

**Statement of Peter Lyons**  
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**Before the**  
**Subcommittee on Energy and Water Development, and Related Agencies**  
**Committee on Appropriations**  
**U.S. House of Representatives**

**FY 2013 Appropriations Hearing**  
**March 7, 2012**

Chairman Frelinghuysen, Ranking Member Visclosky and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the President's fiscal year 2013 budget request for the Office of Nuclear Energy (NE) at the Department of Energy.

When I testified before you last year, the events at Fukushima were still unfolding. Over the last year, the Nuclear Regulatory Commission (NRC) has undertaken a significant review of the events at Fukushima and how they may affect nuclear plant operations in the U.S. NE has reevaluated its R&D activities in light of these events to continue to support the safety of operating and future plants. We are working to develop fuels with enhanced accident tolerance. We are using modeling and simulation to better understand operations in off-normal conditions, how nuclear plants respond to seismic events and how reactor materials evolve over time. Through the Nuclear Energy University Program, we are enlisting the help of the university communities to focus on safety-related R&D projects including such issues as the safe storage of used fuel. NE remains committed to ensuring that the option for safe nuclear power remains open to the nation.

Domestically, this has been a historic year for nuclear energy. Late last year, the Westinghouse AP1000 reactor received design certification from the NRC. On February 9, 2012, the NRC voted to approve issuance of a combined operation and construction license for two new units at the Vogtle nuclear power plant in Georgia. The vote authorizes construction of the Nation's first new commercial nuclear reactor since 1978.

With the support of Congress, the Department has also taken the first step to accelerate the commercialization of Small Modular Reactors (SMRs). If industry chooses to deploy this technology, SMRs could help meet the nation's economic, energy security and climate change goals. On January 20, 2012, NE released a draft Funding Opportunity Announcement (FOA), soliciting input from industry to establish cost-shared agreements for first-of-a-kind engineering to support design certification and licensing of SMRs. The Department is currently reviewing the submitted comments and looks forward to releasing the final FOA in the coming weeks.

On January 26, 2012, the Blue Ribbon Commission on America's Nuclear Future released its final report, providing recommendations for managing the back end of the nuclear fuel cycle. The Commissioners worked collaboratively and constructively through a public, open and transparent process. The

Administration commends the Commission for its work over the past two years. Secretary Chu has created an internal task force to assess the Commission's recommendations and develop a strategy that builds off their work. The Administration will work with Congress to define a responsible and achievable path forward to manage our nation's used nuclear fuel and nuclear waste.

On November 26, 2011, the Mars Science Laboratory rover lifted off from Cape Canaveral, carrying a Radioisotope Thermal Generator power source to enable the Curiosity rover mission. This year marked the 50th anniversary of the use of nuclear power for space exploration, which has made some of the most complex and challenging missions possible.

As the President emphasized in his State of the Union Address, "this country needs an all-out, all-of-the-above strategy that develops every available source of American energy." And as Secretary Chu stated during his recent trip to the Vogtle plant, "Nuclear energy is a critical part of President Obama's all-of-the-above energy strategy." Nuclear energy currently supplies over 70 percent of our nation's carbon-free electricity and will continue to play an integral role in our nation's energy mix. NE will explore the avenues that offer the highest probability of nuclear power fulfilling this role.

While new builds of nuclear power, as well as other clean energy sources, are challenged by the current low price of natural gas, I've already described many exciting developments that are expected to help enable a strong future for nuclear power.

The President's fiscal year 2013 budget requests \$770.4 million for the Office of Nuclear Energy, a decrease of 10.3 percent from the FY 2012 appropriation. Of the \$770.4 million, \$314.4 million is for research, development and demonstration. This austere budget required extremely careful prioritization.

#### OFFICE OF NUCLEAR ENERGY (NE) PROGRAMS

##### **SMR Licensing Technical Support - \$65.0 million**

The SMR Licensing Technical Support program is designed to support first-of-a-kind engineering activities for design certification and licensing activities for two SMR designs through cost-shared arrangements with industry partners in order to promote accelerated deployment of these technologies. The acceleration provided by the cost-shared funding is expected to improve U.S. global competitiveness, enhance domestic energy security and contribute to meeting greenhouse gas reduction goals. The program will help demonstrate the potential of the nascent SMR technology and encourage new competition in the marketplace. The program involves providing cost-shared support for two teams of specific reactor technology vendors for the design, engineering, testing, analysis related to a design certification application for each vendor's reactor system and specific utilities or consortia for the development of a license application specific to the chosen sites.

