

## Section 1. Energy Security

### Nuclear Energy

	(discretionary dollars in thousands)				
	FY 2006	FY 2007	FY 2008	FY 2008 vs. FY 2007	
	Current	Congressional	Congressional	\$	%
	Approp.	Request	Request		
<b>Office of Nuclear Energy</b>					
Energy Supply and Conservation					
University reactor infrastructure and education assistance.....	26,730	—	—	—	—
Research and development.....	221,068	347,132	567,745	+220,613	+63.6%
Infrastructure.....	241,030	145,012	157,734	+12,722	+8.8%
Program direction.....	60,498	67,608	76,224	+8,616	+12.7%
Transfer from state department.....	17,238	—	—	—	—
<b>Subtotal, Energy Supply and Conservation.....</b>	<b>566,564</b>	<b>559,752</b>	<b>801,703</b>	<b>+241,951</b>	<b>+43.2%</b>
Funding from other defense activities.....	-122,634	—	—	—	—
Funding from Naval Reactors.....	-13,365	—	—	—	—
<b>Total, Energy Supply and Conservation.....</b>	<b>430,565</b>	<b>559,752</b>	<b>801,703</b>	<b>+241,951</b>	<b>+43.2%</b>
Other Defense Activities					
Infrastructure.....	91,872	75,949	75,949	—	—
Program direction.....	30,792	—	—	—	—
<b>Subtotal, Other Defense Activities.....</b>	<b>122,664</b>	<b>75,949</b>	<b>75,949</b>	<b>—</b>	<b>—</b>
Use of prior year balances and other adjustments.....	-3,003	-3,003	-3,003	—	—
<b>Total, Other Defense Activities.....</b>	<b>119,661</b>	<b>72,946</b>	<b>72,946</b>	<b>—</b>	<b>—</b>
<b>Total, Office of Nuclear Energy.....</b>	<b>550,226</b>	<b>632,698</b>	<b>874,649</b>	<b>+241,951</b>	<b>+38.2%</b>

The **Office of Nuclear Energy (NE)** is funded in two accounts within the Energy and Water Development Appropriation: Energy Supply and Conservation and Other Defense Activities. All funding for research and development and landlord activities for the Idaho National Laboratory is requested in the Energy Supply and Conservation account. Funding for Safeguards and Security is requested within Other Defense Activities. Within the two accounts, DOE is **requesting** a total of **\$874.6 million** for NE activities in **FY 2008**.

#### PROGRAM DESCRIPTION

NE leads the government's efforts to develop new nuclear energy generation technologies to meet energy and climate goals; develop advanced, proliferation-resistant nuclear fuel technologies that maximize energy from nuclear fuel; and maintain and enhance the national nuclear infrastructure. NE serves the present and future energy needs of the country by managing the safe operation and maintenance of our critical nuclear research infrastructure that provides nuclear technology goods and services. A key mission of DOE's nuclear energy research and development program is to lead the U.S. and international research community in planning and conducting applied research in next generation nuclear technologies. The aim of these efforts and those of our industrial and overseas partners is to enable nuclear energy to fulfill its promise as a safe, advanced, cost-effective and environmentally friendly approach to providing reliable energy to all of the world's people.

The programs within NE fully support development of new nuclear generation technologies that may provide significant improvements in sustainability, economics, safety and reliability, proliferation resistance, and physical protection. Through the **Advanced Fuel Cycle Initiative**, the technology development element of the **Global Nuclear Energy Partnership**, DOE seeks to develop advanced, proliferation resistant nuclear fuel technologies that maximize the energy produced from nuclear fuel while minimizing wastes. The **Global Nuclear Energy Partnership** will further provide for the expansion of nuclear power plants in the United States and around the world, in addition to promoting nuclear nonproliferation goals and helping resolve nuclear waste disposal issues. The **Nuclear Power 2010** program supports technology development and demonstration activities that advance the Presidents' National Energy Policy goals for enhancing long-term U.S. energy independence by expanding the contribution of nuclear power to the nation's energy portfolio. In addition, the

**Generation IV Nuclear Energy Systems Initiative** establishes a basis for expansive cooperation with our international partners to develop next-generation reactor systems that represent a significant leap in economic performance, safety, and proliferation-resistance. Finally, the **Nuclear Hydrogen Initiative** will develop advanced technologies that can be used in tandem with next-generation nuclear energy plants to generate economic, commercial quantities of hydrogen to support a sustainable, clean energy future for the United States.

