



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Nuclear Energy: Priorities for FY 2009 and FY 2010

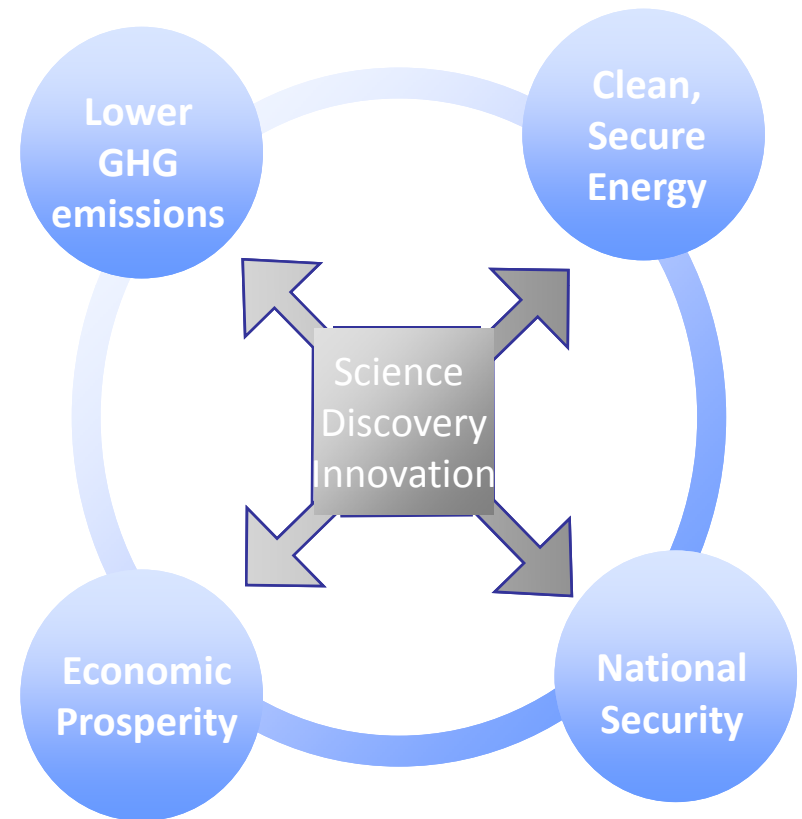
R. Shane Johnson
Acting Assistant Secretary
for Nuclear Energy

June 9, 2009



The Secretary's Priorities

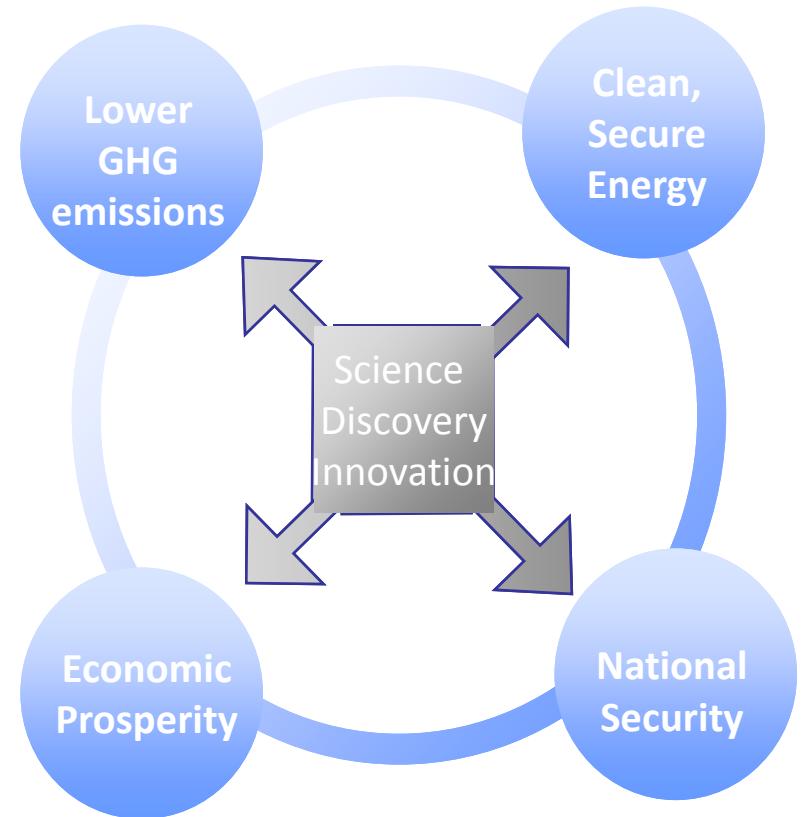
- **Science and Discovery**
 - Invest in science to achieve transformational discoveries
- **Clean, Secure Energy**
 - Change the landscape of energy demand and supply
- **Economic Prosperity**
 - Create millions of green jobs and increase competitiveness
- **National Security and Legacy**
 - Maintain nuclear deterrent and prevent proliferation
- **Climate Change**
 - Position U.S. to lead on climate change policy, technology, and science