## **Reactor Concepts - Research, Development and Demonstration- \$73.7 million**

The Reactor Concepts Research, Development and Demonstration (RD&D) program is designed to develop new and advanced reactor designs and technologies that enable improved competitiveness and help to advance nuclear power as a resource capable of meeting the Nation's energy, environmental and national security needs. R&D activities are designed to address technical, cost, safety and security issues associated with reactor concepts including advanced SMR designs, the Next Generation Nuclear Plant (NGNP) and other advanced reactor concepts. Additionally, we will conduct R&D on advanced technologies to support possible life extensions of Light Water Reactors (LWRs) and address the impacts of the Fukushima accident with a focus on further improving safety of LWRs by enhancing their accident tolerance.

### *Small Modular Reactor Advanced Concepts R&D- \$18.5 million*

The SMR Advanced Concepts R&D subprogram is designed to support the development of innovative SMR designs that may offer improved safety, functionality and affordability, incorporating the existing or advanced nuclear technology and operating experience base. The program supports laboratory/university and industry projects to conduct nuclear technology R&D that would be useful to support development of advanced SMR concepts for use in the mid-to long-term. Emphasis is on advanced reactor technologies that offer simplified operation and maintenance for distributed power applications and increased proliferation resistance and security.

### *Next Generation Nuclear Plant Demonstration Project- \$21.2 million*

The NGNP project is designed to investigate the technical viability of very high temperature nuclear reactor (VHTR) technology to provide more efficient carbon-free electricity and high-temperature process heat for a variety of industrial uses. In October 2011, the Secretarial Determination was made not to proceed with Phase 2 design activities at this time. However, the program will continue to focus on R&D in the near term. The Department continues to work with the U.S. private sector to understand industrial end-user requirements, produce trade studies evaluating the integration of NGNP into various industrial applications and develop consider partnership opportunities with appropriate cost-sharing strategies to support industry in their efforts to commercialize VHTR technologies.

### *Light Water Reactor Sustainability- \$21.7 million*

This program will conduct R&D to explore extending the operating lifetime of current plants beyond 60 years and, where possible, enable further improvement in their safety and productivity. The program will partner with industry and work with the NRC to conduct the long-term research needed to inform major component refurbishment and replacement strategies, performance enhancements and plant license extensions. 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 and will also address post-Fukushima lessons learned, in particular, research to enhance the accident tolerance of light water reactors, accident response analysis capabilities and emerging issues. 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.

#### *Advanced Reactor Concepts - \$12.4 million*

This program is designed to develop and refine future reactor concepts that could dramatically improve nuclear power performance including sustainability, economics and safety and proliferation resistance. The program will continue support for international activities in the Generation IV International Forum and international collaborations on advanced reactor operations and safety.

The key R&D needs are being addressed for two high priority advanced concepts: liquid metal-cooled fast reactors and liquid fluoride salt cooled reactors. In addition, R&D that could provide wide benefits (e.g., development of advanced energy conversion technology such as a supercritical CO<sub>2</sub> Brayton cycle) is being pursued with a view to application in many different reactor technologies. The Advanced Reactor Concepts program will continue to solicit and evaluate new ideas in order to encourage innovation, incorporation of technology advances and to enhance the safety, as well as performance, of these systems.

#### **Fuel Cycle Research and Development- \$175.4 million**

The mission of the Fuel Cycle R&D program is to develop sustainable fuel cycles as described in the *Office of Nuclear Energy's Research and Development Roadmap*. Specifically, the program will develop a suite of options that will enable future policy-makers and stakeholders to make informed decisions about how best to manage used fuel from reactors. A long-term, science-based approach is employed to foster innovative, transformational technology solutions to achieve the mission.

#### *Advanced Fuel Research and Development- \$40.4 million*

The development of advanced fuels may be an essential part of achieving a sustainable fuel cycle. We are pursuing two major paths: (1) the development of next generation light water reactor fuels with enhanced accident tolerance and (2) development over the long term of transmutation fuels with enhanced proliferation resistance and resource utilization. This activity also supports NE's international fuel development cooperation activities and university commitments.