## *PROGRAM HIGHLIGHTS*

The FY 2008 request supports innovative applications of nuclear technology to develop new nuclear generation technologies and advanced energy products, develop advanced proliferation-resistant nuclear fuel technologies that maximize energy output, and maintain and enhance national nuclear capabilities to meet future challenges.

The **Advanced Fuel Cycle Initiative**, the technology development element of the **Global Nuclear Energy Partnership** (GNEP) is requesting \$395 million in FY 2008. This research and development program is focusing on methods to reduce the volume and long-term toxicity of high-level waste from spent nuclear fuel, reduce the long-term proliferation threat posed by civilian inventories of plutonium in spent fuel, and provide for proliferation-resistant technologies to recover the energy content in spent nuclear fuel.

Advanced recycling technologies can extract highly radioactive elements of commercial spent nuclear fuel and use that material as fuel in fast spectrum reactors to generate additional electricity. The extracted material, which includes all transuranic elements (e.g., plutonium, neptunium, americium and curium), would be consumed by fast reactors to reduce significantly the quantity of material requiring disposal in a repository and to produce power. With the transuranic materials separated and used for fuel, the volume of waste that would require disposal in a repository would be reduced by 80 percent.

Improving the way spent nuclear fuel is managed will facilitate the expansion of civilian nuclear power in the United States and encourage civilian nuclear power internationally to evolve in a more proliferation-resistant manner. The United States and other countries having the established infrastructure could arrange to supply nuclear fuel to countries seeking the energy benefits of civilian nuclear power, and the spent nuclear fuel could be returned to partner countries for eventual disposal in international repositories. In this way, foreign countries could obtain the benefits of nuclear energy without needing to design, build, and operate uranium enrichment or recycling technologies to process and store the waste.

The **Nuclear Power 2010** program is requesting funding of \$114.0 million in FY 2008 to complete the two Early Site Permit demonstration projects and continue the New Nuclear Plant Licensing Demonstration projects that will exercise the untested licensing process to build and operate a new nuclear plant. Design activities will continue in support of the submission of two combined Construction and Operating License applications to the Nuclear Regulatory Commission; development of final designs for two standard nuclear plants; and development of total project cost and schedule needed by industry to initiate purchase of long lead procurement equipment, to request cost recovery through their Public Utility Commissions and to begin loan discussions with financial institutions.

The goal of the **Generation IV Nuclear Energy Systems Initiative** (Gen IV) is to address the fundamental research and development issues necessary to establish the viability of next-generation nuclear energy system concepts. The 2008 budget provides \$36.1 million to maintain critical R&D to achieve desired goals of sustainability, economics, and proliferation resistance. This R&D will further investigate the technical and economical challenges of next-generation reactors.

The **Nuclear Hydrogen Initiative** (NHI), with funding of \$22.6 million, will conduct research and development on enabling technologies, demonstrate nuclear-based hydrogen production technologies, and develop technologies that will apply heat from Generation IV nuclear energy systems to produce hydrogen. DOE's Offices of Nuclear Energy, Fossil Energy, Science, and Energy Efficiency and Renewable Energy are working together to provide the technological underpinnings of the **Hydrogen Fuel Initiative**. Research and development work carried out by NHI may enable the United States to generate hydrogen at a scale and cost that would support a future hydrogen-based economy.

The **Radiological Facilities Management** program with funding of \$53.0 million, maintains irreplaceable DOE nuclear technology facilities in a safe, secure, environmentally compliant and cost-effective manner to support national priorities, including the provision of radioisotope power systems that can generate electrical power in remote harsh environments for space exploration. This program also supports the medical isotope production infrastructure and research reactor infrastructure.

The **Idaho Facilities Management** program (\$104.7) provides Idaho National Laboratory (INL) with the site-wide infrastructure required to support the laboratory's research and development programs. The Department has developed a detailed INL Ten-Year Site Plan that will guide its investments in INL's infrastructure over the next decade.

