Office of Nuclear Energy

FY 2016 Budget Request

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President Obama's Nuclear Energy Goals

"Thanks to the ingenuity of our businesses, we're starting to produce much more of our own energy. We're building the first nuclear power plants in more than three decades in Georgia and South Carolina."
-Georgetown University June 26th, 2013

"Now, one of the biggest factors in bringing more jobs back is our commitment to American energy. The all-of-the-above energy strategy I announced a few years ago is working, and today, America is closer to energy independence than we've been in decades."
- State of the Union, January 26th, 2014

Department of Energy Mission and Goals

DOE Mission

The mission of the Department of Energy is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.

Goal 1: Science and Energy

Advance foundational science, innovate energy technologies, and inform data driven policies that enhance U.S. economic growth and job creation, energy security, and environmental quality, with emphasis on implementation of the President's Climate Action Plan to mitigate the risks of and enhance resilience against climate change.

Strategic Objective 1 – Advance the goals and objectives in the President's Climate Action Plan by supporting prudent development, deployment, and efficient us of "all of the above" energy resources that also create new jobs and industries

Strategic Objective 2 - Support a more economically competitive, environmentally responsible, secure and resilient U.S. energy infrastructure

Nuclear Energy – DOE Technology Team Crosscut Support

Supercritical sCO_2:

FY 2016 activities will include efforts to support the STEP pilot scale demonstration project through technical evaluations of risk and cost reduction option, and the development and testing of high efficiency Brayton cycle turbo-machinery and the conduct of experiments to explore liquid metal / sCO_2 heat exchanger performance. (STEP R&D $5.0 million, Reactor Concepts RD&D $3.3 million).

Subsurface Engineering:

FY 2016 activities include the initiation of a field test to support R&D of the concept of waste disposal in deep boreholes in crystalline basement rock and RD&D on characterization and performance of generic mined geologic repository media and concepts for disposal of high-level radioactive waste and used nuclear fuel. (Fuel Cycle R&D $39.5 million).

Cybersecurity:

FY 2016 activities will support Idaho National Laboratory computing infrastructure and network security configuration necessary to support classified and unclassified information and electronic operations. (Idaho Sitewide Safeguards and Security $14.5 million)

Highlights of the Nuclear Energy FY 2016 Request

FY 2015 Enacted	FY 2016 Request	FY 16 vs FY15 Delta
$914M	$908M	-$6M

- **Small Modular Reactors ($63M)—**Continues technical support for licensing SMRs.
- **STEP R&D ($5M)**—Continue support for DOE effort to accelerate commercialization of sCO2 Brayton cycle energy conversion technologies.
- **Reactor Concepts ($108M)**— Continues light water reactor sustainability efforts to maintain carbon free generation of the current fleet and supports development of advanced reactor technologies.
- **Nuclear Energy Enabling Technologies ($86M)**—Continues Energy Innovation Hub for Modeling and Simulation for second 5-year period; advanced modeling and simulation for NE R&D programs, and initiates Traineeship program in radiochemistry.
- **Fuel Cycle R&D ($218M)**—Supports Administration's waste management strategy through R&D on deep borehole disposal and extended storage of high burnup used nuclear fuel, laying the groundwork for interim storage and transportation of nuclear waste, and activities associated with exploring potential alternative disposal options for some DOE-managed HLW and cooler DOE-managed spent nuclear fuel.
- **Idaho National Laboratory ($338M)**—Modernization of facilities and security capabilities.

NE FY 2016 Congressional Request
Funding Summary

(Dollars in Thousands)

	FY 2015 Enacted [a]	FY 2016 Request
Integrated University Program	5,000	0
SMR Licensing Technical Support	54,500	62,500
STEP R&D	5,000	5,000
Reactor Concepts RD&D	133,000	108,140
Fuel Cycle R&D	197,000	217,760
Nuclear Energy Enabling Technologies	101,000	86,387
Radiological Facilities Management	25,000	6,800
International Nuclear Energy Cooperation	3,000	3,000
Idaho Facilities Management	206,000	211,826
Idaho Sitewide Safeguards and Security	104,000	126,161
Program Direction	80,000	80,000
Total, Nuclear Energy	**913,500**	**907,574**

a) Does not reflect rescission of $80,121,000 of prior year appropriations.

