanced computing architectures. The Hub will also provide opportunities for fundamental and applied research that will combine experiments, theory and modeling and simulation to better understand nuclear energy technologies. The exact scope of work to be performed by the Hub will, however, be defined by the successful applicant.

The Hub will accelerate the validation of modeling and simulation of nuclear energy technologies, develop advanced approaches to demonstrate the "predictability" of advanced modeling and simulation, and implement advanced instrumentation to observe the operation of physical nuclear energy technologies. A great deal of work has been accomplished or is currently underway to build, verify, and validate the modeling and simulation capabilities needed for nuclear energy. The Hub will serve a valuable and unique role that supplements this work by focusing on an existing reactor, focusing on engineering "usability issues" for advanced modeling and simulation, and allowing an opportunity for national laboratories, universities, and industry to work in a highly collaborative environment focused on a single mission.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

The Department anticipates that the benefits of the Hub will extend to all other forms of energy. The same user environment needed by nuclear energy technology designers and engineers will be usable by other energy technologies (e.g. solar, wind, and biomass energy systems). The user environment has the potential to transform advanced modeling and simulation applied to traditional forms of energy such as coal, natural gas, and petroleum as well.

In FY 2010, the Department is:

- Competitively establishing the Hub.
- Developing and issuing a Funding Opportunity Announcement.
- Preparing to select an applicant and award of a Cooperative Agreement contract for five years with the possibility of a five year extension if a high standard of performance is achieved.

Once the contract is awarded, the Department-funded Hub will:

- Proceed to establish the Hub to provide the deliverables and achieve the goals and objectives presented in the winning proposal.
- Staff the Hub with subject matter experts for required core capabilities and relocate personnel as needed for optimum Hub operating efficiency.
- Prepare the Hub infrastructure including any required renovation of existing buildings, leasing buildings, purchase of research equipment and instrumentation, and installation of state-of-the-art Hub communications and interface capabilities for long distance collaboration.
- Initiate robust interaction with private industry for the collection of requirements from expected users of the nuclear energy engineering environment.

In FY 2011, funding is requested in the Nuclear Energy Enabling Technologies (NEET) budget.

SBIR/STTR	**0**	**6,164**	**0**

The FY 2010 amount shown is an estimated requirement for the continuation of the SBIR and STTR program.

Total, Generation IV Nuclear Energy Systems	**178,649**	**220,137**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Generation IV R&D	
The decrease from $28,321,000 to $0 reflects the transfer of activities to the Reactor Concepts RD&D and NEET budgets.	-28,321
Next Generation Nuclear Plant R&D	
The decrease from $164,268,000 to $0 reflects the transfer of activities to the Reactor Concepts RD&D budget.	-164,268
Energy Innovation Hub for Modeling and Simulation	
The decrease from $21,384,000 to $0 reflects the transfer of activities to the NEET budget.	-21,384
SBIR/STTR	
The decrease from $6,164,000 to $0 reflects the transfer of R&D expenditures subject to SBIR and STTR to the Reactor Concepts RD&D and NEET.	-6,164
Total Funding Change, Generation IV Nuclear Energy Systems	**-220,137**

Reactor Concepts Research, Development and Demonstration

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Reactor Concepts Research, Development and Demonstration	0	0	0	195,000

Mission

The mission of the Reactor Concepts Research, Development and Demonstration (RD&D) program is to develop new and advanced reactor designs and technologies that advance the state of reactor technology to broaden its applicability, improve its competitiveness, and ensure its lasting contribution in meeting our nation's energy and environmental challenges. RD&D activities carried out by the program are designed to address technical, cost, safety, and security issues associated with reactor concepts, including Small Modular Reactors (SMRs), the Next Generation Nuclear Plant Demonstration Project (NGNP), and other advanced reactor concepts. In addition, the program will develop advanced technologies that will support extending the life of existing Light Water Reactors (LWRs). Nuclear Energy (NE) will leverage innovative, crosscutting research and development (R&D) activities carried out by the Nuclear Energy Enabling Technologies (NEET) program, complementing the RD&D carried out in this program.

Benefits

Through scientific research at pre-eminent national laboratories, collaboration with universities and international research agencies, and competitive cost-shared RD&D with industry, nuclear power can expand both domestically and internationally, providing a clean, safe, secure, affordable and abundant source of energy. However, to maximize the benefits of nuclear power, work must be done to address technical, cost, safety, and security challenges.

These challenges include:

- Improving the affordability of nuclear energy;
- Addressing the management of nuclear waste; and
- Minimizing proliferation risks of nuclear materials.

The four elements within the Reactor Concepts RD&D program will help address these challenges. Research into SMRs can improve the affordability of nuclear power making it more appealing to owners and investors because of the potential to reduce capital costs. The NGNP will help demonstrate the technical viability of co-generation by providing electricity and carbon-free, high-temperature process heat for a variety of industrial uses. The Light Water Reactor Sustainability (LWRS) research will help provide a technical basis for the long-term safety and reliability of the current nuclear power fleet beyond 60 years. Without this life extension, the current fleet will begin to shutdown in 2029 and will offset any increases in clean energy generation from newly constructed plants. Research into other

advanced reactor concepts may improve the sustainability of nuclear energy in a variety of ways, including improving the nuclear fuel cycle and nuclear waste management. Innovative reactor concepts offer the potential to further reduce capital and operating costs, improve performance, enhance safety, and minimize the risk of proliferation. These activities will enable nuclear power to continue to be a key component of our energy portfolio and help to achieve the energy security and greenhouse gas (GHG) emission reduction objectives of the United States.

Annual Performance Results and Targets

The Reactor Concepts RD&D program's performance measures align to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the GPRA Unit Program Goal of New Nuclear Generation Technologies. The NGNP performance measure aligns to these goals by tracking progress on milestones that must be met before proceeding with construction and demonstration of a Very High Temperature Reactor (VHTR). The LWRS performance measure aligns to the Secretary's goal by tracking R&D activities on component and material aging and degradation for existing nuclear power plants. These activities will directly benefit existing plants by extending their current operating licensing period. By extending the life of existing reactors, these activities contribute to GHG abatement efforts.

Annual Performance Targets and Results

Secretarial Goal: Energy

GPRA Unit Program Goal: New Nuclear Generation Technologies

FY PY-3	FY PY-2	FY PY-1	FY PY	FY CY	FY BY	FY BY+1	FY BY+2	FY BY+3	FY BY+4
FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
FY 2011 Efficiency Performance Measure: *Maintain total administrative overhead costs in relation to total R&D program costs of less than 8 percent.*									
T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:
NGNP FY 2011 Effectiveness Performance Measure: Determine a path forward for the design and construction of a next generation nuclear power plant by 2011 by partnering with private industry on the development of NGNP, performing environmental assessment activities, and continuing with the research, analysis, design, and licensing activities to establish the basis for determining whether the project should continue to Phase 2. FY 2010: Support the Nuclear Energy Advisory Committee's (NEAC) evaluation of ongoing R&D and identification of future R&D and other activities needed. Additional performance measures and targets are under development. FY 2009: Continued the research, analysis and conceptual design activities needed to identify preferred alternative technologies for reactor systems, including examination of fuel and moderator materials. FY 2008 Determined a path forward for the design and construction of a next generation nuclear power plant by 2011 by submitting an NGNP licensing strategy to Congress and completing NGNP conceptual design technology selection studies. FY 2007 Completed Generation IV (Gen IV) activities, focusing on fuels and materials testing and plant system optimization, to inform the functional and operational design requirements of a next generation of nuclear power plant by FY 2011. FY 2006: Completed Gen IV R&D activities to inform a design selection for the next generation nuclear power plant by FY 2011.									
T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:
Light Water Reactor Sustainability FY 2011 Effectiveness Performance Measure: Develop the scientific knowledge to extend existing nuclear plant operating life beyond the current 60 year limit and ensure their long term reliability, productivity, safety, and security by conducting R&D activities in partnership with national laboratories, industry, universities, and international partners. FY 2010: Develop the scientific knowledge to extend existing nuclear plant operating life beyond the current 60 year limit and ensure their long term reliability, productivity, safety, and security by conducting R&D activities in partnership with national laboratories, industry, universities, and international partners. (This measure is new starting in FY 2010.)									
T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:

Means and Strategies

The Reactor Concepts RD&D program will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- Advanced, next-generation reactor systems that offer the most sustainable, cost-competitive, reliable, and secure means of generating electricity and high-temperature process heat are being developed by the Reactor Concepts RD&D program. The program includes participation by the national laboratories, industry, and university research communities as well as the international research community, including collaborations through the Generation IV International Forum (GIF).
- International cost sharing is in place for the R&D on some intermediate- and long-term reactor technologies and industry cost-sharing will be pursued for the design and the construction of the NGNP.
- The program will implement joint government/industry cost-shared R&D activities to establish the technical and licensing basis to extend the safe and economical operation of the existing nuclear plants to beyond 60 years. Laboratory R&D will be conducted to research, develop, and test high-performance LWR reactor fuel and clad materials to extend the operating cycles and enhance safety and productivity of existing nuclear plants and will be conducted with universities, industry, and national laboratories.
- The program will conduct R&D of innovative nuclear plant designs capable of achieving generation and performance demands currently not serviceable by large base load nuclear power plants. Solicit, competitively select, and award innovative nuclear plant design project(s) with industry partners.
- The program will leverage innovative, crosscutting R&D activities carried out by the NEET program, complementing the RD&D carried out in this program.
- The program will leverage capabilities developed by National Nuclear Security Administration and the Department of Energy's (DOE) Office of Science in modeling and simulation.

The Department will implement the following strategies:

- NE's R&D programs will partner with the private sector, national laboratories, universities, and international partners to develop advanced nuclear technologies.
- Programs will also engage the international community in pursuit of advanced nuclear technologies that will benefit the United States with enhanced safety, improved economics, and reduced production of wastes.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- Whether new nuclear plant technology is deployed depends on power demand and economic and environmental factors beyond the scope of DOE R&D programs. It depends on complex economic decisions made by industrial partners.
- Industry is inclined to focus on near-term deployment using proven technologies. Industry may not readily support or be supportive of longer-term development of better technologies.
- All nuclear energy research programs rely in part on data produced through collaborations with foreign nations. Should vital data from foreign partners prove unavailable, an increased U.S. effort in technology development would be required.

In carrying out the program's mission, the program performs the following collaborative activities:

- Reactor Concepts RD&D will support international collaboration on various reactor concepts and coolants to include fuel and material development, systems and components.
- The Department will work with the NRC in program planning to assure that their R&D activities are complementary, cost effective, and not duplicative.
- The Reactor Concepts RD&D program is receiving broad international cooperation and support, consistent with the objectives of the program. These R&D activities are integrated, where possible, into GIF activities in order to better leverage U.S. funding.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include NEET and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

NE has engaged its stakeholders in a number of recent evaluation activities to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals. NE considers input from a wide variety of sources and stakeholders in determining what activities it will undertake.

NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee (NEAC) and National Academy of Sciences.

Reactor Concepts Research, Development and Demonstration

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Reactor Concepts Research, Development and Demonstration			
Small Modular Reactors	0	0	38,880
Next Generation Nuclear Plant Demonstration Project	0	0	103,032
Light Water Reactor Sustainability	0	0	25,758
Advanced Reactor Concepts (formerly Generation IV Nuclear Energy Systems Research and Development)	0	0	21,870
SBIR/STTR	0	0	5,460
Total, Reactor Concepts Research, Development and Demonstration	0	0	195,000

Benefits

The primary mission of NE is to advance nuclear power as a resource capable of making major contributions in meeting the nation's energy supply, environmental, and energy security needs by resolving technical, cost, safety, and security issues, through RD&D. The Reactor Concepts RD&D program consolidates and integrates a variety of nuclear reactor technology initiatives to support this mission.

The Reactor Concepts RD&D program includes the following program elements:

- Small Modular Reactors
- Next Generation Nuclear Plant Demonstration Project
- Light Water Reactor Sustainability
- Advanced Reactor Concepts

These reactor technologies will support a diverse set of fission power systems capable of producing electricity (MWe) and, in the case of NGNP, generating process heat (BTUs) in a socially acceptable, environmentally sustainable, and economically attractive manner. Development of each reactor concept will seek to improve performance, economics, safety, waste minimization, and reduced proliferation risks. Some reactor technologies in the long term may support sustainable fuel cycle options without increasing nuclear proliferation and security risks.

SMRs have potential advantages over larger plants by providing an owner more flexibility in financing, siting, sizing, and end-use applications. SMRs can reduce an owner's initial capital outlay or investment due to the lower plant capital cost. Modular components and factory fabrication can reduce construction costs and schedule duration. Additional modules can be added incrementally as demand for power increases. SMRs can provide power for applications where large plants are not needed or may not have the necessary infrastructure to support a large unit such as smaller electrical markets, isolated areas, smaller grids, or restricted water or acreage sites.

SMRs also are expected to provide potential nonproliferation benefits to the United States and the wider international community. Some SMRs could be able to operate for decades without refueling. These

SMRs would be fabricated and fueled in a factory, sealed and shipped to the site, and then returned to the factory for defueling at the end of its life cycle. This approach could help to minimize the spread of nuclear material. There is both a domestic and international market for SMRs and U.S. industry is well positioned to compete for these markets.

The NGNP program supports the design, licensing, and R&D necessary to demonstrate a gas-cooled reactor technology in the United States. The NGNP would be a small-to-medium sized reactor capable of high-temperature operation in excess of 700°C. Plants of this type should have a good combination of size, heat-output and passive safety features to make them favorable candidates for use in industrial settings. The NGNP program is a collaborative enterprise with participation by the Department's national laboratories, U.S. universities, the nuclear industry, and the NRC, and includes work on a regulatory framework for licensing an NGNP, plant design, and R&D. Near-term emphasis is on developing information that will support key decisions by the Secretary of Energy on the future of the program. Important considerations include the availability of a licensable fuel for the reactor, qualification of nuclear grade graphite, design of high project-risk components such as steam-generators and gas-coolant circulators, and the development of form and content requirements needed to submit a license application for an advanced gas-cooled reactor.

The LWRS program conducts research to ensure a technical basis for the long-term, safety and reliability of currently operating LWR nuclear power plants from the currently expected 60 years to perhaps 80 years or longer. The LWRS program focuses on developing the scientific basis to understand, predict, and measure changes in materials, systems, structures, and components as they age in environments associated with continued long-term operations of existing LWR reactors. The program will then apply this knowledge to develop and demonstrate methods and technologies that support safe and economical long-term operation of existing reactors. In addition, the program will research new technologies to address enhanced plant performance, economics, and safety in the existing LWR fleet.

Advanced Reactor Concepts (formerly Generation IV Nuclear Energy Systems Research and Development (GEN IV)) provide technical, economical, and environmental benefits for clean and sustainable energy produced by the nuclear energy option. NE will pursue these technical advancements through R&D activities with national laboratories, universities, industry and other domestic and international governmental partners. These activities include conducting traditional R&D needed to advance the technologies; pioneering the use of advanced modeling and simulation; supporting international collaborative work to use available facilities for nuclear R&D; and reducing the technical uncertainties for deploying new nuclear reactor technologies. The program will carry on Gen IV R&D and will research innovative nuclear energy technologies that can compete economically with other technologies for the production of electricity, provide clean (low-carbon) energy resources, and minimize environmental impacts. Activities carried out under Advanced Reactor Concepts will focus on the development of advanced materials for structures, components and fuel claddings for use with various coolants that face high-radiation, high-temperature environments.

This program will also utilize advanced modeling and simulation activities to directly support reactor related activities in order to extrapolate and predict behaviors beyond tested states as well as improve experiments by predicting areas of interest and validating expected experimental results. The program will create and deploy science-based, verified, and validated modeling and simulation capabilities essential for the design, implementation, and operation of all aspects of nuclear energy systems and their nuclear fuel cycles to improve U.S. energy security. Program activities encompass the micro behavior level of fuels and materials in Fuel Cycle R&D, to the macro behavior level of reactor systems (e.g.,

LWRs and advanced reactors in Reactor Concepts RD&D) and their fuel cycles. The successful application of these advancements will enable the use of computer simulation in a fundamentally new way for design, licensing, and operation of nuclear systems.

The modeling and simulation activities in this program will differ from those conducted in the Energy Innovation Hub for Modeling and Simulation (Hub) within the NEET program. While modeling and simulation activities carried out in the Reactor Concepts RD&D and Fuel Cycle R&D programs are focused on building new advanced modeling and simulation capabilities in the areas of nuclear fuels, separations processes, material safeguards, waste forms, and repositories for near-term, mid-term, and long-term nuclear power system concepts, the Hub will have a narrower focus of validating and demonstrating the application of modeling and simulation capabilities through the virtual modeling of an existing operating reactor. Additionally, the Hub will be managed by an independent consortium. While the Hub activities may complement those in the NE program, they are not directly linked to the activities proposed under Fuel Cycle R&D and Reactor Concepts RD&D.

NE programs allocate R&D funding to those entities (e.g., industry, laboratories, and universities) that are best qualified to carry out the work in support of NE's mission. Consistent with NE's commitment to supporting R&D activities at university and educational research institutions, NE programs competitively award funds that support both mission-specific and mission-related activities. NE designates up to 20 percent of funds appropriated to its R&D programs for work to be performed at university and research institutions, through open, competitive solicitations for investigator-led projects. The national laboratories are encouraged to partner with universities to conduct R&D.

Reactor Concepts RD&D activities provide technical benefits across the NE R&D portfolio. These technical advancements and anticipated benefits include pioneering the use of advanced modeling and simulation, creating an international network of user facilities for nuclear R&D, and reducing the technical uncertainties surrounding new nuclear reactor technologies. These advancements will allow nuclear energy to compete economically with other clean energy technologies.

The energy sector must supply increasing amounts of electricity safely, dependably, economically, and in an environmentally advantageous manner with reduced CO_2 emissions. The 60-year licenses for the current nuclear power plants will begin to expire in 2029. Utilities are beginning to initiate planning for baseload replacement power and the technology options developed under the Reactor Concepts RD&D program can help ensure that nuclear energy remains a key part of the U.S. energy portfolio. These concepts may also help enable the United States to regain technical leadership and economic competitiveness in the global marketplace.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Small Modular Reactors	**0**	**0**	**38,880**

This program element supports laboratory/university and industry cost-shared projects to conduct nuclear technology R&D and to develop advanced computer modeling and simulation tools that demonstrate and validate new design capabilities of innovative SMR designs. These activities focus on demonstrating that SMRs provide an innovative reactor technology that is capable of achieving electricity generation and performance objectives that meet market demands and are comparable, in both safety and economics, to the current large base load nuclear power plants. The Department plans to, through a competitive process,

(dollars in thousands)		
FY 2009	FY 2010	FY 2011

solicit and select up to two SMR designs for financial cost-share assistance. These funds are required to help demonstrate the potential of the nascent SMR technology and encourage new competition in the marketplace. In the near term the Department would fund the LWR SMR program on a cost-shared basis with a view toward design certification; support the development of new/revised nuclear industry codes and standards necessary to support licensing and commercialization of innovative designs; and, consistent with NRC guidance and regulations, identify activities for DOE funding to enable SMR licensing for deployment in the United States.

Assessments and Evaluation - In FY 2010, DOE will hold workshops with LWR SMR vendors and suppliers, potential utility customers, national laboratory, and university researchers, DOE, NRC, and other stakeholders, to identify potential priorities to enable their commercialization and development. The Administration will evaluate potential priorities in the context of the appropriate Federal role to identify the most cost effective, efficient, and appropriate mechanisms to support further development. DOE will then develop a detailed five-year roadmap for the Administration's SMR efforts. Possible areas of activity in FY 2011 could include cost-shared activities and R&D on sensors, instrumentation and controls, material qualification for novel components, component and system validation testing, and the extension of modeling and simulation codes to SMR configurations and validation. This funding also supports work to be conducted in conjunction with the Standards Developing Organizations (ANS, ASME, IEEE, ASTM, etc) to revise and establish nuclear codes and standards that need to be developed by on a priority bases to support SMR designs.

Advanced Small Modular Reactor R&D - NE will support R&D activities for advanced non-LWR small modular reactor designs, including high-temperature designs and ones and that utilize fast spectrum neutrons and associated fuel and reactor technologies, which offer added functionality and affordability. For these SMRs based on concepts with lower levels of technical maturity, the Department will first seek to establish the laboratory/university R&D activities necessary to prove and advance innovative reactor technologies and concepts towards commercialization. The Department will support R&D activities at its national laboratories and universities to develop and prove the proposed design concepts. Emphasis will be on advanced reactor technologies that offer simplified operation and maintenance for distributed power and load-following applications and increased proliferation resistance and security. Areas of R&D could include: basic physics and materials research and testing; state-of-the-art computer modeling and simulation of reactor systems and components; probabilistic risk analyses of innovative safety designs and features; and other development activities that are necessary to establish the feasibility of the concept for future deployment. In addition, some funds may be used to begin implementing certain activities outlined in the forthcoming roadmap described above.

Next Generation Nuclear Plant Demonstration Project	**0**	**0**	**103,032**

This program sponsors a collaborative effort with universities, industry, and the NRC to conduct the design, licensing and R&D necessary to demonstrate a gas-cooled reactor technology in the United States.

In FY 2010, the Department will engage with industry to complete cost-shared conceptual designs for the NGNP. In the first quarter of FY 2011, the NEAC will review the conceptual design reports along with the state of NGNP R&D and licensing activities and make recommendations on whether or not to proceed into Phase 2 of the project. Phase 2 includes the selection of one technology for final design, licensing, R&D, and construction. If the Secretary of Energy determines that the NGNP should start Phase 2, then the Department will seek cost-sharing partners to conduct the Phase 2 scope of work.

(dollars in thousands)

FY 2009	FY 2010	FY 2011

The Department continues to work with the U.S. private sector to establish industrial end-user requirements, produce trade studies integrating NGNP into various industrial applications, and develop cost-sharing strategies to support industry in their efforts to commercialize gas-cooled reactor technologies. Because the project is now in the demonstration phase, the private sector cost share in FY 2011 is expected to be at least 50 percent, consistent with Energy Policy Act of 2005. Similarly, the Department's collaboration with the NRC is speeding the development of a framework for licensing gas-cooled reactors in the United States. Key issues include the establishment of gas-cooled reactor-specific requirements for emergency planning zones, containment design, and the quantification of potential radioactive releases. Finally, the Department is working with universities, national laboratories, and the international community to develop analytical tools, identify additional R&D needs, and conduct tests on fuel, metals and graphite to support the data needs of the reactor designers, regulators, and end-users. The Idaho National Laboratory (INL) coordinates NGNP R&D on behalf of the Department.

FY 2009 and FY 2010 activities are discussed under the Gen IV budget.

In FY 2011, the Department will:

- Sponsor an independent review of NGNP activities by the NEAC.
- Make a decision on readiness to proceed into Phase 2 of the NGNP project.
- Enter into a cost-sharing public-private partnership to conduct design and licensing activities leading to NRC issuance of a Combined Operating License.
- Continue the irradiation in the INL Advanced Test Reactor (ATR) of the first NGNP fuel produced in commercial scale production equipment (AGR-2).
- Complete post-irradiation examination of the first NGNP fuel tested in the ATR.
- Continue selection and characterization of NGNP graphite and composite materials, including the irradiation of the first AGC-1 test experiment to provide data for nuclear graphite qualification.
- Initiate assembly of High-Temperature Vessel experiments 1 and 2 for irradiation at Oak Ridge that is necessary to obtain critical data (physical expansion, process monitoring) for designing AGC-5 and AGC-6.
- Continue environmental, mechanical property, and joining method (e.g., welding) studies for selected heat exchanger and reactor pressure vessel materials for code-case data package development and qualification.
- Complete Regulatory Gap Analysis that will review existing NRC rules and regulations and identify their applicability to gas reactors.
- Continue topical report analysis and responses to possible Requests for Additional Information from the NRC, to support the NRC's development of form and content requirements needed to submit a license application for an advanced gas-cooled reactor.
- Continue international R&D collaborations through the GIF VHTR System Arrangement and associated second tier Project Arrangements.
- Develop capability to subject structural materials to a combination of tension and torsion to simulate the stress state in the NGNP and to understand and model component material response under complex stress states.
- Use existing test facilities (High-Temperature Test Reactor in Japan) and construct separate effects and integral effects test equipment to perform thermal-fluid behavior validation experiments.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

- Conduct research on process heat applications, including system interface requirements and materials compatibility issues, for coupling NGNP to various non-electric applications.
- Continue fuel performance modeling, fabrication modeling, and fission product transport modeling.
- Conduct methods development and experimental validation to determine the capability of the passive system to remove decay heat and to validate state-of-the-art thermal-fluid models for the unique geometry of the NGNP reactor cavity cooling system.