The **Idaho Site-Wide Safeguards and Security** program protects DOE interests from theft, diversion, sabotage, espionage, unauthorized access, compromise, and other hostile acts, which could cause unacceptable adverse impacts on national security, program continuity, the health and safety of employees, the public, or the environment at the INL.

**Program Direction** provides the federal staffing resources and associated costs required to provide overall direction and execution of the Department's Nuclear Energy program.

*SIGNIFICANT FUNDING CHANGES – FY 2007 to 2008 Request (\$ in millions)*

**Nuclear Power 2010 (FY 2007 \$54.0; FY 2008 \$114.0) .....+\$60.0**

Additional funds are requested to maintain scheduled work to continue reactor designs and implement licensing interactions with NRC to support utility decisions to build new nuclear plants by 2009.

**Generation IV Nuclear Energy Systems Initiative (FY 2007 \$31.4; FY 2008 \$36.1) .....+\$4.7**

Increase reflects additional R&D activities for nuclear reactor fuel development and for completion of the Energy Policy Act of 2005 mandated Next Generation Nuclear Plant Licensing Strategy.

**Nuclear Hydrogen Initiative (FY 2007 \$18.7; FY 2008 \$22.6) .....+\$3.9**

Increase reflects additional experiments to determine the feasibility of alternative cycles selected for further development, and to begin design activities for pilot-scale experiments for thermochemical and high-temperature electrolysis production methods.

**Advanced Fuel Cycle Initiative (FY 2007 \$243.0; FY 2008 \$395.0).....+\$152.0**

Increase reflects enhanced R&D activity to support separations technology development (+\$14.0); significant enhancement in systems analysis and advanced computing and simulation (+\$59.0); expansion of conceptual design activities for process equipment design and nuclear safety for the Advanced Fuel Cycle Facility (+\$10.0); consolidation of all technology development activities supporting the Advanced Fuel Cycle Facility, Advanced Burner Reactor, and Recycling Demonstration projects into the GNEP Technology Development program as well as the initiation of the small reactors initiative

and GNEP related international collaborations with other fuel cycle states (+\$65.0); and the continuation of NERI grants (+\$4.0).

**Radiological Facilities Management (FY 2007 \$49.7; FY 2008 \$53.0) .....+\$3.3**

Cumulative change in funding is due to an increase for maintaining and upgrading the Space and Defense Infrastructure (+\$4.5); a decrease in the Medical Isotope Infrastructure program including the transfer of responsibility for the Annular Core Research Reactor (ACRR) to NNSA (-\$1.8) offset by an increase to maintain the Medical Isotope Infrastructure(+ \$1.1); and a decrease to reflect the shift in responsibility for the monitoring and maintenance of the DOE leased assets at the Paducah Gaseous Diffusion Plant to the federal staff at the Oak Ridge Operations Office (-\$0.5).

**Idaho Facilities Management (FY 2007 \$95.3; FY 2008 \$104.7) .....+\$9.4**

Increase reflects the initiation of necessary recapitalization at the INL to reduce the deferred maintenance backlog to within 5% of RPV at the site (+\$30.4); required funding to support mitigation of NE legacy waste (+\$4.0); and the transfer of activities previously funded by the Office of Environment, Safety and Health to support the Radiological and Environmental Sciences Laboratory (+\$2.5). Increases are offset by decreases due to completion of planned work scope for the Gas Test Loop and Project Engineering and Design activities (-\$10.4); and a reduced scope of work for the ATR Life Extension Program (-\$17.1).

**Program Direction (FY 2007 \$67.6; FY 2008 \$76.2) .....+\$8.6**

Increase represents a 2.5-percent escalation in accordance with established guidelines and funds for promotions and within-grade salary increases (+\$2.4); funds required to implement the acceleration of the Advanced Fuel Cycle Initiative, including salaries and benefits for an additional 10 FTEs, travel, Working Capital Fund costs and training (+\$2.8); and the inclusion of 19 FTEs for the Radiological and Environmental Sciences Laboratory previously funded by the Office of Environment Safety and Health (+\$3.4).