Small Modular Reactor Licensing Technical Support

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
SMR Licensing Technical Support	54,500	62,500
Total:	**54,500**	**62,500**

Tennessee Valley Authority Clinch River Site

NuScale SMR

Program will provide $452M over 6 years

Mission

Technical support for design certification (DC) and licensing activities for SMR designs through cost-shared arrangements with industry partners in order to accelerate commercialization and deployment of SMRs that can provide safe, clean, affordable power options.

FY 2016 Planned Accomplishments

- NuScale completes:
  - integral systems testing for reactor module design.
  - safety analysis and probabilistic risk assessment.
  - final draft of design certification application for submission to NRC in November 2016.
- Supports site permitting and related licensing activities for ongoing partners and for an electricity provider partnered with NuScale.

STEP R&D

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
STEP	5,000	5,000
Total:	**5,000**	**5,000**

Secretary Moniz (9/13/13) at SNL viewing a Brayton Cycle turbine (2x125 Kw)

Mission

Accelerate the commercialization of sCO_2 Brayton cycle energy conversion technologies through cost-shared cooperative agreements for a pilot-scale demonstration.

STEP is a collaboration among NE, Fossil Energy and Energy Efficiency and Renewable Energy.

FY 2016 Planned Accomplishments

- Support FE in the implementation of the STEP pilot scale demonstration project.
- Evaluate options to reduce technical risks and reduce cost for the STEP demonstration facility.
- Conduct specific R&D and technology development activities.

Reactor Concepts
Research, Development and Demonstration

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
Light Water Reactor Sustainability	35,000	33,275
Advanced Reactor Technology	98,000	74,865
Total:	**135,000**	**108,140**

Mission

Develop new and advanced reactor designs and technologies that advance the state of reactor technology to improve competitiveness and support meeting Nation's energy , environmental, and national security goals.

FY 2016 Planned Accomplishments

- Complete a model for concrete degradation in nuclear environments and a prototype non-destructive examination technique. (LWRS)
- Complete a full-scope safety margins analysis of a power uprate scenario. (LWRS)
- Develop a strategy to achieve a modernized, hybrid (mixed analog and digital) control room. (LWRS)
- Support NRC development of Advanced Reactor Design Criteria and regulatory guidelines. (ART)
- Development TRISO coated particle fuel and nuclear grades of graphite. (ART)
- Support ASME Code Qualification case approvals for selected advanced reactor materials. (ART)
- Complete a comprehensive advanced test/demonstration reactor planning study and continue economic analysis study. (ART)

Fuel Cycle Research and Development

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
Material Recovery and Waste Form Development	35,300	35,300
Advanced Fuels	60,100	48,700
Systems Analysis & Integration	16,900	11,200
Materials Protection, Accounting & Control Technology	7,600	8,600
Used Nuclear Fuel Disposition (UNFD) Research & Development	49,000	75,360
UNFD Integrated waste management system	22,500	30,000
UNFD *DOE-Managed HLW and SNF*	--	3,000
Fuel Resources	5,600	5,600
Total:	**197,000**	**217,760**

Mission

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.

Conduct generic R&D on used nuclear fuel and nuclear waste management strategies and technologies to support USG responsibility to manage and dispose of the nation's commercial UNF and high-level waste.