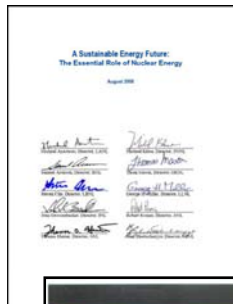
Nuclear Energy and the Secretary's Priorities

- **Science and Discovery**
 - Move beyond incremental improvement of existing reactor and fuel cycle technologies to achieve transformational advances in knowledge and application
- **Clean, Secure Energy**
 - Reliably provides 70% of the U.S. non-carbon generated electricity
- **Economic Prosperity**
 - Advances U.S. technology leadership and global competitiveness and creates significant long-term employment and reliable and affordable electricity
- **National Security and Legacy**
 - R&D is essential to reducing the risk of nuclear proliferation as nuclear-based electricity generation expands globally
- **Climate Change**
 - Recognized as essential to addressing global climate change



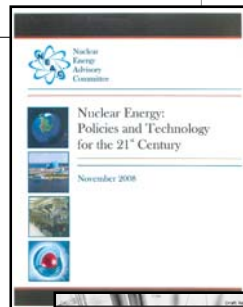


Priorities for FY 2009 and FY 2010



Deliver Clean Energy Products to Market

- Maintain Existing LWRs in Operation
- Deploy New ALWRs
- Develop New Advanced High Temperature Gas-Cooled Reactors

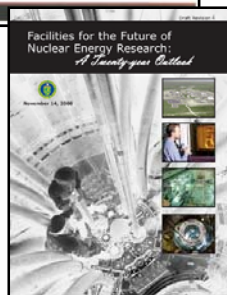


Develop Options to Current Fuel Cycle Management Strategy

- Develop Technical and Policy Options

Advance U.S. International Engagement

- Ensure safety and security by advancing policy and technology objectives
- Maintain leadership role in international forums



Develop U.S. Nuclear Energy Research Infrastructure

- Build the Idaho National Laboratory
- Support U.S. University Nuclear Engineering Programs



NEAC Recommendations*

Waste Management	<ul style="list-style-type: none">• Complete YM licensing process while exploring other options;• Dedicate significant R&D effort to improve fuel cycle and minimize proliferation risks
Research and Development	<ul style="list-style-type: none">• Develop and Implement NE R&D roadmap;• Strengthen university & industry programs in R&D and modernize DOE facilities;• Assure fuel cycle R&D meeting U.S. needs
Human Resources	<ul style="list-style-type: none">• Promote development of workforce w/ NRC
Supply Chain Management	<ul style="list-style-type: none">• Identify “gaps” in meeting needs for new plants
Safety	<ul style="list-style-type: none">• Principle of “Safety First” to guide all actions
Security	<ul style="list-style-type: none">• Top priority premised on solid threat analysis
Reactor Licensing	<ul style="list-style-type: none">• Strive to further improve NRC processes
Policy Environment and Financing	<ul style="list-style-type: none">• Consistent and sound policy environment - scientifically grounded, publicly supported, and informed by clear standards

* *Nuclear Energy: Policies and Technology for the 21st Century*, November 2008



NEAC Recommendations*

Facilities	<ul style="list-style-type: none">• NE inventory of R&D facilities should include university, industrial, and foreign facilities and recognize multi-mission use of these facilities• Strategic initiative needed to ensure facilities are mission-ready• International collaboration important to longer term, high-cost R&D goals• U.S. needs robust set of nuclear research facilities• DOE needs to develop multi-year program for upgrades and new facilities• Need to broaden infrastructure needs to include once-through fuel cycle of current LWRs and expected ALWRs
Modeling and Simulation	<ul style="list-style-type: none">• Focus the program on major problems impeding the rapid deployment of advanced nuclear systems• Utilize existing capabilities of NNSA and Office of Science• Execute a pilot program
Internal Coupling	<ul style="list-style-type: none">• Strengthen links between different parts of DOE
Research and Development	<ul style="list-style-type: none">• Establish base R&D program to support current LWR fleet• Encourage new cadre of engineers and scientists• Include focus on waste management• Maintain U.S. as major participant in international discussions
Down Selects	<ul style="list-style-type: none">• Expedite technical decisions to wisely allocate funding

