Nuclear Energy
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 10 buses and 2 ambulances, all for replacement only, $889,190,000] *$863,386*,000 to remain available until expended, *of which $24,000,000 shall be derived from the Nuclear Waste Fund*: Provided, That, of the amount made available under this heading, [$90,000,000] *$73,090,000* shall be available until September 30, [2015,] *2016*, for program direction.

Explanation of Changes

$24,000,000 is requested from the Nuclear Waste Fund to support the Fuel Cycle Research and Development/Used Fuel Disposition/Integrated Waste Management System sub-program element.

Public Law Authorizations

42 U.S.C. 10101, Nuclear Waste Policy Act of 1982

Nuclear Energy

($K)

FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request
708,429	888,376	888,376	863,386

Overview

The primary mission of the Nuclear Energy (NE) program is to advance nuclear power as a resource capable of contributing to meeting the Nation's energy supply, environmental, and national security needs. To ensure that nuclear energy remains a viable energy option for the Nation, NE supports research, development, and demonstration activities, if appropriate, which are designed to resolve the technical, cost, safety, waste management, proliferation resistance, and security challenges of increased use of nuclear energy. NE leads the Federal research effort to develop nuclear energy technologies, including generation, safety, waste storage and management, and security technologies to help meet energy security, proliferation resistance, and climate goals.

Within the Nuclear Energy Appropriation, NE funds the following major programs: SMR Licensing Technical Support, Reactor Concepts Research, Development and Demonstration, Fuel Cycle Research and Development, Nuclear Energy Enabling Technologies, Radiological Facilities Management, Idaho Facilities Management, Idaho Safeguards and Security (S&S), International Nuclear Energy Cooperation, Program Direction and the Supercritical Transformational Electric Power Generation (STEP) demonstration.

A prerequisite to the continued use of nuclear power is public confidence in the safety of nuclear plants and commercial confidence that the plants can be operated safely, reliably and economically. The Department will explore improvements to light water reactor systems and fuel forms to further enhance safety and reliability under severe accident conditions. Our R&D efforts will be coordinated with reactor vendors, utilities, universities, regulators and the international community to ensure that lessons learned from the events at Fukushima, Japan are appropriately incorporated and that these efforts are integrated and efficient.

The safe, long-term management and disposal of used nuclear fuel and high-level radioactive waste is also critical to maintaining nuclear power as part of our diversified clean-energy portfolio. In January 2013, the Administration released its *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*. This Strategy lays out a broad outline for a stable, integrated system capable of transporting, storing, and disposing of high-level nuclear waste from civilian nuclear power generation, defense, national security and other activities. Full implementation of the Strategy's principles and components requires new legislation; however the Department continues to lay the groundwork for implementation within existing authorities. In FY 2015 through NE's Used Fuel Disposition subprogram the Department is allocating $30 million, including $24M from the Nuclear Waste Fund, for generic process development and other non-R&D activities related to activities related to storage, transportation, disposal, and consent-based siting and $49 million for related generic R&D.

To support the nuclear waste management program over the long term, reform of the current funding arrangement is necessary and the Administration believes the funding system should consist of the following elements: ongoing discretionary appropriations, access to annual fee collections provided in legislation either through their reclassification from mandatory to discretionary or as a direct mandatory appropriation, and eventual access to the balance or "corpus" of the Nuclear Waste Fund. The FY 2015 Budget includes a proposal to implement such reform. Discretionary appropriations are included and continue for the duration of the effort. In FY 2015 these funds are in the Used Fuel Disposition subprogram. Discretionary funding would support expenses that are regular and recurring, such as program management costs, including administrative expenses, salaries and benefits, studies, and regulatory interactions. Mandatory appropriations in addition to the discretionary funding are proposed to be provided annually, beginning in 2018, to fund the balance of the annual program costs. The sooner that legislation enables progress on implementing a nuclear waste management program, the lower the ultimate cost will be to the taxpayers.

Highlights and Major Changes in the FY 2015 Budget Request

<u>Supercritical Transformational Electric Power Generation (STEP)</u>

Supercritical Carbon Dioxide (SCO2) Brayton cycle energy conversion is a transformative technology that offers significant improvements in energy and environmental performance over the steam-Rankine cycle, which is used for roughly 80% of the world's electricity generation. The higher thermal efficiency of the SCO2 cycle could produce a 40% reduction in fuel

consumption and emissions, a 95% reduction in cooling water consumption, or a 60% increase in electricity generation for a constant heat input when used in appropriate applications.

The Supercritical Transformational Electric Power Generation (STEP) project, funded within NE and coordinated among the Offices of Nuclear Energy, Fossil Energy, and Energy Efficiency and Renewable Energy, is a pilot-scale cost-shared demonstration project to accelerate pre-commercial development and validation of advanced Supercritical Carbon Dioxide (SCO2) Brayton cycle energy conversion technology. The STEP project is part of a new collaborative effort in the Department focused on the research, development, and demonstration of supercritical carbon dioxide technologies with the potential for significant improvements in energy and environmental performance over current power generation systems.

Nuclear Energy University Program

NE designates up to 20 percent of the funds appropriated to its R&D programs to be applied to university-led R&D and associated infrastructure projects to be performed at universities and collaborating research institutions. These R&D projects are awarded through an open, competitive solicitations process; and managed by the Nuclear Energy University Programs (NEUP).

(dollars in thousands)

	FY 2013 Current	FY 2014 Current	FY 2015 Request
Reactor Concepts Research, Development and Demonstration	20,847	19,519	19,000
Fuel Cycle Research and Development	30,036	30,239	30,200
Nuclear Energy Enabling Technologies	2,124	2,587	4,300
Total, NEUP	**53,007**	**52,345**	**53,500**

Nuclear Energy
Funding by Congressional Control ($K)

	FY 2013 Current[1]	FY 2014 Enacted[2]	FY 2014 Adjustments	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Integrated University Program	**4,677**	**5,500**	**--**	**5,500**	**0**	**-5,500**
Supercritical Transformational Electric Power Generation	**0**	**0**	**--**	**0**	**27,500**	**+27,500**
SMR Licensing Technical Support	**62,670**	**110,000**	**--**	**110,000**	**97,000**	**-13,000**
Reactor Concepts Research, Development and Demonstration	**104,780**	**112,822**	**--**	**112,822**	**100,540**	**-12,282**
Fuel Cycle Research and Development	**169,896**	**186,205**	**--**	**186,205**	**189,100**	**+2,895**
Nuclear Energy Enabling Technologies	**67,904**	**71,109**	**--**	**71,109**	**78,246**	**+7,137**
Radiological Facilities Management	**65,370**	**24,968**	**--**	**24,968**	**5,000**	**-19,968**
Idaho Facilities Management						
Operations & Maintenance	144,981	179,878	--	179,878	180,541	+663
13-D-905, Remote Handled Low-Level Waste Disposal Project, INL	0	16,398	--	16,398	5,369	-11,029
Subtotal, Idaho Facilities Management	**144,981**	**196,276**	**--**	**196,276**	**185,910**	**-10,366**
Idaho Sitewide Safeguards and Security[3]	**0**	**94,000**	**--**	**94,000**	**104,000**	**+10,000**
International Nuclear Energy Cooperation	**2,806**	**2,496**	**--**	**2,496**	**3,000**	**+504**
Program Direction	**85,118**	**90,000**	**--**	**90,000**	**73,090**	**-16,910**
Subtotal, Nuclear Energy	**708,202**	**893,376**	**--**	**893,376**	**863,386**	**-29,990**
Transfer from Department of State	227					
Use of Prior Year Balances	0	-5,000	--	-5,000	0	+5,000
Total, Nuclear Energy	**708,429**	**888,376**	**--**	**888,376**	**863,386**	**-24,990**
Federal FTEs	**403**	**418**	**--**	**418**	**418**	**+0**

SBIR/STTR:

- FY 2013 Transferred: SBIR: $9,540; STTR: $1,237
- FY 2014 Projected: SBIR $9,524; STTR: $1,360
- FY 2015 Request: SBIR $9,799; STTR: $1,351

[1] Funding reflects the transfer of SBIR/STTR to Science.
[2] FY 2014 Enacted column reflects a rescission of $814,100,000 as identified within Section 317 of Public Law 113-76.
[3] Funded within Other Defense Activities in FY 2013.

Integrated University Program

Overview

No funding is being requested in FY 2015 for the Integrated University Program (IUP).

In FY 2014, $5.5 million was provided consistent with the Omnibus Appropriation. Funding will be used to support nuclear science and engineering by fully funding up to 70 single-year scholarships and 30 multi-year fellowships in nuclear energy related fields of study as well as investigate nuclear trade craft workforce needs in both the civilian and government nuclear sectors.

All awards under this program are fully funded in the year funding was received. As a result, multi-year student research fellowships do not require support by out-year funds after the appropriation year.

Integrated University Program
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Integrated University Program					
Integrated University Program	**4,677**	**5,500**	**5,500**	**0**	**-5,500**
Total, Integrated University Program	**4,677**	**5,500**	**5,500**	**0**	**-5,500**

Integrated University Program

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Fund up to 70 new scholarships and 30 new multi-year fellowships to support nuclear science and engineering. Continue FY 2012 and FY 2013 multi-year fellowships. Investigate nuclear trade craft workforce needs.	No new FY 2015 funded activities. Continue FY 2012, FY 2013 and FY 2014 multi-year fellowships.	No new FY 2015 funds are being requested.

SMR Licensing Technical Support

Overview

The development of clean, affordable nuclear power options is a key element of the Department of Energy's Office of Nuclear Energy (DOE-NE) *Nuclear Energy Research and Development Roadmap.* As a part of this strategy, a high priority of the Department has been to help accelerate the timelines for the commercialization and deployment of small modular reactor (SMR) technologies through the SMR Licensing Technical Support program. The mission of the program is to support first-of-a-kind costs associated with design certification and licensing activities for SMR designs through cost-shared arrangements with industry partners (industry contributions are a minimum of 50% of the cost) to promote the commercialization and deployment of SMRs that can provide safe, clean, affordable power. If industry chooses to widely deploy these technologies in the United. States (U.S.)., they could help meet the Nation's economic, energy security and climate change goals. The Energy Department's cooperative agreements awarded under this program require that the reactors be built domestically – strengthening American manufacturing capabilities and creating important export opportunities for the United States.

SMR Licensing Technical Support is a $452 million, six-year (through 2017) program. The Department has made two awards under this program under two separate Funding Opportunity Announcements (FOAs).

In November 2012, the Department selected the Generation mPower team under the initial SMR FOA. Generation mPower is an industry partnership consisting of Babcock & Wilcox, Bechtel International, and the Tennessee Valley Authority (TVA). The goal of the cost-shared arrangement is to support the development of the mPower SMR design, and the technical information for certification and licensing documentation that would lay the groundwork for SMR deployment at the TVA-owned Clinch River site near Oak Ridge, Tennessee. DOE determined that the Generation mPower team was the most capable applicant, had the most mature SMR design, and had the best chance to accomplish the program mission and help gain insights to help address the generic issues that will face the SMR class of reactors. Under the initial SMR FOA, the Generation mPower team has developed a comprehensive integrated schedule that outlines the engineering development needed to address the NRC requirements for certification and licensing. These activities are being conducted and completed on a schedule that supports TVA obtaining certification and license approvals in the 2018-19 timeframe and deployment by TVA in the 2022 timeframe.

A second FOA solicited innovations that can improve SMR safety, operations and economics through lower core damage frequencies, longer post-accident coping periods, enhanced resistance to hazards presented by natural phenomena, and potentially reduced emergency preparedness zones or workforce requirements. The initial FOA provided cost-shared technical support for both the design certification and construction and operating license applications because DOE believed that would best serve to establish the licensing blueprint for subsequent SMR license applications. The 2nd FOA provides funding only for the selected vendor organization to execute the first-of-a-kind engineering, design development, and associated design certification application and approval efforts because it targets more innovative designs that are in earlier stages of development.

In December 2013, DOE selected NuScale Power for negotiation of the second SMR Licensing Technical Support award. The NuScale Power design represented the best option available that met the criteria for both innovation and deployment potential. The NuScale design is an innovative, factory-built, transportable, scalable SMR technology that is expected to achieve levels of safety performance exceeding currently certified reactor designs. NuScale Power has developed a comprehensive schedule that describes the activities required to design, engineer and produce the certification documentation to meet the goals outlined in the FOA. The Department is currently determining plans for the outyear funding allocation between the selected SMR designs based on project requirements.

In order to ensure that expected progress is being made on the projects, the program has established a methodology to track progress on spend rates and milestones to ensure effective use of funds to support achievement of program goals. This effort involves industry partner reporting of performance data into a DOE-owned project management system. DOE oversight involves:

- Ensuring industry partners are completing engineering and testing efforts in a timely manner to support licensing efforts.
- Ensuring that industry partners are preparing high quality certification and license applications to facilitate efficient NRC reviews.

- Ensuring early engagement of NRC to address long-lead items on the critical path to licensing and deployment.

In addition to the specific industry partnerships, the Department will support several focused projects that will provide generic benefit to the SMR industry by addressing issues common to SMR designs and providing tools to facilitate commercialization and deployment. In prior years, DOE supported the following activities that were considered supportive of the overall goals of the SMR LTS program:

- SMR economic studies – studies that provided an understanding of anticipated SMR overnight costs and a basis for expectations for cost reductions based on manufacturing learning.
- SMR User Requirements Document - provided a user framework for utilities interested in deploying SMRs in the future.
- SMR Site Characterization studies – provided an understanding of the siting potential for SMR designs by identifying a plant parameter envelope specific to SMR characteristics, including water usage, underground siting, seismic robustness, and many others.

These efforts have typically been modest investments and in some cases, cost-shared, but with high returns. In FY 2015, the SMR LTS program management will be considering additional efforts that may be able to provide some value to the overall program goals within the constraints of the program budget.

Highlights of the FY 2015 Budget Request

This request supports the award to NuScale Power under the 2nd SMR FOA in addition to continuation of the mPower project. These awards will provide no more than 50% Government cost share with the selected vendor partners. DOE believes that the addition of the NuScale Power award will provide a much-needed innovative technology option for our domestic utilities and will accelerate the international competitiveness and export potential of our domestic SMR designs. A total program funding level of $452M will adequately accelerate the licensing and certification efforts of our industry partners.

SMR Licensing Technical Support
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
SMR Licensing Technical Support					
SMR Licensing Technical Support	62,670	110,000	110,000	97,000	-13,000
Total, SMR Licensing Technical Support	**62,670**	**110,000**	**110,000**	**97,000**	**-13,000**

SMR Licensing Technical Support
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
SMR Licensing Technical Support: The decrease from $110,000,000 to $97,000,000 is consistent with the funding requirements for both of the SMR licensing projects. In FY 2015, the mPower engineering and design requirements will decrease as it is expected B&W will have submitted to the NRC the design certification documentation and will be in a mode of responding to NRC requests for additional information. At the same time, NuScale will be ramping up efforts to complete their design certification application for submittal to the NRC. The $97 M Government share is adequate to meet the spend plans for both of the cooperative agreement recipients.	**-13,000**
Total, SMR Licensing Technical Support	**-13,000**

SMR Licensing Technical Support

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
SMR Licensing Technical Support		
Award #1: Generation mPower: • The Generation mPower SMR Project will continue design development, design certification and license applications for submittal to NRC. • TVA completes site characterization activities for the Clinch River site. Award #2: NuScale Power: • NuScale Power selected under the second SMR FOA. • NuScale continue activities related to SMR design, engineering and certification application development. • DOE establishes cooperative agreement with NuScale Power. Program Management: • DOE will conduct on-going project management review and hold periodic program status meetings with all industry partners to ensure adequate progress against milestones established in cooperative agreements. • DOE will continue analysis and studies important to improving SMR licensing and commercialization potential.	• Submit mPower Fuel System Design Evaluation Topical Report to NRC. • Generation mPower completes Nuclear Steam Supply System Design. • Generation mPower completes design certification documentation and submits certification application to the NRC. • TVA continues Clinch River Site environmental report requirements. • TVA submits construction permit application to NRC. • NuScale Power continues activities to design, engineer and develop certification documentation. • NuScale Power completes helical coil steam generator testing. • NuScale Power submits final fuel design report to the NRC. • DOE will conduct on-going project management review and hold periodic program status meetings with all industry partners to ensure adequate progress against milestones established in cooperative agreements. • DOE will continue analysis and studies important to improving SMR licensing and commercialization potential.	Funding reduction is consistent with the level of activity expected in FY 2015 between the 2 industry partners. The bulk of the funding will be allocated to the NuScale effort as they begin to finalize the design, engineering and licensing efforts required to complete the DCA. At the same time, B&W will be spending at a lower rate as they will have submitted their DCA and be in a mode of comment and response with the NRC.

Supercritical Transformational Electric Power Generation Initiative

Overview

The Supercritical Transformational Electric Power Generation (STEP) initiative is a collaborative DOE project to develop and scale up advanced Supercritical Carbon Dioxide (sCO_2) Brayton cycle energy conversion technology to pre-commercial pilot demonstration level to facilitate commercial development. This initiative is developing a transformative technology that has the potential to significantly reduce costs of energy production by dramatically improving the efficiency of converting energy from heat to electricity. This energy conversion system is a technology that offers significant improvements in performance over the steam-Rankine cycle, which is used for roughly 80% of the world's electricity generation. The potential benefits could include: a 40% reduction in fuel consumption and emissions, a 95% reduction in cooling water consumption, or a 60% increase in electricity generation. These improvements would make renewable and advanced nuclear energy technologies more cost competitive and could reduce emissions from fossil sources. Maturing this promising technology supports our "all of the above" energy strategy. If industry were to commercialize and deploy the matured technology, it could contribute towards meeting national climate and energy goals, would promote domestic job creation, and facilitate industrial competitiveness. STEP is a DOE initiative that is intended to provide additional support needed to encourage further technology development and near-term commercialization of sCO_2 Brayton cycle energy conversion technology.

STEP initiative builds upon existing DOE R&D projects of multiple DOE offices with the intention to collaborate with industry through issuance of Funding Opportunity Announcements (FOA) to establish cost-shared agreements to further develop the next generation of sCO_2 Brayton cycle power systems. While the power generation industry has shown interest in the sCO_2 cycle, cost-shared development is needed to move the technology forward. In addition to STEP, program-specific sCO_2 Brayton cycle energy R&D activities for FY 2015 are funded within each office's respective budget request.

A unique aspect of this conversion technology is that it can be used by nuclear, solar and fossil energy plants to improve their energy generation efficiency. As a result, this will be a collaborative DOE project among the Offices of Fossil Energy (FE), Energy Efficiency and Renewable Energy (EERE), and Nuclear Energy (NE) to further develop the technology by establishing cost shared pre-commercial pilot demonstration, while continuing to leverage the technical expertise and capabilities of the national laboratories. For organizational simplicity, NE will coordinate activities across energy domains as appropriate. The STEP initiative will focus on sCO_2 components and technologies common to solar, nuclear, fossil, and geothermal heat sources to secure end-user confidence for a commercial sCO_2 power cycles.

The sCO_2 Brayton cycle energy conversion system transforms heat energy to electrical energy through use of a gas medium rather than through steam and water (Rankine cycle) and has the potential to reach greater efficiencies (up to 50%) over the Rankine cycle, which has traditionally demonstrated 33% efficiency. Energy Information Administration estimates U.S. energy consumption growth of 0.3% per year from 2011 to 2040; leading to energy need of 107.6 quadrillion Btu in 2040. The implications of a significantly higher-efficiency power cycle are immense, representing both a multi-billion dollar market and billions of dollars in potential savings. Furthermore, the relatively high density of sCO2 leads to compact turbomachinery of significantly reduced size compared to an equivalent steam cycle, leading to reduced capital costs. Through this initiative, DOE and the United States have a unique opportunity to position themselves on the forefront of next generation power generation technology. The STEP innovation would maintain American advantages in turbomachinery technology, and provide strategic growth opportunities for domestic manufacturers.

Currently, the technology development risk for a large scaled sCO_2 power turbine is too high for the private sector to independently undertake on its own. Development and deployment work to date has been limited to small scale (250KWe –1MWe), government-funded initiatives. No commercial sCO_2 facility exists at temperatures greater than 700°C and pressures higher than 35 MPa. While smaller, low-efficiency sCO_2 systems are being developed by the private sector, federal involvement is required to demonstrate a larger scale high-efficiency Recompression Closed Brayton Cycle. The goal of this collaborative effort is to work with industry through a competitive, cost-shared FOA to develop and establish a demonstration of the technology at the pilot scale in order to facilitate commercialization. STEP would spur the development of the necessary designs, materials, components, operation and control systems, sensors, and understanding and characterization for large scale sCO_2 power conversion. The demonstration, designed to be scalable and operated under commercially-relevant conditions, would be supportive of DOE's mission and extremely valuable to the nation.

In 2015, an FOA will be released for 50/50 cost-shared development of a pilot scale (nominally $10MW_e$) sCO_2 demonstration facility. The FOA will be based on Department wide R&D programs and leverage activities conducted at DOE national

laboratories. DOE may make multiple awards if more than one application of sufficient merit is received and it is determined that more than one team could be capable of making progress on the completion of a sCO_2 demonstration at the pilot (nominally $10MW_e$) scale. The Department may decide to issue this award in multiple stages to promote innovative designs that may improve efficiency and reduce cost while maintaining safety. The STEP program will establish and track progress on milestones in all tasks to ensure effective use of funds to support achievement of the initiative's goal. This oversight will involve ensuring industry partners are completing engineering and testing efforts in a timely manner. Federal oversight of this initiative will be a joint effort between FE, NE, and EERE, which includes both solar and geothermal offices.