Light Water Reactor Sustainability	**0**	**0**	**25,758**

This program will conduct R&D to extend the operating lifetime of current plants beyond 60 years and, where possible, enable further improvement in their productivity. The program will partner with industry and the NRC to conduct the long-term research needed to inform major component refurbishment and replacement strategies, performance enhancements, plant license extensions, and NRC's age-related regulatory oversight decisions. The research will focus on aging phenomena and issues that require long-term research that affect the existing fleet of both boiling and pressurized water reactors. Because industry has a significant financial incentive to extend the life of existing plants, the Department will work to ensure that activities are cost-shared to the maximum degree possible.

Planned activities are divided into five areas:

(1) Materials Aging and Degradation Assessment will develop a science-based fundamental understanding of materials aging and degradation to reduce the uncertainty in analytical predictions and provide insights for developing components with longer lifetimes. A mechanistic understanding of key materials aging and degradation phenomena will support longer-term operation of existing reactors, support licensing basis for extended operations, and support component life predictions for critical structures, systems, and components.

(2) Safety Margin Characterization will develop improved modeling and analysis methods including uncertainty quantification to enhance industry's ability to accurately predict safety margins, address aging effects to understand how safety margins change with aging plants, support power up-rates, and combine risk-informed, performance-based methodologies with fundamental scientific understanding of critical phenomenological conditions and deterministic predictions of nuclear plant performance.

(3) Efficiency Improvements will address the potential for additional power up-rates and capacity factor improvements as well as the possibility of reduced operations of operating reactors due to the unavailability of adequate supplies of secondary cooling water. Drought conditions and competition with other users have created situations that are of immediate concern.

(4) Instrumentation and Controls will develop new systems and human/machine interface capabilities including advanced plant monitoring capabilities, support power up-rates and plant efficiency improvements, support longer-term operation, facilitate centralized monitoring of nuclear status and performance, and develop advanced condition monitoring and prognostics technologies to understand and measure the aging of systems, structures, and components of nuclear power plants.

(dollars in thousands)		
FY 2009	FY 2010	FY 2011

(5) Advanced LWR Fuel will develop new long-life fuel designs using advanced materials for fuel and cladding to achieve substantial increases in safety margins and performance, eliminate fuel failures, and achieve higher fuel burn-ups. Goals include improving the fundamental understanding of nuclear fuel and cladding behavior under extended burn-up conditions, developing a predictive analysis tool for advanced nuclear fuel performance, and developing advanced mesoscale fuel models to enable a predictive analysis of fission gas release.

FY 2010 activities are discussed under the Gen IV budget.

In FY 2011, the Department will:

- Address high-fluence neutron irradiation effects on reactor metals including the reactor pressure vessels and core internals (stainless steels and high strength alloys), radiation-induced swelling effects, and phase transformation of core internals.
- Evaluate long-term aging of concrete structures.
- Investigate crack initiation in nickel-based alloys (steam generator tubing).
- Examine advanced mitigation techniques such as welding and weld repair techniques, post-irradiation annealing and modern replacement alloys.
- Develop a risk-informed simulation-driven methodology to guide safety system analysis and uncertainty quantification.
- Enhance the deterministic safety analysis capability to simulate plant dynamics and compute safety margin.
- Incorporate passive structures, systems, and components into a probabilistic safety analysis at one plant type.
- Develop alternative and new cooling technologies that can be applied in the near term to reactors impacted by insufficient cooling water supplies.
- Develop innovative technologies that lessen the environmental impacts of removing large volumes of cooling water from naturally occurring sources.
- Develop plant control and monitoring systems to improve plant efficiency, facilitate power up-rates, and enable remote monitoring and support.
- Develop a model for fuel cracking at the mesoscale level with sufficient understanding to develop a predictive model for fission gas release.
- Begin the development of new long-life fuel designs with advanced fuel and cladding materials.

Advanced Reactor Concepts	**0**	**0**	**21,870**

This program is an expanded version of the Gen IV R&D program. It will continue the Gen IV R&D work being done today but has been expanded to encompass reactor technologies beyond Generation IV. The program will focus on reactors that could dramatically improve performance in sustainability, safety, economics, security, and proliferation resistance. This work includes scientific research at national laboratories and universities as well as through international collaboration. Competitive cost-sharing arrangements will be used where practical to establish beneficial government-industry partnerships.

Both advanced thermal and fast reactor systems will be considered. Fast reactors could be employed to consume long-lived, high-activity elements found in used LWR fuels as part of a long term waste management approach if economic, technical, safety, and proliferation challenges are addressed. Some

modified open fuel cycle concepts are enabled by fast neutron spectra. Fast reactors using a variety of coolants will be considered. Some research activities are coordinated with foreign researchers through the GIF as well as other bilateral and multilateral agreements. R&D to support a domestic Sodium Fast Reactor (SFR) prototype reactor has been discontinued. Long term R&D on Gen IV reactor concepts, including the SFR, with international GIF partners will continue. This element includes an examination of supercritical carbon dioxide as a working fluid for a more efficient method of producing electricity. Support is also included for the international policy and experts groups of the GIF, including working groups for common evaluation methodologies of reactor economics, safety, and proliferation resistance and physical protection. Reactor component testing and infrastructure needs will be evaluated and prioritized to support R&D activities according to technical and policy requirements. General technical support associated with international R&D collaborations that is not technology-specific is provided by the International Nuclear Energy Cooperation program.

In order to be effective, innovative reactor design concepts must consider the overall system performance, e.g., fuel and reactor performance and economics, material utilization and waste disposition, and non-proliferation considerations. Integrated reactor concepts will employ a diverse range of innovative ideas. It is important to both confirm the feasibility and assess the importance of technology innovations. R&D on innovative concepts will be guided by a clear assessment of potential performance and economic improvements. The existing knowledge base and the pursuit of new ideas will generate innovative concepts to focus R&D, with the goal of developing transformational technologies.

In FY 2011, the Department will:

- Evaluate innovative reactor systems to identify promising candidates for further R&D as part of an integrated system.
- Evaluate heat transfer properties for a wide range of operating fluids and conditions; testing will be conducted for innovative heat exchange systems.
- Complete post-irradiation examinations on unique material samples obtained from the Fast Flux Test Facility and the Phénix Fast Reactor in France to obtain mechanical and physical properties of these materials for use in materials model development.
- Continue advanced modeling techniques utilizing the Department's high-speed, parallel computers for the development of close-coupled neutronic and thermofluid codes.
- Demonstrate the technical and economic viability of an advanced Brayton-cycle energy-conversion system using supercritical carbon dioxide as the working fluid.
- Conduct nuclear data measurements and validation, specifically cross section and other nuclear data measurements needed for advanced fast reactor designs and safety validation.
- Conduct research on components or systems applicable to multiple reactor concepts, such as fuel handling, in-service inspection and repair, and energy conversion.
- Continue international collaboration on nuclear safety and cost reduction.
- Evaluate molten salt and other advanced reactor conceptual ideas.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
SBIR/STTR	**0**	**0**	**5,460**
The FY 2011 amount shown is an estimated requirement for the continuation of the SBIR and STTR program.			
Total, Reactor Concepts Research, Development and Demonstration	**0**	**0**	**195,000**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Small Modular Reactors The increase from $0 to $38,880,000 reflects the addition of a new SMR budget element beginning in FY 2011.	+38,880
Next Generation Nuclear Plant Demonstration Project The increase from $0 to $103,032,000 reflects the shift of NGNP from the Gen IV budget to this new budget. In FY 2010, NGNP is funded at $164,373,000. The FY 2011 request reflects the appropriate level of activity for the project in FY 2011 and adequately funds all project needs.	+103,032
Light Water Reactor Sustainability The increase from $0 to $25,758,000 reflects the new budget structure for reactor-related R&D, not the true increase in funding for LWRS activities within NE. In FY 2010, LWRS activities were funded at $9,720,000 as part of the Gen IV program. Therefore, the actual increase in funding for these activities in FY 2011 is $16,038,000. This increase will focus on expanding the experimental suite across all research pathways, whereas in FY 2010 research was limited to materials and advanced fuels.	+25,758
Advanced Reactor Concepts The increase from $0 to $21,870,000 reflects the transfer of reactor technology activities previously included in Gen IV R&D and the inclusion of new R&D on reactor technologies beyond Gen IV. In FY 2010, Gen IV R&D activities not associated with LWRS were funded at $18,601,164.	+21,870
SBIR/STTR The increase from $0 to $5,460,000 reflects the contribution of R&D funding for SBIR/STTR.	+5,460
Total Funding Change, Reactor Concepts Research, Development and Demonstration	**+195,000**

of its research and development (R&D) and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts Research, Development & Demonstration and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

Nuclear Hydrogen Initiative

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Nuclear Hydrogen Initiative	7,343	0	0	0

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriation Act (2009)

Mission

This program was completed at the end of FY 2009. Consistent with the FY 2010 request, the FY 2011 budget requests no funding for the Nuclear Hydrogen Initiative (NHI).

Benefits

In FY 2009, the program completed experiments and testing on long-term cell operability, thermal cycling, process stability, and other important questions, developing insights into high-temperature thermochemical cycles, high-temperature electrolysis, and reactor/process interface issues.

Annual Performance Results and Targets

In FY 2009, the program completed research activities including high temperature electrolysis experiments and testing on the Sulfur-Iodine integrated laboratory-scale thermochemical experiment to assess process stability and component durability.

Means and Strategies

The Department has implemented the following means:

- Researched hydrogen production technologies compatible with nuclear energy systems with the participation of the national laboratories, industry, and university research communities as well as international research partners.

The Department has implemented the following strategies:

- Partnered with the private sector, national laboratories, universities, and international partners.

Validation and Verification

The Office of Nuclear Energy (NE) conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight

Nuclear Hydrogen Initiative

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Nuclear Hydrogen Initiative	7,343	0	0

Benefits

By completing experiments and testing on long-term cell operability, thermal cycling, process stability, and other important questions, the program developed useful insights into high temperature thermochemical cycles, high temperature electrolysis, and reactor/process interface issues.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Nuclear Hydrogen Initiative	**7,343**	**0**	**0**

Through FY 2009, this program focused on long-term R&D activities associated with thermochemical and High Temperature Electrolysis (HTE) processes designed to demonstrate the viability of using heat and/or electricity from various advanced reactors researched by the Generation IV Nuclear Energy Systems program (mainly Next Generation Nuclear Plant). In FY 2009, integrated laboratory-scale experiments were completed and long-term performance of components and materials evaluated.

NHI R&D activities have been conducted through several vehicles including international collaborations via the Generation IV International Forum and bilateral agreements pioneered under the International Nuclear Energy Research Initiative and domestically via the national laboratories.

In FY 2009, the Department:

- Completed HTE experiments begun in FY 2008 to investigate long-term cell operability and thermal cycling issues.
- Completed operation and testing on the Sulfur-Iodine integrated laboratory-scale thermochemical experiment to assess process stability and component durability.
- Finalized investigation of improved membranes for the Hybrid Sulfur electrolyzer.
- Summarized research findings and identified HTE as the hydrogen production technology with the most promise for future development and deployment with advanced nuclear reactors.
- Completed the final year of university research projects awarded in FY 2007.

Total, Nuclear Hydrogen Initiative	**7,343**	**0**	**0**

Fuel Cycle Research and Development

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Fuel Cycle Research and Development	142,652	0	136,000	201,000

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriation Act (2009)
P.L. 111-85, Appropriation Act (2010)

Mission

The mission of Fuel Cycle Research and Development (R&D) program is to research and develop nuclear fuel and waste management technologies that will enable a safe, secure, and economic fuel cycle. Beginning in FY 2010, the program shifted from a near-term technology development and deployment program to a long-term, science-based R&D program which has the potential to produce beneficial changes to the way the fuel cycle, and particularly spent fuel, is managed. The program will examine three fuel cycle approaches: once-through fuel cycle, modified open fuel cycle, and full fuel recycle. Examination of this full range of approaches is critical to provide future decision-makers with information needed to make decisions on how best to manage used fuel. In addition, the Office of Nuclear Energy (NE) will leverage transformative and crosscutting R&D activities carried out by the Nuclear Energy Enabling Technologies program, complementing the R&D carried out in this program. NE will oversee on-going responsibilities under the Nuclear Waste Policy Act. Within the Fuel Cycle R&D program, these include activities associated with nuclear waste management.

Benefits

The Fuel Cycle R&D program supports long-term technology development activities and will:

- Develop high burn-up and other fuels for use in reactors that could help reduce the amount of used fuel for direct disposal for each megawatt-hour of electricity produced;
- Investigate fuel forms, reactors and fuel/waste management approaches that could dramatically increase utilization, if economically competitive, of fuel resources and reduce the quantity of long-lived radiotoxic elements in the used fuel to be disposed (per megawatt-hour). Technologies will be considered that require at most limited separation steps and minimize proliferation risks; and
- Develop techniques that will enable long-lived actinide elements to be repeatedly recycled. The ultimate goal is to develop a cost-effective and low-proliferation-risk approach that would significantly decrease the long-term challenges posed by the waste and reduce uncertainties associated with its disposal.

The goal is to perform R&D within each of the three tracks above to advance fuel cycle technologies and waste management strategies to inform decision-making.

Annual Performance Results and Targets

The Fuel Cycle R&D program's performance measure aligns to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the GPRA Unit Program Goal of New Nuclear Generation Technologies. The Fuel Cycle R&D performance measure aligns to these goals by tracking progress on researching and developing nuclear fuel and waste management technologies that will enable a safe, secure, and economic fuel cycle. This will involve identifying gaps in knowledge and uncertainties that require resolution and making progress toward key technology challenges and goals. The program will help create a safe and sustainable path forward and help to optimize the nuclear fuel cycle. Developing these advanced technologies decreases the fuel cycle risks associated with nuclear power plants, increasing the likelihood that new nuclear power plants will be deployed, thus contributing to greenhouse gas abatement efforts.

Fuel Cycle R&D Annual Performance Targets and Results

Secretarial Goal: Energy

GPRA Unit Program Goal: New Nuclear Generation Technologies

FY PY-3	FY PY-2	FY PY-1	FY PY	FY CY	FY BY	FY BY+1	FY BY+2	FY BY+3	FY BY+4
FY 2006	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**
FY 2011 Efficiency Performance Measure: *Maintain total administrative overhead costs in relation to total R&D program costs of less than 8 percent.*									
T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:

Fuel Cycle R&D FY 2011 Effectiveness Performance Measure: Demonstrate progress toward the long-term mission to develop options to the current commercial fuel cycle management strategy by establishing long-term strategic plans for the program, identifying gaps in knowledge and uncertainties to resolve, and beginning the path to achieve the program's grand challenge goals.

FY 2010: Demonstrate progress toward the long-term mission to develop options to the current commercial fuel cycle management strategy by establishing long-term strategic plans for the program, identifying gaps in knowledge and uncertainties to resolve, and beginning the path to achieve the program's grand challenge goals.

FY 2009: Support the development of advanced technologies to close the fuel cycle by performing specific used fuel separations, transmutation fuels and fast reactor research and development activities in support of the AFCI.

FY 2008: Create a technology development document on recycling technology options, including their readiness and risks, the state of technology development achieved to date, future research and development, and economic evaluations needed to achieve the Global Nuclear Energy Partnership vision.

FY 2007: Complete research and development activities, focused on advanced fuel separations technology development and demonstration, to support the Secretary of Energy's determination of the need for a second geologic repository for spent nuclear fuel by FY 2008.

FY 2006: Complete research and development activities that allow the Advanced Fuel Cycle Initiative (AFCI) program to support the Secretary of Energy's determination of the need for a second geologic repository for spent nuclear fuel by FY 2008.

T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A: 1 (Met)	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:

Means and Strategies

The Fuel Cycle R&D program will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- Conduct long-term science-based R&D through small-scale experiments, theory development, modeling and simulation, validation experiments, and development of transformational technologies that have the potential to produce beneficial changes in the way the nuclear fuel cycle, and particularly nuclear waste, is managed.
- Conduct R&D needed for the Department to provide input into the Administration's development of a National nuclear waste management strategy and to support the planned Blue Ribbon Commission.
- Leverage transformative and crosscutting R&D activities carried out by the Nuclear Energy Enabling Technologies program, complementing the R&D carried out in this program.

The Department will implement the following strategies:

- NE's R&D programs will partner with the private sector, national laboratories, universities, and international partners to develop advanced nuclear technologies.
- Programs will also engage the international community in pursuit of advanced nuclear technology that will benefit the United States in terms of enhanced safety, improved economics, and reduced production of wastes.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- Nuclear energy research programs rely on data produced through collaborations with foreign nations. Should vital data from foreign partners prove unavailable, U.S. efforts would need to be re-evaluated.

In carrying out the program's mission, the program performs the following collaborative activities:

- The Fuel Cycle R&D program is undertaking long-term R&D on fuel cycle technologies to provide the U.S. government with information on and options for the long-term disposition of spent nuclear fuel. Interdependencies with the Office of Environmental Management include collaboration on spent fuel treatment technologies and waste forms to avoid duplication of effort.
- Interdependencies with National Nuclear Security Administration (NNSA) include coordination of advanced material control and accountability monitoring technology development, and safeguards and security aspects of advanced fuel cycle technologies.
- Interdependencies with the Office of Science (SC) include providing the basic science tools that can be used to close technology gaps that currently impede the implementation of fuel cycle technologies. Interfaces in basic energy sciences including actinide chemistry and materials, nuclear physics, and development of advanced simulation and modeling tools must be coordinated between NE and SC.
- The Department and the NRC coordinate program planning to assure that their R&D activities are complementary, cost effective, and not duplicative.
- Participation in international experiments related to the development of advanced fuel cycle technologies is being performed in support of Fuel Cycle R&D program objectives.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts Research, Development and Demonstration (RD&D) and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

NE engages its stakeholders to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals. NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee and National Academy of Sciences.

Fuel Cycle Research and Development

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Fuel Cycle Research and Development			
Separations and Waste Forms	40,355	41,615	31,324
Advanced Fuels	28,975	29,651	40,000
Transmutation Research and Development	28,394	4,288	0
Modeling and Simulation	24,845	26,009	15,570
Systems Analysis and Integration	20,083	14,783	15,664
Materials Protection, Accountancy, and Controls for Transmutation	0	6,826	7,814
Used Nuclear Fuel Disposition	0	9,124	45,000
Modified Open Cycle	0	0	40,000
SBIR/STTR	0	3,704	5,628
Total, Fuel Cycle Research and Development	142,652	136,000	201,000

Benefits

The program focus has been re-directed from near-term technology deployment to long-term, results-oriented, science-based R&D which has the potential to produce beneficial changes to the way the fuel cycle, particularly used nuclear fuel, is managed. The program will research and develop technologies for each of three fuel cycle management approaches (once-though fuel cycle, modified open fuel cycle, and full fuel recycle).

The Fuel Cycle R&D program is an integrated program to research, develop, and improve fuel cycle and waste management options and technologies. It involves small-scale experiments coupled with theory development and advanced modeling and simulation with validation experiments. This science-based R&D program will provide a more complete understanding of the underlying science supporting the development of advanced fuel cycle and waste management technologies and, therefore, help provide a sound basis for future decision-making. The program will also conduct scientific research and technology development to enable storage, transportation, and disposal of used nuclear fuel and all radioactive wastes generated by existing and future nuclear fuel cycles.

NE programs allocate R&D funding to those entities (e.g., industry, laboratories, and universities) that are best qualified to carry out the work in support of NE's mission. Consistent with NE's commitment to support R&D activities at university and educational research institutions, NE programs competitively award funds that support both mission-specific and mission-related activities. NE designates up to 20 percent of funds appropriated to its R&D programs for work to be performed at university and research institutions, through open, competitive solicitations for investigator-led projects. The national laboratories are encouraged to partner with universities to conduct R&D.

The Fuel Cycle R&D program also collaborates with nuclear industry and, where appropriate, international partners from other countries with advanced fuel cycles to leverage U.S. research

investments and pursue common goals towards advanced fuel cycles that are economic, minimize waste, and reduce proliferation risk. The program provides technical support to NE's international mission via participation in meetings, seminars, related publications, and international technical cooperation agreements. Fuel Cycle R&D continues to pursue and seek new international cooperation activities that leverage the program's activities for mutual benefit and provide access to facilities not available in the United States, such as fast spectrum test reactors for advanced fuel testing.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Separations and Waste Forms	**40,355**	**41,615**	**31,324**

The mission of the Separations and Waste Forms technical area is to develop the next generation of used fuel separations and waste management technologies that enable a sustainable fuel cycle with minimal processing, waste generation, and potential for material diversion. Challenges in separations and waste forms include: 1) develop separations technologies and systems with reduced proliferation risk, very low process losses, and minimal undesirable waste streams; and 2) develop waste forms with predictable, long-term behavior and enhanced resistance to long-term degradation suitable for a variety of potential storage or geologic repository environments.

In FY 2009, the Department:

- Continued to research advanced aqueous separations processes with an increasing emphasis on simplification of the process steps including investigating alternate extraction processes to minimize the number of different solvents needed.
- Continued research on electrochemical processing technologies with a focus on improving process throughput and process control and monitoring technologies.
- Investigated safeguards issues related to special material accountability.
- Continued R&D to optimize the stability of waste forms and the efficiency of waste form production through laboratory-scale demonstration of solidification processes for both glass and metal waste forms.
- Characterized waste forms resulting from separations processes and investigated their potential performance in a variety of geological settings.
- Evaluated metal waste forms to understand and define waste loading performance.
- Prepared the first metal waste form using surrogate undissolved solids.

In FY 2010, the Department is:

- Researching innovative methods for the separation of americium or americium/curium in a single process step.
- Researching innovative methods to capture off-gasses such as iodine and krypton from the head end processes and immobilize the captured gasses.
- Developing advanced concepts for electrochemical processing to recycle salt for waste minimization, advanced methods for transuranic recovery, and novel product consolidation methods.
- Developing alternative waste forms that are tailored to specific radionuclides and potential geologic media.
- Characterizing waste forms and assessing their performance in a variety of potential geologic

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

media.

- Investigating new waste forms for electrochemical process inactive metals and spent salt streams.
- Evaluating current methodologies for assessing proliferation risk and developing a plan for integrating new and existing concepts into analytical tools for evaluating proliferation risks associated with fuel cycle concepts. Probabilistic risk assessment approaches will be included in the evaluation.
- Developing advanced fuel cycle instrumentation that will provide for online/at-line, near real-time, active and passive nondestructive monitoring of electrochemical and aqueous processes.
- Developing advanced safeguards approaches, including formalization of requirements, for advanced fuel cycles.
- Developing modeling and simulation approaches to support radiation transport and detection, materials behavior in harsh environments, development of radiation and non-radiation based signatures, performance assessments/optimization, virtual inspector presence, and data visualization.

In FY 2011, the Department will:

- Continue to research innovative methods for the separation of americium or americium/curium in a single process step.
- Continue to research innovative methods to capture off-gasses such as iodine and krypton from the head end processes and immobilize the captured gasses.
- Continue to develop advanced concepts for electrochemical processing to recycle salt for waste minimization, advanced methods for transuranic recovery, and novel product consolidation methods.
- Continue to develop alternative waste forms that are tailored to specific radionuclides and potential geologic media.
- Continue to characterize waste forms and assess their long-term stability.
- Continue to investigate new waste forms for electrochemical process inactive metals and spent salt streams.

Advanced Fuels	**28,975**	**29,651**	**40,000**

The mission of the Advanced Fuels technical area is to perform R&D on fuel systems and fabrication processes to achieve multi-fold improvements in fuel and fabrication process performance. This will be in direct support to NE's imperatives of extending plant lifetimes, enabling new reactor builds, and developing sustainable fuel cycles through advanced transmutation fuels. One challenge in advanced fuels is to develop nuclear fuels and/or targets for thermal and fast reactors with multi-fold increases in performance over previous generation fuels. Fuel research under Fuel Cycle R&D is specifically motivated by fuel cycle challenges.

Within the context of long-term (40+ years) waste management technology R&D investigated by the Fuel Cycle R&D program, the design and development of advanced fuels that could ultimately be utilized in fast reactors would be pursued. These activities would include investigating conceptual design modifications to fast reactor concepts to accommodate advanced fuels developed by the program. The Advanced Fuels technical area will also initiate R&D on fuel resources that may improve the

sustainability of nuclear energy in the long term and enhance the security of the fuel supply.