*Nuclear Energy: Policies and Technology for the 21st Century, November 2008



NEAC Recommendations*

International Engagement

Policy

- USG should articulate nuclear energy policy that minimizes risk of nuclear proliferation
- USG should work urgently w/ IAEA and other nations to institutionalize fuel cycle mechanisms
- IAEA should be budgeted w/ sufficient resources to perform mission
- USG should preserve and strengthen NPT
- USG should respect existing commercial programs in countries that adhere fully to global non-proliferation norms and should work w/ international partners to develop most safe and secure forms and use of materials

Technical

- Investigate shared funding model to support work at foreign facilities
- Establish a reciprocal international user facility in the U.S., such as TREAT
- Develop high temperature reactor fuel jointly with Japan and industry

*Nuclear Energy: Policies and Technology for the 21st Century, November 2008



FY 2009 Program Highlights

- Initiate new University Program: Program-Specific R&D; Investigator-Initiated R&D; Fellowships and Scholarships; and Enhancements to Research Capabilities
- Continue the NP 2010 Program to complete COL applications and continue first-of-a-kind engineering and design finalization activities for the AP1000 and ESBWR standardized designs.
- Complete the High Temperature Electrolysis experiments, down select to a single nuclear hydrogen production technology, and bring Nuclear Hydrogen Initiative to a close.
- Continue infrastructure upgrades through the INL Revitalization Program and University Program to support nuclear science, engineering and energy-related R&D programs.
- Re-focus fuel cycle program from near-term, commercial demonstration projects to long-term, science-based R&D activities regarding spent fuel management.
- Closeout GNEP Programmatic Environmental Impact Statement following completion of public comment period on Draft document.



FY 2010 Program Highlights

- Sponsor transformational research to achieve scientific breakthroughs in nuclear science and technology to address energy security and climate change.
- Create new science and technology partnerships to leverage government, industry and academia
 - Energy Innovation Hubs for Extreme Materials, Modeling and Simulation
- Invest in facilities and infrastructure to support nuclear energy research
 - Address today's needs and build tomorrow's workforce
- Create new capabilities to support unique U.S. government missions
 - New production capability for Plutonium 238
- Complete the Nuclear Power 2010 program through support for the NuStart COLA
- Expand Generation IV R&D to solve the underlying technology challenges (fuels, materials, and neutronic and thermofluids modeling) of advanced reactor concepts.
- Redirect Fuel Cycle R&D from a near-term technology deployment program to a long-term, science-based research and development program.



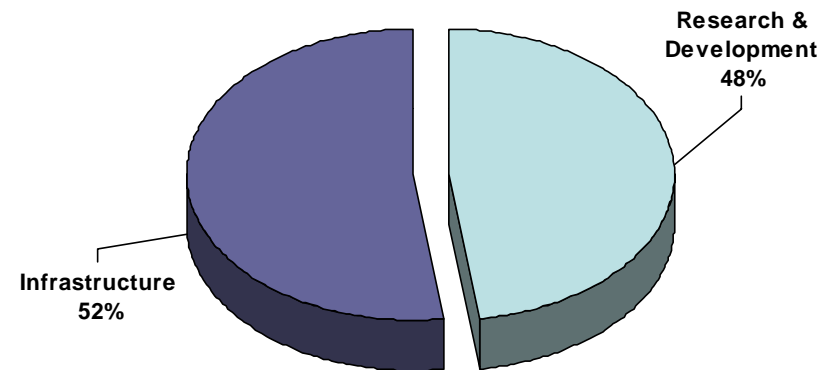
FY 2010 Budget Request

In thousands

Program:	FY 2009 Approp	FY 2010 Request
Research & Development		
University Research	5,000	0
Nuclear Power 2010	177,500	20,000
Generation IV	180,000	191,000 ^{ab}
Nuclear Hydrogen	7,500	0
Fuel Cycle R&D	145,000	192,000 ^{ac}
Infrastructure		
Radiological Facilities	66,146	77,000 ^d
Idaho Facilities Management	140,000	203,402 ^e
Idaho Sitewide S&S	78,811	83,358
Program Direction	73,000	77,872
Adjustments ^f	-2,146	0
Total NE:	870,811	844,632