The desired end point for this initiative is a pilot demonstration to collect test data from a scalable (nominally $10MW_e$), recompression cycle that clearly demonstrates improved efficiencies with dry cooling, reliability, and ultimately reduces energy costs. Detailed program planning activities will occur in FY 2015.

Highlights of the FY 2015 Budget Request

This STEP generation initiative will develop and scale up advanced Supercritical Carbon Dioxide Closed Brayton Cycle technology to a pilot demonstration that can serve as a launching point for commercial development of the respective energy applications. Current R&D projects have used smaller size systems to prove, validate and reduce cost; however this has limited the ability to develop full scale systems. Developing a pilot scale (nominally $10MW_e$) system will be applicable for smaller geothermal, solar, and nuclear applications, in addition to supporting a direct scale-up for fossil and larger applications.

In FY 2015 it is proposed that DOE:

- Establish an FOA for Industry support of development of a pre-commercial sCO_2 pilot demonstration.
- Award the FOA.
- Detailed program planning.

The STEP initiative is a part of the broader Supercritical Carbon Dioxide electricity production technology crosscutting collaboration within DOE, which includes continued program-specific sCO_2 Brayton cycle energy R&D activities included within each office's respective FY 2015 budget request. These program specific activities will help to define the operating parameters and conditions that are necessary considerations for the STEP initiative. These activities will be fully integrated and coordinated with the STEP initiative and include:

- The Office of Energy Efficiency and Renewable Energy, Solar Energy Technologies - continues to develop and demonstrate a 1 MW_e simple-cycle test loop, to be completed by FY 2015. In addition, funds have also been committed to the development of sCO_2 solar receivers and to study the degradation mechanisms of sCO_2 containment materials ($25M).
- Office of Nuclear Energy, Office of Reactor Concepts RD&D - previous investments have culminated in a 250 kW_e proof-of-principle RCBC test loop at Sandia National Laboratories. Work on primary heat exchangers and liquid sodium / sCO_2 interaction continues ($3.3M).
- Office of Fossil Energy Research and Development/Coal/Carbon Capture and Storage and Power Systems Crosscutting research - continues to investigate sCO_2 cycle modeling, analysis, determining the physical properties of sCO_2, and corrosion mechanisms for materials of sCO_2 ($2M).

Supercritical Transformational Electric Power Generation Initiative
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Supercritical Transformational Electric Power Generation Initiative					
Supercritical Transformational Electric Power Generation Initiative	0	0	0	27,500	+$27,500
Total, Supercritical Transformational Electric Power Generation Initiative	**0**	**0**	**0**	**27,500**	**+$27,500**

Supercritical Transformational Electric Power Generation Initiative
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Supercritical Transformational Electric Power Generation Initiative: The increase from $0 to $27,500,000 for a cost-shared pilot scale demonstration (nominally $10MW_e$) of advanced pre-commercial sCO_2 Brayton cycle energy conversion technology to encourage commercial development. The project will be executed through 50/50 cost-shared cooperative agreements. While responsibility for this collaborative effort will be led by the Office of Nuclear Energy, activities will be coordinated and fully integrated across the applied energy programs, as appropriate.	**+27,500**
Total, Supercritical Transformational Electric Power Generation Initiative	**+27,500**

Supercritical Transformational Electric Power Generation Initiative

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Supercritical Transformational Electric Power Generation Initiative		
No activities.	• Establish and announce FOA for industry support. • Review FOAs for industry support applications. • Award one or more FOAs for industry support.	Initiate efforts for scale demonstration.

Reactor Concepts Research, Development and Demonstration

Overview

The Reactor Concepts Research, Development and Demonstration (RD&D) program is designed to develop new and advanced reactor designs and technologies that advance the state of reactor technology, to improve its competitiveness, and help advance nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs. Program activities are designed to address technical, cost, safety and security issues associated with advanced reactor technologies such as liquid metal-cooled, liquid salt-cooled, high temperature gas-cooled reactors (HTGRs) and others.

Additionally, Reactor Concepts RD&D will conduct research and development (R&D) on advanced technologies to support life extensions of Light Water Reactors (LWRs) and address the impacts of the Fukushima accident with a focus on enhancing the accident tolerant characteristics of reactors and their operation.

In maximizing the benefits of nuclear power, work must be done to address the following challenges:

- Improving affordability of nuclear energy;
- Addressing the management of nuclear waste;
- Minimizing proliferation risks of nuclear materials; and
- Further enhancing safety and incorporating lessons learned from Fukushima.

Highlights of the FY 2015 Budget Request

Light Water Reactor Sustainability

The Light Water Reactor sustainability (LWRS) subprogram is focusing research on material aging issues where research results will help support subsequent license renewal applications expected from industry in the 2016 to 2018 time period. Activities in the Reactor Safety Technologies area have been expanded to address lessons learned from the Fukushima Daiichi accident, particularly in understanding and managing Severe Accident (SA) events. These include evaluation of SA instrumentation needs to better monitor and manage SAs, computer analysis of SA progression, and preparation and planning efforts in support of eventual examination of the damaged reactors.

Advanced Reactor Technologies

The Advanced Reactor Technologies (ART) subprogram reflects the consolidation of the Advanced Small Modular Reactor (AdvSMR) R&D and the Advanced Reactor Concepts (ARC) subprograms. This consolidation will allow better integration of R&D activities and use of a portfolio approach with an emphasis on long-term activities and collaborations with industry and international partners. The consolidated program will continue R&D on advanced reactor technologies and will support work on generic topics that can apply to various advanced reactor concepts. This consolidated program focuses on efforts in the following areas: advanced reactor coolants, safety and technology for advanced reactors, advanced energy conversion, advanced instrumentation and controls, support the Nuclear Regulatory Commission (NRC) in the development of an advanced reactor licensing framework, liquid metal reactor component testing, TRISO fuel and graphite material qualification, advanced materials development and codification, continued international collaborations, and industry supporting research. Research results from this program are expected to help reduce design and construction costs, contribute data to the technical bases for the operation of safety systems, improve proliferation resistance, and provide critical insights to help solve key feasibility and performance challenges.

Reactor Concepts Research, Development and Demonstration
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted[2]	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Reactor Concepts Research, Development and Demonstration					
Advanced Small Modular Reactor R&D	22,909	22,964	22,964	0	-22,964
Next Generation Nuclear Plant Demonstration Project	38,056	0	0	0	0
Light Water Reactor Sustainability	23,481	29,953	29,953	30,300	+347
Advanced Reactor Technologies (formerly Advanced Reactor Concepts and beginning in FY 2015 also incorporates AdvSMR R&D activities)	20,334	59,905	59,905	70,240	+10,335
Total, Reactor Concepts Research, Development and Demonstration	**104,780**	**112,822**	**112,822**	**100,540**	**-12,282**

SBIR/STTR:

- FY 2013 Transferred: SBIR $2,918; STTR: $378
- FY 2014 Projected: SBIR $3,159; STTR: $451
- FY 2015 Request: SBIR $2,916: STTR: $402

[1] Funding reflects the transfer of SBIR/STTR to Science.

[2] FY 2014 Enacted column reflects a rescission of $178,400 as identified within Section 317 of Public Law 113-76.

Reactor Concepts Research, Development and Demonstration
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Advanced Small Modular Reactors R&D: The decrease from $22,963,688 to $0 reflects the consolidation of activities into the ART subprogram.	**-22,964**
Light Water Reactor Sustainability: The increase from $29,952,637 to $30,300,000 reflects expanded activities in the Reactor Safety Technologies area to address lessons learned from Fukushima Daiichi to better understand and manage severe accidents.	**+347**
Advanced Reactor Technologies (formerly Advanced Reactor Concepts): The increase from $59,905,275 to $70,240,000 reflects the consolidation of the former ARC subprogram with the AdvSMR R&D subprogram. The consolidated subprogram's request now incorporates the AdvSMR subprogram with enacted FY 2014 funding of $22,963,688 and the ARC subprogram with enacted FY 2014 funding of $59,905,275. The overall decrease in the consolidated program's funding from $82,868,963 in FY 2014 to $70,240,000 reflects a reduction of $12,628,963 provided in FY 2014 to fully fund a multi-year industry only R&D competition which is not being requested in FY 2015 and other minor efficiencies obtained through the sub-program consolidation.	**+10,335**
Total, Reactor Concepts Research, Development and Demonstration	**-12,282**

Reactor Concepts Research, Development and Demonstration
Advanced Small Modular Reactor R&D

Description

The AdvSMR R&D subprogram will support the development of innovative SMR designs that may offer improved safety, functionality and affordability, and build upon existing nuclear technology and operating experience. The program supports laboratory, university and industry projects to conduct nuclear technology R&D, including the development of codes and standards, novel sensors, control systems for multiple units, and other technologies that are unique and would be useful to support development of advanced SMR concepts for use in the mid-to long-term. Emphasis is on advanced reactor technologies to support advanced small reactors that offer simplified operation and maintenance for distributed power applications, more efficient energy conversion and increased proliferation resistance and security.

R&D activities within the AdvSMR subprogram will follow a stepwise process that includes feedback and a focus on efficiency and cost-effectiveness. All activities will be reviewed, revisited, and revised as necessary in the annual budget development and program planning processes.

In FY 2015, the AdvSMR subprogram is being consolidated into the ART (formerly Advanced Reactor Concepts (ARC)) subprogram.

Advanced Small Modular Reactor R&D

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Advanced Small Modular Reactor R&D		
• Advanced Reactor Generic Technologies – Conduct heat exchanger development for Brayton Cycle Energy Conversion. Conduct SMR workshops to review and update R&D plans for materials, fuels, instrumentation and control (I&C) and Human Machine Interface. • Advanced Reactor Regulatory Framework – Provide technical reports on General Design Criteria (GDCs) related issues for advanced reactor technology as input for NRC staff's development of its regulatory framework and guidance. Conduct analysis of the potential for reduced staffing to meet NRC criteria (human factors for security, operations and maintenance) requirements. • Advanced Reactor System Studies – Conduct Economic Analysis Study including capital, operations and fuel costs for SMR types.	• Activities are included in the Advanced Reactor Technologies (ART) (formerly Advanced Reactor Concepts (ARC)) subprogram.	The decrease reflects the transfer of activities to the ART (formerly ARC) subprogram.

Reactor Concepts Research, Development and Demonstration
Light Water Reactor Sustainability

Description

The existing U.S. commercial nuclear fleet has an excellent safety and performance record and today accounts for about 20% of the U.S. electricity supply and more than 60% of the low greenhouse-gas-emitting, domestic electricity production. However, with the 60-year operating licenses beginning to expire (no later than 2029) and the long planning horizon required to place new generation capabilities in service; utilities are beginning the planning process to obtain a license for operation of existing nuclear plants beyond 60 years or for baseload replacement power. The first relicensing applications are expected in the 2016 to 2018 time frame. Replacing the current 100-GWe fleet with new nuclear plants would cost hundreds of billions of dollars and replacement with traditional fossil plants would lead to significant increases in carbon dioxide emissions. Extending operating licenses beyond 60 years would enable existing plants to continue to provide safe, clean, and economical electricity without significant greenhouse gas emissions, while reducing the pressure to bring new non-greenhouse-gas-emitting capacity on line. The LWRS program has partnered with industry and the NRC to closely coordinate research needs and share costs. Industry will primarily address the near-term research needs and the LWRS program, along with industry and the NRC, will make progress on the long-term research needs. This research will form the technical basis for age-related material degradation management and inform major component refurbishment and replacement strategies related to Instrumentation and Control systems, and safety margin characterization. Given the nature of the work done by this program cost-sharing is of particular importance. The program will ensure appropriate cost-sharing arrangements for its activities according to Section 988 of the Energy Policy Act of 2005. Cost-sharing with industry is currently conducted primarily through specifically identified coordinated or collaborative research projects with the Electric Power Research Institute as documented in a joint research and development plan. Cost sharing with other industry partners is documented in project work agreements.

After the Fukushima Daiichi accident the nuclear community has been reassessing safety assumptions and nuclear plant safety performance. As a part of this, NE has initiated research within the LWRS program to develop a fuller understanding of the accident and its consequences with an eye toward how technological advancements can help address emergent safety concerns. Research activities include assessing the validity of modeling and simulation tools using information from Fukushima; working with industry to develop new technologies that could be used to prevent accidents, mitigate consequences, or provide reliable information during accidents; and working with Japan and the international community to conduct forensics on the Fukushima event and provide data to industry so that they can incorporate lessons learned and improve safety. These activities are expected to lead to the enhancement of the accident tolerance of current and future light water reactors and the enhancement of accident response capabilities.

Execution of the LWRS subprogram activities will follow a stepwise process that includes feedback, critical industry involvement and cost-sharing, and a focus on efficiency and cost-effectiveness to ensure maximum usefulness and applicability of results. All activities will be reviewed, revisited, and revised, as necessary, in the annual budget development and program planning processes.

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Light Water Reactor Sustainability		
• Materials Aging and Degradation Assessment - Conduct analysis of irradiation-assisted stress corrosion cracking data and develop mechanistic understanding. Develop an approach to assess the continued-service risk for plants with degraded concrete components. Harvest reactor vessel steel and other material samples from the shutdown Zion plant. Conduct initial demonstration of solid state and laser weld repair tests on irradiated stainless steel specimens. Laboratory-scale demonstration of new non-destructive examination techniques for concrete and reactor pressure vessel inspections. Demonstrate component aging modeling and simulation capabilities for extended service conditions. • Safety Margin Characterization – Complete software structure of the coupled RAVEN/RELAP-7 software tool. Demonstrate the Risk-informed Safety Margin Characterization (RISMC) methodology on stakeholder-selected case studies using the completed software structure to achieve widespread stakeholder acceptance of the RISMC approach. Assess leading accident resistant fuel technologies to understand changes in safety margin using the RISMC methodology. Develop advanced safety analysis methods related to seismic and severe accident scenarios. • Instrumentation and Controls - Complete	• Materials Aging and Degradation Assessment – Develop a mechanistic understanding of irradiation-assisted stress corrosion cracking (IASCC) including crack initiation, swelling, and phase transformations. Assess the long-term performance of cables and concrete, including the collection of samples from aging plants. Develop new non-destructive examination (NDE) techniques for concrete and cables. Conduct irradiation effects experiments on concrete. Collect data on the thermal aging of cast stainless steels in service beyond 40 years. Develop a mechanistic understanding of environmental fatigue. Develop a mechanistic model for reactor pressure vessel (RPV) irradiation attenuation effects through the vessel wall. • Safety Margin Characterization – Work with industry to demonstrate the use of the coupled RELAP-7/RAVEN software safety analysis tool. Demonstrate the use of the Risk-informed Safety Margin Characterization (RISMC) methodology to conduct safety margin quantifications of boiling water reactor station blackout scenarios. Expand the Grizzly component aging model to include concrete degradation. • Instrumentation and Controls - Complete human factors evaluations and guidance for pilot plant projects related to the use of computer based procedures; the use of mobile technologies that support real-time automated field work packages; and an advanced alarm system. Continue work on a prototype hybrid (analog and digital) control room design. Initiate new pilot plant projects on the use of advanced on-line monitoring systems and advanced outage risk monitor systems. • Systems Analysis and Emerging Issues – Address emerging issues that could influence the continued viability of the existing nuclear power plants, such as water usage issues and economic viability assessments. • Reactor Safety Technologies – Perform a severe accident	The increase reflects expanded Reactor Safety Technologies activities such as evaluation of Severe Accident (SA) instrumentation needs, computer analysis of SA progression and preparation and planning efforts in support of eventual examination of the damaged reactors.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
human factors evaluations and guidance for deployment of automated field activity work packages using mobile technologies. Complete guidance for advanced outage control centers to improve outage coordination, emergent issue resolution, and outage risk management. Publish a technical report on measures, sensors, algorithms, and methods for large active component diagnostic and prognostics monitoring technologies. • Systems Analysis and Emerging Issues - Participate in Japanese-led international effort to analyze the accident and develop a sampling and examination plan for collecting key data from the Fukushima Daiichi reactors. Continue research on the survivability of instruments during severe accidents In support of Fukushima lessons learned.	instrument needs evaluation for all major domestic plant types and identify instrument research gaps. Initiate research into seismic base isolation system to improve plant response to seismic events. Develop severe accident models and test plans for molten core experiments. Conduct failure evaluation of safety components under severe accident conditions. Initiate research on new technologies that could be used to prevent accidents, mitigate consequences, or provide reliable information during accidents. In collaboration with Japan and the international community, develop a plan for inspection of damaged Fukushima Daiichi reactors and associated systems.	

Reactor Concepts Research, Development and Demonstration
Advanced Reactor Technologies

Description

The Advanced Reactor Technologies (ART) subprogram represents the renaming of the former ARC subprogram and consolidation with the former AdvSMR subprogram activities. The ART subprogram will support the development of innovative reactor technologies that may offer improved safety, functionality and affordability, and build upon existing nuclear technology and operating experience. The subprogram supports research to reduce long-term technical barriers for advanced nuclear energy systems addressing advanced reactor technologies. The subprogram will continue support for international activities in the Generation IV International Forum, and international collaborations on advanced reactor operations and safety. This subprogram will be focused on high value research for long term concepts, R&D needs of promising mid-range concepts, the development of innovative technologies that benefit multiple concepts, and stimulation of new ideas for transformational future concepts. Near-term emphasis is on advanced reactor components and technologies to support advanced small modular reactors which could be manufactured in a factory and shipped to the site and that offer simplified operation and maintenance for distributed power applications. The subprogram also supports R&D for more efficient energy conversion, increased proliferation resistance and security. In addition, the ART program supports laboratory/university and industry projects to conduct nuclear technology R&D, including the development of codes and standards, sensors and instrumentation, control systems for multiple units, probabilistic risk assessments (PRA) methods, and other technologies that are unique and would be useful to support development of advanced concepts.

Advanced reactor technologies considered in this program reside at different maturity levels. R&D efforts are mainly focused on three advanced concepts: liquid metal-cooled fast reactors, including sodium-cooled fast reactors (SFRs), fluoride salt-cooled high-temperature reactors (FHRs), and high temperature gas-cooled reactors (HTGR), which includes R&D for high-temperature reactors including qualification of TRISO coated particle fuel and graphite used in both FHRs and HTGRs. In addition, R&D that could provide wide benefits is being pursued with a view to application in many different reactor technologies. The ART subprogram 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. The ART subprogram is continuing engagement with industry by evaluating advanced reactor technologies through the Technical Review Panel (TRP) process. The program will use the TRP process to identify R&D opportunities and help inform R&D investment decisions with a view toward long term commercialization by industry.

R&D activities within the ART subprogram will follow a stepwise process that includes feedback and a focus on efficiency and cost-effectiveness to ensure maximum usefulness and applicability of results. All activities will be reviewed, revisited, and revised as necessary in the annual budget development and program planning processes.

Advanced Reactor Technologies

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Advanced Reactor Technologies		
• Fast Reactor Technologies – Continue build out of the Mechanisms Engineering Test Laboratory (METL). Continue development of advanced sensors and technology to enable in-service-inspection of systems and components within liquid metal coolant environments. Continue industry supporting R&D that aligns with the Technical Review Panel (TRP) results. • High Temperature Reactor Technologies – Complete irradiation of AGR-3/4 fuel experiment in ATR; perform limited post-irradiation examination of AGR-2 fuel; perform fuel fabrication and characterization for AGR-5/6/7 fuel qualification experiments. Prepare AGC-4 graphite experiment for irradiation in ATR. • Support international collaborations under bi-lateral agreements and Generation IV International Forum. • Make multi-year awards for an industry only R&D competition.	• Fast Reactor Technologies – Complete METL construction and commissioning. Complete engineering analyses on first gear test assembly innovations and conduct initial operational tests using METL. Complete Reactor Cavity Cooling System decay heat removal test matrix on partial and full system failures. Continue cost-shared technology development projects with industry in alignment with the TRP results. • High Temperature Reactor Technologies – Perform post-irradiation examination of AGR-2 and AGR-3/4 fuel experiments. Complete the design of the AGR-5/6/7 experiment. Perform irradiation of AGC-4 graphite experiment in ATR and perform post-irradiation examination of AGC-2 graphite experiment. • Advanced Reactor Generic Technologies – Conduct advanced reactor materials research including completion of ASME Code Qualification case proposals for selected materials and properties enhancement testing of high temperature steel. Continue development and operational performance testing on heat exchangers and modeling for high efficiency Brayton cycle energy conversion technology. Continue U.S.-China, Generation IV International Forum (GIF), and trilateral efforts on advanced reactor safety, thermohydraulics, facilities, and other collaborative research. • Advanced Reactor Regulatory Framework– Provide technical reports to NRC on General Design Criteria related topics and advanced reactor technologies to support the NRC's establishment of an advanced reactor licensing framework. Complete development of a database that captures historical SFR equipment performance data which will be used to support the risk and safety analysis of future advanced reactors. • Advanced Reactor System Studies – Continue economic analysis study including capital, operations and fuel costs.	The increase from $59,905,275 to $70,240,000 reflects the consolidation of the former Advanced Reactor Concepts (ARC) subprogram with the Advanced Small Modular Reactor (AdvSMR) R&D subprogram and a refocusing of the RD&D on advanced technologies for non-water cooled reactor systems. The consolidated subprogram's request now incorporates the AdvSMR subprogram with enacted FY 2014 funding of $22,963,688 and the ARC subprogram with enacted FY 2014 funding of $59,905,275. The overall decrease in the consolidated program's funding from $82,868,963 in FY 2014 to $70,240,000 reflects a reduction of $12,628,963 provided in FY 2014 to fully fund a multi-year industry only R&D competition which is not being requested in FY 2015, and other minor efficiencies obtained through the sub-program consolidation.