In FY 2009, the Department:

- Initiated post-irradiation examination of Advanced Test Reactor (ATR) test fuel pins removed from the test reactor in FY 2008.
- Continued irradiation and testing of metal and oxide transmutation fuels in the ATR.
- Researched fuel fabrication processes evaluating advanced cladding materials.
- Completed irradiation of U.S. origin transmutation fuels in the French Phénix fast reactor. This reactor was permanently shutdown in FY 2009.
- Continued to prepare transmutation-related feedstock material needed for national and international fuels irradiation testing.
- Continued international collaborations on innovative fuel development.
- Continued development of instrumentation and controls for safeguarding nuclear materials during the fuel cycle and waste management process.
- Initiated development of safeguards related tools and methods for advanced integration and control to enable knowledge extraction of facility operation.
- Investigated safeguard issues related to special material accountability in metal fuel fabrication systems.

In FY 2010, the Department is:

- Exploring innovative fuel designs including transmutation fuels with long-term high performance payback such as composite dispersion fuels with microstructural properties targeted for specific characteristics.
- Continuing to develop advanced fabrication techniques that provide the desired control on fuel microstructure with the inclusion of strategic additives if needed.
- Performing analyses to investigate potential transformational advances in advanced fuels development.
- Initiating small-scale experiments needed to verify specific features of modeling development needs.
- Continuing post-irradiation examination of irradiated experiments from the Fast Flux Test Facility and ATR, as required for input to fuel performance modeling and initiating plans for the return of the U.S. material irradiated in Phénix.
- Developing initial plans for the development of advanced Light Water Reactor (LWR) fuels and claddings in coordination with the LWR Sustainability activity within the Reactor Concepts RD&D program, industry, and universities.
- Continuing irradiation experiments at ATR for the development of advanced oxide and metal fuels and initiated plans for future separative effects testing to support advanced model development.

In FY 2011, the Department will:

Modeling & Simulation (M&S) Support

- Provide advanced fuels requirements input to the M&S program and seek clarification on what M&S parameters need experimental verification in the fuels program.
- Support development and fabrication of experimental techniques that are closely coupled to

M&S development needs, including advanced instrumented irradiation assembly designs for use in ATR and High Flux Isotope Reactor.

- Initiate design and fabrication of an instrumented test assembly for use in ATR to permit parameter uncertainty reductions needed in M&S code development.
- Continue to support performance-modeling development via small-scale experiments to investigate important separate effects.

Post-Irradiation Examination (PIE)

- Initiate destructive PIE on fuel pins from the shutdown Fast Flux Test Facility. These mixed oxide pins, and their associated HT-9 clad material, are the highest burn up fast spectrum reactor fuel in the world, and are of significant national and international interest.
- Transfer irradiated U.S.-origin fuels and materials from Phénix and initiate PIE.
- Continue supporting plans for developing needs and requirements for the Idaho Transient Reactor Test Facility which will be needed for licensing related testing of any new fuel to be used in a nuclear power reactor in the United States. There is significant international interest (France, Japan) in this facility due to its unique testing capabilities.
- Continue to expand the use of new, highly advanced, post-irradiation devices as they become available. Additional post-irradiation characterization equipment will be radiation hardened (e.g. focused Ion Beam) so they can be used on irradiated samples.

Fabrication

- Continue fabrication and characterization development of metal fuels, with the capability to transmute large quantities of minor actinide bearing fuel so its technology readiness level is made comparable to oxide-based mixed oxide fuel. Fabrication process heat modeling will be continued in support of this activity and also to support ceramic development as needed.
- Continue fabrication, characterization, testing, and modeling of ceramic fuels having the capability to transmute large quantities of minor actinides and fission products.
- Continue to develop advanced fabrication techniques that provide the desired control on fuel microstructure with the inclusion of strategic additives if needed.

Other Fuel Activities

- Initiate development of innovative fuel systems that possibly support alternative fuel cycles to the current UOx once-through fuel cycle with the potential for dramatic performance and waste minimization potential.
- Initiate development of advanced high performance particle based fuel systems including the thermal “deep burn” concept.
- Continue pursuit of fuel cladding material development for both thermal and fast reactor use to achieve major increase in irradiation tolerance characteristics, opening the door to overall “deep burn” concepts.
- Collaborate with the Advanced Reactor Concepts program on nuclear data measurements and validation activities that support advanced fuel development activities.
- Continue to explore innovative fuel designs with long-term, high performance.
- Continue the development of transmutation fuels in coordination with long-term separations R&D and systems analysis.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

- Initiate R&D on fuel resources including uranium and thorium resource estimates, advanced exploration methods, and methods to improve resource recovery efficiencies.
- Complete an analysis to characterize long-term uranium resources, including economic considerations and technical barriers. This study would also include an evaluation of the utilization of low-grade or unconventional resources (e.g., phosphates, seawater, etc.).

Transmutation Research and Development	**28,394**	**4,288**	**0**

The mission of the Transmutation technical area was to convert long-lived radioactive isotopes into shorter-lived elements. Transmutation can lower the long-term radiotoxicity of used nuclear fuel to below that of mined uranium ore by reducing the time for decay from hundreds of millennia to as little as centuries.

In the context of long-term waste management technology R&D, this activity supported research on advanced instruments and measures as well as analyses of highly accurate nuclear data such as neutron fission and captures cross-sections for elements of interest to the Fuel Cycle R&D program. Improved accuracy of nuclear data is important to a variety of activities including transmutation performance analysis, safeguards instrumentation design, high-burnup fuel development, waste package performance, and development of advanced models and simulation codes. Nuclear data research will be performed in collaboration with SC.

In FY 2009, the Department:

- Continued R&D activities on high precision measurements of nuclear data, sensitivity analyses to reduce uncertainty, and development of advanced measurement techniques.
- Continued the development of advanced materials that will significantly improve the performance of nuclear systems.
- Continued to work collaboratively with the international community to efficiently leverage existing infrastructure.

In FY 2010, the Department is:

- Continuing R&D activities on high precision measurements of nuclear data, sensitivity analyses to reduce uncertainty, and development of advanced measurement techniques.
- Updating nuclear data libraries to include reduced uncertainties based on new data in the fast neutron region of the spectrum.

In FY 2011, the Department will:

- Focus on separations of fast reactor fuels, transmutation fuels, and systems analysis of fuel cycles containing fast reactors and be funded under those technical areas.

Modeling and Simulation	**24,845**	**26,009**	**15,570**

The mission of Modeling and Simulation within NE is to create and deploy science-based, verified and validated modeling and simulation capabilities essential for the design, implementation, and operation of all aspects of nuclear energy systems and their nuclear fuel cycles to improve U.S. energy security. Program activities encompass the micro-behavior level of fuels and materials in Fuel Cycle R&D, to the macro-behavior level of reactor systems (e.g., LWRs and advanced reactors in Reactor Concepts RD&D)

and their fuel cycles. The successful application of these advancements will enable the use of computer simulation in a fundamentally new way for design, licensing, and operation of nuclear systems.

These activities differ from those conducted in conjunction with the Energy Innovation Hub for Modeling and Simulation within the Nuclear Energy Enabling Technologies program. While modeling and simulation activities carried out in the Reactor Concepts RD&D and Fuel Cycle R&D programs are focused on building new advanced modeling and simulation capabilities in the areas of nuclear fuels, separations processes, material safeguards, waste forms, and repositories for near-term, mid-term, and long-term nuclear power system concepts, the Hub will have a narrower focus of validating and demonstrating the application of modeling and simulation capabilities through the virtual modeling of an existing operating reactor. Additionally, the Hub will be managed by an independent consortium and while the Hub activities may complement those in the NE program, they are not directly linked to the activities proposed under Fuel Cycle R&D and Reactor Concepts RD&D.

In FY 2009, the Department:

- Expanded code team efforts to develop a fast reactor design code to couple thermal-hydraulics, neutronics and structural mechanics with three-dimensional capabilities.
- Improved the fidelity of thermo-mechanical codes used for fuel modeling and improving the models of multi-component materials used in reactor fuels.
- Developed code architectures and methods to model the performance of advanced waste forms in adverse geological environments for very long-term storage and disposition.
- Initiated the development of simulation codes to model the used nuclear fuel recycling process to improve our understanding of what is needed to better design recycling processes with integrated advanced safeguards.
- Developed a Unified Markup Language specification for a modeling and simulation interoperability framework that will facilitate the transfer of capabilities from the research environment to the engineers who will design, build, and operate the new nuclear energy systems.
- Delivered Fundamental Models and Methods that will allow the understanding of performance of materials on the lower length scales needed to simulate the performance of integrated systems.
- Delivered an initial modeling and simulation integration framework that facilitates capability transfer by allowing interoperability of existing codes, industry codes, and newly developed capabilities.
- Provided a centrally planned, but distributed, set of computational resources that leverages other Department of Energy (DOE) high performance computing programs and is needed to support the application development and use.
- Developed a set of experimental data needs and requirements over the entire spectrum of time- and length-scale for the models.
- Developed the set of validation techniques necessary for demonstrating the quality of the modeling tools and for defining requirements for further development of these tools.
- Issued a competitive solicitation to award mission-specific R&D projects to universities.
- Awarded competitive contracts to enhance university infrastructure and increase human capital developmental programs for nuclear engineers and scientists.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

In FY 2010, the Department is:

- Delivering the first generation of integrated performance and safety codes to provide a limited science based understanding of the performance of nuclear fuels and reactor core and safety systems.
- Establishing projects with universities, industry, and laboratories to deliver fundamental material performance models to the integrated code activities.
- Completing surveys of existing verification, validation, and uncertainty quantification methodologies and beginning to implement the most appropriate ones.
- Creating a prototype application that provides a systematic approach to meeting security requirements by integrating the safeguard systems and separations process.
- Developing an initial three-dimensional, high-resolution, integrated system application to understand and predict the performance of nuclear waste forms in repository environments.

In FY 2011, the Department will:

- Deliver advancements for the integrated performance and safety codes for nuclear fuel that remove empirical based behaviors and replace them with first principle based science.
- Continue projects with universities, industry, and laboratories to deliver fundamental material performance models to the integrated code activities.
- Deliver first generation of codes to simulate waste forms in a repository environment and the operation of safeguard systems in a separations facility.
- Create a prototype application that provides a systematic approach to meeting security requirements by integrating the safeguard systems and separations process.
- Implement advanced verification, validation, and uncertainty methodologies.
- Develop an initial modeling and simulation integration framework that facilitates capability transfer by allowing interoperability of existing codes, industry codes, and newly developed capabilities.
- Provide a centrally planned but distributed set of implemented computational resources that leverage other DOE high-performance computing programs needed to support applications development and use.

Systems Analysis and Integration	**20,083**	**14,783**	**15,664**

The mission of the Systems Analysis technical area is to perform systems engineering and integrating analyses of nuclear energy and fuel cycle systems to inform fuel cycle R&D, programmatic decisions, strategy formulation, and policy development.

The technical integration program element provides support in the areas of technical integration, project controls, quality assurance, document management, knowledge management, and communications. This function ensures the technical consistency of the program, integrated product development, and planning and monitoring of work activities.

In FY 2009, the Department:

- Conducted a study of nuclear fuel cycle management options that was focused on identifying a very broad range of possible options for used fuel storage, recycling, waste disposal (including pathways for options that would require significant scientific breakthroughs), and specified

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

criteria for each key technical and scientific challenge.

- Designed and assessed specific technical options and trade studies for future fuel cycle systems such as assessment of approaches for minor actinide and heat management.
- Revised quality assurance program to better reflect National Quality Assurance -1 guidance and increased collaborations with industry and universities.
- Began development of knowledge management processes that permit historical sodium reactor data to be available on line to program researchers.

In FY 2010, the Department is:

- Performing systems analyses, optimization studies, and trade studies. Defining sensitivity coefficients with respect to system level assumptions to guide the R&D prioritization effort.
- Providing strategic and program planning support in developing technology roadmaps, integrated schedules, and other planning documents.
- Developing and maintaining a set of tiered models to be used for policy level decision making.
- Expanding knowledge management to include historical fuels data and geologic repository data and reports.
- Developing specifications and requirements for a fuel cycle simulator that can synthesize and visually present multi-variable attributes of potential fuel cycles.

In FY 2011, the Department will:

- Use a systems engineering approach, conduct systems analyses to define and analyze a broad variety of innovative fuel cycle options including analyzing the effects of a variety of alternative disposal geologies to inform R&D prioritization and program planning.
- Develop a directory of innovative fuel cycle options that documents key characteristics.
- Continue knowledge management activities related to historical fuels data and geologic repository data and reports.
- Continue development of a fuel cycle simulator to support future decision making.
- Perform trade studies and systems analyses to develop information and data on newly-defined innovative fuel cycles to inform program planning and R&D prioritization efforts.

Materials Protection, Accountancy, and Controls for Transmutation	**0**	**6,826**	**7,814**

The mission of the Materials Protection, Accountancy, and Controls for Transmutation (MPACT) technical area is to develop technologies and analysis tools to enable next generation nuclear materials management for future U.S. nuclear fuel cycles to prevent diversion or misuse, thereby, reducing proliferation risks and enhancing confidence and acceptance of nuclear energy. One challenge MPACT will focus on is to develop online, real-time, continuous, accountability instruments and techniques that permit at least an order of magnitude improvement in the ability to inventory fissile materials in domestic fuel cycle systems in order to detect diversion and prevent misuse.

Work within this technical area will be closely coordinated with work described in NE's Enabling Technologies program but will focus specifically on informing future fuel cycle and safeguards R&D. Work will continue to be closely coordinated with NNSA programs.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

In FY 2010, the Department is:

- Identifying gaps and areas for improving proliferation risk assessments of nuclear fuel cycles and drafting a roadmap outlining the path forward.
- Initiating the development of technologies to provide online, real-time measurement systems, including process-monitoring capabilities for improving material accountancy and reduced proliferation risk associated with advanced fuel cycle systems.
- Initiating the development of methodologies to incorporate safeguards and security systems into advanced fuel cycle systems to reduce proliferation risk, optimize performance, and reduce costs.

In FY 2011, the Department will:

- Based on the roadmap created in FY 2010, continue development of improved proliferation risk assessment tools to evaluate fuel cycle options.
- Continue to develop technologies to provide online, real-time measurement systems, including process-monitoring capabilities for improving material accountancy and reduced proliferation risk associated with advanced fuel cycles.
- Continue to develop methodologies to incorporate safeguards and security systems into advanced fuel cycles to reduce proliferation risk, optimize performance, and reduce costs.
- Develop an integrated safeguards and separations design framework using advanced modeling and simulation to inform and guide safeguards technology development and process design.

Used Nuclear Fuel Disposition	**0**	**9,124**	**45,000**

The mission of the Used Nuclear Fuel Disposition technical area is to identify alternatives and conduct scientific research and technology development to enable storage, transportation, and disposal of used nuclear fuel and all radioactive wastes generated by existing and future nuclear fuel cycles. The challenge for Used Nuclear Fuel Disposition is the development of storage, transportation, and disposal systems resulting in near-zero radionuclide releases. Work in this program element supports all three fuel cycle approaches; once-through fuel cycle, modified open fuel cycle, and full fuel recycle. NE will oversee ongoing responsibilities under the Nuclear Waste Policy Act. Within the Fuel Cycle R&D program, these include activities associated with nuclear waste management.

In FY 2010, the Department is:

- Developing capabilities for analyses and trade studies to evaluate all aspects of storage and disposition scenarios and to provide rapid response capability as needed.
- Developing the technical bases and lessons learned for used nuclear fuel disposition.
- Developing modeling tools and initiating systems modeling for engineered and natural barrier systems and generic disposal concepts in multiple environments.
- Initiating an modeling and simulation experiment and testing program.

In FY 2011, the Department will:

- Provide technical expertise to inform policy decision-making regarding the management of used nuclear fuel and radioactive waste that would be generated under existing and potential future nuclear fuel cycles, in collaboration with Office of Environmental Management.
- Develop commercial used fuel and DOE high-level waste projection databases for consistency

in the amounts, locations, discharges and timeframes for systems analysis for the policy decision process.

- Provide rapid response support for inquiries from the proposed Blue Ribbon Commission.
- Work with the EPA and NRC on to help ensure regulatory frameworks can accommodate waste forms and disposition paths not yet defined.
- Develop a systems model to perform cost-benefit analysis of the variety of waste forms, storage concepts, transportation options, and disposal options to provide to policy makers.
- Develop a lessons learned effort that evaluates the critical components of both the international and the past U.S. policy for nuclear waste to inform decision makers.
- Develop a comprehensive understanding of the current technical bases for storage and transportation of used nuclear fuel and high-level nuclear waste; then identify opportunities for long-term R&D.
- Develop a fundamental understanding of the performance of potential storage system concepts over many decades for a variety of used nuclear fuel types and radioactive waste forms based on simulation and experiment.
- Evaluate and model the effects of a wide range of factors that could impact long term storage including cladding behavior, helium buildup, and marine environments.
- Conduct R&D related to data and modeling needs to ensure security over long periods of storage and future transportation.
- Evaluate technical capability of dual purpose canisters to be transported after long-term storage with consideration of regulatory requirements.
- Investigate techniques for repackaging nuclear materials after long periods of storage.
- Develop and test new techniques for monitoring of nuclear materials during long-term storage and new techniques for non-destructive examination.
- Prepare for qualification of new types of nuclear fuel and new waste forms in shipping casks.
- Develop a features, events, and processes database, beginning with international databases and expanding as required to include additional disposal media and/or disposal concepts.
- Develop enhanced databases and other tools for the management and analysis of activities related to domestic used fuel management.
- Develop a comprehensive understanding of the current technical bases for geologic disposal of used nuclear fuel and high-level nuclear waste; then identify opportunities for long-term R&D.
- Conduct R&D advanced models of disposal options to evaluate a variety of used nuclear fuel and high-level waste forms emplaced in a variety of geologic disposal media such as granite, tuff, deep boreholes, clay, shale, salt, and basalt.
- Initiate validation of these advanced models by measuring the thermomechanical, hydrological, and chemical properties of selected geologic media in laboratory experiments and field tests.
- Evaluate and model the inclusion of low-level waste with various high-level waste disposal options.

Modified Open Cycle	**0**	**0**	**40,000**

The FY 2011 budget expands the focus of the Fuel Cycle R&D program to include fuel cycle strategies beyond a full fuel recycle system. The modified open cycle constitutes a range of technology options in between the once-through and full recycle strategies and could be an important

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

part of achieving a sustainable fuel cycle. All three fuel cycles need to be studied in order to provide future decision-makers with a full range of options for making decisions on the best way to manage used fuel. Full recycle has been the focus of the Fuel Cycle R&D program to date and the once-through fuel cycle is the current practice in the United States. The modified open cycle has not been studied as thoroughly as the other two options and that is why it is being singled out as a new technical area for FY 2011.

As a potential waste management option in the long-term if economically viable, a modified open cycle could involve limited used fuel conditioning or processing and would have a higher uranium utilization than the once-through cycle, though not as high as the full recycle option. Similar to other fuel cycle approaches, the modified open cycle would still require a repository for disposal of high level waste for hundreds of thousands of years. A key challenge in this area is to accomplish minimum used fuel conditioning or separations in order to keep costs and proliferation risk low.

In FY 2011, the Department will:

- Identify novel fuel forms, ultra-high burnup fuels, thorium-based fuels, deep burn of transuranic-bearing tristructural isotropic fuels, new advanced reactors designed for transuranic burnup such as molten salt reactors and travelling wave reactors, and options to declad and reclad used fuel to allow volatile and gaseous fission products to be removed and captured before recycling.
- Initiate the exploration of limited treatment of used fuel to add more fuel material to the used fuel, remove wastes from the fuel that inhibit the nuclear reactions, and repair or replace the cladding that contains the fuel.
- Initiate systems engineering to define, establish requirements for, and evaluate modified open fuel cycle options.
- Initiate systems analyses to provide needed information on such topics as transuranic management, separations and partitioning efficiency, fission product behavior, materials reuse, and transmutation approaches of modified open fuel cycle systems.
- Initiate the research and analysis of limited fuel treatment processes, waste forms resulting from limited fuel treatment processes, and advanced transmutation concepts.

SBIR/STTR	**0**	**3,704**	**5,628**

The FY 2010 and FY 2011 amounts shown are an estimate of the requirement for the continuation of the SBIR and STTR program.

Total, Fuel Cycle Research and Development	**142,652**	**136,000**	**201,000**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Separations and Waste Forms The decrease from $41,615,000 to $31,324,000 reflects: ▪ The transfer of Experimental Breeder Reactor-II used nuclear fuel treatment to the Idaho Facilities Management program. ▪ Activities related to materials protection, accountancy, and controls for transmutation have been consolidated into a new activity.	-10,291
Advanced Fuels The increase from $29,651,000 to $40,000,000 reflects an increase in scope to expand R&D from primarily transmutation fuels to a multitude of fuel types.	+10,349
Transmutation Research and Development The decrease from $4,288,000 to $0 reflects the transfer of this activity to other technical areas such as separations, advanced fuels, and systems analysis.	-4,288
Modeling and Simulation The decrease from $26,009,000 to $15,570,000 reflects the transfer of much of the code development and experimental support activities to the technical areas in reactors, fuels, separations and waste forms. In addition, a portion of the Nuclear Energy Advanced Modeling and Simulation support element development will be cost-shared with the Reactor Concepts RD&D program.	-10,439
Systems Analysis and Integration The increase from $14,783,000 to $15,664,000 reflects increases to conduct systems engineering and more analyses comparing the three fuel cycle options. These increases are partially offset by sharing the technical integration function with the Reactor Concepts RD&D program.	+881
Materials Protection, Accountancy, and Controls for Transmutation The increase from $6,826,000 to $7,814,000 reflects a ramping up of activities related to the development of measurement systems and M&S tools.	+988
Used Nuclear Fuel Disposition The increase from $9,124,000 to $45,000,000 reflects a large increase in scope of waste management R&D.	+35,876
Modified Open Cycle The increase from $0 to $40,000,000 reflects the introduction of a new technical area to support R&D for the modified open cycle option, one of three fuel cycle options being studied by Fuel Cycle R&D.	+40,000

	FY 2011 vs. FY 2010 ($000)
SBIR/STTR	
The increase from $3,704,000 to $5,628,000 reflects an increase in R&D expenditures subject to SBIR and STTR.	+1,924
Total Funding Change, Fuel Cycle Research and Development	**+65,000**

Nuclear Energy Enabling Technologies

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Nuclear Energy Enabling Technologies	0	0	0	99,300

Mission

The mission of the Nuclear Energy Enabling Technologies (NEET) program is to develop crosscutting technologies that directly support and complement the Office of Nuclear Energy's (NE) development of new and advanced reactor concepts and fuel cycle technologies and to encourage the development of transformative, "outside-the-box" solutions across the full range of nuclear energy technology issues. The program will focus on innovative research relevant to multiple reactor and fuel cycle concepts that offer the promise of dramatically improved performance. Crosscutting areas of inquiry include the development of advanced fuels and reactor materials, research on innovative nuclear manufacturing methods, new sensor technologies for monitoring material, and equipment conditions in existing reactors and creative approaches to further reduce proliferation risks. The investigator-initiated, peer reviewed program will be open to projects that relate to any aspect of nuclear energy generation - reactor and power conversion technologies, enrichment, fuels and fuel management, waste disposal, nonproliferation, and so forth - ensuring that good ideas have sufficient outlet for exploration. In addition, NE will support research and development (R&D) on transformative, high-risk high-reward concepts that have the potential for making significant leaps forward in advanced nuclear technology development. This effort will cover the full nuclear technology spectrum. Finally, the Energy Innovation Hub for Modeling & Simulation (HUB) will provide crosscutting support to facilitate future improvement of nuclear technologies. Technical innovations emerging from the NEET programs will be used to advance the Reactor Concepts Research, Development and Demonstration (RD&D) and Fuel Cycle R&D programs.

Benefits

Pursuing crosscutting and transformative nuclear technologies and capabilities for incorporation into advanced reactor and fuel cycle concepts offers the promise of revolutionary improvements in safety, performance, reliability, economics and proliferation risk reduction, and promotes creative solutions to the broad array of nuclear energy problems related to reactor and fuel cycle development. The activities undertaken in this program complement those within the Reactor Concepts RD&D and Fuel Cycle R&D programs by providing a mechanism for pursuing broadly applicable R&D in areas that may ultimately benefit specific reactor and fuel cycle technology development. Leveraging the knowledge generated through activities in the NEET program will provide useful information for program and strategic planning and will allow NE to address key challenges affecting nuclear reactor deployment (e.g., capital cost, technology risks and proliferation concerns).

Annual Performance Results and Targets

The NEET program's performance measure aligns to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the GPRA Unit Program Goal of New Nuclear Generation Technologies. Measures for the NEET program are under development but will support progress in these areas.