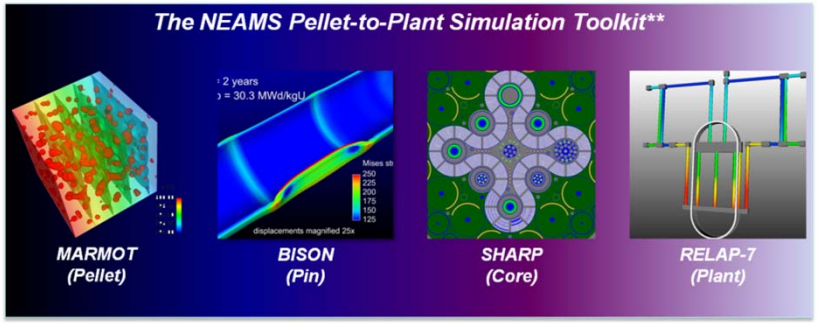
FY 2016 Planned Accomplishments

- Complete the first phase of the initial demonstration of electrochemical processing with the Republic of Korea using 30-50 kilograms used oxide fuel.
- Advance to laboratory-scale demonstration using actual used nuclear fuel in minor actinide separations, zirconium recycle from cladding hulls, and tritium pretreatment.
- Select accident tolerant fuel concepts to be pursued in the development and qualification phase.
- Initiate a field test to examine the viability of deep borehole disposal of high-level radioactive waste.
- Expand integrated waste management system activities to continue to lay the groundwork for storage and transportation of nuclear waste.
- Activities associated with exploring potential alternative disposal options for some DOE-managed HLW and SNF.

Nuclear Energy Enabling Technologies

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
Energy Innovation Hub for Modeling & Simulation	24,300	24,300
Crosscutting Technology Development	14,000	15,343
Nuclear Energy Advanced Modeling and Simulation	26,200	23,612
Nuclear Science User Facilities	36,500	21,132
NE Traineeships	--	2,000
Total:	**101,000**	**86,387**



Mission

Develop crosscutting technologies that directly support and complement NE's R&D efforts and encourage transformative and creative solutions.

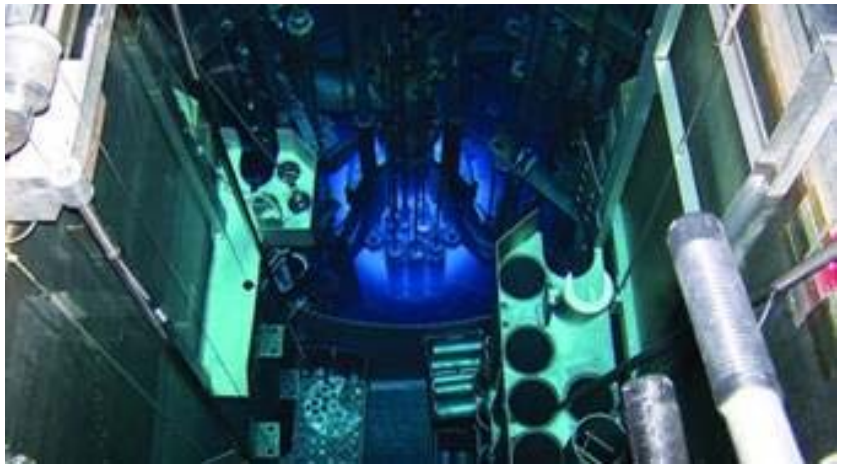
FY 2016 Planned Accomplishment

- Award competitive research projects on selected crosscutting nuclear concepts topics.
- Improve BISON (fuels) – SHARP (reactor) integration and assessment plan (crucial step to achieving multi-scale, multi-physics simulations).
- Complete mid-term reviews of the first collaborative High-Impact Problems (HIPs) (crucial to validation/demonstration of NEAMS tools).
- Release version 6.0 of the Virtual Environment for Reactor Analysis (VERA).
- Award NSUF capabilities access for materials irradiation and post-irradiation examination; expand NSUF access to high performance computing capabilities; and provide access to nuclear infrastructure database.
- Initial NE Traineeship program in radiochemistry.

Radiological Facilities Management

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
Space and Defense Infrastructure	20,000	--
Research Reactor Infrastructure	5,000	6,800
Total:	**25,000**	**6,800**



Mission

Support the continued operation of 25 U.S. university research reactors by providing fuel services and maintenance of fuel fabrication equipment.