Fuel Cycle Research and Development

Overview

The mission of the Fuel Cycle Research and Development (FCR&D) program is to conduct generic research and development (R&D) and non-R&D activities related to used nuclear fuel (UNF), nuclear waste management and disposal issues and conduct R&D on advanced sustainable fuel cycle technologies that have the potential to improve resource utilization and energy generation, reduce waste generation, enhance safety, and limit proliferation risk. The program employs a long-term, science-based approach to foster innovative, transformational technology solutions to achieve this mission. Advancements in fuel cycle technologies and solutions support the enhanced availability, affordability, safety, and security of nuclear-generated electricity in the United States.

Highlights of the FY 2015 Budget Request

FCR&D's UNF Disposition subprogram will continue to conduct scientific research and technology development to enable storage, transportation, and disposal of UNF and wastes generated by existing and future fuel cycles. To support the evolution of the domestic UNF inventory, special emphasis is placed on understanding the behavior of high-burnup fuels.

In January 2013, the Administration released its *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*. Full implementation of the Strategy's principles and components requires new legislation; however the Department continues to implement elements of the Strategy where possible within existing authorities. In FY 2015 in the UNF Disposition subprogram the Department is allocating $30 million to support preliminary generic process development and other non-R&D activities related to storage, transportation, disposal, and consent-based siting, including $24 million from the Nuclear Waste Fund. In addition, the Department requests $49 million for related research and development.

To support the nuclear waste management program over the long term, reform of the current funding arrangement is necessary and the Administration believes the funding system should consist of the following elements: ongoing discretionary appropriations, access to annual fee collections provided in legislation either through their reclassification from mandatory to discretionary or as a direct mandatory appropriation, and eventual access to the balance or "corpus" of the Nuclear Waste Fund.

The FY 2015 Budget includes a proposal to implement such reform. Discretionary appropriations are included for the duration of the effort. These funds would be used to fund expenses that are regular and recurring, such as program management costs, including administrative expenses, salaries and benefits, studies, and regulatory interactions. In FY 2015 these funds will be for ongoing studies and outreach efforts associated with transportation, storage, and geologic disposal through the UNF Disposition subprogram. Mandatory appropriations in addition to the discretionary funding are proposed to be provided annually beginning in 2018 to fund the balance of the annual program costs.

Over the next 10 years the program reflected in the FY 2015 Budget begins operation of a pilot interim storage facility, advances toward the siting and licensing of a larger interim storage facility, and makes demonstrable progress on the siting and characterization of geologic repository sites.

Fuel Cycle Research and Development
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted[2]	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Fuel Cycle Research and Development					
Material Recovery and Waste Form Development	37,450	34,300	34,300	35,300	+1,000
Advanced Fuels	39,146	60,100	60,100	43,100	-17,000
Systems Analysis and Integration	21,993	19,605	19,605	18,500	-1,105
Materials Protection, Accounting. & Control Technology	6,983	7,600	7,600	7,600	0
Used Nuclear Fuel Disposition	57,848	60,000	60,000	79,000	+19,000
Fuel Resources	6,476	4,600	4,600	5,600	+1,000
Total, Fuel Cycle Research and Development	**169,896**	**186,205**	**186,205**	**189,100**	**+2,895**

SBIR/STTR:

- FY 2013 Transferred: SBIR $4,732; STTR: $613
- FY 2014 Projected: SBIR $4,374; STTR: $625
- FY 2015 Request: SBIR $4,614: STTR: $636

[1] Funding reflects the transfer of SBIR/STTR to Science.

[2] FY 2014 Enacted column reflects a rescission of $295K as identified within Section 317 of Public Law 113-76.

Fuel Cycle Research and Development
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Request
Material Recovery and Waste Form Development: The increase from $34,300,000 to $35,300,000 supports the US-Republic of Korea (ROK) Joint Fuel Cycle Studies (JFCS) for the installation of integrated, kilogram-scale electrochemical processing equipment. In general, the subprogram is shifting its focus to near-term support for the current fuel cycle and leveraging its technical expertise in material recovery to support U.S. non-proliferation goals.	**+1,000**
Advanced Fuels: The decrease from $60,100,000 to $43,100,000 reflects completion or full funding of activities related to accident tolerant fuel development in FY 2014 resulting from the increased funding provided in the FY 2014 Omnibus Appropriations.	**-17,000**
Systems Analysis and Integration: The decrease from $19,605,000 to $18,500,000 reflects the completion of the evaluation and screening of fuel cycle options in FY 2014.	**-1,105**
Used Nuclear Fuel R&D: The increase from $60,000,000 to $79,000,000 supports research and development activities required to develop the technical knowledge to support long-term storage of high-burnup fuels. Of this increase, $9M will be used to implement the adaptions that are determined to be necessary to use existing Idaho National Laboratory (INL) facilities to handle large transportation casks. Funding increases to $6M for the high-burnup, dry storage demonstration effort. It is expected that this will be the peak funding year for this effort. Other increases include progress on deep borehole demonstration activities and implementing the field tests to advance salt repository science for disposal of heat-generating waste.	**+19,000**
Fuel Resources: The increase from $4,600,000 to $5,600,000 is to investigate advanced ligand design and advanced adsorbent material for extracting uranium from seawater. The subprogram exceeded its short-term goal to double the world's best uranium adsorption capacity. There is great potential to progress beyond this goal with additional R&D into advanced techniques and materials such as nanosynthesis and nanomanufacturing techniques and computational screening tools for evaluation and rational synthesis of additional functional ligands for enhanced selectivity, capacity, durability, and kinetics.	**+1,000**
Total, Fuel Cycle Research and Development	**+2,895**

Fuel Cycle Research and Development
Material Recovery and Waste Form Development

Description

Material Recovery and Waste Form Development, formerly Separations and Waste Forms, is increasingly applying the expertise and technical capabilities to a wider array of applications than just separations. The subprogram now also leverages its expertise by working with others in areas such as environmental remediation, national security missions, as well as civilian nuclear applications.

Regarding civilian nuclear applications, our future ability to sustainably and economically recycle LWR fuels and advanced reactor fuels, if deemed cost-effective, appropriate and necessary, will depend in part on our ability to separate the various elements from the used nuclear fuel into material for reuse and material for disposal. The ability to engineer, produce, and manage fuel cycle waste forms that are chemically and structurally stable over relevant periods of time from decades to hundreds of thousands of years (depending on the radioisotope), would be critical for any advanced fuel cycle.

Material Recovery and Waste Form Development

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Material Recovery and Waste Form Development		
• Complete plans for initial integrated lab-scale testing of a separations case study for aqueous separations. • Select and refine advanced waste forms for separations a separations case study. • Perform Phase 2 of US-ROK JFCS. • Conduct focused research on advanced aqueous separations technologies. • Continue research on the next generation electrochemical separation technology. • Continue limited exploration of used fuel pretreatment technologies as a low-risk extended storage alternative.	• Develop minor actinide separation methods to support development/testing of reference process(es) for americium alone or americium and curium separation methods and of high potential alternatives that could provide significant improvement over a separation case study. • Support international collaborations with France, Japan, China, and Russia. • Develop and demonstrate alternative adsorbents for iodine (such as metal-organic framework, aerogels) and effective waste forms for iodine. Perform deep bed sorption tests for Iodine capture using a variety of sorbents to determine sorption capacities. Study the performance of iodine waste forms. • Conduct deep bed sorption tests for krypton using a variety of sorbents to determine sorption capacities. • Develop integrated off-gas flowsheet that includes tritium capture and seeks to maintain separation between iodine and tritium. • Investigate thermodynamics and kinetics of reference process(es) to better characterize operating window and optimize process performance. • Continue development of atomistic models for waste form performance over geologic timescales to include corrosion processes and radiation stability. • Continue progress on development of plant scale model framework and model integration; hydraulic modeling of centrifugal contactors, including generation of data to support model development; modeling of reference flow sheet to develop/determine waste compositions; and product compositions and waste quantities. • Begin defining and developing process parameters and testing plans for reference process(es). • Testing of solvent degradation mechanisms and products for	A high priority of the subprogram is the US-ROK JFCS. This activity receives increased funding in FY 2015 for the installation of integrated, kilogram-scale electrochemical processing equipment. In general, the subprogram is shifting its focus to near-term support for the current fuel cycle and leveraging its technical expertise in material recovery with national security programs and international collaborations to support U.S. non-proliferation goals.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
	reference processes and support international collaboration on solvent degradation with France. • Perform lab-scale chemistry testing of reference process(es) using simulants and actual fuel, perform flowsheet testing of reference processes on simulants. • Continue development of uranium/transuranic drawdown technologies on solid cathode. • Complete hot demonstration of zirconium purification from hulls. • Develop alternative glass ceramic waste forms, epsilon metals in undissolved solids and alternative crystalline ceramic waste forms. • Begin to develop engineering data for advanced processing using the cold crucible induction melter.	

Fuel Cycle Research and Development
Advanced Fuels

Description

The development of improved and advanced nuclear fuels is a major objective for both existing LWRs and the entire spectrum of advanced nuclear energy systems. The development of advanced fuels is an essential part of certain future sustainable fuel cycle options. Advanced fuels is pursuing two major paths: 1) the development of next generation LWR fuels with enhanced accident tolerance, and 2) development over the long term of transmutation fuels with enhanced proliferation resistance and resource utilization. The Advanced Fuels subprogram sustains core development and experimental capabilities in support of the nuclear reactor technologies described in the Office of Nuclear Energy's Reactor Concepts Research, Development, and Demonstration program.

In FY 2015, the program continues feasibility and assessment activities of accident tolerant fuel (ATF) and clad concepts. This includes bench-scale fuel fabrication and testing involving irradiations, steam environments, furnaces, and mechanical property testing. These feasibility and assessment activities also include establishing modeling capability for these new concepts (largely developed from existing models) as well as studies of impacts on economics, the fuel cycle, operations, safety, and the environment. These evaluations will inform decisions about future activities in this subprogram.

Advanced Fuels

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Advanced Fuels		
• Continue feasibility testing of advanced LWR fuel concepts with enhanced accident tolerance in preparation for down selection of concepts for further study. • Complete impact studies to inform decisions about next steps. • Develop additional capabilities for a science-based approach to fuel development by initiating irradiation testing of selected single-crystal uranium dioxide separate effects samples to support model development. • Conduct focused testing/examinations in support of accident tolerant fuel (ATF) concept evaluation. • Supports industry's continued participation to evaluate the feasibility of accident tolerant fuel. • Identify steady state and transient testing equipment and associated advanced instrumentation needs, conduct options evaluation and begin preliminary design. • Accelerate provision of refined data from advanced testing instrumentation and post-irradiation examination results to the NE Advanced Simulation and Modeling program. This will improve our capabilities to qualify accident tolerant fuel.	• Perform R&D across multiple laboratory organizations supporting the development of innovative accident tolerant fuel for LWRs. • Develop metrics, performance assessment, and characterization for LWR accident tolerant fuel to inform next steps for the program. • Test accident tolerant fuel irradiation capsule in the INL's Advanced Test Reactor. • Support international activities related to collaborations with Japan, France, Korea, Russia, China, and Euratom. International activities will include acquisition of neptunium dioxide (NpO2) for support to the Global Actinide Cycle International Demonstration Project. • Acquire, prepare, characterize, and maintain the uranium and actinide feedstocks. • Continue development of fabrication processes for minor actinide-bearing metal fuel. • Characterize minor actinide bearing metal alloy fuel composition for mechanical, physical, and thermal properties. • Install advanced post-irradiation examination equipment in the Irradiated Materials Characterization Laboratory at the Idaho National Laboratory.	The reduction in Advanced Fuels reflects completion or full funding for several activities related to ATF development in FY 2014 resulting from the increased funding provided in the FY 2014 Omnibus Appropriations.

Fuel Cycle Research and Development
Systems Analysis and Integration

Description

Systems Analysis and Integration subprogram provides the critical capability needed to analyze complex fuel cycle system options, assess overall performance under various scenarios, and improve understanding of the interdependencies between various subsystems and associated technologies. Systems analysis coupled with the application of the principles of systems engineering will: 1) help the program objectively and openly identify fuel cycle options worthy of further study; 2) aid identification and prioritization of the R&D needed; 3) help formulate and execute program budgets; 4) enable clearer communication of the rationale for R&D funding decisions; and 5) enhance the ability of the program to rapidly adapt to future decisions.

Hundreds of potential fuel cycle options exist within three broad fuel cycle strategies (once through, limited recycle, and full recycle). The main focus of work in this area is evaluation and screening of fuel cycle options. The screening results will be used to identify a relatively small number of those fuel cycle options that can potentially offer significant performance benefits compared to the current fuel cycle. They will be used to determine fuel cycle component technology functions and requirements to inform future research.

Systems analysis and integration provides support in knowledge management, communications, fostering innovation, project controls, and program integration.

Systems Analysis and Integration

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Systems Analysis and Integration		
• Complete and summarize fuel cycle evaluation and screening results to inform decisions about associated R&D directions. • Integrated fuel cycle analysis: develop fuel cycle data packages, perform detailed technology assessments, and develop analysis tools. • Fuel cycle evaluation and screening: identify options with highest potential and evaluate whether further research is warranted, integrate results into ongoing R&D activities. • Program support: continue information management, communications, quality assurance, knowledge management, program reviews, and innovation. • Program management: facilitate communication of guidance and technical direction to participating laboratories; coordinate the development of program R&D objectives, strategies, and activities; administer project control functions. • Continue to provide the leadership for the International Criticality Safety Benchmark Evaluation Project. • Complete independent peer review of selected subprograms. • Respond to evolving Fuel Cycle Technologies (FCT) R&D program needs for systems-level examinations of fuel cycle performance and integration of FCT	• Conduct analyses of transitions from current fuel cycles to the much smaller set of "most promising" fuel cycles as defined by the evaluation and screening activity, including both evolutionary changes and introduction of new technologies, and including economics, growth rates, extended storage, and facility deployment. • Develop communication products for the results of the evaluation and screening, focusing on the identification of potential R&D directions. • Provide for fuel cycle catalog evolution and continued development to be available to the FCR&D program as a resource of fuel cycle knowledge. • Examine the nuclear energy system impacts of using accident tolerant fuel, including the effects on resources, economics, and potential impacts to the other parts of the fuel cycle, depending on the accident tolerant fuel and the fuel cycle being considered. • Participate in international systems analysis activities, including those at the International Atomic Energy Agency and Organization for Economic Cooperation and Development/Nuclear Energy Agency. • Provide supporting analyses of fuel cycle options to evaluate: safety, reliability, system maturity, intra-system cohesion, technology adoption risks. • Prepare addendum to the Fuel Cycle Cost Basis Report. • Develop Fuel Cycle Data Packages to support population of the Fuel Cycle Catalog. • Continue to revaluate and refine the specific credible fuel cycle options working with the R&D campaigns as the FCR&D program directions are defined, and as results are obtained. • Respond to evolving FCT R&D program needs for systems-level examinations of fuel cycle performance and integration of FCT R&D program activities.	• The decrease in Systems Analysis and Integration reflects the completion of the evaluation and screening of fuel cycle options in FY 2014.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
R&D program activities. • Establish effective interactions with the R&D campaigns to ensure that the Fuel Cycle Options campaign supports the need for integrated fuel cycle analysis of fuel cycle issues important to decision- and policy-makers.		

Fuel Cycle Research and Development
Materials Protection, Accounting and Control Technology

Description

The Materials Protection, Accounting and Control Technology (MPACT) subprogram strives to develop the technologies and analysis tools to support the next generation of nuclear materials management and safeguards for future U.S. nuclear fuel cycles. It also includes assessing vulnerabilities and security of the consolidated storage of used nuclear fuel. Moving forward to address the energy security needs of the country will require innovative approaches to materials control and accounting to ensure that nuclear material is not misused, diverted, or stolen.

NE works closely with the National Nuclear Security Administration (NNSA), Department of State, and the Nuclear Regulatory Commission (NRC) on issues related to nuclear nonproliferation. NNSA has broad responsibilities in international nonproliferation and security matters for the present and into the future. MPACT is focused on R&D as it relates to potential future fuel cycle facilities here in the United States.

Challenges facing nuclear materials accountancy in general include:

- Limitations of accuracy and timeliness of detection (especially in high radiation fields)
- New reactor designs and fuel cycle concepts, which require new nuclear material management approaches (Small Modular Reactors, Gas-Cooled Reactors, Thorium, etc.)
- Traditional material control and accountability challenges, such as uncertainty in large throughput facilities

Materials Protection, Accounting and Control Technology

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Materials Protection, Accounting and Control Technology		
• Continue development and initiate testing of improved nuclear materials accountancy technologies to support electrochemical separations processes. (Results of this work will be shared under the US-ROK JFCS as appropriate.) • Complete initial assessment of reference fuel cycle technologies and establish Safeguards and Security by Design methods and guidance. • Complete detailed assessment of used fuel transportation and consolidated storage safeguards. • Develop and test innovative new methods for proliferation and terrorism risk assessment. • Support interim storage design activities to advance Safeguards and Security by Design.	• Develop analyses and technologies to address security of used fuel extended storage (publish guidance documents, develop and apply risk-informed nuclear security analytical methods, perform threat assessments, develop innovative security technologies). • Develop and demonstrate innovative new methods for proliferation and terrorism risk assessment (adversary analysis, decision analysis, game theory, and prototypic evaluations building on existing risk assessment methods). • Develop analysis tools to enable next generation nuclear materials management (fundamental models and signature development, statistical inference and methodology, facility-level performance models). • Develop and demonstrate sensors to fill gaps in nuclear materials protection, accounting and control emphasizing electrochemical processing (microfluidic sampling, potentiometric sensor, level and density sensor, product assay). • Support the Department's *Strategy for Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste* through Safeguards and Security by Design. • Test next generation nuclear materials management technologies and approaches as opportunities arise. • Address safeguards and security issues associated with technology development in other Campaigns. • Support NRC rulemaking through engagement and data generation. • Continue international engagement to help influence and support nuclear energy enterprise.	Related to proliferation risk assessment MPACT will conduct more focused studies using existing tools rather than develop new methodologies and tools. This is consistent with the findings of the 2013 National Academy of Sciences study on proliferation risk. The subprogram is increasing the demonstration of next generation nuclear materials management technologies as opportunities arise both domestically and internationally.

Fuel Cycle Research and Development
Used Nuclear Fuel Disposition

Description

This subprogram is organized into two distinct activities: 1) research and development to identify alternatives and conduct scientific research and technology development to enable storage, transportation, and disposal of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles, and 2) activities to lay the ground work and develop options for decision makers on the design of an integrated waste management system.

Work continues with strong focus on researching and developing storage, transportation, and disposal technologies for used fuel and nuclear waste. R&D efforts in these important areas began in NE in FY 2010. 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 UFD R&D encompasses these elements.

Analyses conducted in FY 2012 indicated that the current inventory of domestic UNF has significantly evolved since the first 50 years of nuclear power operation. Examination of UNF discharges in recent years indicates an increase in average burnup projected to be 50 GWd/MTU. R&D in this subprogram includes a focus on the need to develop the technical knowledge to support long-term storage and transportation of high-burnup fuels.

Also, the Department began to work in FY 2012 to lay the groundwork that could lead to one or more facilities for spent fuel management under a consent-based siting program and prepare for large-scale transport of used fuel.

In January 2013, the Administration released its *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste* and all of the activities in this subprogram support this Strategy. Full implementation of the Strategy requires legislation, however, in the meantime the Department is taking action on the Strategy to the extent possible within existing authorities.

To support the nuclear waste management program over the long term, reform of the current funding arrangement is necessary and the Administration believes the funding system should consist of the following elements: ongoing discretionary appropriations, access to annual fee collections provided in legislation either through their reclassification from mandatory to discretionary or as a direct mandatory appropriation, and eventual access to the balance or "corpus" of the Nuclear Waste Fund.

The FY 2015 Budget includes a proposal to implement such reform. Discretionary appropriations are included for this new program for the duration of the effort. These funds would be used for expenses that are regular and recurring, such as program management costs, including administrative expenses, salaries and benefits, studies, and regulatory interactions. In FY 2015 Department is requesting $30 million, including $24 million from the Nuclear Waste Fund, to support preliminary generic process development and other non-R&D activities related to storage, transportation, disposal, and consent-based siting. Mandatory appropriations in addition to the discretionary funding are proposed to be provided annually beginning in 2018 to fund the balance of the annual program costs.