Annual Performance Targets and Results

Secretarial Goal: Energy

GPRA Unit Program Goal: New Nuclear Generation Technologies

FY PY-3	FY PY-2	FY PY-1	FY PY	FY CY	FY BY	FY BY+1	FY BY+2	FY BY+3	FY BY+4
FY 2006	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**
FY 2011 Efficiency Performance Measure: *Maintain total administrative overhead costs in relation to total R&D program costs of less than 8 percent.*									
T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:
Crosscutting Technology Development FY 2011 Effectiveness Performance Measure: Measures Under Development. New measures for this new program will be finalized and in place by the start of FY 2011.									
T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:	T: 1 A:

Means and Strategies

The NEET program will use various means and strategies to achieve its GPRA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- Develop crosscutting, transformative technologies that directly support and complement NE's development of new and advanced reactor concepts and fuel cycle technologies.
- Partner with the national laboratories, industry, and university research communities as well as the international research community through various multilateral and bilateral international agreements and pursue cost-sharing agreements where appropriate.
- Evaluate improvements in other industrial sectors (aerospace, shipbuilding, etc.) to identify potential transformational technology ideas to be applied to the research, development, and deployment of nuclear energy technologies.
- Solicit and competitively select projects to conduct research on advanced manufacturing technologies.

The Department will implement the following strategies:

- NE will establish the Hub in FY 2010 and will continue to support it in FY 2011. The Hub will transform the way in which the United States develops, implements, and licenses nuclear energy technologies through the application of state-of-the-art computer modeling and simulation of all processes from the sub-atomic to the system-integration level.
- NE's R&D programs will partner with the private sector, national laboratories, universities, and international partners to develop crosscutting advanced nuclear technologies.
- Programs will also engage the international community in pursuit of advanced nuclear technology that will benefit the U.S. with enhanced safety, improved economics, and reduced production of wastes.
- R&D will use a "science-based" approach that involves the close coupling of experiments, theory, and advanced modeling and simulation to create new levels of understanding about the performance and safety of complex physical systems.
- Open competition for new ideas through broad solicitation of novel and transformative concepts for any technology or system that might contribute to nuclear power, from enrichment to fuel management.
- NE designates up to 20 percent of funds appropriated to its R&D programs for work to be performed at university and research institutions, through open, competitive solicitations for investigator-led projects.

The following external factors could affect the program's ability to achieve its strategic goal:

- Deployment of advanced reactor technologies may be influenced by Administration policy decisions related to advanced spent fuel and waste management technologies (e.g., Secretarial Blue Ribbon Commission on nuclear waste management).
- The decision to build new commercial nuclear power plants rests with the power industry alone. This decision depends in part on power demand and economic and environmental factors beyond the scope of the Department's programs. In the near term, it depends on complex economic decisions made by industrial partners.

In carrying out the program's mission, the program performs the following collaborative activities:

- NE supports the Modeling and Simulation Hub in its NEET program. The NEET program will work closely with the Office of Science to ensure synergy and avoid redundancies.
- The Department will consult with the NRC on program planning to assure that their R&D activities are complimentary, cost effective, and not duplicative.
- The program will work to receive broad international cooperation and support, consistent with the objectives of the program.
- NE will partner with industry, research and standards groups, where appropriate, in a cost-shared manner to conduct research, technology development and ensure industrial codes and standards are valid and up to date.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts RD&D and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

NE has engaged its stakeholders in a number of recent evaluation activities to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals. NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee and National Academy of Sciences.

Nuclear Energy Enabling Technologies

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Nuclear Energy Enabling Technologies			
Crosscutting Technology Development	0	0	43,332
Transformative Nuclear Concepts Research and Development	0	0	28,888
Energy Innovation Hub for Modeling and Simulation[a]	0	0	24,300
SBIR/STTR	0	0	2,780
Total, Nuclear Energy Enabling Technologies	0	0	99,300

Benefits

The Nuclear Energy Enabling Technologies program includes three budget elements. The Crosscutting Technology Development activity provides crosscutting R&D support for the various nuclear energy concepts (existing and future) in areas such as advanced fuels and reactor materials, innovative nuclear fabrication and construction methods, new sensor technologies for monitoring material and equipment conditions in existing reactors, and creative approaches to further reduce proliferation risks. The Transformative Nuclear Concepts R&D will support, via an open, competitive solicitation process, investigator-initiated projects that relate to any aspect of nuclear energy generation—reactor and power conversion technologies, enrichment, fuels and fuel management, waste disposal, nonproliferation, and so forth—ensuring that good ideas have sufficient outlet for exploration. The Energy Innovation Hub for Modeling and Simulation will apply existing modeling and simulation capabilities to create a "virtual" reactor user environment for engineers to simulate a currently operating reactor. This approach will provide a detailed, validated reactor performance predictive capability for use by engineers to address performance and safety issues related to power "uprates" and life extensions for current reactors. Collectively, these activities complement activities within the Reactor Concepts RD&D and Fuel Cycle R&D programs, by addressing challenges that are not specific to particular reactor or fuel cycle technologies. Elements of this program will be subject to peer review. Crosscutting activities previously carried out in other NE R&D programs are now within the scope of this program to avoid duplication of effort.

A balanced science-based R&D approach includes both performance enhancement of evolutionary concepts and investigation of crosscutting and novel concepts. These elements will further promote the generation of new ideas and foster exploration of new and original technology options. The research on transformative nuclear concepts will pursue non-traditional nuclear energy ideas that offer the potential for improved system performance and may radically alter nuclear system configuration and development needs. This could include the development of specialized nuclear fuels, revolutionary materials, new enrichment techniques, tailored coolants, new techniques for energy conversion, or other innovations. Some examples of radical changes could be utilization of non-solid fuel forms or replacement of the

[a] In FY 2010, funding for the Energy Innovation Hub for Modeling and Simulation was included in the Generation IV Nuclear Energy Systems program.

conventional steam cycle. Including these transformational technologies into integrated system concepts is vital for the stimulation of refined concepts and systematic comparison of long-term options.

Incorporating these technologies and capabilities as part of an integrated system offers the promise of revolutionary improvement in safety, performance, reliability, economics and proliferation risk reduction. Advances in these enabling technologies could reduce capital and operating costs, increase plant efficiency and reliability and improve the overall economics of nuclear energy. Better understanding and quantification of proliferation risks will improve the technical and policy choices associated with the nuclear fuel cycle. Improved material performance has the potential to enable greater reactor temperatures, new reactor designs, and/or new reactor missions. New classes of alloys and materials, not yet considered for reactor performance, may enable transformational reactor performance. Improving the accuracy of nuclear data and the use of advanced modeling and simulation tools and capabilities will contribute to improved safety and improved design processes without unneeded conservatism.

Generally, NE programs allocate R&D funding to those entities (e.g., industry, laboratories, and universities) that are best qualified to carry out the work in support of NE's mission. Consistent with NE's commitment to supporting R&D activities at university and educational research institutions, NE designates up to 20 percent of funds appropriated to its R&D programs for work to be performed at university and research institutions. In addition, the Transformative Nuclear Concepts R&D activity will make funds available for investigator-initiated projects through open and competitive solicitations designed to encourage broad participation across national laboratories, universities, research institutions, and industry.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Crosscutting Technology Development	**0**	**0**	**43,332**

Crosscutting Technology Development provide either crosscutting or enabling technologies to support multiple reactor concepts in the areas including reactor materials, advanced methods for manufacturing, new sensor technologies for monitoring material and equipment conditions in existing reactors, and creative approaches to further reduce proliferation risks.

Reactor Materials – New classes of alloys and materials, not yet considered for reactor performance may enable transformational reactor performance. The custom design of innovative steels using modern materials science techniques, industrial knowledge, and previous experience can improve performance over traditional materials by a factor of five to ten, increasing the maximum operating temperature by 200 degrees Celsius for a period of at least 80 years. Concepts that may be evaluated include optimized alloy composition, engineered microstructures, age-tempered microstructures, or combinations thereof. Other, more radical concepts that may be explored to enable even greater performance include bi-metallic layers, metal/ceramic composites, ion-beam or surface-modified alloys. A wide range of operating conditions will be considered, with the general goal of improved strength and radiation resistance.

In FY 2011, the Department will:

- Create and analyze small samples to verify material properties, and separate effects testing will assess key environmental effects.
- Evaluate and prioritize innovative structural materials (e.g., oxide dispersion strengthened, nano-structured ferritic materials, and nano-cluster dispersion materials) for use in radiation environment and other high temperature applications.
- Consider approaches such as the use of ion beams to simulate accelerated aging of materials.
- Develop collaborations with industry, universities, and/or domestic/international agencies using competitive processes and cost-sharing arrangements as appropriate.
- Coordinate and integrate materials development activities with modeling and simulation and reactor component and system development to optimize the performance with the service requirements.

Proliferation Risk Assessment – The program will develop new tools and approaches for understanding, limiting, and managing the risks of proliferation and physical security for fuel cycle options. NE, in collaboration with National Nuclear Security Administration, will focus on assessments required to inform domestic fuel cycle technology and system option development, partnering with other organizations to share results of assessments. These analytical/predictive tools for comprehensive proliferation risk assessments will provide important information for discussions and decisions regarding fuel cycle options. These assessments will:

- Exploit science-based approaches for analyzing difficult-to-quantify proliferation risk factors or indicators (e.g., capabilities, motivations and intentions); address issues identified in several National Academy of Sciences studies related to risk assessment; and leverage current state-of-the-art academic research in this field.
- Evaluate the diverse decision factors (including economics, public health and safety, public

perceptions, environmental benefits and proliferation and terrorism risk reduction) for different fuel cycle options to understand the tradeoffs and potential synergies between these decision criteria.

- Apply these tools to study nuclear energy system options and display the results in a useful format for decision makers.

In FY 2011, the Department will:

- Develop a detailed project plan for quantification of proliferation risk to include scope of work, steering committee and external review plans, and evaluation of nuclear energy's role in a broader national and international security context.
- Initiate studies of current risk assessment methodologies (strengths, key components, scopes, applicability) to include: 1) current methodologies in "prototype scenarios"; and 2) effective coordination with other national security (including counter terrorism and game theory) methodologies and entities (DHS, DARPA, etc.).

Advanced Methods for Manufacturing - This task will include research on advanced manufacturing technologies. This effort will draw upon successful practices in the oil, aircraft, and shipbuilding industries, as appropriate, and employ the modeling and simulation capabilities of the national laboratories to validate and optimize new technologies. The technologies and techniques researched will be independent of reactor type and broadly applicable to industry.

In FY 2011, the Department will:

- Initiate competitively selected high-potential R&D activities that improve nuclear plant manufacturing efficiency with universities, industry and laboratories in hybrid gas metal arc and laser welding; Automated Non-Destructive Examination techniques such as digital radiography and phased array ultrasonic; steel concrete composite structures; and prefabricated modular rebar assemblies.

Advanced Sensors and Instrumentation – This task will conduct necessary R&D unique sensor and instrumentation infrastructure technology to monitor and control new advanced reactors and small modular reactor systems. The unique operating conditions and fluids, upset and accident conditions, and degradation and aging phenomena (e.g. multiple units, very high temperature, and liquid metal) that are inherent to advanced and small modular reactor systems will require advancement in sensor, infrastructure and control technology to enhance nuclear plant safety and performance. It is expected that some of the development work will provide useful information for measurement, sensing, and materials accountability in waste management and fuel cycle arenas as well.

In FY 2011, the Department will:

- Perform research to develop advanced sensors to improve physical measurement accuracy and reduce uncertainty.
- Perform research on adaptive digital monitoring and control technology to provide increases in control system performance and self calibration capability.
- Perform research on fiber optic and wireless digital instrument communication systems.
- Perform research on highly integrated control system architectures for multiple reactor module

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

control.

Transformative Nuclear Concepts Research and Development	**0**	**0**	**28,888**

This program will support, via an open, competitive solicitation process, investigator-initiated projects that relate to any aspect of nuclear energy generation—reactor and power conversion technologies, enrichment, fuels and fuel management, waste disposal, nonproliferation, and so forth—ensuring that good ideas have sufficient outlet for exploration. One goal of this effort is to encourage the identification and development of "outside the box" options in all aspects of the civilian nuclear energy program. The scope of eligible topics is not specific to any on-going, mission activities. NE funds mission-specific activities through investigator-initiated and directed research mechanisms within its other R&D activities; this includes support for universities and research institutions.

This effort is a key mechanism in NE's R&D portfolio to further encourage out-of-the-box thinking and promote creative solutions to the universe of nuclear energy challenges and questions. By pursuing novel and transformative concepts across all aspects of nuclear technologies, the projects funded under this activity may ultimately enable NE to make significant leaps forward in advanced nuclear technology development. This program is not focused on bringing nuclear concepts to the prototype stage.

In FY 2011, the Department will:

- Make available through open and competitive solicitations designed to encourage broad participation across national laboratories, universities, research institutions, and industry. Awards will likely span 2-3 years, depending upon project scope. Applications will be peer-reviewed by a body of internal and external experts to help select promising concepts, and to ensure that activities are not duplicative of any existing R&D activities. NE will monitor progress, utilize results to inform and adjust its program and activity planning and strategy development, and ultimately consider the outcomes of funded activities within the context of its mission-specific activities.

Energy Innovation Hub for Modeling and Simulation	**0**	**0**	**24,300**

The national priorities for NE include working with industry and the existing reactor fleet to safely uprate power and to extend the reactors operating life. In addition, NE undertakes R&D to advance new nuclear energy technologies. This includes the Generation III+ and IV reactor systems as well as the development of small modular reactors. Advanced modeling and simulation is an essential tool to improving our scientific understanding of these systems to safely increase the pace of innovation and reduce costs.

One of the greatest challenges facing the designers and engineers for the Generation III+ and Generation IV reactors in using advanced modeling and simulation is the "user interface" required to access greater computing power. The current user interface for these tools and computers was created for work in the discovery sciences domain; a domain characterized by a small number of highly educated users, running a limited number of jobs for long periods on very powerful computers. In contrast, the applied domain of designers and engineers is characterized by a large variety of users running a plethora of jobs for short periods on very low power computers (e.g. desktops).

(dollars in thousands)

FY 2009	FY 2010	FY 2011

The focus of the Hub will be on dramatically changing the user environment for advanced modeling and simulation and high performance computing. The result will increase the pace of innovation, lower costs, and reduce uncertainty and risk for the design of reactors. The Hub will integrate and simplify the use of a wide range of technologies needed to use high performance advanced modeling and simulation by employing a cross-disciplinary team of nuclear engineers and scientists, computer scientists, mathematicians, verification and validation specialist and other experts.

To achieve the highest degree of success the Hub will be mission driven. The mission focus of the Hub is to create a "virtual" model of an operating reactor with the potential coupling of a physical reactor for validation and verification purposes. This will involve the use of existing appropriate capabilities, the integration of existing and new modeling and simulation capabilities via an interoperability framework, the development of additional modeling and simulation capabilities as needed, and the validation of the capabilities using data obtained from the operating reactor. This will allow the creation of advanced user environments to provide interface with the virtual model. Also, where needed, the Hub will develop new 3D science-based modeling and simulation capacities that are usable on advanced computing architectures. The Hub will also provide opportunities for fundamental and applied research that will combine experiments, theory and modeling and simulation to better understand nuclear energy technologies. The exact scope of work to be performed by the Hub will be, however, defined by the successful applicant.

The Hub will accelerate the validation of modeling and simulation of nuclear energy technologies, develop advanced approaches to demonstrate the "predictability" of advanced modeling and simulation, and implement advanced instrumentation to observe the operation of physical nuclear energy technologies. A great deal of work has been accomplished or is currently underway to build, verify, and validate the modeling and simulation capabilities needed for nuclear energy. The Hub will serve a valuable and unique role that supplements this work by focusing on an existing reactor, focusing on engineering "usability issues" for advanced modeling and simulation, and allowing an opportunity for national laboratories, universities, and industry to work in a highly collaborative environment focused on a single mission.

The Department anticipates that the benefits of the Hub will extend to all other forms of energy. The same user environment needed by nuclear energy technology designers and engineers will be usable by other energy technologies (e.g. solar, wind, and biomass energy systems). The user environment has the potential to transform advanced modeling and simulation applied to traditional forms of energy such as coal, natural gas, and petroleum as well.

FY 2010 activities are discussed in the Gen IV budget.

In FY 2011, the Department will:

- Continue to fund the Energy Innovation Hub for Modeling and Simulation, established in FY 2010 under the Gen IV program, to accomplish its objectives according to the Hub's funding plan, including cost sharing if applicable.
- Establish an Energy Innovation Hubs Oversight Board to review the progress of the Hub's scientific program and its management structure, policies, and practices.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

- Provide ongoing review of the Hub's deliverables and performance.

SBIR/STTR	**0**	**0**	**2,780**
The FY 2011 amount shown is an estimated requirement for the continuation of the SBIR and STTR program.			
Total, Nuclear Energy Enabling Technologies	**0**	**0**	**99,300**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Crosscutting Technology Development The increase from $0 to $43,332,000 reflects the creation of the new budget activity in FY 2011 to support the development of crosscutting technologies capable of supporting multiple reactor types and inclusion of activities previously funded within the Gen IV budget in FY 2010 (e.g., reactor materials).	+43,332
Transformative Nuclear Concepts Research and Development The increase from $0 to $28,888,000 reflects the creation of the new budget activity in FY 2011 to pursue novel and transformative, investigator-initiated concepts across the full spectrum of nuclear areas to help enable significant leaps forward in advanced nuclear technology development.	+28,888
Energy Innovation Hub for Modeling and Simulation The overall funding increase reflects the transfer of the Hub from the Gen IV budget to the NEET budget. In FY 2010, the Hub is funded at $21,384,000; the FY 2011 request reflects an increase of $2,916,000 to support on-going activities following from creation of the Hub in FY 2010.	+24,300
SBIR/STTR The increase from $0 to $2,780,000 reflects an increase in R&D expenditures subject to SBIR and STTR.	+2,780
Total Funding Change, Nuclear Energy Enabling Technologies	**+99,300**

Radiological Facilities Management

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Radiological Facilities Management				
Space and Defense Infrastructure	35,000	0	42,000	47,000
Research Reactor Infrastructure	6,146	0	10,000	4,818
Oak Ridge Nuclear Infrastructure	12,500	0	10,000	0
Los Alamos Nuclear Infrastructure	12,500	0	10,000	0
Pu-238 Production Restart Project	0	0	0	15,000
Total, Radiological Facilities Management	66,146	0	72,000	66,818

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriation Act (2009)
P.L. 111-85, Appropriation Act (2010)

Mission

The Radiological Facilities Management (RFM) program maintains Office of Nuclear Energy (NE) managed nuclear facilities at the Idaho National Laboratory, Oak Ridge National Laboratory (ORNL), and Los Alamos National Laboratory (LANL), primarily housing large gloveboxes, hot cells, and their associated support facilities. These facilities are supported through the Space and Defense Infrastructure subprogram and support the production of radioisotope power systems. Beginning in FY 2011, DOE and the National Aeronautics and Space Administration (NASA) will initiate a project to restart the production of Plutonium-238 (Pu-238) for future NASA missions and potential national security applications. NE's Research Reactor Infrastructure program will continue to provide fresh reactor fuel services to operating university reactors that support nuclear energy research and development (R&D). Finally, in FY 2009 and FY 2010, NE supports Congressionally-directed infrastructure activities at ORNL and LANL.

Benefits

The RFM program ensures that the Department's nuclear capabilities supporting radioisotope power systems production are maintained and operated in a safe, environmentally-compliant and cost-effective manner to support those priorities and supports fuels management for university reactors. Key activities include managing all special nuclear materials contained in the Department of Energy (DOE) facilities, the management and disposition of all special nuclear materials under NE ownership contained in these facilities, and the new Pu-238 Production Restart Project. This Pu-238 Production Restart Project will be co-funded by DOE and NASA and will re-establish a domestic capability to produce Pu-238 to enable future NASA space missions and potential national security applications that require radioisotope

power systems (RPSs). Existing supplies of Pu-238 are limited; domestic production will help ensure that Pu-238 is available beyond the next decade to meet NASA and national security users' long-term demand.

Isotope Development, Production, and Research

Isotope production at the DOE is primarily the responsibility of the Office of Science (SC) with two exceptions: Pu-238 production by NE and molybdenum-99 (Mo-99) production supported by the National Nuclear Security Administration's (NNSA's) Global Threat Reduction Initiative (GTRI).

The Isotope Development and Production for Research and Applications (Isotope) program located in SC's Nuclear Physics program offers more than 120 stable and radioactive isotopes for use in basic research and in medical diagnostic, medical treatment, national security, energy, and industrial applications. The Isotope program produces isotopes only where there is no U.S. private sector capability or where other production capacity is insufficient to meet U.S. needs. Isotope production for commercial use or repackaging is on a full-cost recovery basis, while isotopes produced solely for non-proprietary research purposes are provided at below cost. The Isotope program works in close collaboration with other Federal agencies and the isotope-using communities to develop priorities for production. This past year, the Nuclear Science Advisory Committee (NSAC) issued its report establishing priorities for the production of research isotopes in April 2009. A long-term strategic plan for the program came out in November 2009. Both reports were developed with Federal, commercial, and research community input. A current priority is the production of Helium-3 (He-3), used in neutron detection and cryogenics. Historically, He-3 has been a by-product of tritium production for the U.S. weapons program. With the reduction in nuclear weapons, tritium production is at a low level and current demand for He-3 has drawn down supplies. U.S. and international efforts are underway to address the He-3 supply shortfall.

For nearly 50 years, the NE's Space and Defense Power Systems program has maintained the capabilities needed to support the design, development, production, and safety of Pu-238 RPS for science missions to the outer planets, exploration of the moon and Mars, and potential national security applications. With a limited existing Pu-238 stockpile, NE is working to re-establish domestic Pu-238 production in order to assure continued availability of these power systems.

Mo-99 is widely used in medical diagnosis and has been produced commercially with reactors using highly enriched uranium (HEU) fuel. Because of the nonproliferation mission to remove HEU from use, NNSA's GTRI program has the lead for Mo-99. As part of its nuclear nonproliferation mission, and in light of the current Mo-99 supply shortage, GTRI is working to demonstrate Mo-99 production without the use of HEU. GTRI is implementing projects to demonstrate the viability of non-HEU based technologies for large-scale commercial Mo-99 production, including for example: accelerator technology, Low Enriched Uranium (LEU) target technology, LEU solution reactor technology, and neutron capture technology.

Annual Performance Results and Targets

The RFM program contributes to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the National Nuclear Infrastructure GPRA Unit Program Goal. The program's performance measure contributes to these goals by ensuring that the Department's unique facilities, required for advanced nuclear energy technology R&D, are maintained

and operated such that they are available to support national priorities. Key activities conducted under this program include ensuring that all NE facilities meet essential safety and environmental requirements and are maintained at user-ready levels. Other key activities include the management and disposition of all special nuclear materials under NE ownership contained in these facilities, and providing support for university research reactors through fuel management and upgrading control system.

Annual Performance Targets and Results

Secretarial Goal: Energy

GPRA Unit Program Goal: National Nuclear Infrastructure

FY PY-3	FY PY-2	FY PY-1	FY PY	FY CY	FY BY	FY BY+1	FY BY+2	FY BY+3	FY BY+4
FY 2006	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**
Efficiency Performance Measure: *Maintain total administrative overhead costs in relation to total R&D program costs of less than 8 percent.*									
T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A: Met	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:	T: < 8% A:
Effectiveness Performance Measure: To ensure unique nuclear facilities are available to support critical Departmental missions, maintain a facility operability index of 0.9 for key RFM program facilities. (Beginning in FY 2010, this measure tracks RFM program facilities only. Idaho Facilities Management program facilities are tracked separately.)									
T: 0.9 A: Met	T: 0.9 A: Met	T: 0.9 A: Met	T: 0.9 A: Met	T: 0.9 A:	T: 0.9 A:	T: 0.9 A:	T: 0.9 A:	T: 0.9 A:	T: 0.9 A:

Means and Strategies

The program will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- Maintain the unique infrastructure and capability to deliver advanced RPS for space and national security missions.
- Aggressively implement contracting reforms, including fixed price competitive bidding, earned value management, capital planning processes in accordance with DOE Order 413.3A, independent external evaluations, etc., to ensure that the infrastructure program is operating effectively and efficiently to meet the Department's highest priority program needs.

The Department will implement the following strategies:

- Partner with the private sector, national laboratories, universities, and international partners to develop and deploy advanced nuclear technologies to increase the use of nuclear energy in the United States.
- Re-establish domestic Pu-238 production capability to address anticipated future supply shortages.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- Program infrastructure activities are interrelated with customer-defined (i.e., NASA and national security agencies) requirements for the development of RPS. Changes in long-term projected demands for RPSs would impact NE's provision of infrastructure and development support, including activities associated with restarting domestic Pu-238 production.