FY 2016 Planned Accomplishments

- Procure 40 and deliver between 33 and 36 plate fuel elements required annually by MURR and MIT as determined by need and fuel availability.
- Continue TRIGA fuel alternatives analysis and implementation activities as warranted by results of FY 2014 analysis results and status of TRIGA International outage.
- Complete NRC application for approval of BRR cask SAR amendment and procure associated universal “basket “ to support shipment of university fuel types that lack an approved basket.

International Nuclear Energy Cooperation

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
International Nuclear Energy Cooperation	3,000	3,000
Total:	**3,000**	**3,000**

Mission

Serve as the overall lead for the Office of Nuclear Energy in implementing international cooperative R&D activities and support other DOE and broader USG international nuclear energy related priorities.

FY 2016 Planned Accomplishments

- Integrate and coordinate NE's international nuclear R&D activities.
- Maintain the existing bilateral and multilateral cooperation commitments as appropriate and develop new cooperation mechanisms with advanced and developing nuclear energy countries as needed to support both the Office of Nuclear Energy and U.S. Government strategic priorities and objectives.
- Support Administration priorities by enhancing USG engagement with international partners on civil nuclear policy, RD&D, exports, and related activities.

Idaho Facilities Management

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
INL Nuclear Research Reactor Operations and Maintenance	99,264	90,244
INL Non-Reactor Nuclear Research Facility Operations and Maintenance	76,207	75,584
INL Engineering and Support Facility Operations and Maintenance	11,356	31,459
INL Regulatory Compliance	13,804	12,539
13-D-905, Remote Handled Low-Level Waste Disposal Project, INL	5,369	0
16-E-200, Sample Preparation Laboratory, INL	--	2,000
Total:	**206,000**	**211,826**

Mission

Manage the planning, acquisition, operation, maintenance, and disposition of nuclear facilities and capabilities at the Idaho National Laboratory (INL).

FY 2016 Planned Accomplishments

- Complete construction of the Remote Handled Low-Level Waste Disposal Project.
- Complete TREAT fuel inspections and fire protection upgrades.
- Initiate refurbishment of the INL power distribution infrastructure.
- Complete 1-3 shipments of NE-owned special nuclear material for off-site disposition.
- Initiate preliminary design activities for the Sample Preparation laboratory (SPL) project.

Idaho Sitewide Safeguards and Security

Budget Summary
$ in thousands

	FY 2015 Enacted	FY 2016 Request
Idaho Sitewide S&S	104,000	126,161
Total:	**104,000**	**126,161**

Mission

Provide protection of nuclear materials, classified matter, Government property, and other vital assets at the Idaho National Laboratory (INL).

FY 2016 Planned Accomplishments

- Upgrade the Perimeter Intrusion Detection and Assessment System (PIDAS) and the Central Alarm System (CAS) at the Materials and Fuels Complex (MFC).
- Implement enhanced capabilities to monitor and mitigate risks for INL Cloud services.
- Establish an INL Industrial Control Systems cyber security program.

Program Direction

Budget Summary
$ in thousands

Program Element	FY 2015 Enacted	FY 2016 Request
Program Direction	80,000	80,000
Total:	**80,000**	**80,000**

Mission

Provide federal oversight and planning for the Nuclear Energy applied energy programs and ensure the effective, safe, and secure operation of the Idaho National Laboratory.

FY 2016 Planned Accomplishments

- Plan, manage and oversee the Nuclear Energy research and development program.
- Oversee $700M/year INL M&O Contract
- Oversee approx. $250M in work for other federal agencies.
- Issue awards for NEUP, NEET and Nuclear Infrastructure programs.
- Provide Nuclear Safety Specialist and Safety System Oversight programs.
- Coordinate IAEA related commitments.
- Participate as USG representative on numerous international engagement entities.
- Manage preparation of NASA funded nuclear safety analysis for future NASA mission.