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Used Nuclear Fuel Disposition		
Research and Development activities Perform R&D to support extended storage of used fuel. • Perform R&D on alternative disposal environments (modeling, evaluation and experiments). • Implement laboratory tests and modeling studies to further advance salt repository science. • Implement the field tests to advance salt repository science for disposal of heat-generating waste. • Undertake R&D as necessary to further the understanding of hydro-geochemical, physical geology, structural geology, geophysical state and engineering properties of deep crystalline rocks--borehole R&D. • Increase involvement with international organizations and groups working on the disposition of spent nuclear fuel to leverage existing international knowledge. • Perform R&D to support transportation of extended storage fuel: field testing to assess realistic loadings during transport.	*Research and Development activities* • Develop the technical knowledge and the capability to examine high-burnup UNF to support NRC licensing for long-term storage. This activity involves the following: o Initiate activities to develop capabilities to examine fuel and evaluate high-burnup fuel in long-term storage through adapting existing facilities at the Idaho National Laboratory. The adapted facilities will have the capability to examine the entire dry cask storage system (DCSS) after storage, including the fuel, cladding, assembly hardware, baskets, neutron poisons, and canister/cask and reseal the cask after examination. o Support for industry testing of canister material performance in situ at three additional independent Spent Fuel Storage installation sites in collaboration with the Electric Power Research Institute to obtain environmental samples and canister performance data. o Develop advanced instrumentation: Explore the development of nondestructive evaluation/examination and long-term online monitoring technologies for DCSS integrity assessments including crucial physical parameters such as temperature, pressure, leakage and structural integrity in general. o Conduct tests: Conduct additional shaker table tests on industry-supplied dummy fuel assemblies. Test high-burnup cladding and stainless steel canisters for corrosion. Test measurement of loads on fuel assemblies during transportation. • Continue long-term R&D and international collaborations on alternative disposal environments, including field tests. • Continue R&D work to explore the possibility of direct disposing existing loaded dual purpose canisters in a repository. • Evaluate alternative design concepts for deep borehole	*Research and Development activities* Most of the $19M increase for research and development activities in FY 2015 is required to develop the technical knowledge to support long-term storage of high-burnup fuels. Of this amount, $9M will be used to implement the adaptations that are determined to be necessary to use existing INL facilities to handle large transportation casks. Funding increases to $6M for the high-burnup, dry storage demonstration effort. Other increases include field tests, including beginning implementation of the deep borehole demonstration tests.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
	disposal. Start to implement the deep borehole demonstration and participate in DOE's Subsurface Crosscut tasks. • Continue evaluating 3 main geologic rock types: crystalline, clay/shale, and salt. Analyses, lab and field tests will be conducted for all three rock types as appropriate.	
Integrated waste management system activities • Continue developing plans for a consent-based siting process. • Complete an analysis for initial used fuel shipments from shutdown reactor sites: including staffing, routing, procurement, operations, security, quality assurance, emergency response, training, logistics, site servicing, mobilization, operational readiness, and site servicing schedules. • Continue the conceptual design for a generic storage facility and supporting transportation system. • Conduct system architecture and operating evaluations of various used fuel management systems: Centralized and/or regional storage facilities, various repackaging scenarios and acceptance rates, update transportation and storage system models, and develop cost data bases. • Continue the evaluation of standardized containers for storage, transportation, and potentially disposal. • Continue to work cooperatively with the state regional groups on transportation issues. • Update the National Transportation Plan to address initial shipments from shutdown reactors to a generic	*Integrated waste management system activities* • Continue developing plans for a consent-based siting process. • Maintain and expand the unified and integrated UNF database and analysis system to characterize the input to the waste management system. • Prepare for large-scale transportation of UNF and high-level radioactive waste to a pilot interim storage facility with focus on UNF at shutdown reactor sites. Engage with State Regional Groups, tribes and other stakeholders, revise National Transportation Plan, prepare to implement the Nuclear Waste Policy Act Section 180(c) pilot program, initiate efforts to develop railcars per Association of American Railroads standard, initiate efforts according to hardware acquisition strategy, refine routing studies, address recommendations from the 2006 National Academy of Sciences Going the Distance study, etc. • Evaluate integrated approaches to storage, transportation, and disposal in the waste management system with an emphasis on providing flexibility, including evaluation of standardization of dry cask storage and transportation systems. • Evaluate expanded generic operational and conceptual design alternatives for the expanded interim storage facility. This includes developing more detailed cost and schedule data. • Develop a generic topical safety analysis report for a pilot integrated storage facility, including cask receipt and handling facilities, and engage with NRC on their review. • Complete expanded system architecture studies and decision analysis capability, expanded organizational infrastructure for document control and UNF data/knowledge	The Department continues to make progress in implementing the recommendations of the Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
consolidated storage facility.	management, and expanded efforts to support licensing and UNF acceptance. • Complete enveloping generic designs of small and medium size Standardized Transportation Aging and Disposal canisters. • Continue existing work in development of advanced modeling tools for systems-level analysis of repository concepts. • Verify and establish the next-generation waste management systems logistics analysis tool to enable the transition from legacy tools.	

Fuel Cycle Research and Development
Fuel Resources

Description

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. Seawater contains more than 4 billion tons of dissolved uranium. This unconventional uranium resource, combined with a suitable extraction cost, can potentially provide a price cap and ensure centuries of uranium supply even with aggressive world-wide growth in nuclear energy applications. Seawater uranium recovery technology is identified in the Nuclear Energy Roadmap as an area most appropriate for federal involvement to support a long-term, "game-changing" approach.

The Fuel Resources subprogram exceeded its initial goal to double the world's best uranium adsorption capacity. In FY 2015, the subprogram continues to develop advanced adsorbent materials through fundamental understanding of uranium coordination chemistry in diluted seawater environments. The subprogram is also pursuing the development of advanced adsorbents by taking advantage of tunable porosity, high surface area nano-materials. The subprogram objectives are to reduce the seawater uranium recovery technology cost uncertainties and to provide options for addressing long-term sustainability of uranium resource.

Fuel Resources

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Fuel Resources		
• Continue utilizing nanosynthesis and nanomanufacturing techniques to develop new polymer sorbents. • Continue optimizing synthesis and the design of new functional ligands via computational tools. • Provide technical coordination of R&D activities within Fuel Resources area. • Develop advanced adsorbent materials by irradiation (e-beam and x-ray) induced and chemical grafting methods to increase the uranium sorption capacity and selectivity. • Conduct sorption and uranium recovery experiments in a marine environment to provide data for scale-up and evaluation of marine deployment. • Conduct cost and energy analyses and developed cost/energy models to include newly developed adsorbents and technologies to aid in focusing R&D efforts.	• Continue improving adsorbent processing technology to reduce cost and increase performance. • Continue utilizing nanosynthesis and nanomanufacturing techniques to develop new polymer sorbents. • Continue optimizing synthesis and the design of new functional ligands via computational tools. • Optimize the development design of braided fiber adsorbents by increasing loop length, loop density and loop numbers. • Conduct sorption and uranium recovery experiments in a marine environment to provide data for scale-up and evaluation of marine deployment. • Conduct cost and energy analyses and developed cost/energy models to include newly developed adsorbents and technologies to aid in focusing R&D efforts. • Continue material durability evaluation.	The increase in Fuel Resources is to investigate advanced ligand design and advanced adsorbent material for extracting uranium from seawater.

Fuel Cycle Research and Development
Capital Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment > $500K (including MIE)	n/a	n/a	0	3,150		3,000	-150
Plant Projects (GPP and IGPP) (<$10M)	n/a	n/a	822	0		0	0
Accelerator Improvement Projects (AIP) (<$5M)	n/a	n/a	0	0		0	0
Total, Capital Operating Expenses	**n/a**	**n/a**	**822**	**3,150**		**3,000**	**-150**
Capital Equipment > $500K (including MIE)							
Electron Probe Micro-Analyzer	4,500	n/a	0	2,500		2,000	-500
Glovebox and hoods	1,650	n/a	0	650		1,000	+350
Total, Capital Equipment (including MIE)	**6,150**	**n/a**	**0**	**3,150**		**3,000**	**-150**
Plant Projects (GPP and IGPP) (Total Estimated Cost (TEC) <$10M)							
Total Plant Projects (GPP/IGPP) (Total Estimated Cost (TEC) <$5M)	822	n/a	822	0		0	0
High Density Fuel Glovebox	822	n/a	822	0		0	0
Total, Plant Projects (GPP/IGPP) (Total Estimated Cost (TEC) <$10M)	**822**	**n/a**	**822**	**0**		**0**	**0**
Total, Capital Summary	**6,972**	**n/a**	**822**	**3,150**		**3,000**	**-150**

Nuclear Energy Enabling Technologies

Overview

The Nuclear Energy Enabling Technologies (NEET) program sponsors research and development (R&D) in crosscutting technology areas, such as materials and sensors and instrumentation, and advanced manufacturing, that can inform extended economical operation of the current fleet of light water reactors and enable the development of advanced reactor designs and fuel cycle technologies. This program also makes a strong investment in modeling and simulation efforts to bring 30 years of improved computational and material science to reactor and fuel system simulation. The result will provide researchers, designers, and operators with advanced tools to better understand the behavior of nuclear systems and thereby improve safety and efficiency. These technologies will advance the state of nuclear technology, improving its competitiveness, and promoting continued contribution to meeting our Nation's energy and environmental challenges.

The R&D activities will create the basis for improvements in safety, performance, reliability, economics, and proliferation risk reduction and promote creative solutions to the broad array of nuclear energy challenges related to reactor and fuel cycle development. The activities undertaken in this program complement those within the Reactor Concepts and Fuel Cycle research and development programs. The knowledge generated through these activities will allow the Office of Nuclear Energy (NE) to address key challenges affecting nuclear reactor and fuel cycle deployment (e.g., capital cost, technology risks, and proliferation concerns). Further, these activities will contribute to sustaining nuclear energy as a key component of our energy portfolio and help to achieve energy security and greenhouse gas emission reduction objectives of the United States.

In maximizing the benefits of nuclear power, work must be done to address the broader nuclear energy challenges:

- Maintaining and improving the safety of nuclear energy.
- Improving the affordability and efficiency of nuclear energy.
- Addressing the management of nuclear waste.
- Minimizing proliferation risks of nuclear materials.

Highlights of the FY 2015 Budget Request

The FY 2015 budget provides funding for the continuation of the Nuclear Energy Innovation Hub in Modeling and Simulation (Hub) into a final five year term, assuming the determination is made that the Hub meets all requirements and criteria to be eligible for renewal. NE is using a formal process to determine whether or not the Hub meets the criteria for a second, final phase. General criteria for this decision process were provided in a 2012 report to Congress and include completion of proposed milestones, successfully completing annual NE reviews, significant number of publications, and substantial evidence of technology transfer. The final determination will be completed within FY 2014. The Hub has effectively utilized Nuclear Energy Advanced Modeling and Simulation (NEAMS) technologies to address several important operational issues with the current fleet. In the second term the Hub would address additional reactor operational challenges and demonstrate the technology transfer from lab to industry of Hub analytic techniques. The NEAMS program will initiate critical experiments and benchmarking activities to verify and validate the computer models for use by industry, academia and the national laboratory communities while continuing the development of its state-of-the-art simulation capabilities.

Nuclear Energy Enabling Tehcnologies
Funding ($K)

	FY 2013 Current[1]	FY 2014 Enacted	FY 2014 Current[2]	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Nuclear Energy Enabling Technologies					
Crosscutting Technology Development	13,230	13,923	13,923	13,901	-22
Nuclear Energy Advanced Modeling and Simulation	16,717	13,363	13,363	21,536	+8,173
Energy Innovation Hub for Modeling and Simulation	23,838	24,293	24,293	24,300	+7
National Scientific User Facility (NSUF)	14,119	19,530	19,530	18,509	-1,021
Total, Nuclear Energy Enabling Technologies	**67,904**	**71,109**	**71,109**	**78,246**	**+7,137**

SBIR/STTR:

- FY 2013 Transferred: SBIR $1,891; STTR: $245
- FY 2014 Projected: SBIR $1,991; STTR: $284
- FY 2015 Request: SBIR $2,269; STTR: $313

[1] Funding reflects the transfer of SBIR/STTR to Science.

[2] FY 2014 Enacted column reflects a rescission of $21,100 as identified within Section 317 of Public Law 113-76.

Nuclear Energy Enabling Technologies
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Crosscutting Technology Development: No significant changes.	**-22**
Nuclear Energy Advanced Modeling and Simulation: The overall increase of $8,173,000 accommodates the need for verification and validation activities associated with the NEAMS program. NEAMS develops advanced analytic tools for use by national labs, industry, and academia to simulate nuclear energy systems including reactors and fuels. The additional funding will be used to fund one or two additional Nuclear Energy University Program (NEUP) awards for NEAMS verification and validation, and to accelerate the verification and validation of NEAMS tools through modeling and testing so that end users can use them with confidence. This includes a highly leveraged three dimensional in-core nuclear fuels test being designed for the Halden Reactor in Norway and continuing bilateral research with other countries interested in benchmarking exercises for NEAMS codes. Completion of the validated NEAMS Toolkit will provide the nuclear energy enterprise with a modern analytic capability that incorporates the latest understanding of physics and that scales to run on laptops to supercomputers.	**+8,173**
Energy Innovation Hub for Modeling and Simulation: No significant changes.	**+7**
National Scientific User Facility: The overall reduction of $1,021,000 represents the successful completion of NSUF-sponsored R&D projects in FY 2014.	**-1,021**
Total, Nuclear Energy Enabling Technologies	**+7,137**

Nuclear Energy Enabling Technologies
Crosscutting Technology Development

Description

The Crosscutting Technology Development activities support the Light Water Reactor Sustainability, Reactor Concepts and Fuel Cycle programs. A balanced science-based R&D approach includes both performance enhancement of evolutionary concepts and investigation of novel concepts, which crosscut two or more reactor concepts or fuel cycles. Incorporating these technologies and capabilities as part of an integrated system offers the potential of revolutionary improvement in safety, performance, reliability, economics, and proliferation risk reduction.

The Crosscutting Technology Development subprogram includes the following elements: (1) Reactor Materials (materials for nuclear applications), (2) Advanced Sensors and Instrumentation, and (3) Advanced Methods for Manufacturing. Each element provides overall coordination of its associated technology research focus area across NE to ensure synergy, prevent redundancies, and help identify NE R&D programs' on-going research activities, needs, gaps, and common crosscutting issues.

The potential benefits of the technology research activities within this subprogram include:

- High risk research which could overcome current technological limitations.
- Examination of new classes of materials not previously considered for nuclear applications.
- Coordinated capabilities common across NE R&D programs.
- Development of enabling technologies beyond individual programs.
- New capabilities needed by the NE R&D enterprise.

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Crosscutting Technology Development		
Advanced Sensor and Instrumentation (ASI) • Initiate competitively-awarded ASI research to develop advanced sensor and communication requirements for power harvesting; fault tolerant and resilient systems; and real time embedded instrumentation and control (I&C). • Competitively award ASI research-supporting equipment and infrastructure capability to national laboratories and universities. • Continue direct-funded research on digital technology qualification to obtain the basis for implementing fully digital systems for nuclear power applications. • Complete direct-funded research on fabrication and evaluation of prototype harsh environment sensors that are compact and can measure thermal flux, fast flux, and temperature simultaneously. • Continue development of advanced hardened electronics for high irradiation environment. (Post-Fukushima R&D). *Advanced Methods for Manufacturing (AMM)* • Initiate competitively-awarded AMM research to develop new methods of additive manufacturing, modular/traditional manufacturing and welding techniques. • Complete research on laser-arc hybrid welding and the development of seismic isolation systems. • Continue research on hybrid laser-GMAW monitoring processes, additive manufacturing technologies such as the	*Advanced Sensor and Instrumentation* • Initiate competitively-awarded ASI research projects to develop improved performance measurement technology that provides revolutionary gains in reactor and fuel cycle systems. • Complete research on the development of a scientific basis for implementing fully digital I&C systems for nuclear power application and complete the identification of digital technologies that could replace legacy analog actuator technologies in new plant designs. • Continue development of advanced hardened electronics for harsh environments. Continue development and demonstration of advanced, multi-functional, diverse power system capability for NPP instrumentation (power harvesting) and advanced sensors to improve physical measurement accuracy and reduce uncertainty. • Continue development of harsh environment sensors, advanced sensing and control embedded electronic system, and study sensor degradation and transient models. *Advanced Methods for Manufacturing* • Initiate competitively-awarded AMM research projects to develop new methods of welding techniques, factory and field fabrication techniques and assembly innovations to enhance modular building techniques. • Complete the development and demonstration of a real-time nondestructive examination technology to monitor hybrid laser-GMAW processes for a more efficient fabrication process. • Complete research on the powder metallurgy/hot isostatic process to accelerate the deployment of large,	*Advanced Sensor and Instrumentation* Completion of two direct-funded projects in FY 2014 allows increase in funds for competitively-awarded, fully-funded, multi-year research in FY 2015

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
powder metallurgy/hot isostatic and the laser direct manufacturing processes, and the steel-plate composite wall connection technologies. • Continue research on new methods of additive manufacturing, modular/traditional manufacturing and welding techniques.	near-net shaped components with erosion/corrosion resistant surfaces. • Complete research on the laser direct manufacturing process to more effectively generate nuclear components with radiation tolerant alloys. • Complete development of steel-plate composite wall connection technologies which will accelerate the licensing and construction of SMRs utilizing this technology. • Continue research on new methods of additive manufacturing, modular/traditional manufacturing and welding techniques.	
Reactor Materials (RM) • Initiate competitively-awarded RM research in advanced techniques in joining and joint analysis. • Competitively award RM research-supporting modern materials science capabilities to national laboratories • Continue irradiation of nanocomposite dielectrics for advanced cabling materials • Continue computational modeling for the advanced alloy design of zirconium bearing ferritic/martensitic steels.	*Reactor Materials* • Initiate competitively-awarded RM research on advanced alloy and materials development for nuclear structural materials. • Competitively award RM research-supporting modern materials science capabilities to national laboratories. • Continue ion irradiations of advanced amorphous-ceramic/metal composites for an increased irradiation resistant material. • Continue mechanical testing on nanocrystalline SiC/Ti3SiC2 composites for increased fracture toughness and thermal conductivity.	
Management & Integration (M&I) • Planned activities include managing the CTD program and coordinating research across NE, including holding mid-term reviews of materials and manufacturing research awarded at the end of FY2012 and transitioning advanced sensor and instrumentation direct-funded research to a fully competitive approach.	*Management & Integration* • Planned activities include managing the Crosscutting Technology Development program and coordinating research across NE, including holding mid-term reviews of materials, advanced sensors and instrumentation, and manufacturing research awarded at the end of FY2013.	

Nuclear Energy Enabling Technologies
Nuclear Energy Advanced Modeling and Simulation (NEAMS)

Description

NEAMS provides support relevant to both Reactor Concepts and Fuel Cycle R&D programs by creating analytic tools, codes and methods for use by scientists and engineers who need to simulate nuclear energy systems. NEAMS is developing a computational ToolKit which is comprised of both reactor and fuel systems analysis capabilities that can be exercised either coupled or independently, depending on the needs of the end user. NEAMS tools are already in use by over 60 organizations domestically and abroad. NEAMS tools today define the state of the art in nuclear simulation.

In FY 2015 the work on the ToolKit will focus on creating a release version that incorporates a fully functional pressurized water reactor (PWR) fuel performance code for steady state, operational transients, and accident conditions (BISON). In addition, the next-generation RELAP-7 reactor systems code will continue development for light water reactor applications. Additional investments will be made in verification and validation for the Toolkit.

Nuclear Energy Advanced Modeling and Simulation

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Nuclear Energy Advanced Modeling and Simulation		
Fuels Product Line • Use atomistic and MARMOT simulations to develop a quantitative oxide fuel fracture model for BISON implementation. • Issue BISON Validation Plan (Rev. 0). This plan will lay out the approach to validating BISON, including the experimental databases used. • Release BISON Update for LWR Fuel Performance (Rev. 1) in quasi-steady state and off-normal conditions. This release of BISON will be fully functional for PWR performance under steady-state conditions and operational transients. It will have advanced mechanistic models for thermal conductivity and fission gas behavior. • Issue Update to BISON Validation and Assessment Report (Rev. 1). Will include BISON simulations of steady-state and ramp scenarios compared to (selected) relevant PWR experimental pins from the FRAPCON and FUMEX-III databases.	*Fuels Product Line* • Continue to refine atomistic and MARMOT simulations used to inform engineering scale models in the BISON fuels code. • Release BISON Update for LWR Fuel Performance (Rev. 2) in transient conditions. This release of BISON will be fully functional for PWR performance under steady-state conditions, operational transients (i.e., normal power shifts), and accident conditions (reactivity insertion accidents and loss of coolant accidents). Will also provide some capability to perform boiling water reactor simulations. It will add advanced, mechanistic models for cracking and restructuring. • Issue Update to BISON Validation and Assessment Report (Rev. 2). Will include BISON simulations of steady-state, ramp, and RIA scenarios compared to (selected) relevant PWR experimental pins from the FRAPCON and FUMEX-III databases. • Complete design of three dimensional in-core fuels validation experiment to be conducted at the Halden Reactor.	*Fuels Product Line* FY 2015 builds on the performance of FY 2014. Additional funds in the amount of $8,173,000 are provided in FY 2015 to accelerate the verification and validation of NEAMS tools so that end users can be confident in using the codes. Validation efforts include enhanced data mining of relevant older experiments, identification and design of new experiments, benchmarking against industry standard codes, and collaborations with international bodies,
Reactor Product Line: • Demonstrate coupling of SHARP and RELAP-7 components (neutronics, fluid dynamics, and structural dynamics assembly-scale tools) to the engineering-scale fuel performance tool (BISON) in the Fuels Product Line. • Demonstrate computational cost savings with Nek5000 URANS CFD module for nuclear reactor fuel assembly and release module to users. Release Diablo structural mechanics module to early users.	*Reactor Product Line:* • Use SHARP to complete a high-resolution, multi-physics simulation of the Unprotected Loss of Flow (ULOF) transient in EBR-II, with explicit calculation of reactivity feedback due to structural deformation of fuel pins, assembly components and core support structures. • Release version 0.9 of the integrated SHARP reactor core analysis toolkit to early users. • Initiate expanded effort to validate NEAMS Toolkit	

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
• Complete review of state of the art in neutronics simulation and identify lower cost options for continued development of high-fidelity neutronics tools. • Use SHARP to complete a high-resolution, multi-physics simulation of a transient event in the EBR-II.	components through the use of experimentation, benchmarking, and collaborations with end user partners.	