In carrying out the program's mission, the program performs the following collaborative activities:

- Coordinates with national security agencies and NASA in developing RPS for their use to ensure proposed systems and technologies satisfy the necessary technical requirements identified by customers for identified mission scenarios.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts Research, Development and Demonstration and Fuel Cycle R&D. NE infrastructure programs, such as the Idaho Facilities Management program, are managed using similar oversight techniques.

NE has engaged its stakeholders in a number of recent evaluation activities to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals.

NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as NSAC and National Academy of Sciences.

Space and Defense Infrastructure

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Space and Defense Infrastructure			
Idaho National Laboratory	9,500	9,840	9,840
Los Alamos National Laboratory	15,000	22,030	27,030
Oak Ridge National Laboratory	4,900	5,160	5,160
Other Activities	5,600	4,970	4,970
Total, Space and Defense Infrastructure	35,000	42,000	47,000

Benefits

The Space and Defense Infrastructure program produces plutonium 238 (Pu-238) based Radioisotope Power Systems (RPS) for National Aeronautics and Space Administration (NASA) mission and certain national security applications. The Department maintains capabilities at the Idaho, Oak Ridge, and Los Alamos National Laboratories needed to produce these systems.

The Pu-238 based RPS are needed for certain NASA and national security applications where other power sources, such as batteries, fuel cells, and solar technologies, are not economical or technologically viable. They enable NASA deep space missions that could lead to scientific discoveries, possibilities, and opportunities, as well as, support national security applications.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Idaho National Laboratory	**9,500**	**9,840**	**9,840**
▪ **Radioisotope Power Systems Assembly Operations**	**9,000**	**9,340**	**9,340**

Funding supports the facility manager, alternate facility manager, trained operators and maintenance staff, materials control, quality control, quality inspection, documentation, radiation health physicist support, radiation engineering, nuclear safety support, facility Documented Safety Analysis, mechanical and electrical engineering support, crane operations and maintenance, tooling and engineer development technical and equipment support, and overall program management including: training, transportation coordination, project management, shipping container hardware fabrication and repair, and drawing support. Idaho National Laboratory will store and maintain the flight quality status of the RPS for the NASA Mars Science Laboratory mission.

▪ **Capital Equipment for Radioisotope Power System Assembly Operations**	**500**	**500**	**500**

These funds support capital equipment used in RPS assembly activities.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Los Alamos National Laboratory	**15,000**	**22,030**	**27,030**
▪ **Pu-238 Encapsulation and Scrap Recovery Facilities**	**12,000**	**20,030**	**25,030**
Funding supports maintenance and operation of dedicated Pu-238 processing, encapsulation, and scrap recovery facilities. The facilities include equipment and support capabilities to manufacture the fuel forms and weld them into fuel clads; chemically remove impurities from the fuel; support the required materials control, quality control, quality inspection and documentation, and overall program management which includes: training, transportation coordination, project management, and facility safety.			
▪ **Capital Equipment for the Pu-238 Facilities**	**3,000**	**2,000**	**2,000**
These funds support capital equipment related to the maintenance and operation of dedicated Pu-238 processing, encapsulation and scrap recovery facilities.			
Oak Ridge National Laboratory	**4,900**	**5,160**	**5,160**
▪ **Iridium Fabrication Facilities for Radioisotope Power Systems**	**4,400**	**4,410**	**4,660**
Funding maintains infrastructure and capabilities to fabricate iridium cladding and carbon insulators used to encapsulate and contain the fuel pellets necessary for the safe operation of RPS equipment and capabilities for the production of iridium clad vent sets used to encapsulate the fuel; equipment and capability for the production of thermal insulation sleeves used in the re-entry protection system; materials control, quality control, quality inspection, and documentation; and overall program management which includes: training, iridium inventory management, project management, and facility safety.			
▪ **Capital Equipment for Iridium Fabrication Facilities**	**500**	**750**	**500**
These funds support capital equipment associated with the capabilities to fabricate iridium cladding and carbon insulators.			
Other Activities	**5,600**	**4,970**	**4,970**
▪ **Safety/Program Analysis and Testing Infrastructure**	**4,610**	**4,670**	**4,670**
Funding supports the maintenance of the required analytical and testing capability which enables the Department to analyze RPS performance and safety for various applications.			
▪ **Certification of Type "B" Shipping Containers**	**990**	**300**	**300**
Funding supports Department of Energy certification of fuel and power system shipping containers.			
Total, Space and Defense Infrastructure	**35,000**	**42,000**	**47,000**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Los Alamos National Laboratory	
▪ **Pu-238 Encapsulation and Scrap Recovery Facilities** The increase from $22,030,000 to $27,030,000 is for the distributed facility charge that was initiated in FY 2010. The funds support engineering and services needed to maintain operational readiness.	+5,000
Total, Los Alamos National Laboratory	**+5,000**
Oak Ridge National Laboratory	
▪ **Iridium Fabrication Facilities for Radioisotope Power Systems** The increase from $4,410,000 to $4,660,000 is a minor increase in the cost of personnel required to maintain capability at the iridium fabrication facilities.	+250
▪ **Capital Equipment for Iridium Fabrication Facilities** The decrease from $750,000 to $500,000 is due to reduced capital equipment needs in FY 2011.	-250
Total, Oak Ridge National Laboratory	**+0**
Total, Space and Defense Infrastructure	**+5,000**

Capital Operating Expenses and Construction Summary
Capital Operating Expenses

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Capital Equipment	4,000	3,250	3,000
Total, Capital Operating Expenses	4,000	3,250	3,000

Research Reactor Infrastructure

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Research Reactor Infrastructure			
Idaho National Laboratory	6,146	10,000	4,818
Total, Research Reactor Infrastructure	6,146	10,000	4,818

Benefits

This program provides fresh reactor fuel to and removes used fuel from 26 operating university reactors. It supports the continued operation of university research reactors by providing test reactor capability to universities, coupled with research, development, and educational opportunities in support of U.S. nuclear energy initiatives.

This program supports the continued operation of university research reactors which play an important role in developing future scientists and engineers in the United States. This program sustains unique capabilities for research and development and educational opportunities supporting U.S. energy initiatives. Used fuel shipments support U.S. and Department of Energy non-proliferation and national security objectives.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Idaho National Laboratory	**6,146**	**10,000**	**4,818**
FY 2011 funds would provide universities with fresh fuel to support continued operation of their research reactors and the shipments of used fuel as needed. Funding also supports maintenance and repair of fuel fabricating equipment.			
Total, Research Reactor Infrastructure	**6,146**	**10,000**	**4,818**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Idaho National Laboratory	
The decrease from $10,000,000 to $4,818,000 is attributed to the completion of the following activities: 1) fabrication of a spare fuel inventory to respond to unplanned U.S. university fuel needs, and 2) reactor equipment and instrumentation upgrades at U.S. universities.	-5,182
Total, Idaho National Laboratory	**-5,182**

Oak Ridge Nuclear Infrastructure

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Oak Ridge Nuclear Infrastructure			
Oak Ridge National Laboratory	12,500	10,000	0
Total, Oak Ridge Nuclear Infrastructure	12,500	10,000	0

Benefits

In FY 2010, this Congressionally directed funding will be used for hot cell upgrades and maintenance at the Radiochemical Engineering Development Center (REDC) at the Oak Ridge National Laboratory, which is the Department's production, storage, and distribution center for heavy-element research activities.

Constructed in the mid-1960's, REDC contains hot cells in Buildings 7920 and 7930 and auxiliary facilities that support laboratory scale testing in the areas of aqueous separation research and development and irradiated target processing activities for the High Flux Isotope Reactor.

Detail Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Oak Ridge National Laboratory	**12,500**	**10,000**	**0**

Based on FY 2010 Congressional direction, funding in the amount of $10,000,000 was provided for the following activities:

- Conduct corrective and other targeted maintenance on nuclear safety and facility support components and equipment within REDC building systems such as ventilation, electrical, instrumentation, air, steam, cooling water, hot cells windows, manipulators, building structure and hoists/cranes; and
- Perform roof refurbishment and off-gas upgrades to the high-efficiency particulate air systems.

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Oak Ridge National Laboratory	
The decrease from $10,000,000 to $0 reflects the elimination of this Congressionally directed funding. No funding is requested in FY 2011 for these activities.	**-10,000**
Total Funding Change, Oak Ridge National Laboratory	**-10,000**

Los Alamos Nuclear Infrastructure

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Los Alamos Nuclear Infrastructure			
Los Alamos National Laboratory	12,500	10,000	0
Total, Los Alamos Nuclear Infrastructure	12,500	10,000	0

Benefits

In FY 2010, this Congressionally directed funding was used to support equipment and facility upgrades, maintenance, and management practices at Los Alamos National Laboratory (LANL).

The LANL radiological facilities provide unique national actinide capabilities in the areas of analytical chemistry, materials characterization, chemical diagnostics, radiochemistry, and applied spectroscopy.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Los Alamos National Laboratory	**12,500**	**10,000**	**0**

Based on FY 2010 Congressional direction, funding in the amount of $10,000,000 was applied to the following activities:

- Address deficiencies in building structures, systems and components that are credited to the facilities' operations and safety bases;
- Perform maintenance and end-of-life replacement of equipment and infrastructure to assure that the facilities continue to meet Departmental safety standards and required operational reliability;
- Maintain facility management practices to meet current Departmental requirements, including preparing safety documentation and supporting technical safety analyses, managing nuclear material inventories, enhancing worker protection programs, and training staff; and
- Conduct corrective and routine preventive maintenance on nuclear safety and facility support components and equipment within building systems.

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Los Alamos National Laboratory	**-10,000**
The decrease from $10,000 to $0 reflects the elimination of this Congressionally directed funding. No funding is requested in FY 2011.	
Total Funding Change, Los Alamos National Laboratory	**-10,000**

Pu-238 Production Restart Project

Funding Schedule by Activity

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Pu-238 Production Restart Project			
Pu-238 Production Project	0	0	15,000
Total, Pu-238 Production Restart Project	0	0	15,000

Benefits

This Plutonium-238 (Pu-238) Production Restart Project will re-establish a domestic capability to produce Pu-238 for use in radioisotope power systems (RPS) and radioisotope heater units required by certain National Aeronautics and Space Administration (NASA) space missions and national security applications. The Department of Energy (DOE) will conduct the project in accordance with the principles of DOE Order 413.3A, the Department's approved project management system for acquisition of capital assets. The project will establish the capability to fabricate neptunium-237 (Np) targets, to irradiate the targets in existing DOE nuclear reactors, and to recover Pu-238 from the irradiated targets. The Department has an ongoing program to produce RPSs that rely on Pu-238 as an energy source. The capabilities necessary for developing these systems are funded within the Office of Nuclear Energy's Space and Defense Infrastructure program.

Pu-238-based RPSs are needed for certain NASA and potential national security applications where other power sources, such as batteries, fuel cells, and solar technologies are not viable. In the past NASA has used Pu-238-based RPSs to power missions to the outer planets Jupiter and Saturn, which are too distant from the Sun to depend on solar arrays to power their instruments. Likewise, Pu-238-fueled RPSs are critical to Mars missions, such as the Viking landers of the 1970s and the Mars Science Laboratory to be launched in 2011; solar panels cannot operate reliably on the planet given its frequent dust storms and temperature extremes. NASA also has depended on Pu-238 to fuel heater units to keep critical systems warm on spacecraft sent to Mars and destinations throughout the solar system. Continued access to Pu-238 will enable the agency to explore a wide range of planets, moons and asteroids.

Existing supplies of Pu-238 are limited. While NASA has been able to support planned missions with Pu-238 procured from Russia, that source is limited. National security applications are prohibited by agreement from using Russian-supplied Pu-238, and the remaining supply of domestically produced Pu-238, produced more than a decade ago, is dwindling. Additional Pu-238 will be needed within the next decade to meet NASA projected demand, as well as support longer term NASA needs and potential national security applications. NASA has established Pu-238 requirements to meet the power and heating needs of planned missions to explore the outer planets and a range of other solar system destinations for the next two decades. While the agency will continue to refine the needs of specific missions, particularly those anticipated in the more distant outyears, its requirement for Pu-238 is expected to remain constant. National security users' longer-term requirements are less certain.

Supply and demand analyses indicate that projected user needs can be met with a production rate of up to five kilograms of Pu-238 per year. DOE can provide the capability to support this production rate by modifying existing facilities, possibly in combination with minimal new construction. Initiating this project in FY 2011 is necessary because it is expected to take approximately eight years to reach full production capacity. Funds in FY 2011 will be used to update environmental analyses to support necessary National Energy Policy Act (NEPA) actions, complete conceptual design and initiate target production and separations development. The Department and NASA are working together to develop a start up plan, which will soon be submitted to Congress to address a reporting requirement in the Conference Report to Accompany H.R. 3183, Energy and Water Development and Related Agencies Appropriations Act, 2010, Report 111-278. That report will provide additional details on planned activities.

Cost-Share with NASA

As the primary user of Pu-238, NASA will share with DOE, in equal amounts, the capital cost of re-establishing a production capability. The full amount required for this project in FY 2011 is $30 million. The DOE request for $15 million complements a parallel NASA request for $15 million, which NASA will provide to DOE, to accomplish the full scope of activities. DOE and NASA will be submitting a start-up plan outlining how the project will be executed and how costs will be shared. This funding allocation reflects that Pu-238 production re-start is needed to support future requirements at user agencies, not because of a mission need within DOE.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Pu-238 Production Restart Project			
▪ **Pu-238/Conceptual Design and NEPA Support**	**0**	**0**	**10,250**
Update environmental analyses to support necessary NEPA actions. Complete conceptual design of Np target production and irradiated target processing facilities, including project management and technical support in support of Critical Decision-1[a], Approve Alternative Selection and Cost Range, which is expected by December 2012. This request assumes an additional $10,250k from NASA will be provided to accomplish the full scope of this activity.			
▪ **Pu-238/Target Production and Separations Development and Reactor Optimization**	**0**	**0**	**4,750**
Finalize target design and fabrication using existing laboratory facilities and equipment. Initiate separations process development. Evaluate Advanced Test Reactor (ATR) and High Flux Isotope Reactor (HFIR) internal core configurations for optimal neutronics to produce Pu-238. Prepare documentation for developmental and full production target irradiation in ATR and HFIR. This request assumes an additional $4,750k from NASA will be provided to accomplish the full scope of this activity.			
Total, Pu-238 Production Restart Project	**0**	**0**	**15,000**

[a] Critical Decision-1 is the stage in the DOE's project management framework that reaffirms the mission need for a proposed project, establishes the alternative selections and forms the basis to proceed with the preliminary design. It also establishes the preliminary cost estimate and schedule ranges for the project.

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Pu-238 Production Restart Project	
Pu-238/Conceptual Design and NEPA Support	
▪ The increase from $0 to $10,250,000 is due to the planned initiation of conceptual design and NEPA support activities.	**+10,250**
Pu-238/Target Production and Separations Development and Reactor Optimization	
▪ The increase from $0 to $4,750,000 is due to initiation of reactor optimization studies and process development activities.	**+4,750**
Total, Pu-238 Production Restart Project	**+15,000**

Idaho Facilities Management

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Idaho Facilities Management	140,000	0	173,000	162,482

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriations Act (2009)
P.L. 111-85, Appropriations Act (2010)

Mission

The mission of the Idaho Facilities Management (IFM) program is to manage the planning, acquisition, operation, maintenance, and disposition of nuclear facilities and resources at the Idaho National Laboratory (INL). The IFM program maintains Department of Energy (DOE) mission-supporting facilities and resources at INL in a safe, compliant status to support the Department's nuclear energy research, testing of naval reactor fuels and reactor core components, and range of national security technology programs that support the National Nuclear Security Administration (NNSA) and other Federal agencies such as the Department of Homeland Security in the areas of critical infrastructure protection and nuclear nonproliferation.

Benefits

The IFM program enables long-term nuclear research and development (R&D) activities by providing the people, facilities, equipment, and nuclear materials necessary to conduct a wide array of experimental activities in a safe and compliant manner. The Advanced Test Reactor (ATR) provides unique irradiation capability to further nuclear fuel and reactor component research in support of advanced nuclear reactor designs activities. The Materials and Fuels Complex (MFC) contains a comprehensive range of pre- and post-irradiation examinations to assess material and fuel characteristics and performance in varying reactor environments.

Through the National Scientific User Facility (NSUF), universities are able to access INL facilities and equipment to further nuclear science and engineering research goals.

Annual Performance Results and Targets

The IFM program contributes to the Secretary's Goal of *Energy: Build a Competitive, Low-Carbon Economy and Secure America's Energy Future* and to the National Nuclear Infrastructure GPRA Unit Program Goal. The program's performance measures contribute to these goals by ensuring that the Department's unique facilities, required for advanced nuclear energy technology R&D, are maintained and operated such that they are available to support national priorities. Key activities conducted under this program include ensuring that all Nuclear Energy (NE) facilities meet essential safety and environmental requirements and are maintained at user-ready levels. Other key activities include

managing all special nuclear materials contained in these facilities and the disposition of DOE materials under NE ownership and providing support for university research reactors through fuel management and upgrading control system. The IFM program maintains DOE mission-supporting facilities and resources at INL in a user-ready status to support multiple nuclear energy R&D programs.

Annual Performance Targets and Results

Secretarial Goal: Energy

GPRA Unit Program Goal: National Nuclear Infrastructure

FY PY-3	FY PY-2	FY PY-1	FY PY	FY CY	FY BY	FY BY+1	FY BY+2	FY BY+3	FY BY+4
FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Facility Availability Performance Measure: To ensure unique nuclear facilities are available to support critical Departmental missions, maintain a facility operability index of 0.9 for key IFM and program facilities. [Measures Under Development. Measures for this program will be finalized and in place by the start of FY 2011.] FY 2010: Enable nuclear research and development activities by providing operational facilities and capabilities, as measured by availability percentages. FY 2009 – FY 2006: To ensure unique nuclear facilities are available to support critical Departmental missions, maintain a facility operability index of 0.9 for key IFM and program facilities.									
T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: 75% A:	T: 80% A:	T: 82% A:	T: 85% A:	T: 88% A:	T: 90% A:
Cost and Schedule Performance Measure: Achieve cumulative variance of less than 10 percent from cost and schedule baselines at INL for IFM facilities and activities consistent with safe operations. [Measures Under Development. Measures for this program will be finalized and in place by the start of FY 2011.] FY 2010: Execute general plant and construction projects within approved cost profiles and schedules, as measured by the total percentages of projects with cost performance indexes and schedule performance indexes between 0.9 and 1.15 (using earned value measurement systems for GPPs and other program defined maintenance and upgrade projects). FY 2009 – FY 2006: Achieve cumulative variance of less than 10 percent from cost and schedule baselines at INL for IFM facilities and activities consistent with safe operations.									
T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: 75% A:	T: 80% A:	T: 85% A:	T: 90% A:	T: 90% A:	T: 90% A:
Deferred Maintenance Performance Measure: [New Measures Under Development. New measures for this program will be finalized and in place by the start of FY 2011.]									
T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: none A: NA	T: 5% A:	T: 10% A:	T: 20% A:	T: 25% A:	T: 30% A:

Means and Strategies

The program will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- Aggressively implement contracting reforms, including fixed price competitive bidding, earned value management, capital planning processes in accordance with DOE Order 413.3A, independent external evaluations, etc., to ensure that the infrastructure program is operating effectively and efficiently to meet the Department's highest priority program needs.
- Ensure that mission essential systems, resources, and services are identified, maintained, and operated in compliance with DOE, Federal, and state safety and environmental requirements in a secure and cost-effective manner.

The Department will implement the following strategies:

- Identify IFM mission critical facilities and activities through various means, including review of the INL Ten-Year Site Plan and other relevant materials. Develop detailed work planning and funding requests accordingly.
- Meet periodically throughout the year with INL, NRC, NNSA and the Test, Research, and Training Reactor Management Group to review university research reactor activities; discuss program issues; and solicit input, advice, and guidance.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- Changes in nuclear energy R&D progress and priorities could possibly impact priorities within the IFM program, but not necessarily impact its overall cost and long-term liabilities.

In carrying out the program's mission, the program performs the following collaborative activities:

- As a NSUF, INL carries out a variety of experiment design, fabrication, irradiation, and post-irradiation work in support of the NNSA, Naval Reactors, universities, and industry organizations.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs. Examples of NE's R&D programs include Reactor Concepts Research, Development and Demonstration and Fuel Cycle R&D. NE infrastructure programs, such as the Radiological Facilities Management program and the IFM program, are managed using similar oversight techniques.

NE engages its stakeholders to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals. NE's programmatic activities are also subject to periodic external reviews by Congress, GAO, the

Department's IG, NRC, the EPA, state environmental and health agencies, and the Department's Office of Engineering and Construction Management. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee and National Academy of Sciences.

Idaho Facilities Management

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Idaho Facilities Management			
INL Nuclear Research Reactor Operations and Maintenance	50,717	58,537	58,537
INL Non-Reactor Nuclear Research Facility Operations and Maintenance	41,238	53,825	51,506
INL Engineering and Support Facility Operations and Maintenance	14,369	20,741	14,005
National Scientific User Facility	3,559	4,000	4,000
INL Regulatory Compliance	10,467	7,388	12,183
INL Facility Infrastructure Revitalization Program	17,200	28,509	22,251
Radiological and Environmental Sciences Laboratory	2,450	0	0
Total, Idaho Facilities Management	140,000	173,000	162,482

Benefits

The IFM program enables long-term nuclear R&D activities by providing the people, facilities, equipment, and nuclear materials necessary to conduct a wide array of experimental activities. The ATR provides unique irradiation capability to further nuclear fuel and reactor component research in support of advanced nuclear reactor designs activities. The MFC contains a comprehensive range of pre- and post-irradiation examinations to assess material and fuel characteristics and performance in varying reactor environments. The Research and Education Campus houses laboratories, machining and glass shops, and administration building that support R&D for multiple programs.

Through the NSUF, universities are able to access INL facilities and equipment to further nuclear science and engineering research goals.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
INL Nuclear Research Reactor Operations and Maintenance	**50,717**	**58,537**	**58,537**

This category supports nuclear research reactor operations and maintenance at the INL for the ATR and associated supporting infrastructure, the ATR Critical Facility (ATRC), and the Neutron Radiography Reactor (NRAD). It also maintains the Transient Reactor Test (TREAT) facility in an inactive standby mode.

The primary reactor at INL is the ATR. ATR supports the majority of NE R&D programs as well as NNSA programs, including Naval Reactors Program work in support of the U.S. Navy nuclear fleet and Global Threat Reduction Initiatives to support conversion of research and test reactors to low-enriched uranium fuel. The ATR also supports universities and industry users. Programmatic work is funded by the sponsoring programs. The cost to other users depends upon the demands on the reactor and the

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

nature of the user in accordance with DOE regulations.

In FY 2010, key planned accomplishments include: conduct the analysis and down selection process for upgrading safety related ATR nuclear instrumentation; complete modifications for ATR Loop 2A, complete six spent ATR fuel shipments to the Idaho Nuclear Technology and Engineering Center; complete more than 35 irradiation campaigns for universities, the NNSA's Offices of Naval Reactors and Defense Nuclear Nonproliferation, and production of Cobalt-60 for commercial use in industrial radiography sources.

In FY 2011, the following reactor activities will be supported:

- ATR operations includes funding for five reactor crews; operations management; new fuel, core components and supplies; critical facility operations; test sponsor engineering and safety; reactor systems engineering; project management; safety basis maintenance; training; quality assurance; safety and environmental programs and oversight; and personnel, materials and services required to maintain all of the 54 buildings and structures, utilities, and grounds within the perimeter of the ATR site. The request also supports over 40 irradiation campaigns as scheduled while maintaining an operating efficiency greater than 80%, and operating ATR Loop 2A with enhanced instrumentation and fuel ramp capability to support advanced fuel and material testing experiments.
- Maintenance and repair of ATR and the surrounding complex includes the cost of personnel, materials and services required to maintain the buildings, equipment, structures, utilities, and grounds. ATR has extensive system surveillance and maintenance requirements that are dictated by component manufacturers, Technical Specifications and Requirements and local procedures. The request also supports scheduled maintenance activities consistent with these established requirements.
- ATR life extension and safety margin improvement activities restore outdated systems and documentation essential to maintaining performance and reliability to extend operations at a small fraction of the reactor's replacement cost. Although over 40 years old, the ATR has the potential for an extremely long operating life due to its unique design that allows extensive replacement of neutron-damaged components on an approximately seven year cycle. The request also supports activities such as ATR safety related nuclear-power-indicating instrumentation replacement and engineering and system analysis trade-off studies for ATR systems.
- NRAD, ATRC, and TREAT reactors operations and maintenance activities including preventative and corrective maintenance on reactor systems, maintaining safety basis documentation, and training and qualification activities for reactor operators. The request also supports planned operational and maintenance levels for NRAD and ATRC, consistent with scheduled experiments as well as continued surveillance and the preservation of essential systems for the TREAT reactor.