#### *Used Nuclear Fuel Disposition Research and Development - \$59.7 million*

The Used Nuclear Fuel Disposition subprogram will identify alternatives and conduct scientific research and technology development to enable long-term storage, transportation and geologic disposal of used nuclear fuel and waste generated by existing and future nuclear fuel cycles. There are a number of key elements that the Department has recognized as foundational to the nation's used fuel management and high-level waste disposal program, and has been pursuing even prior to the recommendations recently put forward by the Blue Ribbon Commission on America's Nuclear Future. The Commission's recommendations for research and development-related near-term priorities align with the funding allocations within the Used Nuclear Fuel Disposition subprogram. The FY 2013 request builds upon the FY 2012 activities by focusing on evaluating consolidated interim storage and transportation issues

(focused initially on decommissioned sites); working with industry to develop standardized cask systems for used fuel management; conducting material testing to support extended storage of used fuel; revisiting and preparing a report on plans to address recommendations identified by the National Academy of Sciences transportation report; and initiating research on generic geologic disposal environments (e.g. system modeling, engineered barriers, natural barriers, evaluation of design concepts and experiments). Of the \$60 million requested, \$10 million would be derived from the Nuclear Waste Fund to be used consistent with the Nuclear Waste Policy Act.

#### *Fuel Resources - \$6.7 million*

For nuclear energy to remain a sustainable energy source, there must be assurance that an economically viable supply of nuclear fuel is available. The availability of fuel resources for each potential fuel cycle and reactor deployment scenario must be understood. Most appropriate for federal involvement in this area is research and development to support investigation of long term, "game-changing" approaches such as the recovery of uranium from seawater.

#### **Nuclear Energy Enabling Technologies- \$65.3 million**

The Nuclear Energy Enabling Technologies (NEET) program is designed to conduct R&D in crosscutting technologies that directly support and enable the development of new and advanced reactor designs and fuel cycle technologies

#### *Crosscutting Technology Development- \$26.2 million*

The NEET program includes the following elements: (1) Reactor Materials (materials for nuclear applications); (2) Advanced Sensors and Instrumentation; (3) Advanced Modeling and Simulation; (4) Advanced Methods for Manufacturing; and (5) Proliferation and Terrorism Risk Assessment. In FY 2013, the funding activities will be in the first three elements: Reactor Materials, Advanced Sensors and Instrumentation and Advanced Modeling and Simulation. Some of the research in the last two elements, Advanced Methods for Manufacturing and Proliferation Risk Assessment, will be funded through Nuclear Energy University Program (NEUP) awards. An on-going National Academy study on Proliferation Risk Assessment is also funded in Crosscutting Technology Development.

#### *Energy Innovation Hub for Modeling and Simulation- \$24.6 million*

The Energy Innovation Hub for Modeling and Simulation (Hub) is creating a virtual reactor model of actual Tennessee Valley Authority-owned (TVA), Westinghouse-designed, operating pressurized water reactors (PWRs) that will be able to simulate reactor behavior. Engineers will be able to use this virtual model to improve the safety and economics of reactor operations by simulating off-normal conditions as well as reactor power production increases and reactor life and license extensions. The combination of data gained from the virtual model and the physical reactor will be used to resolve technology issues confronting nuclear energy development. The Hub will also serve to educate today's reactor engineers in the use of advanced modeling and simulation through direct engagement in Hub activities. The Oak Ridge National Laboratory is leading a consortium (CASL – Consortium for Advanced Simulation of Light

Water Reactors) of national labs, universities and industry partners to manage Hub execution. CASL began operations in late June 2010.

#### *National Scientific User Facility- \$14.6 million*

The National Scientific User Facility (NSUF) promotes the use of unique nuclear research facilities for science-based experiments to encourage active university, industry and laboratory collaboration in relevant nuclear scientific research. The Idaho National Laboratory Advanced Test Reactor and post-irradiation examination (PIE) facilities of the Center for Advanced Energy Sciences and Materials and Fuels Complex are available as user facilities. In addition, research reactors at Oak Ridge National Laboratory, the Massachusetts Institute of Technology and North Carolina State University, the Advanced Photon Source beam line capabilities at the Illinois Institute of Technology and examination facilities at the Universities of Wisconsin, Michigan, California-Berkeley and Nevada-Las Vegas, are partnered with the NSUF bringing additional user facilities to the research community.

#### **International Nuclear Energy Cooperation - \$3.0 million**

The International Nuclear Energy Cooperation's (INEC) mission is to serve as the overall lead for all NE international activities, including analysis, development and implementation of international civil nuclear energy policy and coordination and integration of NE's international nuclear technical activities. These activities support international bilateral and multilateral engagement and civil nuclear energy R&D activities with countries with an established or planned civilian nuclear power sector.

INEC provides NE the ability to meet growing demands for engagement with international partners on civil nuclear policy, R&D and related activities. INEC engages both bilaterally and multilaterally to support broader U.S. policy and commercial goals related to nuclear energy globally and will allow more effective integration of NE international R&D and policy interests. INEC also coordinates NE efforts with the Department's National Nuclear Security Administration, Office of Environmental Management and Office of Policy and International Affairs; the National Security Council; Department of State; Department of Commerce; and the Nuclear Regulatory Commission to facilitate U.S. nuclear energy R&D, policy and commercial interests internationally.