Nuclear Energy Enabling Technologies
Energy Innovation Hub for Modeling and Simulation

Description

The Energy Innovation Hub for Modeling and Simulation (Hub) has been creating a virtual reactor model of an actual Tennessee Valley Authority-owned (TVA), Westinghouse-designed, operating pressurized water reactor (PWR) to simulate reactor behavior. Engineers will be able to use this virtual model to improve the safety and economics of reactor operations by simulating proposed solutions to 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 that have long confronted nuclear energy development. 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. The FY 2015 budget provides funding for the continuation of the Nuclear Energy Innovation Hub in Modeling and Simulation into a final five year term, assuming the determination is made that the Hub meets all requirements and criteria to be eligible for renewal. NE is using a formal process to determine whether or not the Hub meets the criteria for a second, final phase. General criteria for this decision process were provided in a 2012 report to Congress and include completion of proposed milestones, successfully completing annual NE reviews, significant number of publications, and substantial evidence of technology transfer. The final determination will be completed within fiscal year 2014. If the Hub is renewed, the scope of the final five years will involve completing ongoing activities and extending the capabilities developed by CASL to other types of operating reactors, the next generation of pressurized water reactors that are under construction, and new small modular reactors. The CASL-developed virtual reactor modeling and simulation tools will be used to assist the design and the start-up testing of those reactors.

Energy Innovation Hub for Modeling and Simulation

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Energy Innovation Hub for Modeling and Simulation		
• Issue Version 4.0 of VERA: Implement, associated with the release, a sustainable strategy for community support and evolution of this modeling and simulation technology. • Apply core simulator capabilities within VERA to PWR operational cycles for a TVA PWR nuclear plant and compare the results with available operational data. • Apply the advanced capabilities within VERA to estimate long-life reactor environment phenomena expected in PWRs after 60 or more operational years such as neutron fluencies, thermal fatigue and mechanical performance. • Deliver a robust multi-phase thermal hydraulics capability within VERA with models for subcooled boiling, bubbly flows, and departure from nucleate boiling under transient and steady-state PWR-relevant conditions. • Deliver and demonstrate a functional and robust 3D pin-resolved transport capability within VERA. • Demonstrate a functional 3D fuel performance capability for prediction of in-core PWR fuel behavior by comparing the predictions with relevant capability within VERA. • Perform uncertainty analysis of CASL challenge problems that incorporate verification and validation, sensitivity analysis, uncertainty quantification, and	If the Hub is renewed: • Start final phase of the Hub. • Release version 5.0 of the Virtual Environment for Reactor Analysis. • Adapt the VERA toolset to be used to improve understanding of LWRs currently under construction and startup testing. • Apply CASL modeling and simulation tools to support design improvements for Small Modular Reactors. • Extend deployment the CASL computer test stands beyond the core consortium partners. • Start implementation of the CASL deployment strategy that supports increased use of the virtual reactor tool set by nuclear technology vendors and utilities to improve the operational performance and safety of existing and new reactors.	

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
data assimilation. • Complete detailed definition of Phase 2 challenge problems that will focus Hub technology development on performance and safety issues on currently operating reactors.		

Nuclear Energy Enabling Technologies
National Scientific User Facility

Description

The National Scientific User Facility (NSUF) subprogram represents a "prototype laboratory for the future" promoting the use of unique nuclear research facilities for science-based experiments and encourages active university, industry, and laboratory collaboration in relevant nuclear scientific research. The NSUF, through competitive solicitations, provides a mechanism for research organizations to collaborate and conduct experiments and post-experiment analysis at facilities not normally accessible to these organizations. On an annual basis, researchers propose projects to be conducted at these unique facilities that may last from a few months to a few years. When projects are awarded, the NSUF program pays for experiment support and laboratory services at the user facilities. In this manner, researchers are introduced to new techniques, equipment, and personnel so that their research benefits from new technologies and experimental capabilities. The Idaho National Laboratory Advanced Test Reactor and post-irradiation examination (PIE) facilities at the Center for Advanced Energy Studies 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, irradiation experiment design and fabrication capabilities at Pacific Northwest National Laboratory, hot cells and fabrication capabilities at Westinghouse, and examination facilities at the Universities of Wisconsin, Michigan, California-Berkeley, Purdue and Nevada-Las Vegas are partnered with the NSUF, bringing additional user facilities to the research community. Since its designation as a user facility in 2007, NSUF has awarded 72 experiments to 20 universities and 4 laboratories. All new awards are fully funded upfront, eliminating mortgages and improving consistency.

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
National Scientific User Facility		
• Continue work on previously awarded multi-year irradiation and post irradiation examination (PIE) projects. • Award approximately one long-term project with full (forward) funding to eliminate future NSUF mortgages. May be a joint award with a NEUP project. • Award, execute and complete a minimum of 5 "rapid turnaround" PIE experiments addressing research areas such as advanced alloy and materials development for nuclear structural materials, neutron irradiation effects on microstructures of fine grained steels, study of microstructures evolution of Kr irradiated UO2, and other competitively-awarded nuclear-energy-related research topics. • Evaluate expansion of testing and monitoring capabilities at ATR and MFC to provide enhanced sensor and mechanical test rigs required to support NSUF-user experiments. Will continue to provide testing upgrades (e.g., SiC temperature monitors, multiple thermocouples, in-pile creep test rigs, and hardware/systems supporting Loop 2A experiments) to ensure NSUF continues to provide irradiation and PIE capabilities broadly supporting the NSUF-user community and to maintain a capability level on par with other national user facilities. • Coordinate with NEUP to issue an	• Accelerate work on previously awarded multi-year irradiation and PIE projects to largely eliminate this mortgage during FY 2015 and fully eliminate it by the end of FY 2016. • Award approximately one long-term project with full (forward) funding to avoid future NSUF mortgages. May be a joint award with a NEUP project. • Award, execute and complete a minimum of 5 competitively-awarded "rapid turnaround" PIE experiments nuclear energy-related research topics. • Coordinate with NEUP to issue an infrastructure award to help support NE relevant work. • Initiate the design and procurement of the shielding and confinement for the Focused Ion Beam.	The reduction in FY 2015 of $1,021,000 reduction represents the successful completion of NSUF-sponsored R&D projects in FY 2014.

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
infrastructure award to help support NE relevant work. • Purchase and install a Focused Ion Beam to support advanced post irradiation work at the Irradiated Materials Characterization Laboratory. • Support mechanical and instrumentation capabilities required to support NSUF-user experiments.		

Nuclear Energy Enabling Technologies
Capital Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment > $500K (including MIE)	n/a	n/a	0	4,812	4,812	0	-4,812
Total, Capital Operating Expenses	**n/a**	**n/a**	**0**	**4,812**	**4,812**	**0**	**-4,812**

Radiological Facilities Management

Overview

Radiological Facilities Management (RFM) provides support for Radiological Facilities not on DOE property or that do not directly support NE missions. In FY 2015, the Department is requesting funding only for the Research Reactor Infrastructure (RRI) subprogram. RRI supports the continued operation of United States (U.S.) research reactors by providing research reactor fuel services and maintenance of fuel fabrication equipment.

In FY 2014, the Space and Defense Infrastructure subprogram, which executes radioisotope power system production operations and infrastructure transitioned to a full cost recovery funding model and funding for that effort was appropriated to the National Aeronautics and Space Administration. Therefore funding will no longer be requested in RFM for that program or any related infrastructure. However, DOE retains its responsibility and authority to manage its facilities and personnel consistent with Departmental requirements and retains its independence in nuclear safety determinations.

Highlights of the FY 2015 Budget Request

Research Reactor Infrastructure

In FY 2015, in support of its mission and objectives, the RRI subprogram will provide project management, technical support, quality engineering and inspection, and nuclear material support to 25 reactors located at 24 U.S. universities. Major program deliverables will be the procurement of and shipment to universities of new plate fuel elements and shipment of used plate and TRIGA fuel elements from universities to DOE used fuel receipt facilities. In addition, work will continue on initiatives to procure a second used nuclear fuel shipping cask and to evaluate alternatives to the current TRIGA reactor fuel sole source.

For the RRI subprogram, continued delays and uncertainties associated with the planned 2018 restart of the TRIGA fuel fabrication facility operated in France by TRIGA International has potential to disrupt the continued operability of a subset of the 12 TRIGA research reactors serviced by the RRI subprogram. Evaluation of alternatives has commenced and will be intensified and more formalized in FY 2014 and 2015.

Radiological Facilities Management
Funding ($K)

	FY 2013 Current	FY 2014 Enacted[1]	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Radiological Facilities Management					
Space and Defense Infrastructure	60,707	19,968	19,968	0	-19,968
Research Reactor Infrastructure	4,663	5,000	5,000	5,000	0
Total, Radiological Facilities Management	**65,370**	**24,968**	**24,968**	**5,000**	**-19,968**

[1] FY 2014 Enacted column reflects a rescission of $31,600 as identified within Section 317 of Public Law 113-76.

Radiological Facilities Management
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Space and Defense Infrastructure: The decrease from $19,968,000 to $0 reflects elimination of unrequested funding for non NE mission infrastructure maintenance at Oak Ridge National Laboratory.	**-19,968**
Research Reactor Infrastructure: There are no significant changes to the RRI subprogram from FY 2014 to FY 2015.	**-**
Total, Radiological Facilities Management	**-19,968**

Radiological Facilities Management
Space and Defense Infrastructure

Description

Consistent with Congressional direction, this category provided funds in FY 2014 to support Oak Ridge National Laboratory (ORNL) hot cells.

Space and Defense Infrastructure

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
• Complete hot cell and equipment maintenance based on Congressional Direction for non-mission infrastructure.	• No funding is requested.	Decrease reflects completion of critical hot cell equipment and infrastructure activities.

Radiological Facilities Management
Research Reactor Infrastructure

Description

The Research Reactor Infrastructure (RRI) subprogram provides fresh reactor fuel to, and removes used fuel from 26 operating university reactors thus supporting the continued operation of university research reactors. This in turn provides continued test reactor capability to universities, coupled with research, development, and educational opportunities in support of U.S. nuclear energy initiatives.

The continued operation of university research reactors plays an important role in developing future scientists and engineers in the United States. This subprogram sustains unique capabilities for research and development and educational opportunities supporting U.S. energy initiatives. Used nuclear fuel shipments support U.S. and DOE non-proliferation and national security objectives.

Research Reactor Infrastructure

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
• Procure 40 and deliver 36 plate fuel elements required annually by MURR and MIT as determined by need and fuel availability. Complete up to 6 used fuel shipments to SRS and INL, pending resolution of moratorium on such shipments to INL. • RRI project management, quality assurance, nuclear material accountability, and BEA Research Reactor (BRR) fuel transportation cask maintenance. • As supported by carryover or other available funding (e.g., shipment cancellations), develop policy and initiate planning to evaluate the potential re-use of used TRIGA low burn-up low-enriched fuel currently in inventory at INL as part of alternatives analysis to address uncertainties due to extended outage at TRIGA International, the current sole source of fresh TRIGA fuel. • As supported by carryover or other available funding, procure ten zircalloy fuel element cladding "boxes" to support fabrication of ten additional fuel elements for the North Carolina State PULSTAR reactor to support continued operations beyond FY 2015. • As supported by carryover or other available funding, initiate amendment to the BRR Cask safety analysis report to support modification to Nuclear Regulatory Commission (NRC) license to allow cask use for all university fuel types.	• Procure 40 and deliver 36 plate fuel elements required annually by MURR and MIT as determined by need and fuel availability. Complete up to 6 used fuel shipments to SRS and INL, pending resolution of moratorium on such shipments to INL. • RRI project management, quality assurance, nuclear material accountability, and transportation cask maintenance. • Continue TRIGA fuel alternatives analysis and implementation activities as warranted by results of FY 2014 analysis results and status of TRIGA International outage. • Complete and receive NRC approval of BRR cask SAR amendment and procure associated universial "basket" to support shipment of university fuel types that lack an approved basket.	No significant change from FY 2014.

Radiological Facilities Management Capital Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))							
Capital Equipment > $500K (including MIE)	n/a	n/a	500	0	0	0	0
Total, Capital Operating Expenses	**n/a**	**n/a**	**500**	**0**	**0**	**0**	**0**

13-D-905, Remote-Handled Low-Level Waste Disposal Project
Idaho National Laboratory
Project is for Design and Construction

1. Summary and Significant Changes

The most recent DOE O 413.3B approved Critical Decision (CD) is CD-1, Approve Alternative Selection and Cost Range, that was approved on July 13, 2011 with a Total Project Cost of $95 million based on the upper end of the cost range. CD-2, Approve Performance Baseline, and CD-3, Approve Start of Construction, is anticipated to be approved in the 3rd Quarter of FY 2014 in compliance with the DOE O 413.3B. The project data sheet (PDS) will be updated to reflect the performance baseline cost and schedule upon approval of CD-2. This is a non-major acquisition project with a cost range less than $100 million. Based on the conceptual design and estimate, the lower and upper bound of the cost range is between $75 million and $95 million respectively. This project is subject to the Freeze the Footprint Initiative.

The project will be jointly funded in accordance with a Memorandum of Agreement between the Department of Energy (DOE) Office of Nuclear Energy (NE) and the Office of Naval Reactors (NR).

A Federal Project Director has been assigned to this project.

This project data sheet (PDS) does not include a new start for the FY 2015 budget year.

This PDS is an update of the FY 2014 PDS.

This PDS reflects a design-build delivery method. The project will employ a combined CD-2/3 critical milestone approach regarding "Approval of the Performance Baseline and Approval to Start Construction", with hold points established by DOE-Idaho (DOE-ID) to verify readiness prior to actual Start of Construction. The funding presented in Sections 5 and 6 represent the upper end of the cost range. The funding will be updated to reflect the performance baseline point estimate upon approval of CD-2/3.

The PDS reflects a revision to the CD-4 date to align with current plans for facility closure of the existing RH LLW Disposal Facility located at the Radioactive Waste Management Complex by the Office of Environmental Management. The performance baseline established at CD-2/3 in 3Q FY 2014 will define the project schedule against which performance will be measured.

2. Critical Decision (CD) and D&D Schedule

(fiscal quarter or date)

	CD-0	CD-1	CD-2/3[a]	CD-4[a,b]	D&D[a] Start	D&D[a] Complete
FY 2013	07/01/2009	07/13/2011	1Q FY 2013	4Q FY 2017	4Q FY 2037	4Q FY 2038
FY 2014	07/01/2009	07/13/2011	2Q FY 2014	4Q FY 2017	4Q FY 2058[c]	4Q FY 2059[c]
FY 2015	07/01/2009	07/13/2011	3Q FY 2014	4Q FY 2020	--[d]	--[d]

a. The Critical Decision (CDs) dates for CD-2/3, CD-4 and D&D are estimates and will be updated to reflect the performance baseline upon approval of CD-2.
b. Dates are based on plans for facility closure of the existing RH LLW Disposal Facility located at the Radioactive Waste Management Complex by the Office of Environmental Management (EM); closure costs of the existing disposal facility, are funded as part of EM activities and are not part of the project.
c. Date change based on design for a 50 year life-expectancy. Funding requested will provide up to 20 years of disposal capacity and infrastructure with a life expectancy of 50 years to allow for expansion.
d. CD schedule does not include future D&D of the facility that is being constructed.

CD-0 – Approve Mission Need
CD-1 – Approve Alternative Selection and Cost Range
CD-2/3– Approve Performance Baseline/Start of Execution
CD-4 – Approve Start of Operations or Project Closeout

D&D Start – Start of Demolition & Decontamination (D&D) work
D&D Complete –Completion of D&D work

3. Baseline and Validation Status

(dollars in thousands)

	TEC[a], Design	TEC[a,b] Construction	TEC, Total[a]	OPC Except D&D[a]	OPC, D&D[a, c]	OPC, Total[a]	TPC[a]
FY 2013[b]	3,820	63,440	67,260	27,740	0	27,740	95,000
FY-2014[b]	3,820	63,440	67,260	27,740	0	27,740	95,000
FY-2015[b]	3,820	63,440	67,260	27,740	0	27,740	95,000

a. A design-build acquisition strategy is being implemented.
b. The baseline has been set at the high-end of the TPC range; the project baseline will be approved upon approval of CD-2/3. No construction will be performed until the project performance baseline has been validated and CD-3 conditions have been addressed and approved by the Acquisition Executive.
c. D&D of the existing RH LLW Disposal Facility located at RWMC is part of the Waste Area Group-7 CERCLA cleanup activity being performed by the Office of Environmental Management in response to the Idaho Settlement Agreement.

4. Project Description, Scope, and Justification

Mission Need

The continuing mission of the Idaho National Laboratory (INL), associated ongoing and planned operations, and Naval spent fuel activities at the Naval Reactors Facility (NRF) requires continued capability to appropriately dispose of remote-handled low level waste (LLW) in support of Office of Nuclear Energy and Office of Naval Reactors mission-critical operations. On July 13, 2011, the Office of Nuclear Energy approved Critical Decision-1, selecting development of a new facility for disposal of remote-handled LLW generated at the Idaho site as the preferred alternative to meet the mission need. In accordance with NEPA (42 USC§ 4321 et seq.), a thorough analysis of a range of reasonable alternatives was subsequently performed and, after evaluating the results of the analysis, the DOE Idaho Operations Office Manager issued a Finding of No Significant Impact on December 21, 2011. A preliminary Disposal Authorization Statement, based on the Low-Level Waste Disposal Facility Federal Review Group's review of the facility's current Performance Assessment and related documentation, was received on April 2, 2012. The new facility can accommodate disposal of up to twenty years of remote-handled LLW generated at the INL, and provide capability for further expansion.

Scope and Justification – 13-D-905 Remote-Handled Low-Level Waste Disposal Project

Scope
The project will provide on-site disposal capability for ten to twenty years of remote-handled LLW generated at the Idaho National Laboratory (INL); however, facilities are being designed to allow operation for 50 years to support future expansion, if needed. Replacement capability must be available when the current waste disposal site, which has been in operation since 1952, becomes unavailable for expansion with the closure of the Radioactive Waste Management Complex (RWMC). The subsurface vaults are envisioned to be constructed of precast concrete cylinders (pipe sections) stacked on end and placed in a honeycomb-type array. Based on waste projections, for a 20 year period, approximately 900 canisters of waste will be disposed of at the facility. The facility is projected to be a Hazard Category 2 nuclear facility, subject to the requirements of DOE-STD-1189, "Integration of Safety into the Design Process." The disposal facility will be located on a suitable site within the INL boundary. Performance of the site/facility will be analyzed in accordance with requirements of DOE Order 435.1, "Radioactive Waste Management."

Supporting infrastructure to the new facility will include a paved access road; electrical service; firewater and potable water; security fence and systems; a maintenance building; administration building; communications and emergency systems; and other operational capabilities. Transportation and handling equipment systems also will be developed for onsite shipments of activated metals and debris waste from the Advanced Test Reactor Complex and the Material and Fuels Complex.

Justification
As DOE's lead nuclear energy laboratory, INL is a multipurpose national laboratory delivering specialized science and engineering global solutions for the DOE. INL also hosts the National Nuclear Security Administration's (NNSA) Naval Reactors Facility (NRF). NRF supports the U.S. Navy's nuclear-powered fleet through research and development of materials and equipment and management of naval spent nuclear fuel. In addition to the nuclear energy mission, Environmental Management (EM) is supporting a large-scale cleanup mission at the INL. These activities include closure of the RWMC under CERCLA (42 USC 9601 et seq. 1980). Remote-handled LLW generated by INL and NRF has been disposed of at RWMC since 1952. EM has notified NE and NR that disposal at RWMC should not be assumed beyond September 30, 2020.

The continuing nuclear energy mission of INL and NRF require continued capability to dispose of remote-handled LLW. Without established, viable remote-handled LLW disposal capability, ongoing and future operations at the INL and NRF would be adversely impacted. In addition to impacting INL operations at the Advanced Test Reactor and Material and Fuels Complex, remote-handled LLW disposal capability also is critical to the NNSA's mission to "provide the United States Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants." Spent nuclear fuel from the Navy's nuclear-powered fleet is sent to NRF for examination, processing, dry storage, and ultimate disposition. A reliable disposal path for remote-handled LLW is essential to NRF's continued receipt and processing of naval spent nuclear fuel and, therefore, national security. Based on an evaluation of on-site and off-site alternatives and completion of an Environmental Assessment in accordance with the National Environmental Policy Act [NEPA], the highest-ranked alternative for providing continued, uninterrupted remote-handled LLW disposal capability is construction of a new onsite remote-handled LLW disposal facility. The life cycle cost to construct and operate a new onsite facility and the risk to the public have been determined to be significantly lower than the offsite disposal alternatives evaluated.

Project Status
With Congressional authorization of the project provided through the Consolidated Appropriations Act of 2014, the project started in FY14. A competitive procurement has been initiated to select a design-build contractor, and will be completed pending CD-2/3 in FY14.

Risks
A detailed evaluation of project risks and mitigations has been performed (INL PLN-2541). Contingency and management reserve adequate to address project risks has been identified and will be managed in accordance with the requirements of DOE O 413.3B.

Funds appropriated under this data sheet may be used to provide independent assessments related to project planning and execution.

The project is being conducted in accordance with the project management requirements in DOE O 413.3B, Program and Project Management for the Acquisition of Capital Assets, and all appropriate project management requirements have been met.