INL Non-Reactor Nuclear Research Facility Operations and Maintenance	**41,238**	**53,825**	**51,506**

This category funds operations, maintenance, and support for non-reactor nuclear and radiological research facilities. The non-reactor nuclear research facilities support programmatic activities such as nuclear fuel development, separations development, pre- and post-irradiation fuel examinations, and

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

radiological chemical analysis. This category also funds the management of NE-owned special nuclear materials (SNM), including the characterization, packaging, and disposition of surplus SNM.

In FY 2010, key planned accomplishments include: completion of documented safety analyses (DSA) upgrades for key MFC nuclear facilities such as the Zero Power Physics Reactor building and the Analytical Laboratory to comply with Departmental requirements, completion of the required DSA-identified facility upgrades to the Fuel Conditioning Facility and Hot Fuel Examination Facility (HFEF), and completion of approximately two to three off-site shipments of surplus SNM.

In FY 2011, the following activities will be supported:

- Provide trained operators and technicians; provide qualified criticality safety officers and material balance custodians; prioritize and support maintenance and modification activities; analyze and authorize adjustments to operating parameters and facility operations; coordinate programmatic work activities; conduct and participate in audits, assessments, and reviews; develop and coordinate action plans; develop and provide nuclear training, quality assurance, document management; systems and safety engineering; environment, safety and health; nuclear materials management and stewardship; and program integration to support effective execution of projects and programs within the nuclear facilities at the MFC.
- Nuclear maintenance and repair includes the cost of personnel, materials, and services required to maintain the buildings, equipment, structures, utilities, and grounds within the perimeter fence at the MFC site and other radiological facilities. This includes facility safety system and procedural upgrades as identified through revised DSAs conducted in FY 2010. Examples of these upgrades may include, but not be limited to, control system upgrades, heating, ventilating, and air conditioning modifications, seismic structural improvements, and operations and maintenance procedure improvements.
- SNM management activities for NE-owned programmatic and surplus SNM at INL, including characterization, stabilization, and disposal of surplus SNM. The request supports the maintenance and operation of glove boxes and supporting systems to condition and prepare NE-owned surplus plutonium and uranium for off-site disposition.

INL Engineering and Support Facility Operations and Maintenance	**14,369**	**20,741**	**14,005**

This category funds all activities that support the effective management of the buildings, structures and systems that support the non-nuclear facilities at the INL consistent with Departmental orders and regulations.

In FY 2010 key planned accomplishments include: completing scheduled facility inspections to assess structural, roof, and systems conditions and preparing three to five surplus, non-radiological facilities for disposition.

The FY 2011, the following activities will be supported:

- Real property life-cycle asset management.
- Recapitalization activities structured to keep existing facilities modern and relevant in an environment of changing standards and missions, consistent with DOE Order 430.1B requirements.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

- Life-cycle planning to identify essential capital alterations and additions; improvements to land, buildings, and utility systems necessary to maintain INL general purpose infrastructure; common/domestic services infrastructure; and multi-program infrastructure.
- Alternative analyses for accomplishing NE-sponsored activities.
- Continue implementation of a systematic real property asset building inspection program and operation and maintenance of the Department's Facility Information Management System and Condition Assessment Information System.

Additionally, support is provided for Federally-funded program activities and community regulatory support activities to meet obligations defined in crosscutting agreements and contracts such as: S.M. Stoller, Payment in Lieu of Taxes, Shoshone-Bannock Tribes, and the National Oceanic and Atmospheric Administration. Beginning in FY 2011, funding in the amount of $1,700,000 to support background investigations conducted by the Federal Bureau of Investigation and the OPM is included in the Idaho Sitewide Safeguards and Security program request.

National Scientific User Facility	**3,559**	**4,000**	**4,000**

This category promotes the use of INL nuclear facilities for non-traditional science-based experiments to encourage active university, industry, and laboratory collaboration in relevant nuclear scientific research. The NSUF provides a mechanism for partner organization to propose and conduct experiments that introduce new techniques, equipment, and personnel in order keep INL capabilities current with new technologies. This work assures continuous improvements in experimental capabilities at the ATR. Last year, university experimenters have proposed and are developing computer-aided experiment design tools, ways to more efficiently extract data from irradiated samples and advanced instrumentation to measure neutron levels in the core.

In FY 2010 key planned accomplishments include: award three to five university experiments using the ATR and other INL research facilities; conduct the annual NSUF User Week workshops to bring together over 100 researchers representing academia, industry and national laboratories to foster collaboration on nuclear energy issues; and support six university partnerships to increase available capabilities for NSUF experiments.

In FY 2011, the following activities will be supported:

- Maintaining support for 6 university partnerships;
- Awarding up to 5 university experiments using ATR and other INL research facilities and multiple smaller-scale experiments using previously irradiated samples at partnership locations; and
- Conducting NSUF user’s week at the INL to educate new users of INL research facilities.

INL Regulatory Compliance	**10,467**	**7,388**	**12,183**

This category supports compliance activities driven by State and Federal environmental and other regulations that are under the purview of NE owner responsibilities. This category also supports other project costs for the proposed Remote-Handled Low Level Waste (RHLLW) Disposal Project to meet long-term waste disposal needs for NE and Office of Naval Reactors, consistent with regulatory requirements.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011

In FY 2010, key planned accomplishments include: treatment of two cubic meters of sodium-contaminated low-level waste backlog at MFC; obtain Critical Decision 1 (Approve Alternative Selection and Cost Range) for the RHLLW Disposal Project; and complete closure of the Resource Conservation and Recovery Act Voluntary Consent Order commitments at ATR.

In FY 2011, the request supports: processing of approximately 400 kilograms of Experimental Breeder Reactor (EBR)-II sodium-bonded fuel, consistent with the 1995 Settlement Agreement; treatment of approximately two cubic meters of sodium-contaminated low-level waste backlog; and develop documentation to support Critical Decision 2 (Approve Performance Baseline) for the RHLLW Disposal Project.

INL Facility Infrastructure Revitalization Program	**17,200**	**28,509**	**22,251**

This category restores, rebuilds, and revitalizes the physical INL infrastructure by replacing aging facilities and larger equipment to address costly, beyond useful life maintenance. These activities enhance program execution, satisfy a critical need for improvement to INL infrastructure, and make a significant contribution to the overall reduction of complex-wide deferred maintenance by providing capabilities that improve safety, reliability and energy efficiency and meet current and future program research needs. The INL Facility Infrastructure Revitalization Program consists of operational-funded projects, General Plan Project (GPP) and General Purpose Capital Equipment (GPCE) and associated pre-planning requirements. Activities performed are consistent with INL five-year infrastructure plans; however, these activities have a level of uncertainty due to the unpredictable nature of infrastructure failures and changing site priorities throughout the year.

In FY 2010, key planned accomplishments include: completing scheduled operational-funded projects and GPPs, including the ATR Radioanalytical Chemistry Laboratory, MFC Dial Room Replacement, and HFEF Argon Chiller System; initiating multiple revitalization projects at ATR and MFC to reduce deferred maintenance; and purchasing priority equipment, including the analytical laboratory remote manipulator; a 25-ton lift truck; and a heat exchanger replacement at ATR.

In FY 2011, the following planned activities include: initiation of new operational-funded projects, GPP projects, and GPCE purchases including, but not limited to:

- Site-wide facility revitalization activities ATR, MFC, and REC to reduce maintenance backlogs and improve infrastructure and reliability of capabilities.
- Replacement of facilities and/or capabilities such as the MFC Analytical Laboratory Alpha and Sodium Gloveboxes to replace 40+ year gloveboxes with modern, compartmentalized, multi-functional gloveboxes to support inert and air atmospheric post-irradiation examination work.
- Equipment purchases such as uninterrupted power supplies to support dial room communication hub in the Central Facilities Area.

Radiological and Environmental Sciences Laboratory	**2,450**	**0**	**0**

Funding for the Radiological and Environmental Sciences Laboratory, a government-owned, government-operated laboratory, was moved to NE's Program Direction Account starting in FY 2010, consistent with federally staffed facilities funding practices.

Total, Idaho Facilities Management	**140,000**	**173,000**	**162,482**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Idaho Facilities Management	
▪ **INL Non-Reactor Nuclear Research Facility Operations and Maintenance** The decrease from $53,825,000 to $51,506,000 reflects the completion the purchase and installation of glove boxes to prepare surplus special nuclear material for off-site shipment.	-2,319
▪ **INL Engineering and Support Facility Operations and Maintenance** The decrease from $20,741,000 to $14,005,000 reflects the completion of one-time planning and preparation activities to disposition surplus non-radiological facilities and a reduction for personnel security investigation activities that are now funded under the Idaho Sitewide Safeguards and Security program.	-6,736
▪ **INL Regulatory Compliance** The increase from $7,388,000 to $12,183,000 reflects moving the processing of EBR-II spent nuclear fuel for off-site shipment from the Fuel Cycle R&D program to IFM in FY 2011 and other project costs for the RHLLW Disposal Project.	+4,795
▪ **Idaho Facility Infrastructure Revitalization Program** The decrease from $28,509,000 to $22,251,000 reflects a level of execution for new operational-funded projects that is consistent with other IFM priorities and the completion of a one-time purchase of an Atom Probe to enhance multi-program experimental capabilities.	-6,258
Total Funding Change, Idaho Facilities Management	**-10,518**

Capital Operating Expenses and Construction Summary

Capital Operating Expenses

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
General Plant Projects	14,363	15,884	7,082
Capital Equipment	500	3,377	2,600
Total, Capital Operating Expenses	14,863	19,261	9,682

Major Items of Equipment *(TEC $2 million or greater)*

(dollars in thousands)

	Total Project Cost (TPC)	Total Estimated Cost (TEC)	Prior-Year Appro-priations	FY 2009	FY 2010	FY 2011	Completion Date
Atom Probe	2,200	2,075	0	0	2,200	0	FY 2010
Total, Major Items of Equipment				0	2,200	0	

Program Direction

Funding Profile by Category

(dollars in thousands/whole FTEs)

	FY 2009	FY 2010	FY 2011
Idaho Operations Office			
Salaries and Benefits	25,565	24,890	25,886
Travel	996	996	1,016
Support Services	1,004	1,015	1,035
Other Related Expenses	5,111	5,036	5,512
Total, Idaho Operations Office	32,676	31,937	33,449
Full Time Equivalents	197	197	197
Radiological and Environmental Sciences Laboratory			
Salaries and Benefits	2,440	2,440	2,538
Travel	65	65	66
Support Services	0	258	263
Other Related Expenses	394	2,400	2,631
Total, Radiological and Environmental Sciences Laboratory	2,899	5,163	5,498
Full Time Equivalents	19	19	19
Oak Ridge Operations Office			
Salaries and Benefits	955	1,000	1,060
Travel	20	20	20
Support Services	50	51	252
Other Related Expenses	265	282	288
Total, Oak Ridge Operations Office	1,290	1,353	1,620
Full Time Equivalents	8	8	8
Headquarters			
Salaries and Benefits	24,314	23,618	37,222
Travel	1,200	1,200	1,624
Support Services	3,971	4,052	4,768
Other Related Expenses	6,650	5,677	7,271
Total, Headquarters	36,135	34,547	50,885
Full Time Equivalents	171	160	200

	(dollars in thousands/whole FTEs)		
	FY 2009	FY 2010	FY 2011
Total Program Direction			
Salaries and Benefits	53,274	51,948	66,706
Travel	2,281	2,281	2,726
Support Services	5,025	5,376	6,318
Other Related Expenses	12,420	13,395	15,702
Total, Program Direction	73,000	73,000	91,452
Total, Full Time Equivalents	395	384	424

Mission

Program Direction provides the Federal staffing resources and associated costs required to provide overall direction and execution of the Office of Nuclear Energy (NE).

In addition to appropriated funds, NE also manages approximately $70 million dollars annually in work for others and reimbursable funding from the National Aeronautics and Space Administration and the Department of Defense for the development of advanced radioisotope power systems for space exploration and national security missions.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Salaries and Benefits	**53,274**	**51,948**	**66,706**

This account provides funding to support the salaries and benefits of the personnel associated with NE programs. Currently, 25 percent of the workforce is eligible to retire and an additional five percent will be eligible by the end of FY 2011. Over the past several years, NE has been trying to address the issue of an aging workforce through the recruitment of entry-level engineering, scientific, and administrative positions. In FY 2011, NE plans to hire additional staff to fulfill its current Full Time Employee (FTE) allocation of 424. In addition to the Headquarters staff (197), NE funds field employees at the Idaho Operation Office (197), the Radiological and Environmental Sciences Laboratory in Idaho (19), the Oak Ridge Operations Office (8), and three employees who support the U.S. Mission to the Organization for Economic Cooperation and Development in Paris (1); U.S. Mission to International Organizations in Vienna (1); and the Department of Energy Tokyo Office (1). The request includes funds for additional FTEs to oversee ongoing responsibilities under the Nuclear Waste Policy Act, including administration of the Nuclear Waste Fund and the Standard Contract.

Travel	**2,281**	**2,281**	**2,726**

Travel includes funding for transportation of Headquarters and Operations Office personnel associated with NE programs, their per diem allowances while in authorized travel status, and other expenses incidental to travel. Also included are travel funds to support the additional FTE's necessary to oversee ongoing responsibilities under the Nuclear Waste Policy Act.

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Support Services	**5,025**	**5,376**	**6,318**

Support services include funding for technical and management support services provided to NE Headquarters and the Operations Offices. The use of support services allows the Department to hire the best available industry experts to assist Federal staff in managing the nuclear programs and complex activities. In addition to rapidly acquiring this expertise, using support services provides unlimited flexibility in team composition as the needs of NE evolve.

Other Related Expenses	**12,420**	**13,395**	**15,702**

The major expenditure in the Other Related Expenses category in FY 2011 is $3,641,000 for the Headquarters Working Capital Fund (WCF). The WCF provides funding for mandatory administrative costs, such as: building occupancy and telephone services; copying, printing, and graphics; networking and desktop support; procurement management; payroll and personnel; corporate training services; and the project management career development program. Beginning in FY 2011, this account also includes WCF to support the additional FTEs to oversee ongoing responsibilities under the Nuclear Waste Policy Act. The Other Related Expense category also includes support for NE's Federal advisory committee and training, as well as, the housing, office communications, supplies, miscellaneous expenses, and International Cooperative Administrative Support Services expenses associated with the three employees assigned overseas.

Total, Program Direction	**73,000**	**73,000**	**91,452**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Salaries and Benefits	
The increase from $51,948,000 to $66,706,000 reflects the following: allowed escalation and additional funds for promotions, awards, and within-grade salary increases (+$2,799,000); additional staff at HQ to support new programs (+$2,700,000); and additional FTEs to oversee ongoing responsibilities under the Nuclear Waste Policy Act. (+$9,259,000).	+14,758
Travel	
The increase from $2,281,000 to $2,726,000 reflects additional funds for projected travel requirements in FY 2011 including $200,000 to oversee ongoing responsibilities under the Nuclear Waste Policy Act.	+445

	FY 2011 vs. FY 2010 ($000)
Support Services The increase from $5,376,000 to $6,318,000 is primarily due to an increase in support services required at Headquarters (HQ) for NE programs (+$716,000), additional support required at Oak Ridge for Uranium Fuel Supply activities (+$201,000), and a minor increase at Idaho (+$25,000).	+942
Other Related Expenses The increase from $13,395,000 to $15,702,000 is primarily due to an increase in requirements to support the WCF including the expenses associated with additional FTEs oversee ongoing responsibilities under the Nuclear Waste Policy Act. Also included are increases for rent and utilities, maintenance of equipment, and other services at the Idaho Operations Office.	+2,307
Total Funding Change, Program Direction	**+18,452**

Support Services by Category

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Technical Support			
Feasibility of Design Considerations	932	950	1,214
Development of Specifications	390	425	445
Economic and Environmental Analyses	300	345	407
Surveys Or Reviews of Technical Operations	528	590	650
Total, Technical Support	2,150	2,310	2,716
Management Support			
Automated Data Processing	1,400	1,500	1,700
Manpower Systems Analyses	200	220	335
Preparation of Program Plans	150	160	225
Training and Education	125	135	156
Reports and Analyses Management and General Administrative Services	1,000	1,051	1,186
Total, Management Support	2,875	3,066	3,602
Total, Support Services	5,025	5,376	6,318

Other Related Expenses by Category

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Other Related Expenses			
Working Capital Fund	4,074	3,439	3,641
Advisory and Assistance Services	100	100	153
Operations and Maintenance of Equipment	2,212	2,517	2,735
Printing and Reproduction	53	54	56
Training	374	377	394
Rent and Utilities	10	64	65
Communications, Utilities, Misc.	1,261	1,230	1,331
Supplies and Materials	636	1,043	1,075
Other Services	3,700	4,571	6,252
Total, Other Related Expenses	12,420	13,395	15,702

International Nuclear Energy Cooperation

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
International Nuclear Energy Cooperation	0	0	0	3,000

Mission

The objective of International Nuclear Energy Cooperation (INEC) is to support the Office of Nuclear Energy (NE) program offices in implementing international cooperative research and development (R&D) activities that further NE's mission; provide technical, policy, and administrative support to carry out the civilian nuclear energy aspects of officially approved international agreements and other relevant U.S. international commitments; provide advice and support to other Department of Energy (DOE) offices and Federal agencies that are planning and/or implementing new agreements and other U.S. commitments having civilian nuclear energy aspects; and serve as advisors to other DOE offices and Federal agencies on general issues related to the international use of civilian nuclear energy.

Benefits

The requested funding would support INEC in its role as NE's principal program supporting NE's international civil nuclear energy activities. INEC will work with NE's R&D programs on the development, negotiation, and execution of international bilateral and multilateral agreements; the provision of policy analysis and guidance on U.S. international civil nuclear activities; support for international nuclear energy cooperation and monitoring of technical, political, and business activities associated with export of U.S. nuclear energy goods and services. INEC serves as the central coordinating program for international engagement within NE and represents NE, along with relevant R&D program staff, in interactions with other government agencies including the Department of State, National Security Council, Department of Commerce, and the NRC.

The requested funding would support international discussion and negotiations and related analyses on a range of international nuclear energy concerns. It would also work with international partners on developing the new framework for civil nuclear cooperation that President Obama called for in his April 2009 speech in Prague: "And we should build a new framework for civil nuclear cooperation… so that countries can access peaceful power without increasing the risks of proliferation. That must be the right of every nation that renounces nuclear weapons, especially developing countries embarking on peaceful programs.".

Annual Performance Results and Targets

The International Nuclear Energy Cooperation program contributes to the Secretary's Goal of *Energy:*

Build a Competitive, Low-Carbon Economy and Secure America's Energy Future and to the New Nuclear Generation Technologies GPRA Unit Program Goal. The International Nuclear Energy Cooperation program supports NE program offices in implementing international cooperative R&D activities that further NE's mission. These activities include working with the R&D programs and providing technical, policy and administrative support to carry out the civilian nuclear energy aspects of officially approved international agreements and other relevant U.S. international commitments and assisting other DOE offices and Federal agencies on general issues related to the international use of civilian nuclear energy.

Means and Strategies

The program will use various means and strategies to achieve its GRPA Unit Program Goal. However, various external factors may impact the ability to achieve these goals. The program also performs collaborative activities to help meet its goals.

The Department will implement the following means:

- NE will provide technical expertise in support of international bilateral and multilateral engagement and civil nuclear energy R&D with countries that are established as significant participants in the nuclear sector

The Department will implement the following strategies:

- NE will partner with the private sector, national laboratories, universities and international partners to support cooperative international R&D activities to support the international use of civilian nuclear power.
- NE will work with DOE's Office of Policy and International Affairs as well as other U.S. Government organizations, including the National Nuclear Security Administration, National Security Council, and Department of State, to support the international use of civilian nuclear power.

These strategies will result in efficient and effective management of the program, thus putting the taxpayers' dollars to more productive use.

The following external factors could affect the program's ability to achieve its strategic goal:

- The international use of civilian nuclear power depends on a number of economic, environmental, and national security factors beyond the scope of DOE's programs. The safe expansion of nuclear energy is contingent upon resolving key challenges associated with limiting proliferation risks associated with international nuclear power deployment.

Validation and Verification

NE conducts various internal and external reviews and audits to validate and verify program performance. Periodic program reviews evaluate progress against established plans. NE holds monthly, quarterly, semi-annual, and annual reviews, consistent with program management plans and project baselines, to ensure technical progress, cost, and schedule adherence, and responsiveness to program requirements. Internally, NE provides continual management and oversight of its R&D and vital infrastructure programs, including its international engagement activities. Examples of NE's R&D programs include Reactor Concepts Research, Development & Demonstration, and Fuel Cycle R&D.

NE infrastructure programs, such as the Radiological Facilities Management program and the Idaho Facilities Management program, are managed using similar oversight techniques.

NE has engaged its stakeholders to help define the appropriate scope of NE's program activities to support nuclear energy's role in meeting the Nation's energy security and environmental goals. In addition, NE solicits the advice and counsel of external agencies such as Nuclear Energy Advisory Committee and National Academy of Sciences. NE's international engagement activities are conducted in consultation and cooperation with a number of U.S. government organizations, including the National Nuclear Security Administration, National Security Council, and Department of State.

International Nuclear Energy Cooperation

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
International Nuclear Energy Cooperation	0	0	3,000

Benefits

The requested funding would support INEC in its role as NE's principal program for coordinating the analysis, development, and implementation of international civil nuclear energy policy. These activities include supporting international bilateral and multilateral engagement and civil nuclear energy R&D activities with countries that are established as significant participants in the civilian nuclear power sector. This program could also include the creation of workshops to engage industry and foreign governments.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
International Nuclear Energy Cooperation	**0**	**0**	**3,000**

In FY 2011, funding would support international civil nuclear energy technical coordination activities that would allow the Department to more efficiently pursue international R&D opportunities, including collaborating in key facilities and in the development of technologies unique to the foreign partners, as appropriate. This may include exploring international fuel service arrangements to build a new framework for civil nuclear cooperation, so that counties can access nuclear energy without increasing the risks of proliferation.

In addition, the funding supports U.S. participation in international organizations that engage in technical collaboration and influence global nuclear energy policy, such as the International Atomic Energy Agency and the international Global Nuclear Energy Partnership. It also supports technical collaborations through bilateral Action Plans, Working Groups, and the International Nuclear Energy Research Initiative. Activities carried out within this program will be closely coordinated with international R&D activities carried out within the R&D programs to avoid duplication (e.g., Generation IV International Forum). NE's international collaborations aim to resolve challenges arising from the global expansion of nuclear power and reinforce U.S. nonproliferation, security and safety policies.

Total, International Nuclear Energy Cooperation	**0**	**0**	**3,000**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
International Nuclear Energy Cooperation	
The increase from $0 to $3,000,000 is provided to establish a function within NE to ensure collaboration across NE programs on international issues.	+3,000
Total Funding Change, International Nuclear Energy Cooperation	**+3,000**

Congressionally Directed Projects

Funding Profile by Subprogram

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 Current Recovery Act Appropriation	FY 2010 Current Appropriation	FY 2011 Request
Congressionally Directed Projects	2,854	0	2,500	0

Public Law Authorizations:
P.L. 111-8, Omnibus Appropriation Act (2009)
P.L. 111-85, Appropriation Act (2010)

Description

The FY 2009 and FY 2010 Appropriation Acts included three congressionally directed projects within the Office of Nuclear Energy, one in FY 2009 and two in FY 2010. No funding is requested for these activities in FY 2011.

Detailed Justification

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Congressionally Directed Projects			
▪ Technologies Ventures Corporation, New Mexico	**2,854**	**0**	**0**
Funding was congressionally directed in FY 2009 for Technologies Ventures Corporation to assist a group of nuclear energy technology entrepreneurs with the development of their business case and funding proposal to facilitate equity investment in those ventures.			
No funding was requested in FY 2010 or is requested in FY 2011.			
▪ Nuclear Fabrication Consortium, Ohio	**0**	**2,000**	**0**
Funding was congressionally directed in FY 2010 for the Nuclear Fabrication Consortium to develop fabrication approaches and data related to welding, joining and non-destructive examination that support the U.S. nuclear manufacturing, fabrication, and construction industries.			
No funding is requested for FY 2011.			
▪ McClellan Nuclear Radiation Center, California	**0**	**500**	**0**
Funding was congressionally directed in FY 2010 for McClellan Nuclear Radiation Center to purchase equipment upgrades needed to resume the processing of medical and research radioisotopes such as Iodine-125.			
No funding is requested for FY 2011.			
Total, Congressionally Directed Projects	**2,854**	**2,500**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Congressionally Directed Projects	
No funding requested	-2,500
Total, Congressionally Directed Projects	**-2,500**

Defense Nuclear Waste Disposal

Defense Nuclear Waste Disposal

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Defense Nuclear Waste Disposal

[For nuclear waste disposal activities to carry out the purposes of Public Law 97-425, as amended, including the acquisition of real property or facility construction or expansion, $98,400,000, to remain available until expended.**]** *(Energy and Water Development and Related Agencies Appropriations Act, 2010.)*

Explanation of Change

All Defense Nuclear Waste Disposal project funding has been eliminated due to the termination of the Yucca Mountain Project and the Office of Civilian Radioactive Waste Management.

Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2010 Recovery Act Current Appropriation	FY 2010 Request	FY 2010 House	FY 2010 Senate	FY 2011 Request
Defense Nuclear Waste Disposal						
Repository Program	143,000	0	98,400	98,400	98,400	0
Total, Defense Nuclear Waste Disposal	143,000	0	98,400	98,400	98,400	0

Nuclear Waste Disposal and Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2010 Recovery Act Current Appropriation	FY 2010 Request	FY 2010 House	FY 2010 Senate	FY 2011 Request
Nuclear Waste Disposal						
Repository Program	40,252	0	17,700	17,700	17,700	0
Transportation	2,100	0	0	0	0	0
Program Management & Integration	26,200	0	10,700	10,700	10,700	0
Program Direction	74,983	0	70,000	70,000	70,000	0
Congressionally Directed	1,855	0	0	0	0	0
Total, Nuclear Waste Disposal	145,390	0	98,400	98,400	98,400	0
Defense Nuclear Waste Disposal						
Repository Program	143,000	0	98,400	98,400	98,400	0
Total, Defense Nuclear Waste Disposal	143,000	0	98,400	98,400	98,400	0
Total, Nuclear Waste Disposal and Defense Nuclear Waste Disposal	288,390	0	196,800	196,800	196,800	0

Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

The Defense Nuclear Waste Disposal appropriation was established by the Congress as part of the 1993 Energy and Water Development Appropriation (P.L. 102-377), in lieu of payment from the Department of Energy (DOE) into the Nuclear Waste Fund for activities related to the disposal of defense high-level waste from DOE's atomic energy defense activities. The Administration has determined that developing a repository at Yucca Mountain, Nevada, is not a workable option and has decided to terminate the Office of Civilian Radioactive Waste Management. The Nation needs a different solution for nuclear waste disposal. As a result, in 2010, the Department will discontinue its application to the U.S. Nuclear Regulatory Commission for a license to construct a high-level waste geologic repository at Yucca Mountain and establish a Blue Ribbon Commission to inform the Administration as it develops a new strategy for nuclear waste management and disposal. All funding for development of the Yucca Mountain facility and the Office of Civilian Radioactive Waste Management will be eliminated by the end of FY 2010. The Administration remains committed to fulfilling its obligations under the Nuclear Waste Policy Act. Ongoing responsibilities under the Act, including administration of the Nuclear Waste Fund and the Standard Contract, will continue under the Office of Nuclear Energy, which will lead future waste management activities.

No funding from the Defense Nuclear Waste Disposal is being requested.

Nuclear Waste Disposal and Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Funding by Site by Program

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
NNSA Service Center			
Program Direction	1,000	500	0
Total, NNSA Service Center	1,000	500	0
Oak Ridge National Laboratory			
Program Direction	0	500	0
Total, Oak Ridge National Laboratory	0	500	0
Sandia National Laboratory			
Repository Project	47,000	40,000	0
Total, Sandia National Laboratory	47,000	40,000	0
Washington Headquarters			
Program Direction	44,590	50,000	0
Program Management and Integration	11,700	4,500	0
Repository Project	14,855	10,200	0
Transportation System	1,000	0	0
Total, Washington Headquarters	72,145	64,700	0
Repository Project Office			
Program Direction	29,393	19,000	0
Program Management and Integration	14,500	6,200	0
Repository Project	123,252	65,900	0
Transportation	1,100	0	0
Total, Repository Project Office	168,245	91,100	0
Total, Nuclear Waste Disposal and Defense Nuclear Waste Disposal	288,390	196,800	0

Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Funding by Site by Program

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Sandia National Laboratory			
Repository Project	47,000	40,000	0
Total, Sandia National Laboratory	47,000	40,000	0
Repository Project Office			
Repository Project	96,000	58,400	0
Total, Repository Project Office	96,000	58,400	0
Total, Defense Nuclear Waste Disposal	143,000	98,400	0

Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Funding by Site by Program

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
NNSA Service Center			
Program Direction	1,000	500	0
Total, NNSA Service Center	1,000	500	0
Oak Ridge National Laboratory			
Program Direction	0	500	0
Total, Oak Ridge National Laboratory	0	500	0
Washington Headquarters			
Program Direction	44,590	50,000	0
Program Management and Integration	11,700	4,500	0
Repository Project	14,855	10,200	0
Transportation Project	1,000	0	0
Total, Washington Headquarters	72,145	64,700	0
Repository Project Office			
Program Direction	29,393	19,000	0
Program Management and Integration	14,500	6,200	0
Repository Project	27,252	7,500	0
Transportation Project	1,100	0	0
Total, Repository Project Office	72,245	32,700	0
Total, Nuclear Waste Disposal	145,390	98,400	0

Nuclear Waste Disposal

Nuclear Waste Disposal

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Nuclear Waste Disposal

[For nuclear waste disposal activities to carry out the purposes of the Nuclear Waste Policy Act of 1982, Public Law 97-425, as amended (the "NWPA"), $98,400,000, to remain available until expended, and to be derived from the Nuclear Waste Fund: *Provided*, That of the funds made available in this Act for nuclear waste disposal and defense nuclear waste disposal activities, 2.54 percent shall be provided to the Office of the Attorney General of the State of Nevada solely for expenditures, other than salaries and expenses of State employees, to conduct scientific oversight responsibilities and participate in licensing activities pursuant to the NWPA: *Provided further*, That notwithstanding the lack of a written agreement with the State of Nevada under section 117(c) of the NWPA, 0.51 percent shall be provided to Nye County, Nevada, for on-site oversight activities under section 117(d) of the NWPA: *Provided further*, That of the funds made available in this Act for nuclear waste disposal and defense nuclear waste disposal activities, 4.57 percent shall be provided to affected units of local government, as defined in the NWPA, to conduct appropriate activities and participate in licensing activities under Section 116(c) of the NWPA: *Provided further*, That of the amounts provided to affected units of local government, 7.5 percent of the funds provided for the affected units of local government shall be made available to affected units of local government in California with the balance made available to affected units of local government in Nevada for distribution as determined by the Nevada affected units of local government: *Provided further*, That of the funds made available in this Act for nuclear waste disposal and defense nuclear waste disposal activities, 0.25 percent shall be provided to the affected federally-recognized Indian tribes, as defined in the NWPA, solely for expenditures, other than salaries and expenses of tribal employees, to conduct appropriate activities and participate in licensing activities under section 118(b) of the NWPA: *Provided further*, That notwithstanding the provisions of chapters 65 and 75 of title 31, United States Code, the Department shall have no monitoring, auditing or other oversight rights or responsibilities over amounts provided to affected units of local government: *Provided further*, That the funds for the State of Nevada shall be made available solely to the Office of the Attorney General by direct payment and to units of local govern-Account Number: 019-20-5227 Nuclear Waste Disposal (APPROPRIATIONS) (Department of Energy - Energy Programs) Page: 1 Agency: Department of Energy Printed: 2:41 PM Friday, January 22 Bureau: Energy Programs For General Counsel Review by direct payment: *Provided further*, That 4.57 percent of the funds made available in this Act for nuclear waste disposal and defense nuclear waste disposal activities shall be provided to Nye County, Nevada, as payment equal to taxes under section 116(c)(3) of the NWPA: *Provided further*, That within 90 days of the completion of each Federal fiscal year, the Office of the Attorney General of the State of Nevada, each affected federally-recognized Indian tribe, and each of the affected units of local government shall provide certification to the Department of Energy that all funds expended from such payments have been expended for activities authorized by the NWPA and this Act: *Provided further*, That failure to provide such certification shall cause such entity to be prohibited from any further funding provided for similar activities: *Provided further*, That none of the funds herein appropriated may be: (1) used directly or indirectly to influence legislative action, except for normal and recognized executive-legislative communications, on any matter pending before Congress or a State legislature or for lobbying activity as provided in 18 U.S.C. 1913; (2) used for litigation expenses; or (3) used to support multi-State efforts or other coalition building activities inconsistent with the restrictions contained in this Act: *Provided further*, That all proceeds and recoveries realized by the Secretary in carrying out activities authorized by the NWPA, including but not limited to, any proceeds from the sale of assets, shall be available without further appropriation and shall remain available until expended: *Provided further*, That of the funds made available in this Act for Nuclear Waste Disposal, $5,000,000 shall be provided to create a Blue Ribbon Commission to consider all alternatives for nuclear waste disposal: *Provided further*, That no funds provided in this Act or any previous Act may be used to pursue repayment or collection of funds provided in any fiscal year to affected units of local government for oversight activities that had been previously approved by the Department of Energy, or to withhold payment of any such funds.**]** *(Energy and Water Development and Related Agencies Appropriations Act, 2010.)*

Explanation of Change

All Nuclear Waste Disposal project funding has been eliminated due to the termination of the Yucca Mountain Project and the Office of Civilian Radioactive Waste Management.

Nuclear Waste Disposal and Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Overview

Appropriation Summary by Program

	FY 2009 Current Appropriation	FY 2010 Current Recovery Act Appropriation	FY 2010 Request	FY 2011 Request
Nuclear Waste Disposal				
Repository Program	40,252	0	17,700	0
Transportation	2,100	0	0	0
Program Management & Integration	26,200	0	10,700	0
Program Direction	74,983	0	70,000	0
Congressionally Directed	1,855	0	0	0
Total, Nuclear Waste Disposal	145,390	0	98,400	0
Defense Nuclear Waste Disposal				
Repository Program	143,000	0	98,400	0
Total, Defense Nuclear Waste Disposal	143,000	0	98,400	0
Total, Nuclear Waste Disposal and Defense Nuclear Waste Disposal	288,390	0	196,800	0

Preface

The Nuclear Waste Disposal Account was established as part of the Nuclear Waste Policy Act of 1982 (P.L. 97-425), as amended, to provide funding to implement Federal policy for disposal of commercial spent nuclear fuel and high-level radioactive waste by the Office of Civilian Radioactive waste Management. The Administration has determined that developing a repository at Yucca Mountain, Nevada, is not a workable option and has decided to terminate the Office of Civilian Radioactive Waste Management. The Nation needs a different solution for nuclear waste disposal. As a result, in 2010, the Department will discontinue its application to the U.S. Nuclear Regulatory Commission for a license to construct a high-level waste geologic repository at Yucca Mountain and establish a Blue Ribbon Commission to inform the Administration as it develops a new strategy for nuclear waste management and disposal. All funding for development of the Yucca Mountain facility and the Office of Civilian Radioactive Waste Management will be eliminated by the end of FY 2010. The Administration remains committed to fulfilling its obligations under the Nuclear Waste Policy Act. Ongoing responsibilities under the Act, including administration of the Nuclear Waste Fund and the Standard Contract, will continue under the Office of Nuclear Energy, which will lead future waste management activities.

Mission

The mission of OCRWM was to manage and dispose of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) in a manner that protects public health, safety, and the environment; enhances national and energy security; and merits public confidence.

Yucca Mountain Repository Project

The President identified the Yucca Mountain Project in the Terminations and Reductions section of the fiscal year (FY) 2010 Congressional Budget Request submitted to Congress in May 2009. Since that time, the Department of Energy has been evaluating a range of options for bringing the project to an orderly close. In FY 2010, the Department of Energy will withdraw from consideration by the Nuclear Regulatory Commission the license application for construction of a geologic repository at Yucca Mountain, Nevada, in accordance with applicable regulatory requirements.

In FY 2010, the Office of Civilian Radioactive Waste Management will prepare the Yucca Mountain site for stewardship and remediation. The Department will work closely with state and federal agencies to develop and implement a remediation plan for the site that adheres to all applicable statutes and regulations. The Office of Environmental Management (EM) staff will support remediation planning for the Yucca Mountain repository site.

Per the Office of Nuclear Energy's FY 2011 budget request, that organization will develop and execute a research and development program that will address critical scientific and technical issues associated with the long-term management and disposal of used nuclear fuel. The Office of Nuclear Energy will support the work of the Blue Ribbon Commission and the development of an integrated approach to waste management options.

Transportation

Transportation planning and procurement activities were ceased in FY 2009.

Program Direction and Management

The Office of Civilian Radioactive Waste Management will also be eliminated in FY 2010. Critical functions under the Nuclear Waste Policy Act, including management of the Standard Contract with utilities and administration of the Nuclear Waste Fund will be the responsibility of the Office of Nuclear Energy. The Department is committed to preserving core scientific knowledge and expertise resident in government and national laboratory personnel and applying it to developing a different approach to used fuel management. The Department will make every effort to utilize the expertise and experience of current Office of Civilian Radioactive Waste Management personnel, consistent with federal statutes, regulations, and union agreements.

Facilities Maintenance and Repair

The FY 2011 maintenance and repair budget request reflects the termination of the program.

Direct-Funded Maintenance and Repair

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Repository Project	1,360	900	0
Total, Direct-Funded Maintenance and Repair	1,360	900	0

Nuclear Waste Disposal and Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Funding by Site by Program

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
NNSA Service Center			
Program Direction	1,000	500	0
Total, NNSA Service Center	1,000	500	0
Oak Ridge National Laboratory			
Program Direction	0	500	0
Total, Oak Ridge National Laboratory	0	500	0
Sandia National Laboratory			
Repository Project	47,000	40,000	0
Total, Sandia National Laboratory	47,000	40,000	0
Washington Headquarters			
Program Direction	44,590	50,000	0
Program Management and Integration	11,700	4,500	0
Repository Project	14,855	10,200	0
Transportation System	1,000	0	0
Total, Washington Headquarters	72,145	64,700	0
Repository Project Office			
Program Direction	29,393	19,000	0
Program Management and Integration	14,500	6,200	0
Repository Project	123,252	65,900	0
Transportation	1,100	0	0
Total, Repository Project Office	168,245	91,100	0
Total, Nuclear Waste Disposal and Defense Nuclear Waste Disposal	288,390	196,800	0

Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Funding by Site by Program

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
NNSA Service Center			
Program Direction	1,000	500	0
Total, NNSA Service Center	1,000	500	0
Oak Ridge National Laboratory			
Program Direction	0	500	0
Total, Oak Ridge National Laboratory	0	500	0
Washington Headquarters			
Program Direction	44,590	50,000	0
Program Management and Integration	11,700	4,500	0
Repository Project	14,855	10,200	0
Transportation Project	1,000	0	0
Total, Washington Headquarters	72,145	64,700	0
Repository Project Office			
Program Direction	29,393	19,000	0
Program Management and Integration	14,500	6,200	0
Repository Project	27,252	7,500	0
Transportation Project	1,100	0	0
Total, Repository Project Office	72,245	32,700	0
Total, Nuclear Waste Disposal	145,390	98,400	0

Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Funding by Site by Program

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Sandia National Laboratory			
Repository Project	47,000	40,000	0
Total, Sandia National Laboratory	47,000	40,000	0
Repository Project Office			
Repository Project	96,000	58,400	0
Total, Repository Project Office	96,000	58,400	0
Total, Defense Nuclear Waste Disposal	143,000	98,400	0

Major Changes or Shifts by Site

In FY 2011, there is no work at OCRWM-related sites due to the termination of the Yucca Mountain Project and the Office of Civilian Radioactive Waste Management.

Site Description

Oak Ridge National Laboratory
In support of the Yucca Mountain Project and the OCRWM Program Direction budget element, the Oak Ridge Office administered disbursement of funds and contracts/agreements with the OCRWM Management and Operations (M&O) contractor, support services contracts and all other financial/contract agreements associated directly with the OCRWM Program.

No funds are provided in FY 2011.

Sandia National Laboratory
The Sandia National Laboratories-New Mexico (SNL) site located in Albuquerque, New Mexico, is a research and development facility and has been the lead laboratory supporting the Yucca Mountain Project.

Funding to SNL is eliminated due to the termination of the Yucca Mountain Project and the Office of Civilian Radioactive Waste Management. Follow on work to explore waste management and disposal alternatives to the Yucca Mountain repository will be supported by the Office of Nuclear Energy.

Repository Project Office in Nevada
No funding will be provided for the Yucca Mountain Repository Project in Las Vegas, Nevada. Leases will be cancelled in FY 2010.

Nuclear Waste Disposal and Defense Nuclear Waste Disposal
Office of Civilian Radioactive Waste Management (OCRWM)

Repository Program

Funding Profile by Subprogram

	FY 2009 Current Appropriation	FY 2010 Current Recovery Act Appropriation	FY 2010 Request	FY 2011 Request
Repository Program				
Repository Project	183,252	0	116,100	0
Transportation	2,100	0	0	0
Program Management & Integration	26,200	0	10,700	0
Congressionally Directed Projects	1,855	0	0	0
Subtotal, Repository Program	213,407	0	126,800	0
Program Direction	74,983	0	70,000	0
Total, Repository Program	288,390	0	196,800	0

Repository Project

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Repository Project			
License	73,000	86,500	0
Safety Analysis	53,478	0	0
Balance of Plant Infrastructure	4,207	2,000	0
Project Support	52,567	27,600	0
Total, Repository Project	183,252	116,100	0

Mission

The mission of the Office of Civilian Radioactive Waste Management (OCRWM) was to manage and dispose of Spent Nuclear Fuel (SNF) and High Level Radioactive Waste (HLW) in a manner that protects public health and safety and the environment; enhances national security; and merits public confidence.

Repository Project

With the FY 2010 President's Budget Request, the Administration announced the termination of the Yucca Mountain Project. All funding for Project has been eliminated due to the withdrawal of the License Application. The Yucca Mountain Project and the Office of Civilian Radioactive Waste Management will be terminated by the end of FY 2010.

The Yucca Mountain site occupies part of the Nevada Test Site as well as lands managed by the Bureau of Land Management (BLM) and the United States Air Force. DOE will engage BLM, the Air Force, and the State of Nevada, which has regulatory authority over certain aspects of the site, to determine the appropriate level of remediation necessary at the site. The Office of Environmental Management will support remediation planning.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Licensing Support	**73,000**	**86,500**	**0**

In FY 2010, the Department of Energy will withdraw from consideration by the Nuclear Regulatory Commission the license application for construction of a geologic repository at Yucca Mountain, Nevada, in accordance with applicable regulatory requirements. The Department will conduct lease cancellation, contract termination, preservation and archiving of project records, and any necessary personnel separation activities.

Safety Analyses and Assessments	**53,478**	**0**	**0**

Safety Analyses and Assessments work ended in FY 2009 with the transition from technical evaluation of the license application to administrative hearings.

Balance of Plant Infrastructure	**4,207**	**2,000**	**0**

Design work associated with development of the geologic repository at Yucca Mountain will be cancelled in 2010. Remaining funds in this area will be dedicated to preparing the repository site for stewardship and remediation.

Project Support	**49,667**	**27,600**	**0**

Financial Assistance:
The Department is meeting its obligation for financial assistance in FY 2010. No funding is requested in FY 2011 due to termination of the Yucca Mountain Project.

Total, Repository Project	**183,252**	**116,100**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
License The decrease is due to the withdrawal of the License Application and the termination of the Yucca Mountain Project.	-86,500
Balance of Plant Infrastructure The decrease is due to the withdrawal of the License Application and the termination of the Yucca Mountain Project.	-2,000
Project Support The decrease is due to the withdrawal of the License Application and the termination of the Yucca Mountain Project.	-27,600
Total Funding Change, Repository Project	**-116,100**

Transportation

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Transportation			
National Transportation			
Intitutional Planning, Policy and Analysis	0	0	0
Stakeholder Relations	0	0	0
180(c) Grants	0	0	0
Nat'l Trans Institutional	1,100	0	0
Corporate Management	0	0	0
Nat'l Trans Management	1,000	0	0
Total National Transportation	2,100	0	0
Nevada Transportation			
Nevada Rail	0	0	0
National Environmental Policy Act (NEPA)	0	0	0
Total Nevada Transportation	0	0	0
Total Transportation	2,100	0	0

Description

The mission of the transportation program was to develop and manage a safe, secure, and efficient transportation system for shipping Spent Nuclear Fuel (SNF) and High-Level Waste (HLW) from locations throughout the United States to a location for effective management and disposal.

National Transportation

In FY 2011, there will be no activities due to the termination of the Office of Civilian Radioactive Waste Management.

Nevada Transportation

In FY 2011, there will be no activities due to the termination of the Office of Civilian Radioactive Waste Management.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
National Transportation			
No funding is requested for activities within this budget element in FY 2011.			
▪ **National Transportation Institutional**	**1,100**	**0**	**0**
▪ **National Transportation Management**	**1,000**	**0**	**0**
Total, National Transportation	**2,100**	**0**	**0**
Nevada Transportation			
No funding is requested for activities within this budget element in FY 2011.			
▪ **Nevada Rail**	**0**	**0**	**0**
▪ **Nevada Rail Environmental Impact Statement (EIS)**	**0**	**0**	**0**
Total, Nevada Transportation	**0**	**0**	**0**
Total, Transportation	**2,100**	**0**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
National Transportation	0
Nevada Transportation	0
Total Funding Change, Transportation	**0**

Program Management and Integration

Funding Schedule by Activity

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Quality Assurance	10,000	6,970	0
Program Management			
Program Management and Control	500	30	0
Information Management	4,000	0	0
Human Resources and Education	500	500	0
Total, Program Management	5,000	530	0
Safeguards and Security	5,000	3,000	0
Waste Acceptance	4,000	0	0
System Analysis and Strategy Development			
Fee Adequacy Assessment	200	200	0
System Configuration Management	0	0	0
Total, System Analysis and Strategy Development	200	200	0
Science and Technology, and International			
International Program and Coordination	2,000	0	0
Science and Technology, and International	0	0	0
Total, Science and Technology and International	2,000	0	0
Total, Program Management & Integration	26,200	10,700	0

Description

All Program Management and Integration activities will cease due to the planned elimination of the Office of Civilian Radioactive Waste Management. Ongoing responsibilities under the Nuclear Waste Policy Act, including administration of the Nuclear Waste Fund and the Standard Contract, will continue under the Office of Nuclear Energy, which will lead future waste management activities.

Contracts for goods and services with the Office of Civilian Radioactive Waste Management will be terminated, excluding the Standard Contract for disposal services with utilities. Current contracts include the management and operations contract for the repository, quality assurance support services, management and technical support services, information technology services, document and records management, security services, administrative services, and legal services. Many of these contracts will require advance notice of termination during which costs incurred will be reimbursed. Further, DOE is responsible for the costs associated with the management and operations contractor's defined benefit pension plan; upon program termination, the Department will fulfill its responsibilities and ensure that current and future retirees receive their benefits in accordance with the plan.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Quality Assurance	**10,000**	**6,970**	**0**

All funding for Quality Assurance has been eliminated due to the withdrawal of the License Application and the termination of the Yucca Mountain Project.

Program Management	**5,000**	**530**	**0**

All funding for Program Management has been eliminated due to the withdrawal of the License Application, termination of the Yucca Mountain Project, and termination of the Office of Civilian Radioactive Waste Management.

▪ **Program Management and Control**	**500**	**30**	**0**

All funding for Program Management and Control has been eliminated due to the withdrawal of the License Application, termination of the Yucca Mountain Project, and termination of the Office of Civilian Radioactive Waste Management.

▪ **Information Management**	**4,000**	**0**	**0**
▪ **Human Resources and Education**	**500**	**500**	**0**

All funding for Human Resources has been eliminated due to the termination of the Office of Civilian Radioactive Waste Management.

Total Program Management	**5,000**	**530**	**0**
Safeguards and Security	**5,000**	**3,000**	**0**

All funding for Safeguards and Security has been eliminated due to the withdrawal of the License Application, termination of the Yucca Mountain Project, and termination of the Office of Civilian Radioactive Waste Management.

Waste Acceptance	**4,000**	**0**	**0**

Other DOE offices will continue to support the implementation of the Standard Disposal Contract and any amendments; negotiating and implementing new reactor waste disposal contracts for the new generation of nuclear reactors; validate and disseminate SNF discharge/storage data; review and validate fee payments; negotiate and implement settlements of litigation relating the delay in beginning waste acceptance; and negotiate and implement modifications to individual contracts that are beneficial to the Government and the individual utility (Purchaser).

In addition to supporting the settlement negotiations and review process, the Department will continue to provide support to the Department of Justice for litigation through the collection of large volumes of discovery materials and will continue to provide depositions and testimony.