FY 2010 Funding

Total: \$844,632



- a 20% competitively awarded under NE University Programs
- b \$35M for Energy Innovation Hub for Modeling and Simulation
- c \$35M for Energy Innovation Hub for Extreme Materials
- d Space and Defense (\$47M) and Pu-238 (\$30M) production
- e \$45 million for INL contractor defined-benefit pension plan
- f \$2.854M for Congressionally Directed Projects, and -\$5M for Use of Prior Year Balance Reduction



Additional Budget & Program Information



Nuclear Power 2010

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
Cost-Shared Program with Industry	177.0	20.0
Standby Support	.5	0
Total:	177.5	20.0

FY 2010 Planned Accomplishments

- Continue NP 2010 efforts toward closure of NRC site open items on selected Combined Construction and Operating License (COL) applications.



Generation IV Nuclear Energy Systems

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
GEN IV R&D	178.7	154.7
Energy Innovation Hub for Modeling & Simulation	0.0	35.0
SBIR/ STTR	1.3	1.3
Total:	180.0	191.0

FY 2010 Planned Accomplishments

- Conduct cross-cutting research in materials, analytical methods, economics and proliferation resistance supporting all Generation IV reactor concepts.
- Continue development of advanced materials for use in structural systems, fuel claddings and other high temperature applications.
- Continue fuel testing to establish a licensing basis for gas-cooled reactor coated particle fuel.
- Demonstrate the technical and economic viability of an advanced Brayton-cycle energy-conversion system using supercritical carbon dioxide as the working fluid.
- Continue to support GIF activities and continue international R&D collaborations through the GIF Very High Temperature Reactor (VHTR) System Arrangement.
- Establish the Energy Innovation Hub for Modeling and Simulation.



Fuel Cycle Research & Development

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
Fuel Cycle R&D	142.7	153.8
Energy Innovation Hub for Extreme Materials	0	35.0
SBIR/ STTR	2.3	3.2
Total:	145.0	192.0

FY 2010 Planned Accomplishments

- Initiate a series of fundamental measurements for understanding the actinide separations science.
- Coordinate advanced safeguards instrumentation development for materials accountability measurements.
- Develop the basis for a science-based waste form program that will provide for a broader set of options with significantly improved performance in a large variety of geologic environments.
- Develop and implement advanced experimental techniques.
- Conduct R&D on advanced alloy and composite cladding technologies to improve performance.
- Conduct R&D activities on high precision measurements of nuclear data, sensitivity analyses, and development of advanced measurement techniques.
- Initiate development of the Fuel Cycle R&D Knowledge Management architecture.
- Conduct detailed fuel cycle system studies for possible fuel cycles (including thorium-based fuel cycles) and geologic repository environments to specify technical requirements for each step of the fuel cycle.
- Establish the Energy Innovation Hub for Extreme Materials.



Radiological Facilities Management

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
Space & Defense Infrastructure	35.0	47.0
Los Alamos Nuclear Infrastructure	12.5	0
Oak Ridge Nuclear Infrastructure	12.5	0
Research Reactor Infrastructure	6.1	0 ^a
Pu-238 Production Restart	0	30.0
Total:	66.1	77.0

^a Transferred to IFM in FY 2010

FY 2010 Planned Accomplishments

- **Space & Defense Infrastructure**
 - Maintain operability of program related facilities to enable DOE and work-for-others milestones to be achieved.
 - Store and monitor the MMRTG Flight unit in support of future NASA missions.
 - Continue development of the Advanced Stirling Generator in support of a potential NASA missions
- **Pu-238 Production Restart**
 - Prepare National Environmental Policy Act (NEPA) documentation.
 - Prepare detailed conceptual designs studies to support selection of alternatives (CD-1).
 - Perform technical reviews of conceptual design.
 - Develop a safety design strategy, a preliminary security vulnerability assessment, a preliminary project execution plan, and a risk assessment and risk management plan.
 - Initiate target fabrication using existing laboratory facilities and equipment; initiate initial target irradiations in ATR and HFR.
 - Finalize separations flowsheets using existing laboratory facilities and equipment.
 - Complete documentation for full production target irradiation in ATR and HFIR.
 - Establish priority for ATR and HFIR irradiation of targets for final design optimization to initiate the target qualification process.
 - Develop engineering design requirements for process equipment that are independent of the alternative selected at CD-1.