5. Financial Schedule

(dollars in thousands) (Total Project Cost @ Upper Bound[b])

	Appropriations			Obligations			Costs		
	NE	NR	Total	NE	NR	Total	NE	NR	Total
Total Estimated Cost (TEC)									
Design									
FY 2014	$47	$1,463	$1,510	$47	$1,463	$1,510	$47	$1,463	$1,510
FY 2015	$940	$1,370	$2,310	$940	$1,370	$2,310	$940	$1,370	$2,310
Total Design	$987	$2,833	$3,820	$987	$2,833	$3,820	$987	$2,833	$3,820
Construction									
FY 2014	$16,351	$19,610	$35,961	$16,351	$19,610	$35,961	$3,973	$3,305	$7,278
FY 2015	$4,429	$13,050	$17,479	$4,429	$13,050	$17,479	$8,711	$21,151	$29,862
FY 2016	$5,870	$0	$5,870	$5,870	$0	$5,870	$10,855	$4,891	$15,746
FY 2017	$4,130	$0	$4,130	$4,130	$0	$4,130	$7,241	$843	$8,084

(dollars in thousands) (Total Project Cost @ Upper Bound[b])

	Appropriations			Obligations			Costs		
	NE	NR	Total	NE	NR	Total	NE	NR	Total
FY 2018	$0	$0	$0	$0	$0	$0	$0	$2,470	$2,470
Total Construction	$30,780	$32,660	$63,440	$30,780	$32,660	$63,440	$30,780	$32,660	$63,440
TEC									
FY 2014	$16,398	$21,073	$37,471	$16,398	$21,073	$37,471	$4,020	$4,768	$8,788
FY 2015	$5,369	$14,420	$19,789	$5,369	$14,420	$19,789	$9,651	$22,521	$32,172
FY 2016	$5,870	$0	$5,870	$5,870	$0	$5,870	$10,855	$4,891	$15,746
FY 2017	$4,130	$0	$4,130	$4,130	$0	$4,130	$7,241	$843	$8,084
FY 2018	$0	$0	$0	$0	$0	$0	$0	$2,470	$2,470
Total TEC	**$31,767**	**$35,493**	**$67,260**	**$31,767**	**$35,493**	**$67,260**	**$31,767**	**$35,493**	**$67,260**
Other Project Cost (OPC)									
OPC, except D&D									
FY 2009	$184	$0	$184	$184	$0	$184	$184	$0	$184
FY 2010	$3,706	$0	$3,706	$3,706	$0	$3,706	$3,706	$0	$3,706
FY 2011	$3,774	$0	$3,774	$3,774	$0	$3,774	$3,774	$0	$3,774
FY 2012	$3,611	$0	$3,611	$3,611	$0	$3,611	$3,611	$0	$3,611
FY 2013	$325	$1,310	$1,635	$325	$1,310	$1,635	$325	$1,310	$1,635
FY 2014	$415	$1,075	$1,490	$415	$1,075	$1,490	$415	$1,075	$1,490
FY 2015	$2,553	$570	$3,123	$2,553	$570	$3,123	$2,553	$570	$3,123
FY 2016	$2,551	$3,640	$6,191	$2,551	$3,640	$6,191	$2,300	$796	$3,096
FY 2017	$2,651	$1,375	$4,026	$2,651	$1,375	$4,026	$2,808	$1,194	$4,002
FY 2018	$0	$0	$0	$0	$0	$0	$94	$3,025	$3,119
Total OPC, except D&D	$19,770	$7,970	$27,740	$19,770	$7,970	$27,740	$19,770	$7,970	$27,740
D&D[c]	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total D&D[c]	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPC									
FY 2009	$184	$0	$184	$184	$0	$184	$184	$0	$184
FY 2010	$3,706	$0	$3,706	$3,706	$0	$3,706	$3,706	$0	$3,706
FY 2011	$3,774	$0	$3,774	$3,774	$0	$3,774	$3,774	$0	$3,774
FY 2012	$3,611	$0	$3,611	$3,611	$0	$3,611	$3,611	$0	$3,611
FY 2013	$325	$1,310	$1,635	$325	$1,310	$1,635	$325	$1,310	$1,635
FY 2014	$415	$1,075	$1,490	$415	$1,075	$1,490	$415	$1,075	$1,490
FY 2015	$2,553	$570	$3,123	$2,553	$570	$3,123	$2,553	$570	$3,123
FY 2016	$2,551	$3,640	$6,191	$2,551	$3,640	$6,191	$2,300	$796	$3,096
FY 2017	$2,651	$1,375	$4,026	$2,651	$1,375	$4,026	$2,808	$1,194	$4,002
FY 2018	$0	$0	$0	$0	$0	$0	$94	$3,025	$3,119
Total OPC	**$19,770**	**$7,970**	**$27,740**	**$19,770**	**$7,970**	**$27,740**	**$19,770**	**$7,970**	**$27,740**
Total Project Cost (TPC)									
FY 2009	$184	$0	$184	$184	$0	$184	$184	$0	$184
FY 2010	$3,706	$0	$3,706	$3,706	$0	$3,706	$3,706	$0	$3,706
FY 2011	$3,774	$0	$3,774	$3,774	$0	$3,774	$3,774	$0	$3,774
FY 2012	$3,611	$0	$3,611	$3,611	$0	$3,611	$3,611	$0	$3,611
FY 2013	$325	$1,310	$1,635	$325	$1,310	$1,635	$325	$1,310	$1,635
FY 2014	$16,813	$22,148	$38,961	$16,813	$22,148	$38,961	$4,435	$5,843	$10,278
FY 2015	$7,922	$14,990	$22,912	$7,922	$14,990	$22,912	$12,204	$23,091	$35,295

(dollars in thousands) (Total Project Cost @ Upper Bound[b])

	Appropriations			Obligations			Costs		
	NE	NR	Total	NE	NR	Total	NE	NR	Total
FY 2016	$8,421	$3,640	$12,061	$8,421	$3,640	$12,061	$13,155	$5,687	$18,842
FY 2017	$6,781	$1,375	$8,156	$6,781	$1,375	$8,156	$10,049	$2,037	$12,086
FY 2018[d]	$0	$0	$0	$0	$0	$0	$94	$5,495	$5,589
Total TPC	**$51,537**	**$43,463**	**$95,000**	**$51,537**	**$43,463**	**$95,000**	**$51,537**	**$43,463**	**$95,000**

a. Budget figures shown are only estimates and based on the high end of the cost range.
b. Design costs are part of the design-build contract, which is funded with construction funds.
c. Existing disposal capability at the INL is managed and operated by EM. Therefore, costs for closure of the existing disposal capability are not included as part of the Remote-Handled Low-Level Waste Disposal Project.
d. The financial schedule presented represents anticipated costs at the high end of the cost range pending CD-2/3 approval. The CD-4 date presented in Section 2 aligns with current plans for closure of the existing disposal capacity. The performance baseline established at CD-2/3 in 3Q FY 2014 will define the project schedule against which performance will be measured. Anticipated costs (and schedule) will be adjusted to reflect the approved performance baseline at CD-2/3.

6. Details of Project Cost Estimate[a]

(dollars in thousands)

	CD-1 Upper Bound Estimate	Previous Total Estimate[b]	Original Validated Baseline
Total Estimated Cost (TEC)			
Design			
Design	3,220	3,220	N/A
Contingency	600	600	N/A
Total, Design	3,820	3,820	N/A
Construction			
Site Preparation	NA	NA	N/A
Equipment	10,000	10,000	N/A
Construction	51,520	51,520	N/A
Contingency	1,920	1,920	N/A
Total, Construction	63,440	63,440	N/A
Total, TEC	67,260	67,260	N/A
Contingency, TEC	2,520	2,520	N/A
Other Project Cost (OPC)			
OPC except D&D			
Conceptual Planning	8,030	8,030	N/A
Conceptual Design	3,240	3,240	N/A
Other OPC Costs	8,490	8,490	N/A

(dollars in thousands)

	CD-1 Upper Bound Estimate	Previous Total Estimate[b]	Original Validated Baseline
Start-Up	3,430	3,430	N/A
Contingency	4,550	4,550	N/A
Total, OPC except D&D	27,740	27,740	N/A
D&D			
D&D	0	0	N/A
Contingency	0	0	N/A
Total, D&D	0	0	N/A
Total, OPC	27,740	27,740	N/A
Contingency, OPC	4,550	4,550	N/A
Total, TPC	95,000	95,000	N/A
Total, Contingency	7,070	7,070	N/A

a. CD-2 approval is expected during the 3Q FY 2014. All funding numbers are only estimates and based on the high end of the cost range approved at CD-1.
b. Previous Total Estimate is from the FY 2014 PDS.

7. Schedule of Appropriation Requests[a]

Request		Prior Years	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	Outyears	Total
FY 2013 (Initial Request)	TEC	0	15,570	39,490	12,600	0	0	0	67,260
	OPC	11,990	1,740	1,490	1,600	7,810	3,110	0	27,740
	TPC	11,990	16,910	40,980	14,200	7,810	3,110	0	95,000
FY 2014[a]	TEC	0	0	37,471	23,919	5,870	0		67,260
	OPC	11,990	1,740	1,490	1,600	7,810	3,110		27,740
	TPC	11,990	1,740	38,961	25,519	13,680	3,110	0	95,000
FY 2015	TEC	0	0	37,471	19,789	5,870	4,130		67,260
	OPC	11,275	1,635	1,490	3,123	6,191	4,026		27,740
	TPC	11,275	1,635	38,961	22,912	12,061	8,156	0	95,000

a. CD-2/3 approval is expected during the 3Q FY 2014. All funding numbers are only estimates and based on the high end of the cost range approved at CD-1.

8. Related Operations and Maintenance Funding Requirements

Start of Operation or Beneficial Occupancy[a] (fiscal quarter or date)	4Q FY 2020
Expected Useful Life[b] (number of years)	50 years
Expected Future Start of D&D of this capital asset (fiscal quarter)	4Q FY 2070

a. Date is based on plans for facility closure of the existing RH LLW Disposal Facility located at the Radioactive Waste Management Complex by the Office of Environmental Management (EM).
b. Facility is designed for a 50 year life-expectancy. Funding requested will provide up to 20 years of disposal capacity and infrastructure with a life expectancy of 50 years to allow for expansion.

(Related Funding requirements)

(dollars in thousands)

	Annual Costs		Life Cycle Costs	
	Current Total Estimate	Previous Total Estimate	Current Total Estimate	Previous Total Estimate
Operations	$4,585	$5,130	$91,700	$102,600
Closure[a]	N/A	N/A	$10,900	$0
Maintenance	$490	$490	$9,800	$9,800
Total, Operations & Closure	$5,075	$5,620	$112,400	$112,400

a. Closure was included in Operations in previous submission.

9. Required D&D Information

Area	Acres
Area of new construction	10 acres
Area of existing facility(s) being replaced and D&D'd by this project	0 acres
Area of other D&D outside the project	97 acres
Area of additional D&D space to meet the "one-for-one" requirement taken from the banked area	0 acres

Name(s) and site location(s) of existing facility(s) to be replaced:

The existing Remote-handled LLW disposal vaults are located within the Subsurface Disposal Area of the Radioactive Waste Management Complex. The RWMC, including the existing remote-handled LLW disposal vaults is funded by DOE EM as part of CERCLA remediation of Waste Area Group 7, Operable Unit 13/14 and is not included in this PDS.

10. Acquisition Approach

The INL Management and Oversight (M&O) contractor will competitively procure the facility design and construction of the proposed onsite remote-handled LLW disposal facility utilizing a negotiated, design-build subcontract. A competitive procurement has been initiated to select a design-build contractor, and will be completed pending CD-2/3 in FY 2014. Responses to the request for proposal will be evaluated using a "best value" selection process that considers pricing, qualifications, and functionality; conformance with established requirements; safety record; and past performance.

Additional support subcontracts (e.g., monitoring well installation) are envisioned. Services will be solicited only from qualified firms via requests for proposal. Dependent on the action, selection will be based on technical merits and price considerations as provided for in the INL operating contractor's DOE-approved procurement procedures manual.

The types of contracts used for acquisition (e.g., fixed price or fixed labor rate) will vary, dependent on the specific scope of work. Financial incentives may be used, as appropriate, to motivate contractor performance, along with competition to

select suppliers. To the extent feasible, procurements will be accomplished by fixed-price contracts awarded based on “best value.”

Because this project is based on proven technology and a simplistic design, the design-build delivery method is considered the best acquisition method to complete the project. This method provides continuity between the designer and constructor, reducing project risks, conflicts, schedule, and cost.

The INL M&O contractor will provide project management, construction oversight, and Safety and Quality inspection during construction. In addition, the INL M&O contractor will also perform the following key project activities with subcontractor support and DOE-ID oversight: preparation of documents to support CDs; preparation of engineering design documentation; preparation of NEPA documentation, including a siting study and an environmental assessment; preparation and support to DOE Headquarters approval of a performance assessment and composite analysis; preparation of disposal facility waste acceptance criteria; preparation of nuclear safety documentation; preparation of requests for proposal and performance specifications; subcontractor selection and contract administration; facility design and construction management; and, operational readiness activities.

Idaho Facilities Management

Overview

The mission of the Idaho Facilities Management (IFM) program is to manage the planning, acquisition, operation, maintenance, and disposition of the Office of Nuclear Energy (NE)-owned facilities and capabilities at the Idaho National Laboratory (INL). The IFM program maintains Department of Energy (DOE) mission-supporting facilities and capabilities 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 a 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, nuclear nonproliferation, and incident response.

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 design activities. The Materials and Fuels Complex (MFC) contains a comprehensive range of fuel and experiment fabrication, and pre- and post-irradiation examination capabilities to assess material and fuel characteristics and performance in varying reactor environments. A limited number of facilities at the Idaho Nuclear Technology and Engineering Center (INTEC) are utilized to support material consolidation and storage at the Material Security Consolidation Facility (CPP-651), fuel cycle research and development, and National and Homeland Security (N&HS) activities. The Research and Education Campus is home to a range of research capabilities and facilities supporting research in nuclear energy as well as N&HS and energy and the environment.

Highlights of the FY 2015 Budget Request

To enable and facilitate R&D activities, strategic priorities for the IFM Program in FY 2015 include maximizing the utility of existing facilities and capabilities through focused sustainment activities and cost-effective rehabilitation. Activities focus on safe and compliant operation of INL's nuclear research reactor and non-reactor research facilities, while conducting corrective and cost-effective preventative maintenance activities necessary to sustain this core infrastructure. When deemed necessary, critical capability improvements or replacements are accomplished through operating activities, plant projects (General Plant Projects and Institutional General Plant Projects), and line item capital projects. In FY 2015, these activities include:

- The Department is proceeding with restart of the Transient Reactor Test Facility (TREAT) Reactor at the INL to reestablish a domestic transient testing capability. This capability will enable the NE R&D programs to understand fuel performance phenomenology at the milli-second to second time scales as well as provide a capability to screen advanced fuel concepts, including accident tolerant fuels, which allows for early identification of the limits of fuel performance.
- The Remote-Handled Low-Level Waste Disposal Project will provide onsite replacement of INL's remote-handled low-level waste disposal capability. The capability is needed to support ongoing and future programs (including NE and Naval Reactors) at INL. This project is funded by NE and Naval Reactors.

In FY 2015, activities associated with the ATR Life Extension Program will complete. Since inception in FY 2005, the LEP Program has successfully completed activities and implemented strategies necessary to ensure the ATR remains viable for the nation's nuclear energy needs. Activities completed as part of the program include seismic analyses and upgrades, nuclear safety design basis analyses and documentation, material condition assessments, identification and procurement of critical spare parts and one-of-a-kind components, and system replacement of critical systems.

Idaho Facilities Management
Funding ($K)

	FY 2013 Current	FY 2014 Enacted[1]	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Idaho Facilities Management					
INL Nuclear Research Reactor Operations and Maintenance	**67,858**	**87,868**	**87,868**	**87,264**	**-604**
INL Non-Reactor Nuclear Research Facility Operations and Maintenance	**59,557**	**69,090**	**69,090**	**69,151**	**+61**
INL Engineering and Support Facility Operations and Maintenance	**10,096**	**10,632**	**10,632**	**11,076**	**+444**
INL Regulatory Compliance	**6,970**	**10,288**	**10,288**	**13,050**	**+2,762**
Advanced Post Irradiation Examination (APIE) Capabilities	**500**	**2,000**	**2,000**	**0**	**-2,000**
Construction	**0**	**16,398**	**16,398**	**5,369**	**-11,029**
Total, Idaho Facilities Management	**144,981**	**196,276**	**196,276**	**185,910**	**-10,366**

[1] FY 2014 Enacted column reflects a rescission of $285k as identified within Section 317 of Public Law 113-76

Idaho Facilities Management
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
INL Nuclear Research Reactor Operations and Maintenance: The decrease from $87,868,000 to $87,264,000 reflects completion of the ATR Life Extension Program, completion of additional ATR fuel purchases, and planned activities to support ATR remote monitoring and management.	**-604**
INL Non-Reactor Nuclear Research Facility Operations and Maintenance: The increase from $69,090,000 to $69,151,000 reflects planned facility modifications identified in Materials and Fuels Complex (MFC) Documented Safety Analyses (DSAs), continued implementation of a material condition assessment program at MFC to improve understanding of facility conditions and long-term maintenance requirements, and continued maintenance of hot cells and procurements/activities associated with hot cell manipulators at MFC.	**+61**
INL Engineering and Support Facility Operations and Maintenance: The increase from $10,632,000 to $11,076,000 reflects activities to reduce excess building footprint through planned non-nuclear facility disposition activities, to conduct facility condition assessments necessary to ensure appropriate investment in NE real property, and to support the consolidation and co-location of mission assets and associated activities.	**+444**
INL Regulatory Compliance: The increase from $10,288,000 to $13,050,000 reflects funding necessary to receive and treat used nuclear fuel from wet storage and other project costs/operating funding for the Remote-Handled Low-Level Waste (RHLLW) Disposal Project consistent with the project schedule.	**+2,762**
Advanced Post-Irradiation Examination (APIE) Capabilities: The decrease from $2,000,000 to $0 reflects a pause in new capability planning to allow for planned curtailment of activities in order to obtain additional operational experience from existing PIE capabilities and to assess the demand and need for APIE capabilities.	**-2,000**
Construction: The decrease from $16,398,000 to $5,369,000 reflects funding necessary to support continued construction of new replacement disposal capability to meet NE and Office of Naval Reactor (NR) long-term program needs. This project is joint-funded with the Office of Naval Reactors.	**-11,029**
Total, Idaho Facilities Management	**-10,366**

Idaho Facilities Management
INL Nuclear Research Reactor Operations and Maintenance

Description

This category supports nuclear research reactor operations and maintenance at the ATR for the INL, including the associated support infrastructure, the ATR Critical Facility (ATRC), the TREAT Facility and the Neutron Radiography Reactor (NRAD). NRAD and TREAT are located at the MFC.

ATR is the primary reactor at INL. The ATR supports the majority of NE R&D programs, as well as NNSA programs including Global Threat Reduction Initiatives to support conversion of research and test reactors to low-enriched uranium fuel and Naval Reactors Program work in support of the U.S. Navy nuclear fleet. The ATR is also used by universities and industry. Research and development demand for neutron irradiation at ATRC and neutron radiography and small component test irradiation at NRAD has increased significantly over the past several years. All programmatic work is funded by the sponsoring federal programs. The cost to other users is determined in accordance with DOE regulations and depends upon the demands on the reactor and the nature of the user.

This category also funds activities related to the resumption of a domestic transient fuel testing capability utilizing TREAT at INL. Activities associated with the restart of the TREAT Reactor include system and component evaluations, design, and refurbishment and replacement, as needed, and safety evaluations.

INL Nuclear Research Reactor Operations and Maintenance

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
INL Nuclear Research Reactor Operations and Maintenance		
• Maintain and operate INL reactors and supporting infrastructure. • Continue planned ATR Life Extension Program (LEP) activities such as Nuclear Instrumentation Replacement and ATR Core Modeling Update with the goal of completing LEP in FY 2015. • Complete all major procurement activitiesand continue preparatory activities for the ATR Core Internal Changeout (CIC). • Conduct over 30 irradiation campaigns as scheduled while maintaining an operating efficiency greater than 80%. • Complete an Environmental Assessment to support Departmental decision on resumption of transient testing. • Initiate screening of TREAT reactor systems and development of safety basis documentation required to conduct physical, in-plant assessments in support of the resumption of transient testing. • Support increased fuel purchases, end-of-life equipment replacement and remote monitoring and management of the ATR.	• Maintain and operate INL reactors and supporting infrastructure. • Maintain a two year minimum ATR fuel inventory and sufficient ATR critical spares. • Complete the ATR LEP, including Nuclear Instrumentation activities. • Complete installation of Uninterrupted Power Supply to support ATR operations. • Continue preparatory activities for the ATR CIC. • Conduct over 30 irradiation campaigns as scheduled while maintaining an operating efficiency greater than 80%. • Continue planned ATR Safety Margin Improvement activities such as installation of automated primary cooling system leak detection. • Complete TREAT system assessments to support resumption of transient testing. • Initiate replacement of electrical equipment at ATR that is past the end of useful life.	The decrease reflects completion of the ATR Life Extension Program and planned activities associated with ATR remote monitoring and management.

Idaho Facilities Management
INL Non-Reactor Nuclear Research Facility Operations and Maintenance

Description
This category funds operations, maintenance, and support for non-reactor nuclear and radiological research facilities, primarily located at the MFC. Activities within this category support sustainment of unique nuclear and radiological capabilities that are required to support NE's essential research and development programs. Work scope focuses on maintaining a safe operating envelope, while conducting corrective and cost-effective preventative maintenance activities necessary to sustain this core infrastructure. The non-reactor nuclear research facilities support core programmatic research capabilities including:

- Post Irradiation Examination (PIE) and Fresh Fuel Characterization – Receipt of irradiated fuels/materials; nondestructive examination; destructive examinations and analyses; and mechanical testing of highly radioactive materials.
- Experimental Fuel Fabrication – Glovebox lines, fume hoods, and hot cell capabilities; unique fabrication capabilities; and instrumentation and testing equipment that support R&D on multiple fuel types and hazard levels.
- Advanced Separation and Waste Forms – Aqueous separations and pretreatment technologies, and electrochemical separations and waste form development (engineering scale)

This category also funds the management of NE-owned special nuclear material (SNM), including the characterization, packaging, storage, and disposition of surplus SNM. Access to and responsible management of SNM is fundamental to ensuring the availability of nuclear material, when needed, to support mission activities.