System Analysis and Strategy Development	**200**	**200**	**0**

▪ **Fee Adequacy Assessment**	**200**	**200**	**0**

The functions for the Fee Adequacy Assessment efforts will be transferred from the Office of Civilian Radioactive Waste Management to support future plans within the Department to implement the Nuclear Waste Policy Act.

▪ **System Configuration Management**	**0**	**0**	**0**
Total, System Analysis and Strategy Development	**200**	**200**	**0**

The functions for the System Analysis efforts will be transferred from the Office of Civilian Radioactive Waste Management to support future plans within the Department to implement the Nuclear Waste Policy Act.

Science and Technology, and International	**2,000**	**0**	**0**

All funding for Science and Technology, and International has been eliminated due to termination of the Office of Civilian Radioactive Waste Management. International activities related to the management and disposition of spent nuclear fuel and high level radioactive waste will be supported by the Office of Nuclear Energy.

▪ **International Program and Coordination**	**2,000**	**0**	**0**
▪ **Science and Technology**	**0**	**0**	**0**
Total, Science and Technology, and International	**2,000**	**0**	**0**
Total Program Management & Integration	**26,200**	**10,700**	**0**

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Quality Assurance The decrease is due to the withdrawal of the License Application and the termination of the Yucca Mountain Project.	-6,970
Program Management The decrease is due to the withdrawal of the License Application and the termination of the Office of Civilian Radioactive Waste Management.	-530
Safeguards and Security The decrease is due to the termination of the termination of the Repository Project and the Office of Civilian Radioactive Waste Management.	-3,000
Total Funding Change, Program Management and Integration	**-10,700**

Program Direction
Funding Profile by Category

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Office of Repository Development			
Salaries and Benefits	25,066	26,883	0
Travel	800	685	0
Information Technology	8,900	8,700	0
Support Services	4,540	3,500	0
Other Related Expenses	1,810	1,810	**0**
Total, Office of Repository Development	41,116	41,578	0
Full-Time Equivalents	175	175	0
Service Center Support			
Salaries and Benefits	1,000	1,000	0
Total, Service Center Support	1,000	1,000	0
Full-Time Equivalents	3	3	0
Headquarters			
Management & Operational Support			
Salaries and Benefits	14,844	14,617	0
Travel	700	300	0
Information Technology	3,800	3,800	0
Support Services	6,433	2,600	0
Other Related Expenses	190	190	0
Working Capital Fund	2,500	2,500	0
	28,467	24,007	0
Other Matrix Support			
Salaries and Benefits	4,375	3,400	0
Travel	25	15	0
Total, Headquarters	32,867	27,422	0
Full-Time Equivalents	118	118	0
Total, Program Direction	74,983	70,000	0
Full-Time Equivalents	296	296	0

Description

The Administration has determined that developing the Yucca Mountain repository is not a workable option and that the Nation needs a different solution for nuclear waste disposal. The Office of Civilian Radioactive Waste Management will be terminated. The core functions and staff to support efforts under the Nuclear Waste Policy Act to meet the obligations of the Government will continue under the Office of Nuclear Energy, which will lead all future waste management activities. Every effort will be made to utilize the expertise and experience of Office of Civilian Radioactive Waste Management personnel in other Departmental organizations or government agencies consistent with Title 5 of the United States Code, Civil Service Regulations, and union agreements.

Detailed Justification

(dollars in thousands)

	FY 2009	FY 2010	FY 2011
Salaries and Benefits	45,285	45,900	0
Travel	1,525	1,000	0
Information Technology	12,700	12,500	0
Support Services	10,973	6,100	0
Other Related Expenses	2,000	2,000	0
Working Capital Fund	2,500	2,500	0
Total, Program Direction	74,983	70,000	0

Explanation of Funding Changes

	FY 2011 vs. FY 2010 ($000)
Salaries and Benefits The decrease is due to the termination of the Office of Civilian Radioactive Waste Management.	-45,900
Travel The decrease is due to the termination of the Office of Civilian Radioactive Waste Management.	-1,000
Information Technology The decrease is due to the termination of the Office of Civilian Radioactive Waste Management.	-12,500
Support Services The decrease is due to the termination of the Office of Civilian Radioactive Waste Management.	-6,100
Other Related Expenses The decrease is due to the termination of the Office of Civilian Radioactive Waste Management.	-2,000
Working Capital Fund The decrease is due to the termination of the Office of Civilian Radioactive Waste Management.	-2,500
Total Funding Changes, Program Direction	**-70,000**

Support Services by Category

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Technical Support			
Repository Project			
Management and Technical Services	9,268	4,400	0
Administrative Services	1,400	1,395	0
Total, Repository Project	10,668	5,795	0
System Analysis and Strategic Development			
System Engineering	0	0	0
System Analysis	0	0	0
Waste Acceptance	0	0	0
Regulatory Coordination	0	0	0
Total, System Analysis & Strategic Development	0	0	0
Total, Technical Support	10,668	5,795	0
Management Support			
Program Management & Integration			
Quality Assurance	300	300	0
Program Management & Control			
Program Management, Planning & Control	5	5	0
Audits and Reports	0	0	0
Baseline Management	0	0	0
Program & Policy Integration	0	0	0
Public Information	0	0	0
Total, Program Management & Control	5	5	0
Total, Program Management & Integration	305	305	0
Total, Management Support	305	305	0
Total, Support Services	10,973	6,100	0

Other Related Expenses by Category
(Including Working Capital Fund)

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Other Related Expenses			
Repository Project			
Communication, Other Rent, and Utilities	1,660	1,660	0
Other Services	90	90	0
Human Resources & Administration	60	60	0
Total, Repository Project	1,810	1,810	0
Headquarters			
Other Services	40	40	0
Human Resources & Administration	30	30	0
Supplies and Materials	20	20	0
Services Performed by Other Agencies	100	100	0
Working Capital Fund	2,500	2,500	0
Total, Headquarters	2,690	2,690	0
Total, Other Related Expenses	4,500	4,500	0

Congressionally Directed Projects

Funding Profile by Subprogram

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Congressionally Directed Projects	1,855	0	0

Description
OCRWM has no Congressionally Directed Projects for FY 2010 or FY 2011.

Detailed Justification

	(dollars in thousands)		
	FY 2009	FY 2010	FY 2011
Congressionally Directed Projects			
▪ Cooperative Agreement between the Department of Energy and Inyo County (CA)	1,522	0	0
▪ Inyo County Affected Unit of Local Government (CA)	333	0	0
Total, Program Direction	1,855	0	0

GENERAL PROVISIONS

[SEC. 301. None of the funds appropriated by this Act may be used to prepare or initiate Requests For Proposals (RFPs) for a program if the program has not been funded by Congress.**]**

[SEC. 302. None of the funds appropriated by this Act may be used—

(1) to augment the funds made available for obligation by this Act for severance payments and other benefits and community assistance grants under section 4604 of the Atomic Energy Defense Act (50 U.S.C. 2704) unless the Department of Energy submits a reprogramming request to the appropriate congressional committees; or

(2) to provide enhanced severance payments or other benefits for employees of the Department of Energy under such section; or

(3) develop or implement a workforce restructuring plan that covers employees of the Department of Energy.**]**

SEC. **[**303**]***301*. The unexpended balances of prior appropriations provided for activities in this Act may be available to the same appropriation accounts for such activities established pursuant to this title. Available balances may be merged with funds in the applicable established accounts and thereafter may be accounted for as one fund for the same time period as originally enacted.

SEC. **[**304**]***302*. None of the funds in this or any other Act for the Administrator of the Bonneville Power Administration may be used to enter into any agreement to perform energy efficiency services outside the legally defined Bonneville service territory, with the exception of services provided internationally, including services provided on a reimbursable basis, unless the Administrator certifies in advance that such services are not available from private sector businesses.

SEC. **[**305**]***303*. When the Department of Energy makes a user facility available to universities or other potential users, or seeks input from universities or other potential users regarding significant characteristics or equipment in a user facility or a proposed user facility, the Department shall ensure broad public notice of such availability or such need for input to universities and other potential users. When the Department of Energy considers the participation of a university or other potential user as a formal partner in the establishment or operation of a user facility, the Department shall employ full and open competition in selecting such a partner. For purposes of this section, the term "user facility" includes, but is not limited to:

(1) a user facility as described in section 2203(a)(2) of the Energy Policy Act of 1992 (42 U.S.C. 13503(a)(2));

(2) a National Nuclear Security Administration Defense Programs Technology Deployment Center/User Facility; and

(3) any other Departmental facility designated by the Department as a user facility.

SEC. **[**306**]***304*. Funds appropriated by this or any other Act, or made available by the transfer of funds in this Act, for intelligence activities are deemed to be specifically authorized by the Congress for purposes of section 504 of the National Security Act of 1947 (50 U.S.C. 414) during fiscal year **[**2010**]** *2011* until the enactment of the Intelligence Authorization Act for fiscal year **[**2010**]** *2011*.

SEC. **[**307**]***305*. Of the funds made available by the Department of Energy for activities at Government-owned, contractor-operated laboratories funded in this Act or subsequent Energy and Water Development Appropriations Acts, the Secretary may authorize a specific amount, not to exceed

8 percent of such funds, to be used by such laboratories for laboratory directed research and development: *Provided*, That the Secretary may also authorize a specific amount not to exceed 4 percent of such funds, to be used by the plant manager of a covered nuclear weapons production plant or the manager of the Nevada Site Office for plant or site directed research and development.

SEC. **[**308**]***306*. (a) In any fiscal year in which the Secretary of Energy determines that additional funds are needed to reimburse the costs of defined benefit pension plans for contractor employees, the Secretary may transfer not more than 1 percent from each appropriation made available in this and subsequent Energy and Water Development Appropriation Acts to any other appropriation available to the Secretary in the same Act for such reimbursements.

[(b) Where the Secretary recovers the costs of defined benefit pension plans for contractor employees through charges for the indirect costs of research and activities at facilities of the Department of Energy, if the indirect costs attributable to defined benefit pension plan costs in a fiscal year are more than charges in fiscal year 2008, the Secretary shall carry out a transfer of funds under this section.**]**

(**[**c**]***b*) In carrying out a transfer under this section, the Secretary shall use each appropriation made available to the Department in that fiscal year as a source or the transfer, and shall reduce each appropriation by an equal percentage, except that appropriations for which the Secretary determines there exists a need for additional funds for pension plan costs in that fiscal year, as well as appropriations made available for the Power Marketing Administrations, the title XVII loan guarantee program, and the Federal Energy Regulatory Commission, shall not be subject to this requirement.

(**[**d**]***c*) Each January, the Secretary shall report to the Committees on Appropriations of the House of Representatives and the Senate on the state of defined benefit pension plan liabilities in the Department for the preceding year.

(**[**e**]***d*) This transfer authority does not apply to supplemental appropriations, and is in addition to any other transfer authority provided in this or any other Act. The authority provided under this section shall expire on September 30, 2015.

(**[**f**]***e*) The Secretary shall notify the Committees on Appropriations of the House of Representatives and the Senate in writing not less than 30 days in advance of each transfer authorized by this section.

[SEC. 309. (a) Subject to subsection (b), no funds appropriated or otherwise made available by this Act or any other Act may be used to record transactions relating to the increase in borrowing authority or bonds outstanding at any time under the Federal Columbia River Transmission System Act (16 U.S.C. 838 et seq.) referred to in section 401 of division A of the American Recovery and Reinvestment Act of 2009 (Public Law 111-5; 123 Stat. 140) under a funding account, subaccount, or fund symbol other than the Bonneville Power Administration Fund Treasury account fund symbol.

(b) Funds appropriated or otherwise made available by this Act or any other Act may be used to ensure, for purposes of meeting any applicable reporting provisions of the American Recovery and Reinvestment Act of 2009 (Public Law 111-5; 123 Stat. 115), that the Bonneville Power Administration uses a fund symbol other than the Bonneville Power Administration Fund Treasury account fund symbol solely to report accrued expenditures of projects attributed by the Administrator of the Bonneville Power Administration to the increased borrowing authority.

(c) This section is effective for fiscal year 2010 and subsequent fiscal years.**]**

[SEC. 310. Section 1702 of the Energy Policy Act of 2005 (42 U.S.C. 16512) is amended by adding at the end the following new subsection:

"(k) WAGE RATE REQUIREMENTS.—All laborers and mechanics employed by contractors and subcontractors in the performance of construction work financed in whole or in part by a loan guaranteed under this title shall be paid wages at rates not less than those prevailing on projects of a

character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code. With respect to the labor standards in this subsection, the Secretary of Labor shall have the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (64 Stat. 1267; 5 U.S.C. App.) and section 3145 of title 40, United States Code.".**]**

[SEC. 311. None of the funds made available by this Act may be used to make a grant allocation, discretionary grant award, discretionary contract award, Other Transaction Agreement, or to issue a letter of intent totaling in excess of $1,000,000, or to announce publicly the intention to make such an award, including a contract covered by the Federal Acquisition Regulation, unless the Secretary of Energy notifies the Committees on Appropriations of the Senate and the House of Representatives at least 3 full business days in advance of making such an award or issuing such a letter: *Provided*, That if the Secretary of the Department of Energy determines that compliance with this section would pose a substantial risk to human life, health, or safety, an award may be made without notification and the Committees on Appropriations of the Senate and the House of Representatives shall be notified not later than 5 full business days after such an award is made or letter issued.**]**

[SEC. 312. (a) ULTRA EFFICIENT VEHICLES.—Section 136 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17013) is amended—

(1) in subsection (a)—

(A) in paragraph (1), by inserting "an ultra efficient vehicle or" after "means"; and

(B) by adding at the end the following new paragraph:

"(5) ULTRA EFFICIENT VEHICLE.—The term `ultra efficient vehicle' means a fully closed compartment vehicle designed to carry at least 2 adult passengers that achieves—

"(A) at least 75 miles per gallon while operating on gasoline or diesel fuel;

"(B) at least 75 miles per gallon equivalent while operating as a hybrid electric-gasoline or electric-diesel vehicle; or

"(C) at least 75 miles per gallon equivalent while operating as a fully electric vehicle.";

(2) in subsection (b)—

(A) by inserting ", ultra efficient vehicle manufacturers," after "automobile manufacturers";

(B) in paragraph (1)—

(i) by striking "or" at the end of subparagraph (A);

(ii) by striking "and" at the end of subparagraph (B) and inserting "or"; and

(iii) by adding at the end the following new subparagraph:

"(C) ultra efficient vehicles; and"; and

(C) in paragraph (2), by inserting ", ultra efficient vehicles," after "qualifying vehicles";

(3) in subsection (g), by inserting "or are utilized primarily for the manufacture of ultra efficient vehicles" after "20 years"; and

(4) in subsection (h)(1)(B), by striking "automobiles" the first place it appears and inserting "ultra efficient vehicles, automobiles,".

(b) RECONSIDERATION OF PRIOR APPLICATIONS.—The Secretary of Energy shall reconsider applications for assistance under section 136 of the Energy Independence and Security Act of 2007 (42 U.S.C. 17013) that were—

(1) timely filed under that section before January 1, 2009;

(2) rejected on the basis that the vehicles to which the proposal related were not advanced technology vehicles; and

(3) related to ultra efficient vehicles.**]**

[SEC. 313. (a) Except as provided in subsection (b), none of the funds appropriated or otherwise made available by this title for the Strategic Petroleum Reserve may be made available to any person that as of the enactment of this Act—

(1) is selling refined petroleum products valued at $1,000,000 or more to the Islamic Republic of Iran;

(2) is engaged in an activity valued at $1,000,000 or more that could contribute to enhancing the ability of the Islamic Republic of Iran to import refined petroleum products, including—

(A) providing ships or shipping services to deliver refined petroleum products to the Islamic Republic of Iran;

(B) underwriting or otherwise providing insurance or reinsurance for such an activity; or

(C) financing or brokering such an activity; or

(3) is selling, leasing, or otherwise providing to the Islamic Republic of Iran any goods, services, or technology valued at $1,000,000 or more that could contribute to the maintenance or expansion of the capacity of the Islamic Republic of Iran to produce refined petroleum products.

(b) The prohibition on the use of funds under subsection (a) shall not apply with respect to any contract entered into by the United States Government before the date of the enactment of this Act.

(c) If the Secretary determines a person made ineligible by this section has ceased the activities enumerated in (a)(1)-(3), that person shall no longer be ineligible under this section.**]**

[SEC. 314. Section 132 of the Energy and Water Development Appropriations Act of 2006 (119 Stat 2261) is amended—

(1) in subsection (a)(3), by striking "Corps of Engineers" and inserting "Southwestern Power Administration";

(2) by adding at the end of subsection (a) the following new paragraph:

"(5) PAYMENT TO NON-FEDERAL LICENSEE.—Southwestern Power Administration shall compensate the licensee of Federal Energy Regulatory Commission Project No. 2221 pursuant to paragraph (3) using receipts collected from the sale of Federal power and energy related services. Pursuant to paragraph (6), Southwestern Power Administration will begin collecting receipts in the Special Receipts and Disbursement account upon the date of enactment of this paragraph. Payment to the licensee of Federal Energy Regulatory Commission Project No. 2221 shall be paid as soon as adequate receipts are collected in the Special Receipts and Disbursement Account to fully compensate the licensee, and in accordance with paragraph (2), such payment shall be considered non-reimbursable.";

(3) by adding at the end of subsection (a) the following new paragraph:

"(6) The Southwestern Power Administration shall compensate the licensee of Federal Energy Regulatory Commission Project No. 2221 in annual payments of not less than $5,000,000, until the licensee of Federal Energy Regulatory Commission Project No. 2221 is fully compensated pursuant to paragraph (3). At the end of each fiscal year subsequent to implementation, any remaining balance to be paid to the licensee of Project No. 2221 shall accrue interest at the 30-year U.S. Treasury bond rate in effect at the time of implementation of the White River Minimum Flows project.";

(4) by adding at the end of subsection (a) the following new paragraph:

"(7) ESTABLISHMENT OF SPECIAL RECEIPT AND DISBURSEMENT ACCOUNTS.—There is established in the Treasury of the United States a special receipt account and corresponding disbursement account to be made available to the Administrator of the Southwestern Power Administration to disburse pre-collected receipts from the sale of federal power and energy and related services. The accounts are authorized for the following uses:

"(A) Collect and disburse receipts for purchase power and wheeling expenses incurred by Southwestern Power Administration to purchase replacement power and energy as a result of implementation of the White River Minimum Flows project.

"(B) Collect and disburse receipts related to compensation of the licensee of Federal Energy Regulatory Commission Project No. 2221.

"(C) Said special receipt and disbursement account shall remain available for not more than 12 months after the date of full compensation of the licensee of Federal Energy Regulatory Commission Project No. 2221."; and

(5) by adding at the end of subsection (a) the following new paragraph:

"(8) TIME OF IMPLEMENTATION.—For purposes of paragraphs (3) and (4), `time of implementation' shall mean the authorization of the special receipt account and corresponding disbursement account described in paragraph (7).". **]**

SEC. 307. (*a*) *Section 1801 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g) is amended in subsection (b)(2) by striking "amounts contained within the Fund" and inserting "assessments collected pursuant to section 1802 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g-1) as amended".*

(*b*) *Section 1802 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g-1) is amended:*

(*1*) *in subsection (a):*

(*A*) *by* striking *"$518,233,333" and inserting "$663,000,000"; and*

(*B*) *by* striking *"on October 24, 1992" and inserting "with fiscal year 2012".*

(*2*) *in subsection (c):*

(*A*) *by* inserting *"(1)" before "The Secretary";*

(*B*) *by* inserting *after "utilities": ", only to the extent provided in advance in appropriation Acts";*

(*C*) *by striking "$150,000,000" and inserting "$200,000,000";*

(*D*) *by* inserting *"beginning in fiscal year 2012" after "adjusted for inflation";*

(*E*) *by striking "(1)" and inserting "(A)";*

(*F*) *by striking "(2)" and inserting "(B)";*

(*G*) *by adding a new paragraph 2, ",(2) Amounts authorized to be collected pursuant to this section shall be deposited in the Fund and credited as offsetting receipts."*

(*3*) *in subsection (d), by striking "for the period encompassing 15 years after the date of the enactment of this title" and inserting "through fiscal year 2026"; and*

(*4*) *in subsection (e):*

(*A*) *in paragraph (1), by striking "15 years after the date of the enactment of this title" and inserting "September 30, 2026";*

(*B*) in *paragraph (2), by striking "$2,250,000,000" and inserting "$3,000,000,000"; and*

(*C*) in *paragraph (2) by inserting "beginning in fiscal year 2012" after "adjusted for inflation".*

SEC. 308. The Secretary shall collect up to $200,000,000 in assessments pursuant to section 1802 of the Atomic Energy Act of 1954 (42 U.S.C. 2297g-1), as amended by this Act.

SEC. 309. For an additional amount for the "Other Defense Activities" account, $11,891,755, to increase the Department's acquisition workforce capacity and capabilities: Provided, That such funds may be transferred by the Secretary to any other account in the Department to carry out the purposes provided herein: Provided further, That such transfer authority is in addition to any other transfer authority provided in this Act: Provided further, That such funds shall be available only to supplement and not to supplant existing acquisition workforce activities: Provided further, That such funds shall be available for training, recruitment, retention, and hiring additional members of the acquisition workforce as defined by the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 401 et

seq.): Provided further, That such funds shall be available for information technology in support of acquisition workforce effectiveness or for management solutions to improve acquisition management.

SEC. 310. Not to exceed 5 per centum, or $100,000,000, of any appropriation, whichever is less, made available for Department of Energy activities funded in this Act or subsequent Energy and Water Development and Related Agencies Appropriation Acts may hereafter be transferred between such appropriations, but no appropriation, except as otherwise provided, shall be increased or decreased by more that 5 per centum by any such transfers, and any such proposed transfers shall be submitted to the Committee on Appropriations of the House and Senate. (Energy and Water Development and Related Agencies Appropriations Act, 2010.)

SEC. 501. None of the funds appropriated by this Act may be used in any way, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913.

SEC. 502. To the extent practicable funds made available in this Act should be used to purchase light bulbs that are "Energy Star" qualified or have the "Federal Energy Management Program" designation.

[SEC. 503. Title IV of division A of the American Recovery and Reinvestment Act of 2009 (Public Law 111-5) is amended by adding at the end of the title, the following new section 411:

"SEC 411. Up to 0.5 percent of each amount appropriated to the Department of the Army and the Bureau of Reclamation in this title may be used for the expenses of management and oversight of the programs, grants, and activities funded by such appropriation, and may be transferred by the Head of the Federal Agency involved to any other appropriate account within the department for that purpose: *Provided*, That the Secretary will provide a report to the Committees on Appropriations of the House of Representatives and the Senate 30 days prior to the transfer: *Provided further*,That funds set aside under this section shall remain available for obligation until September 30, 2012.".**]**

[SEC. 504. (a) DEFINITIONS.—In this section:

(1) *ADMINISTRATIVE* EXPENSES.—The term "administrative expenses" has the meaning as determined by the Director under subsection (b)(2).

(2) *AGENCY*.—The term "agency"—

(A) means an agency as defined under section 1101 of title 31, United States Code, that is established in the executive branch and receives funding under this Act; and

(B) shall not include the District of Columbia government.

(3) *DIRECTOR*.—The term "Director" means the Director of the Office of Management and Budget.

(b) ADMINISTRATIVE EXPENSES.—

(1) IN *GENERAL*.—All agencies shall include a separate category for administrative expenses when submitting their appropriation requests to the Office of Management and Budget for fiscal year 2011 and each fiscal year thereafter.

(2) *ADMINISTRATIVE* EXPENSES DETERMINED.—In consultation with the agencies, the Director shall establish and revise as necessary a definition of administration expenses for the purposes of this section. All questions regarding the definition of administrative expenses shall be resolved by the Director.

(c) BUDGET SUBMISSION.—Each budget of the United States Government submitted under section 1105 of title 31, United States Code, for fiscal year 2011 and each fiscal year thereafter shall include the amount requested for each agency for administrative expenses.**]**

[SEC. 505. None of the funds made available in this Act may be transferred to any department, agency, or instrumentality of the United States Government, except pursuant to a transfer made by, or transfer authority provided in this Act or any other appropriation Act.**]**

SEC. **[**506**]***503*. **[**Specific projects contained in**]** *To the extent that* the report of the Committee on Appropriations of the House of Representatives accompanying this Act **[**(H. Rept. 111-203) **]** *includes specific projects* that are considered congressional earmarks for purposes of clause 9 of rule XXI of the Rules of the House of Representatives, *such projects,* when intended to be awarded to a for-profit entity, shall be awarded under a full and open competition. *(Energy and Water Development and Related Agencies Appropriations Act, 2010.)*

Nuclear Energy

Defense Nuclear Waste Disposal

Nuclear Waste Disposal