Idaho Facilities Management

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
INL Nuclear Research Reactor Operations & Maintenance	50.7	58.5
INL Non-Reactor Nuclear Research Facility Operations & Maintenance	41.2	44.3
INL Engineering & Support Facility Operations & Maintenance	14.4	15.9
National Scientific User Facility	3.6	3.6
INL Regulatory Compliance	10.5	6.7
INL Facility Infrastructure Revitalization Program	17.2	24.7
Radiological & Environmental Sciences Laboratory	2.4	0
Research Reactor Infrastructure	0	4.7
Contractor Defined Benefit Pension Plans	0	45.0
Total:	140.0	203.4

FY 2010 Planned Accomplishments

- Support MFC, REC and RTC base operations and maintenance to enable 30 distinct nuclear energy related R&D programs to conduct over \$200M of work annually at the INL.
- Conduct ATR base operations that enable 275 days of safe, compliant reactor operations per year serving national security and civilian nuclear power R&D programs at the National Scientific User Facility.
- Continue the Revitalization Program in support of facilities such as: MFC Technical Support Building; ATR Dial Room Replacement; IF 608 Building Power Refurbishment and Uninterruptable Power Supply Upgrade; ATR Complex Evaporation Liner Replacement Project.
- Continue ATR Life Extension Program
- Continue nuclear material consolidation activities to improve nuclear material management.
- Approve the Alternative and Selection of Cost Range for the Remote Handled Low Level Waste Disposal Project.
- Purchase fresh fuel for two to four university reactors and the shipment of spent fuel to DOE facilities for storage.



Idaho Sitewide Safeguards & Security

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
Idaho National Laboratory	78.8	83.4
Total:	78.8	83.4

FY 2010 Planned Accomplishments

- Maintain a highly effective safeguards and security program at Idaho National Laboratory consistent with the approved Site Safeguards and Security Plan
- Maintain a Special Response Team capability to address incidents that require response with force options that exceed the capability of front line protective force personnel.
- Complete installation of a vehicle screening station at the Materials and Fuels Complex.
- Ensure security alarm systems are operational and functioning in accordance with applicable DOE orders.
- Maintain and implement the DOE cyber security program for both classified and unclassified systems at Idaho National Laboratory.
- Complete corrective actions for the findings of the 2008 Office of Health, Safety and Security Inspection of the Unclassified Cyber Security Program
- Finalize and submit the 2008 Graded Security Policy Implementation Plan
- Develop a strategy to address the impacts of a revised Graded Safeguards and Security Table



Program Direction

Budget Summary

\$ in millions

Program Element	FY 2009 Approp	FY 2010 Request
Salaries & Benefits	53.3	56.2
Travel	2.3	2.3
Support Services	5.0	4.4
Other Related Expenses	12.4	15.0
Total:	73.0	77.9

FY 2010 Planned Accomplishments

- Support 160 FTEs at Headquarters
- Support 216 FTEs at Idaho including 19 FTEs for the Radiological and Environmental Sciences Laboratory
- Beginning in FY 2010, the Other Related Expenses activities include operation of RESL which was previously funded under Idaho Facilities Management
 - Funding the operation of RESL in Program Direction allows NE to be consistent with funding practices for federally staffed facilities



NE University Funding History

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
University Research & Education Assistance	26,730	16,547	0	0	0
Research Reactor Infrastructure ^{1/}	0	0	2,920	6,146	4,700
University R&D ^{2/}	21,015	31,882	14,813	64,700	68,000
Integrated University Program	0	0	0	5,000	0
Total	47,745	48,429	17,733	75,846	72,700

^{1/} In FY 2006 and FY 2007, Research Reactor Infrastructure was included within University Research & Education Assistance

^{2/} The contribution from NE R&D programs for universities varied from FY 2006 to FY 2008. In FY 2009, the 20% contribution was implemented.



NE R&D Funding History