INL Non-Reactor Nuclear Research Facility Operations and Maintenance

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
INL Non-Reactor Nuclear Research Facility Operations and Maintenance		
• Provide trained operators and technicians, qualified criticality safety officers, and material balance custodians to operate and maintain MFC nuclear facilities. • Analyze and authorize adjustments to operating parameters and facility operations. • Perform program integration to support effective execution of projects and programs within the nuclear facilities at the MFC. • Support planning for and execution of compliance level operations and maintenance activities. • Support reliable and efficient availability of critical facilities and capabilities to meet the R&D mission. • Support Implementation and complete planned facility modifications identified in MFC DSAs. • Complete 1-3 shipments of surplus NE-owned special nuclear material for off-site disposition. • Establish a Materials Condition Assessment program at MFC to improve understanding of facility conditions and long-term maintenance requirements. • Support increased maintenance of hotcells and procurements/activities associated with hotcell manipulators at MFC.	• Provide trained operators and technicians, qualified criticality safety officers, and material balance custodians to operate and maintain MFC nuclear facilities. • Analyze and authorize adjustments to operating parameters and facility operations and coordinate programmatic work activities. • Perform program integration to support effective execution of projects and programs within the nuclear facilities at the MFC. • Perform maintenance within the MFC nuclear facilities and infrastructure consistent with the approved safety bases. • Support reliable and efficient availability of critical facilities and capabilities for the growing demand of R&D mission needs. • Complete planned facility modifications identified in MFC DSAs. • Complete 1-3 shipments of surplus NE-owned special nuclear material for off-site disposition. • Continue the Materials Condition Assessment program at MFC to improve understanding of facility conditions and long-term maintenance requirements.	The increase reflects planned facility modifications identified in MFC DSAs, continued implementation of a material condition assessment program at MFC to improve understanding of facility conditions and long-term maintenance requirements, and continued maintenance of hotcells and procurements/activities associated with hotcell manipulators at MFC.

Idaho Facilities Management
INL Engineering and Support Facility Operations and Maintenance

Description
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. This category includes activities to support Departmental sustainability goals to achieve measureable and verifiable energy, water, and greenhouse gas reductions; for responsible use and disposal of materials and resources; and for cost-effective facilities, services, and program management.

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: Shoshone-Bannock Tribes, Defense Contract Audit Agency, site environmental monitoring, Payment in Lieu of Taxes, and the National Oceanic and Atmospheric Administration.

INL Engineering and Support Facility Operations and Maintenace

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
INL Engineering and Support Facility Operations and Maintenace		
• Manage non-nuclear facilities, real property management, sustainment, and community support activities. • Conduct performance-based real property life-cycle asset management activities. • Recapitalization activities structured to keep existing facilities modern and relevant in an environment of changing standards and missions, consistent with DOE Order 430.1B. • Continue facility and land use 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. • 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.	• Manage non-nuclear facilities, real property management, sustainment, and community support activities. • Conduct performance-based real property life-cycle asset management activities. • Implement recapitalization activities structured to keep existing facilities modern and relevant in an environment of changing standards and missions, consistent with DOE Order 430.1B. • Continue facility and land use 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. • 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. • Conduct planned disposition work for non-nuclear excess buildings. • Conduct planned roof repair and replacement activities utilizing cool roof technology.	The increase reflects activities to reduce excess building footprint through planned non-nuclear facility disposition activities , to conduct facility condition assessments necessary to ensure appropriate investment in NE real property, and to support the consolidation and co-location of mission assets and associated activities.

Idaho Facilities Management
INL Regulatory Compliance

Description

This category supports compliance activities driven by state and Federal environmental and other regulations that are under the purview of NE owner responsibilities. Compliance activities focus on air, soil, and water monitoring and waste disposal consistent with Federal and State permit requirements and agreements such as the INL Site Treatment Plan. Regulatory activities also include work that supports the 1995 Settlement Agreement with the State of Idaho, which governs management and disposition of used nuclear fuel and transuranic wastes at the INL.

This category also supports other project costs for the proposed RHLLW Disposal Project to meet long-term waste disposal needs for NE and NR, consistent with regulatory requirements.

INL Regulatory Compliance

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
INL Regulatory Compliance		
• Continue regulatory compliance program management. • Meet INL Site Treatment Plan milestones for treatment of two cubic meters of mixed low-level waste (MLLW). • Complete transfer(s) of used nuclear fuel from wet storage in accordance with the 1995 Idaho Settlement Agreement and consistent with material requirements for the treatment of enriched uranium EBR-II used nuclear fuel. • Support other project cost (OPC)-funded activities for the RHLLW Disposal Project.	• Continue regulatory compliance program management. • Meet INL Site Treatment Plan milestones for treatment of two cubic meters of MLLW. • Complete transfer(s) of used nuclear fuel from wet storage in accordance with the 1995 Idaho Settlement Agreement and consistent with material requirements for the treatment of enriched uranium EBR-II used nuclear fuel. • Support design and construction activities for RHLLW Disposal Project, including the review and approval process for the Composite Analysis prepared in accordance with DOE O 435.1, Radioactive Waste Management.	The increase reflects funding necessary to receive and treat used nuclear fuel from wet storage and funding to support project activities and other project costs for the RHLLW Disposal Project consistent with the project schedule, including construction management activities.

Idaho Facilities Management
Advanced Post Irradiation Examination (APIE) Capabilities

Description

This activity assesses the benefits and options for developing a possible future large-scale APIE facility. The Department has not committed to constructing any facility that may be considered in this program element. In future years, the Department will decide whether to proceed with a project based on a variety of factors including project costs, research needs, budgetary constraints, and competing priorities. No funding for activities beyond Critical Decision (CD)-1 has been requested. Activities will be curtailed in FY 2015 in order to obtain additional operational experience from existing PIE capabilities and assess the demand and need for APIE capabilities.

NE completed the Irradiated Materials Characterization Laboratory (IMCL), which provides modern, flexible nano- and atomic-scale PIE capabilities. IMCL provides the ability to meet modern electrical, cleanliness, vibration isolation and radiological control requirements to support current PIE tools and equipment and provides a concept testing ground to inform future decisions on the APIE capabilities, including machine-to-sample and machine-to-building interfaces.

If a larger-scale, Advanced PIE Capabilities Project were ever executed, it would require equipment that would allow high hazard materials to be routinely examined in a safe and secure environment. Any such facility could serve as a center for advanced fuels and materials characterization, as well as development of new processes, tools and instruments to further research. The project requirements would specify that alternatives have a flexible footprint with a variety of laboratory capabilities in both fixed and reconfigurable space.

Advanced Post Irradiation Examination (APIE) Capabilities

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Advanced Post Irradiation Examination (APIE) Capabilities		
• Complete alternatives analysis, conceptual design, preparation of the National Environmental Policy Act documentation, project execution plan activities and support design activities pending approval of CD-1, *Approve Alternative Selection and Cost Range*.		The decrease reflects a pause in new capability planning to allow for planned curtailment of activities in order to obtain additional operational experience from existing PIE capabilities and to assess the demand and need for APIE capabilities.

Idaho Facilities Management
Construction

Description

Line-item capital projects are required at INL to maintain its infrastructure and its ability to support mission goals. These projects help achieve NE and DOE strategic objectives by maintaining site services or providing critical information for future decisions. This activity is focused on two primary objectives: (1) identification, planning, and prioritization of projects required to meet NE program objectives, and (2) development and execution of these projects within approved cost and schedule baselines as such projects are deemed necessary. While the Department's acquisition management process does not guarantee that a project will be completed once the initial information gathering and preliminary design phase are complete, it does provide an important decision-making framework that, when well executed, allows only the most critically necessary, cost-effective projects to proceed to construction.

Construction

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Construction		
Remote-Handled Low-Level Waste Disposal Project (13-D-905) • Initiate design and construction of the selected alternative to construct a new disposal facility at INL to meet NE and NR long-term program needs.	• Design and construction of new replacement disposal capability to meet NE and NR long-term program needs • Complete final design and initiate construction on waste receiving facility and site infrastructure. • Complete final design for RHLLW vault system for disposal of waste containers.	The decrease in funding reflects funding necessary to support construction of new replacement disposal capability to meet NE and NR long-term program needs. This project is joint-funded with NR.

Idaho Facilities Management
Capital Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Capital Operating Expenses Summary (including (Major Items of Equipment (MIE))[2]							
Plant Projects (GPP and IGPP) (<$10M)	n/a	n/a	2,954	0	0	5,478	+5,478
Total, Capital Operating Expenses	**n/a**	**n/a**	**2,954**	**0**	**0**	**5,478**	**+5,478**
Plant Projects (GPP) (Total Estimated Cost (TEC) <$10M)							
Total Plant Projects (GPP) (Total Estimated Cost (TEC) <$5M)	n/a	n/a	2,954	0	0	5,478	+5,478
Total, Plant Projects (GPP) (Total Estimated Cost (TEC) <$10M)	**n/a**	**n/a**	**2,954**	**0**	**0**	**5,478**	**+5,478**
Total, Capital Summary	**n/a**	**n/a**	**2,954**	**0**	**0**	**5,478**	**+5,478**

[2] Each MIE Total Estimated Cost (TEC) > $2M; Each Plant Project (GPP) Total Estimated Cost (TEC) > $5M

Idaho Facilities Management
Construction Projects Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
13-D-905, Remote-Handled Low-Level Waste Disposal Project, INL (Summary represents NE costs; Project is co-funded with NR)							
Total Estimated Cost (TEC)	31,767	0	0	16,398	16,398	5,369	-11,029
Other Project Costs (OPC)*	19,770	11,275	325	415	415	2,553	+2,138
Total Project Cost (TPC) Project Number 13-D-905	**51,537**	**11,275**	**325**	**16,813**	**16,813**	**7,922**	**-8,891**
Total All Construction Projects							
Total Total Estimated Cost (TEC)	31,767	0	0	16,398	16,398	5,369	-11,029
Total Other Project Costs (OPC)	19,770	11,275	325	415	415	2,553	+2,138
Total Project Cost (TPC) All Construction Projects	**51,537**	**11,275**	**325**	**16,813**	**16,813**	**7,922**	**-8,891**

* Indicates a project where the cost of the Conceptual Design Report is estimated to exceed $3M

Idaho Sitewide Safeguards and Security

Overview

The Idaho Sitewide Safeguards and Security (S&S) program supports the Idaho National Laboratory (INL) complex nuclear facility infrastructure and enables the Office of Nuclear Energy (NE) to conduct research and development in support of multiple program missions. To better align the S&S funding with INL infrastructure and R&D programs, the S&S program was transferred to the Nuclear Energy appropriation in FY 2014.

The S&S program funds NE base physical and cyber security activities for the INL, providing protection of the Department of Energy's (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 adverse impacts on our national security; program continuity; or the health and safety of employees, the public, or the environment.

The S&S program at the INL benefits the site infrastructure and users by providing the safeguards and security functions required at DOE sites to enable R&D utilizing nuclear materials and protected information. In addition to the Office of Nuclear Energy R&D activities, S&S enables a range of national security 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, nuclear nonproliferation and incident response. Safeguards and security functions through the INL S&S program enable the Department of the Army, the Department of the Navy and NNSA Naval Reactors mission activities.

The FY 2015 request provides direct funding for the S&S base program for NE. Base program costs determined to be allocable, i.e., beneficial to Departmental programs and Work for Others (WFO), are paid by those programs and WFO via full cost recovery. The costs for program and WFO-specific security requirements beyond the S&S base program that are specifically requested or driven by the program or WFO project are directly charged to those customers as appropriate.

Highlights of the FY 2015 Budget Request

In FY 2015, the S&S program will focus on establishing and maintaining effective staffing levels by filling personnel gaps, restoring preventative and corrective maintenance programs, and reducing deferred maintenance and equipment backlogs. In addition, the FY 2015 request will support infrastructure, capital improvements, and emerging technologies investments to adequately secure site assets while simultaneously supporting operations, including completing detailed plans for major system replacements including Perimeter Intrusion Detection and Assessment Systems (PIDAS) for INL high priority facilities.

In order to sustain protection of INL assets while simultaneously meeting operational demands, FY 2015 funding supports:

- Establishing and maintaining Protective Force staffing levels capable of providing effective protection and services at all INL facilities including 24/7 operation of the Warning Communication System.
- Completing preventative/corrective maintenance and lifecycle replacement, including backlog, of physical security systems - intrusion detection, assessment, alarm monitoring equipment and access control systems and maintaining staffing levels consistent with effective maintenance, replacement and performance testing of physical security systems.
- Maintaining an effective Cyber Security program through the addition of lifecycle hardware/software upgrades and replacements, external penetration capabilities, essential cyber security positions and associated training.

Idaho Sitewide Safeguards and Security
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Idaho Sitewide Safeguards and Security					
Protective Forces	0	53,277	53,277	57,547	+4,270
Security Systems	0	10,434	10,434	14,718	+4,284
Information Security	0	3,181	3,181	3,451	+270
Personnel Security	0	6,634	6,634	7,050	+416
Material Control & Accountability	0	4,130	4,130	4,340	+210
Program Management	0	5,354	5,354	5,626	+272
Cyber Security	0	10,990	10,990	11,268	+278
Total, Idaho Sitewide Safeguards and Security	**0**	**94,000**	**94,000**	**104,000**	**+10,000**

Idaho Sitewide Safeguards and Security
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
Protective Forces: The increase from $53,277,000 to $57,547,000 supports protective force staffing levels consistent with the approved site protection plan and approved site labor wage agreement; including 24/7 operation of the Warning Communication System utilized for site-wide notification and coordination of response to emergency and security events.	**+4,270**
Security Systems: The increase from $10,434,000 to $14,718,000 provides funds to complete preventative/corrective maintenance and lifecycle replacement, including addressing the backlog of physical security systems. The increase also supports staffing for effective maintenance, replacement and performance testing of physical security systems and to complete detailed planning for major system replacements including high priority facility Perimeter Intrusion Detection and Assessment Systems.	**+4,284**
Information Security: The increase from $3,181,000 to $3,451,000 provides funds to maintain information security services for key INL facilities consistent with the site operational needs.	**+270**
Personnel Security: The increase from $6,634,000 to $7,050,000 provides additional funds to maintain personnel security services for key INL facilities consistent with the site operational needs including HSPD-12 badging and smart card administration requirements.	**+416**
Material Control & Accountability: The increase from $4,130,000 to $4,340,000 provides additional funds for accounting and control of special nuclear material at key INL facilities consistent with the site operational needs.	**+210**
Program Management: The increase from $5,354,000 to $5,626,000 provides funds for additional efforts to update security program documentation, develop and implement plans to address new security requirements and undertake performance assurance activities (table top exercise, simulations, self-assessments, limited scope performance tests and force-on-force exercises) required to ensure adequate protection of INL assets.	**+272**
Cyber Security: The increase from $10,990,000 to $11,268,000 maintains an effective cyber security program consistent with the Department's measured risk management and vulnerability management strategies.	**+278**
Total, Idaho Sitewide Safeguards and Security	**+10,000**

Idaho Sitewide Safeguards and Security
Protective Forces

Description

Protective Force provides security police officers (SPO's) and other specialized personnel, equipment, training, and management needed during normal and security emergency conditions for adequate protection of Special Nuclear Material (SNM), classified and sensitive information, Government property and personnel. Protective force personnel are deployed 24 hours a day, 7 days a week, across the 890 square miles of the INL site to deter, detect, delay and respond to adversarial threats. Funding needs are based on protection strategies designed to ensure adequate protective force staffing levels, equipment, facilities, training, management and administrative support are available to respond to any security incident outlined in the Site Security Plans.

Protective Forces

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Protective Forces		

• Provides funds to maintain a protective force consistent with the Site Security Plans and approved site labor wage agreement, and associated training activities, including facilities, required to maintain protective force qualifications.
  • Conduct Basic Police Officer Training for new hires.
  • Conduct Special Response Force Selection and Training.
  • Conduct Use of force training on active shooter and lesser threat scenarios.
  • Establish uniformed supervisor positions consistent with Site operational needs.
• Provides funding to purchase protective force equipment such as ammunition, weapons, protective gear (tactical vests, helmets, etc) and vehicles.
  • Additional weapons and protective gear for new hires.
  • Replacement weapons for those at the end of useful life.
	• Provides funds to maintain a protective force consistent with the Site Specific Security Plan and approved site labor wage agreement, and associated training activities, including facilities, required to maintain protective force qualifications.
	  • Provide increased Protective Force services for INL in-town assets.
	  • Maintain and provide 24/7 operation of the Warning Communication System
	  • Conduct Basic Police Officer Training for new hires.
	  • Conduct Use of force training on active shooter and lesser threat scenarios.
	  • Complete refurbishment of Range 3.
	• Provides funding to purchase protective force equipment such as ammunition, weapons, protective gear (tactical vests, helmets) and vehicles.
	  • Additional weapons and protective gear for new hires.
	  • Replacement weapons for those at the end of useful life.
		The increase is due to additional protective force work scope associated with providing protective force services at all INL facilities including in-town assets and 24/7 operation of the Warning Communication System. Increase also reflects the annual cost of additional protective force personnel hired in FY 2014 and FY 2015, additional equipment needs and equipment life-cycle replacements.

Idaho Sitewide Safeguards and Security
Security Systems

Description

Security Systems provides equipment to protect vital security interests and government property, including performance testing, intrusion detection and assessment, entry and search control, barriers, secure storage, lighting, sensors, entry/access control devices, locks, explosives detection, and tamper-safe monitoring. Security Systems provides maintenance of approximately 4,600 security alarms and 6,100 security locks at multiple INL security areas ensuring 24 hour a day, 7 days a week operation of these systems. Maintaining a reliable physical security infrastructure allows the Idaho Sitewide S&S program to maintain consistent/lower staffing levels and lower labor costs.

Security Systems

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Security Systems		

• Provides funds to plan and conduct preventative and corrective maintenance on physical security systems at multiple INL security areas to ensure 24 hour operation of these systems including associated staffing requirements.
• Supports the operation of INL central alarm stations, development and modification of security alarm systems and life cycle replacement of systems including:
  • HSPD-12 card readers, access control system components, entry control systems (X-Ray, metal detectors, turnstiles) and long range detection capabilities.
	• Provides funds to plan and conduct preventative and corrective maintenance on physical security systems at multiple INL security areas to ensure 24 hour operation of these systems including associated staffing requirements.
	• Supports the operation of INL central alarm stations, development and modification of security alarm systems and life cycle replacement of systems including:
	  • Access control system database servers and field panels and detection system equipment (motion sensors, door sensors, cameras, radars, etc.)
		The increase is due to the cost of addressing the backlog of systems requiring lifecycle replacement and the associated staffing to implement replacement, preventative and corrective maintenance and performance testing of the systems.

Idaho Sitewide Safeguards and Security
Information Security

Description

Information Security provides for the protection and control of classified and sensitive matter that is generated, received, transmitted, used, stored, reproduced or destroyed at the INL. The Classified Matter Protection and Control Program and Operations Security Program ensure that classified and sensitive unclassified matter is appropriately managed and adequately protected and controlled to prevent access by unauthorized individuals and that those individuals that do have access are trained to handle classified matter. Information Security executes the Technical Security Countermeasures (TSCM) program and conducts TSCM surveys.

Information Security

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Information Security		
• Provides funds to implement INL information security activities to protect classified and sensitive unclassified matter, including programs for Classified Matter and Control, Technical Surveillance Countermeasures, Classification/ Declassification, and Operations Security. • Supports coordination activities with INL R&D programs to develop project-specific security requirements within the context of the overall INL information security program and to support increased classification work scope.	• Provides funds to implement INL information security activities to protect classified and sensitive unclassified matter, including programs for Classified Matter and Control, Technical Surveillance Countermeasures, Classification/ Declassification, and Operations Security. • Supports coordination activities with INL R&D programs to develop project-specific security requirements within the context of the overall INL information security program and to support increased classification work scope. • Provides funds to support personnel necessary to enhance the Site Operations Security Program.	The increase is due to costs associated with maintaining information security services for key INL facilities/programs consistent with the site operational needs and anticipated growth in work scope.

Idaho Sitewide Safeguards and Security
Personnel Security

Description

Personnel Security provides for access to classified and sensitive information and assignment of personnel in sensitive positions through the clearance program, adjudication, security awareness and education, U.S. citizen and foreign visitor control, Human Reliability Program, psychological/medical assessments, and administrative review costs. Personnel security also provides for the annual cost to support the database that maintains smart card credentials for INL personnel and badging requirements.

Personnel Security

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Personnel Security		
• Provides funds to conduct INL personnel security programs including security investigations to determine the suitability of INL personnel for classified work, assessing requests for U.S and foreign researchers to work in selected sensitive subject areas, and maintaining databases that hold clearance information. • Provides funds for federal activities related to processing, tracking, and adjudication of security investigations for federal and non-federal employees, including medical examinations.	• Provides funds to conduct INL personnel security programs including security investigations to determine the suitability of INL personnel for classified work, assessing requests for U.S and foreign researchers to work in selected sensitive subject areas, and maintaining databases that hold clearance information for approximately 6,000 employees. • Provides funds for federal activities related to processing, tracking, and adjudication of security investigations for federal and non-federal employees, including medical examinations. • Support HSPD-12 badging and smart card administration requirements.	The increase is due to costs associated with maintaining personnel security services consistent including foreign visits and assignments consistent with the site operational needs and additional staffing required to support HSPD-12 badging and smart card administration requirements.

Idaho Sitewide Safeguards and Security
Material Control & Accountability

Description

Material Control & Accountability (MC&A) provides the personnel, equipment, and services required to account for and control all special nuclear material (SNM) at INL from diversion. MC&A is accomplished through the administration of a robust formal inventory process for all SNM on site that allows INL security personnel to locate and track specific quantities in real time, state of the art measurement equipment, non-destructive analysis and a robust tamper indicating device program.