#### **Radiological Facilities Management- \$51.0 million**

Radiological Facilities Management (RFM) maintains NE-managed nuclear facilities at the Idaho National Laboratory; supports nuclear facilities providing NE mission support at Oak Ridge National Laboratory, Los Alamos National Laboratory and Sandia National Laboratories; and, through the Research Reactor Infrastructure subprogram provides fresh reactor fuel to and removes used fuel from 26 operating university reactors. RFM's Space and Defense Infrastructure sub-program ensures that the United States' radioisotope power systems capabilities are maintained and operated in a safe, environmentally-compliant and cost-effective manner to support space exploration missions and certain national security applications.

### **Idaho Facilities Management- \$152.0 million**

The Idaho Facilities Management (IFM) program maintains DOE mission-supporting facilities and capabilities at Idaho National Lab (INL) to support the Department's nuclear energy research, testing of naval reactor fuels and reactor core components and a range of national security technology programs that support the National Nuclear Security Administration and other Federal agencies such as the Department of Homeland Security in the areas of critical infrastructure protection and nuclear nonproliferation.

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 Advanced Test Reactor (ATR) provides unique irradiation capability to further nuclear fuel and reactor component research in support of advanced nuclear reactor design activities. The Materials and Fuels Complex (MFC) contains a comprehensive range of fuel and experiment fabrication and pre- and post-irradiation examinations, to assess material and fuel characteristics and performance in varying reactor environments. We are currently reviewing options for expanding our ability to provide transient testing of advanced reactor fuels, particularly in light of Fukushima, potentially through the re-activation of MFC's Transient Reactor Test Facility (TREAT).

Two new line items are initiated in FY 2013. Project 13-D-905, Remote-Handled Low-Level Waste Disposal Project, Idaho National Laboratory, is a jointly funded, compliance-driven project with the National Nuclear Security Administration's Office of Naval Reactors to provide ongoing on-site disposal of remote-handled low-level waste generated at INL. Project 13-E-200, Advanced Post-Irradiation Examination Capabilities Project will analyze options for and design of, a potential future facility to support modern, state-of-the-art advanced post-irradiation examination capabilities on a larger scale.

### **Idaho Sitewide Safeguards and Security- \$95.0 million**

The Idaho Sitewide Safeguards and Security (S&S) program supports the INL complex nuclear facility infrastructure and enables NE to conduct research and development in support of multiple program missions. In an effort to better align the S&S funding with INL infrastructure and R&D programs, the S&S program is being requested under the Nuclear Energy appropriation in FY 2013.

The S&S program funds all physical and cyber security activities for the INL, providing protection of DOE nuclear materials, classified and unclassified matter, Government property, personnel and other vital assets from theft, diversion, sabotage, espionage, unauthorized access, compromise and other hostile acts that may cause unacceptable adverse impacts on our national security; program continuity; or the health and safety of employees, the public, or the environment.

In addition to NE's R&D activities, S&S enables a range of national security technology programs that support the National Nuclear Security Administration (NNSA) and other Federal agencies including the Department of Homeland Security in the areas of critical infrastructure protection and nuclear nonproliferation. Safeguards and security functions are also provided through the INL S&S program, which supports the Department of the Army, the Department of the Navy and NNSA Naval Reactors missions.

**Program Direction - \$90.0 million**

Program Direction provides the federal staffing resources and associated costs required to provide overall direction and execution of NE's missions and responsibilities. Included is funding for federal personnel from NE; coordination of the Energy portfolio by the Office of the Under Secretary for Energy; and the Office of the General Counsel and Energy Information Administration responsible for administrative and judicial litigation associated with ending of the Yucca Mountain Repository project, legal issues related to the standard contract and the Department's responsibilities regarding spent fuel and high level waste as specified by the Nuclear Waste Policy Act (NWPA).

The Program Direction request reflects NE's continued efforts to optimize support for its federal workforce, while continuing to improve efficiency and cost-effectiveness and ensure the expert federal management and oversight of NE mission activities. Currently, 27 percent of the NE workforce is eligible to retire and an additional five percent will be eligible by the end of fiscal year 2013, presenting a significant challenge to succession planning. Over the past several years, NE has been addressing the issue of an aging workforce through the recruitment of appropriately skilled entry-level engineering, scientific and administrative positions. The fiscal year 2013 request for Program Direction is effectively flat-lined from fiscal year 2012, reflecting efficiencies to be realized in all activity areas.