Material Control & Accountability

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Material Control & Accountability		
• Provides funds to maintain the site's SNM database and tracking systems, coordinate on-and off-site material movements, and to conduct SNM inventories.	• Provides funds to maintain the site's SNM database and tracking systems, coordinate increased on-and off-site material movements, and to conduct SNM inventories.	The increase is due to costs associated with maintaining material control and accountability services for key INL facilities/programs consistent with the site operational needs and increased site material consolidation and disposition activities.

Idaho Sitewide Safeguards and Security
Program Management

Description
Program Management includes policy oversight, development and update of site security plans; vulnerability assessments and performance testing to ensure adequate protection of SNM; and investigations into incidents of security concern and issuance of security infractions. The activities completed within Program Management allow for risk-informed decision making, support a performance-based S&S program and directly test the efficacy of the INL protection methodology/posture.

Program Management

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Program Management		
• Provides funds to maintain and update security program documentation, vulnerability assessments and performance testing through a combination of table-top exercises, simulations and force-on-force exercises to assure program effectiveness and efficiency.	• Provides funds to maintain and update security program documentation, vulnerability assessments and performance testing through a combination of table-top exercises, simulations and force-on-force exercises to assure program effectiveness and efficiency as required annually by Departmental policy. • Provides funds to conduct risk assessments and performance testing activities required to develop implementation plans for additional security requirements.	The increase is due to additional work scope associated with the development of implementation plans for additional security requirements.

Idaho Sitewide Safeguards and Security
Cyber Security

Description

Cyber Security maintains the computing infrastructure and network security configuration necessary to support classified and unclassified information and electronic operations at the INL. The Cyber Security program uses a graduated risk approach based on data sensitivity and impact of loss/ compromise to ensure that electronic or computer information systems, are protected in a manner consistent with upholding key priorities, including importance to national security, support of DOE missions and programs, vulnerability to threats, and the magnitude of harm that would result from an information system compromise.

Cyber Security

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Cyber Security		
• Provide funds to operate, test, and maintain cyber security systems for the INL consistent with the Department's measured risk management and vulnerability management strategies. • Support certification and accreditation activities for classified cyber security systems. • Conduct INL training programs to educate users on cyber security strategies and implementation of optimized Contractor Assurance System (CAS) operating procedures and supporting processes. • Complete lifecycle hardware/software upgrades and replacements and essential cyber security positions and associated training.	• Provide funds to operate, test, and maintain cyber security systems for the INL consistent with the Department's measured risk management and vulnerability management strategies. • Support certification and accreditation activities for classified cyber security systems. • Conduct INL training programs to educate users on cyber security strategies and implementation of optimized Contractor Assurance System (CAS) operating procedures and supporting processes. • Complete lifecycle hardware/software upgrades and replacements and essential cyber security positions and associated training. • Enhance cyber security program to support increasing INL cloud services solutions • Re-categorize two INL network enclaves data categorization from low enclaves to Federal Information Security Management Act (FISMA) to moderate protection • Perform feasibility study for extending the INL cyber security program to include the indusial control systems for INL	The increase is due to additional work scope associated with continuous monitoring and enhanced external penetration capabilities.

Idaho Sitewide Safeguards and Security
Capital Summary ($K)

	Total	Prior Years	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Capital Equipment > $500K (including MIE)[1]							
Total Non-MIE Capital Equipment (>$500K)	n/a	n/a	0,000	1,500	1,500	1,500	000,000
Total, Capital Equipment (including MIE)	**n/a**	**n/a**	**0,000**	**1,500**	**1,500**	**1,500**	**000,000**
Total, Capital Summary	**n/a**	**n/a**	**0,000**	**1,500**	**1,500**	**1,500**	**000,000**

[1] Each MIE Total Estimated Cost (TEC) > $2M; Each Plant Project (GPP/IGPP) Total Estimated Cost (TEC) > $5M

International Nuclear Energy Cooperation

Overview

International Nuclear Energy Cooperation's (INEC) mission is to serve as the Department's overall lead for all international activities related to civil nuclear energy, including analysis, development, and implementation of international civil nuclear energy policy and coordination and integration of the Office of Nuclear Energy's (NE) international nuclear technical activities. These activities support international bilateral and multilateral engagement and civil nuclear energy research and development (R&D) activities with countries with an established or planned civilian nuclear power sector. INEC may also employ workshops to engage industry and foreign governments on international civil nuclear issues such as financing, safety, or comprehensive nuclear fuel services (CFS).

INEC provides the Department 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 allow more effective integration of NE international R&D and policy interests. INEC also leverages nuclear energy efforts with Department of Energy's (DOE) National Nuclear Security Administration, Office of Environmental Management, and Office of 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.

Highlights of the FY 2015 Budget Request

In FY 2015, INEC will continue to support existing international agreements and work with the Department of State and other Departments on establishing new engagements with advanced and developing nuclear energy countries as necessary, particularly in the Western Hemisphere. INEC will continue multilateral collaboration on CFS concepts and continue analytical studies to support this engagement.

International Nuclear Energy Cooperation
Funding ($K)

	FY 2013 Current	FY 2014 Enacted[1]	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
International Nuclear Energy Cooperation					
International Nuclear Energy Cooperation	2,806	2,496	2,496	3,000	+504
Total, International Nuclear Energy Cooperation	**2,806**	**2,496**	**2,496**	**3,000**	**+504**

[1] FY 2014 Enacted column reflects a rescission of $3,900 as identified within Section 317 of Public Law 113-76.

International Nuclear Energy Cooperation
Explanation of Major Changes ($K)

	FY 2015 vs FY 2014 Enacted
International Nuclear Energy Cooperation: The increase from $2,496,000 to $3,000,000 reflects expansion of existing and developing new bilateral and multilateral activities that will be conducted with France, Russia, Western Hemisphere countries, and other states and organizations as determined by Office of Nuclear Energy and U.S. Government strategic priorities and objectives.	**+504**
Total, International Nuclear Energy Cooperation	**+504**

International Nuclear Energy Cooperation

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
• Conduct bilateral and multilateral collaboration on CFS concepts and continue analytical studies to support this engagement. • Provide country-specific policy and logistical support required to effectively implement NE's bilateral nuclear energy R&D activities with expert support from national laboratory lead country coordinators. Maintain the existing bilateral and multilateral cooperation commitments as appropriate. • Provide expertise and technical assistance to the Department of Commerce in its efforts to support U.S. nuclear exports.	• Develop new collaboration opportunities with France, Russia and Japan in light of R&D Agreements and implementing arrangements completed in 2014. • Provide country-specific policy and logistical support required to effectively implement NE's bilateral nuclear energy R&D activities with expert support from national laboratory lead country coordinators. Maintain the existing bilateral and multilateral cooperation commitments as appropriate. Enhance Western Hemisphere technical cooperation with advanced and developing nuclear energy countries to support both the Office of Nuclear Energy and U.S. Government strategic priorities and objectives. • Provide expertise and technical assistance to the Department of Commerce in its efforts to support U.S. nuclear exports. • Advance multilateral collaboration on CFS concepts and continue analytical studies supporting this engagement.	The increase is a result of leveraging existing appropriations in FY 2014 because of high uncosted balances.

Program Direction

Overview

Program Direction provides the Federal staffing resources and associated costs required to provide overall direction and execution of the Office of Nuclear Energy (NE) programs. NE staff is located in Washington, DC, the Idaho Operations Office, Oak Ridge Operations Office and the Nevada Site Office. The Idaho site office funding supports their efforts to continue to be a fully functional service center, not only for the Office of Nuclear Energy, but other Department of Energy offices. Activities within the site office support function include execution of headquarters directed procurements, as well as supplemental support for any unforeseen actions.

In addition to NE federal personnel, Program Direction also supports the coordination of the Energy portfolio by the Office of the Under Secretary for Science and Energy. NE Program Direction also supports select federal staff from the Office of the General Counsel and Energy Information Administration responsible for administrative activities and judicial litigation associated with the termination of the Yucca Mountain Nuclear Waste 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).

Program Direction also includes travel funding for transportation of HQ and field NE personnel, per diem allowances while in authorized travel status, and other expenses incidental to travel. Support Services allows the Department to cost-effectively 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 on an as needed basis, using support services provides unlimited flexibility in team composition as the needs of NE evolve. Finally, Other Related Expenses provides NE's contribution to the Department's Working Capital Fund (WCF) for common administrative services at HQ. DOE is working to achieve economies of scale through an enhanced WCF. The WCF covers certain shared, enterprise activities including enhanced cyber security architecture, employee health and testing services, and consolidated training and recruitment initiatives which were created in previous fiscal years and are being maintained in FY 2015.

In addition to appropriated funds, NE also manages approximately $140 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. The Program Direction request reflects NE's continued attempts 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.

Highlights of the FY 2015 Budget Request

The Nuclear Energy Program Direction request is about 19% less than the FY 2014 request reflecting ongoing efforts to right-size the federal oversight activities of the Nuclear Energy program and to eliminate excess prior year uncosted balances.

Program Direction
Funding ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Program Direction Summary					
Washington Headquarters					
Salaries and Benefits	29,279	30,000	30,000	30,600	+600
Travel	933	925	925	925	0
Support Services	3,000	3,000	3,000	1,500	-1,500
Other Related Expenses	15,158	13,750	13,750	4,465	-9,285
Total, Washington Headquarters	**48,370**	**47,675**	**47,675**	**37,490**	**-10,185**
Oak Ridge					
Salaries and Benefits	1,073	1,100	1,100	1,125	+25
Travel	8	25	25	25	0
Support Services	258	300	300	300	0
Other Related Expenses	1,000	1,000	1,000	1,000	0
Total, Oak Ridge	**2,339**	**2,425**	**2,425**	**2,450**	**+25**
Idaho Operations Office					
Salaries and Benefits	25,000	26,000	26,000	26,250	+250
Travel	909	900	900	900	0
Support Services	4,000	4,000	4,000	2,000	-2,000
Other Related Expenses	4,500	9,000	9,000	4,000	-5,000
Total, Idaho Operations Office	**34,409**	**39,900**	**39,900**	**33,150**	**-6,750**
Total Program Direction					
Salaries and Benefits	55,352	57,100	57,100	57,975	+875
Travel	1,850	1,850	1,850	1,850	0
Support Services	7,258	7,300	7,300	3,800	-3,500
Other Related Expenses	20,658	23,750	23,750	9,465	-14,285
Total, Program Direction	**85,118**	**90,000**	**90,000**	**73,090**	**-16,910**
Federal FTEs	**403**	**418**	**418**	**418**	**0**
Support Services and Other Related Expenses					
Support Services					
Technical Support					
Mission Related	2,390	2,505	2,505	1,400	-1,105

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Advisory and Assistance	325	365	365	185	-180
Total, Technical Support	**2,715**	**2,870**	**2,870**	**1,585**	**-1,285**
Management Support					
Administrative	1,729	1,720	1,720	915	-805
IT	2,814	2,710	2,710	1,300	-1,410
Total Management Support	4,543	4,430	4,430	2,215	-2,215
Total, Support Services	**7,258**	**7,300**	**7,300**	**3,800**	**-3,500**
Other Related Expenses					
Working Capital Fund	3,638	9,096	9,096	6,980	-2,116
Training	515	550	550	250	-300
Miscellaneous	15,100	12,604	12,604	1,235	-11,369
Rents and Utilities	1,405	1,500	1,500	1,000	-500
Total, Other Related Expenses	**20,658**	**23,750**	**23,750**	**9,465**	**-14,285**

Program Direction

Activities and Explanation of Changes

FY 2014 Enacted	FY 2015 Request	Explanation of Changes FY 2015 vs FY 2014 Enacted
Salaries and Benefits		
Provides salaries and benefits for 418 federal staff.	Provides salaries and benefits for 418 federal staff.	Increase provides for a net increase of 2% in federal salary costs for step increases and federal pay scale increases.
Travel		
Provides for travel of the federal staff including any necessary permanent change of duty status costs, particularly associated with the NE staff at DOE overseas offices.	Provides for travel of the federal staff including any necessary permanent change of duty status costs, particularly associated with the NE staff at DOE overseas offices.	Travel remains level at approximately at 70% of FY 2010 Office of Nuclear Energy expenditures. FY 2014 and FY 2015 include 1 -2 permanent change of stations for NE personnel assigned to overseas offices.
Support Services		
Provides for technical and administrative support services for the NE federal staff including access to and participation with external and international nuclear energy organizations such as the Organization for Economic Co-operation and Development / Nuclear Energy Agency.	Provides for technical and administrative support services for the NE federal staff including access to and participation with external and international nuclear energy organizations such as the Organization for Economic Co-operation and Development / Nuclear Energy Agency.	Reduction of $1,285,000 for technical support services reflects ongoing efforts to reduce costs while maintaining appropriate oversight of NE missions. Reduction of $805,000, 46.8%, in administrative support services reflects ongoing savings achieved streamlining and coordination of IT services through the DOE integrated IT services program.
Other Related Expenses		
Provides for NE's share of goods and services procured through the Department's Working Capital Fund; rents and utilities associated with the Idaho Operations Office and allocated shared of such costs for the Nevada Site Office; federal training expenses; and other miscellaneous expenses.	Provides for NE's share of goods and services procured through the Department's Working Capital Fund; rents and utilities associated with the Idaho Operations Office and allocated shared of such costs for the Nevada Site Office; federal training expenses; and other miscellaneous expenses.	Significant savings through the elimination of excess prior year uncosted balances and the reduction of marginal value activities are partially offset by the ongoing growth in the scope and cost of the Department's Working Capital Fund. Also includes NE's modest share of allocated charges at the Nevada Site Office.

Nuclear Energy Research and Development
Research and Development ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Basic	0	0	0	0
Applied	630,863	612,235	581,619	-30,616
Development	26,661	21,871	21,527	-344
Subtotal, R&D	**657,524**	**634,106**	**603,146**	**-30,960**
Equipment	0	0	0	0
Construction	0	0	0	0
Total, R&D	**657,524**	**634,106**	**603,146**	**-30,960**

Nuclear Energy
Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) ($K)

	FY 2013 Transferred	FY 2014 Projected	FY 2015 Request	FY 2015 vs FY 2014 Projected
Reactor Concepts Research, Development and Demonstration	3,296	3,610	3,318	-292
Fuel Cycle Research and Development	5,345	4,999	5,250	+251
Nuclear Energy Enabling Technologies	2,136	2,275	2,582	+307
Total, SBIR/STTR	**10,777**	**10,884**	**11,150**	**+266**

Nuclear Energy
Safeguards and Security ($K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs FY 2014 Enacted
Protective Forces	52,054	53,277	53,277	57,547	+4,270
Security Systems	9,916	10,434	10,434	14,718	+4,284
Information Security	3,112	3,181	3,181	3,451	+270
Personnel Security	5,643	6,634	6,634	7,050	+416
Material Control & Accountability	3,668	4,130	4,130	4,340	+210
Program Management	4,988	5,354	5,354	5,626	+272
Cyber Security	10,472	10,990	10,990	11,268	+278
Total, Idaho Sitewide Safeguards and Security	**89,853**[1]	**94,000**	**94,000**	**104,000**	**+10,000**

[1] Funding level includes $4.1m Appropriations Transfer.

Department Of Energy
FY 2015 Congressional Budget
Funding By Appropriation By Site
($K)

Nuclear Energy	FY 2013 Current	FY 2014 Enacted	FY 2015 Request
Argonne National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	12,725	10,300	10,799
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	3,891	3,220	4,650
Reactors Concepts RD&D			
Reactors Concepts RD&D	11,864	11,490	11,810
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	1,022	565	725
SMR Licensing Technical Support			
SMR Licensing Technical Support	275	0	0
Total, Argonne National Laboratory	**29,777**	**25,575**	**27,984**
Brookhaven National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	2,465	1,800	2,225
Reactors Concepts RD&D			
Reactors Concepts RD&D	457	220	220
Total, Brookhaven National Laboratory	**2,922**	**2,020**	**2,445**
Idaho National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	38,371	43,500	46,469
Radiological Facilities Management			
Radiological Facilities Management	15,103	4,380	4,380
Idaho Facilities Management			
Idaho Facilities Management	138,721	189,852	178,490
Idaho Sitewide Safeguards and Security			
Idaho Sitewide Safeguards and Security	0	91,900	101,900
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	19,762	29,315	27,219
Reactors Concepts RD&D			
Reactors Concepts RD&D	47,784	45,920	41,820
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	1,133	925	1,155
SMR Licensing Technical Support			
SMR Licensing Technical Support	1,436	1,250	0
Total, Idaho National Laboratory	**262,310**	**407,042**	**401,433**

Department Of Energy
FY 2015 Congressional Budget
Funding By Appropriation By Site
($K)

Nuclear Energy	FY 2013 Current	FY 2014 Enacted	FY 2015 Request
Idaho Operations Office			
University Research Program			
University Research	4,677	5,500	0
Fuel Cycle R & D			
Fuel Cycle R & D	30,144	50,000	35,750
Radiological Facilities Management			
Radiological Facilities Management	1,187	600	600
Idaho Facilities Management			
Idaho Facilities Management	5,054	5,100	5,800
Idaho Sitewide Safeguards and Security			
Idaho Sitewide Safeguards and Security	0	2,100	2,100
Program Direction-NE			
Program Direction-NE	34,950	39,900	33,150
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	14,676	8,828	16,016
Reactors Concepts RD&D			
Reactors Concepts RD&D	24,425	32,698	20,952
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	35	37	35
SMR Licensing Technical Support			
SMR Licensing Technical Support	60,530	107,634	96,500
Supercritical Transformational Electric Power Generatio			
Supercritical Transformational Electric Power Generation	0	0	27,500
Total, Idaho Operations Office	**175,678**	**252,397**	**238,403**
Kansas City Site Office			
Idaho Facilities Management			
Idaho Facilities Management	152	60	400
Total, Kansas City Site Office	**152**	**60**	**400**
Lawrence Berkeley National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	2,930	2,900	3,780
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	0	50	50
Total, Lawrence Berkeley National Laboratory	**2,930**	**2,950**	**3,830**

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Nuclear Energy	FY 2013 Current	FY 2014 Enacted	FY 2015 Request
Lawrence Livermore National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	2,525	1,200	1,220
Radiological Facilities Management			
Radiological Facilities Management	100	0	0
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	750	200	505
Reactors Concepts RD&D			
Reactors Concepts RD&D	220	100	100
Total, Lawrence Livermore National Laboratory	**3,595**	**1,500**	**1,825**
Los Alamos National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	13,258	12,600	12,645
Radiological Facilities Management			
Radiological Facilities Management	27,325	0	0
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	1,100	875	1,020
Reactors Concepts RD&D			
Reactors Concepts RD&D	250	0	0
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	14	30	50
Total, Los Alamos National Laboratory	**41,947**	**13,505**	**13,715**
Nevada Site Office			
Idaho Facilities Management			
Idaho Facilities Management	217	272	400
Total, Nevada Site Office	**217**	**272**	**400**
Oak Ridge National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	22,312	20,350	22,279
Radiological Facilities Management			
Radiological Facilities Management	18,855	19,968	0
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	24,320	25,081	24,931
Reactors Concepts RD&D			
Reactors Concepts RD&D	14,530	14,880	17,250
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	337	410	410
SMR Licensing Technical Support			
SMR Licensing Technical Support	150	0	0
Total, Oak Ridge National Laboratory	**80,504**	**80,689**	**64,870**

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Oak Ridge Office			
Fuel Cycle R & D			
Fuel Cycle R & D	550	550	550
Program Direction-NE			
Program Direction-NE	2,339	2,425	2,450
Reactors Concepts RD&D			
Reactors Concepts RD&D	200	0	0
Total, Oak Ridge Office	**3,089**	**2,975**	**3,000**
Pacific Northwest National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	9,998	11,000	9,642
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	250	70	0
Reactors Concepts RD&D			
Reactors Concepts RD&D	1,721	1,150	1,150
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	50	40	100
Total, Pacific Northwest National Laboratory	**12,019**	**12,260**	**10,892**
Sandia National Laboratories			
Fuel Cycle R & D			
Fuel Cycle R & D	13,325	10,700	15,817
Radiological Facilities Management			
Radiological Facilities Management	1,385	0	0
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	305	200	420
Reactors Concepts RD&D			
Reactors Concepts RD&D	2,830	2,620	3,200
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	140	160	190
SMR Licensing Technical Support			
SMR Licensing Technical Support	0	1,116	0
Total, Sandia National Laboratories	**17,985**	**14,796**	**19,627**
Savannah River National Laboratory			
Fuel Cycle R & D			
Fuel Cycle R & D	4,093	3,800	4,942
Radiological Facilities Management			
Radiological Facilities Management	70	0	0
Total, Savannah River National Laboratory	**4,163**	**3,800**	**4,942**

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Nuclear Energy	FY 2013 Current	FY 2014 Enacted	FY 2015 Request
Washington Headquarters			
Fuel Cycle R & D			
Fuel Cycle R & D	17,200	17,505	22,982
Radiological Facilities Management			
Radiological Facilities Management	1,345	20	20
Idaho Facilities Management			
Idaho Facilities Management	837	992	820
Program Direction-NE			
Program Direction-NE	47,829	47,675	37,490
Nuclear Energy Enabling Technologies			
Nuclear Energy Enabling Technologies	2,850	3,270	3,435
Reactors Concepts RD&D			
Reactors Concepts RD&D	499	3,744	4,038
International Nuclear Energy Cooperation			
International Nuclear Energy Cooperation	75	329	335
SMR Licensing Technical Support			
SMR Licensing Technical Support	279	0	500
Total, Washington Headquarters	**70,914**	**73,535**	**69,620**
Total, Nuclear Energy	**708,202**	**893,376**	**863,386**