



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Fuel Cycle Research and Development

Dr. Monica C. Regalbuto

**Deputy Assistant Secretary
Fuel Cycle Technologies
U.S. Department of Energy**

**Nuclear Waste Technical Review Board
Washington, DC
January 9, 2012**



Mission and Program Objectives

Nuclear Energy

Mission

Ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.

DOE

Goal 3: Secure Our Nation

- Enhance nuclear security through defense, nonproliferation, and environmental efforts.



Advance nuclear power as a resource capable of making major contributions in meeting the Nation's energy supply, environmental, and energy security needs by resolving technical, cost, safety, security and regulatory issues through research, development, and demonstration.

NE



Develop sustainable fuel cycles and Used Fuel waste management strategies that improve resource utilization, minimize waste generation, improve safety and limit proliferation risk.

FCRD

Program Objectives

Near Term

- Down select fuel cycle options for further development.
- Increase focus on accident tolerant fuels.
- Address BRC recommendations for Used Fuel Disposition.

Medium Term

- Conduct science based, engineering driven research for selected fuel cycle options.
- Complete implementation plan for developing a Test and Validation Complex for extended storage of used nuclear fuel.
- Evaluate benefits of various geologic media for disposal.

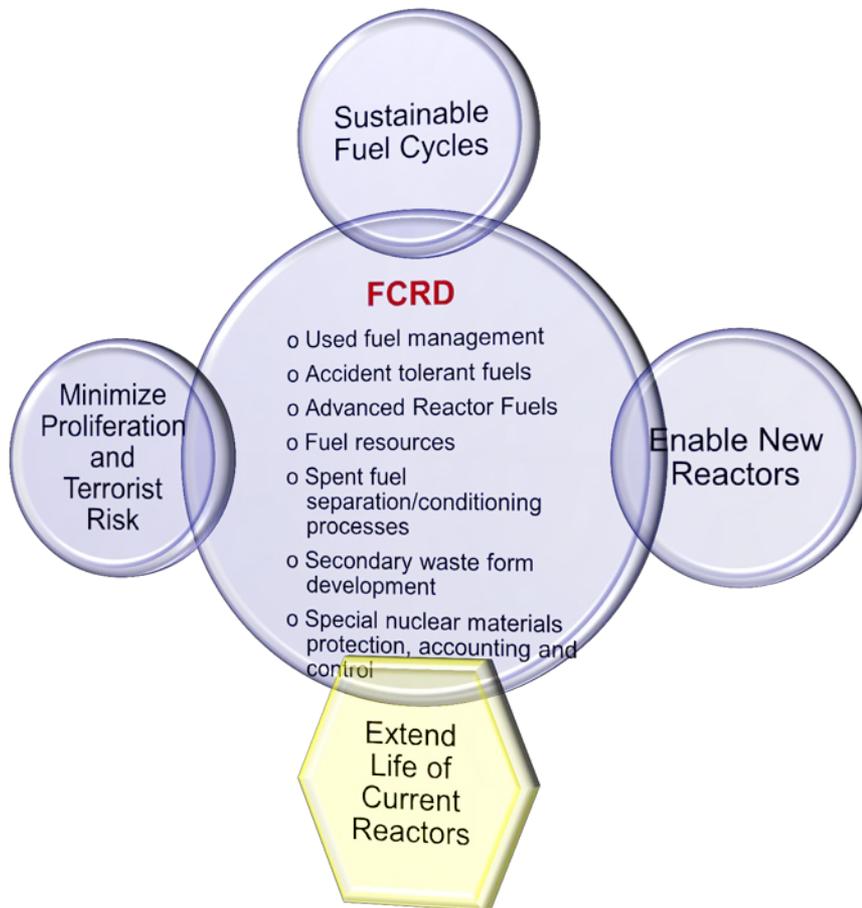
Long Term

- Demonstrate the selected fuel cycle options at engineering scale.
- Execute Test and Validation Complex for extended storage of Used Fuel.
- Conduct engineering analysis of disposal site(s) for selected geologic media.



Strategic Linkages

Nuclear Energy





Working Toward an Integrated Fuel Cycle Approach

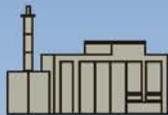
Front End

Back End



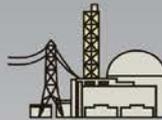
Uranium Resources

- Conventional production
- Innovative approaches

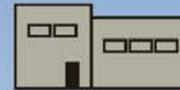


Fuel Fabrication

- Safety enhanced LWR fuel
- Higher performance

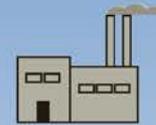


Reactors



Interim Storage

- Evaluating extended time frames
- Transportation after storage



Recycle

- Separations
- Recycled fuel
- Secondary waste treatment



Disposal

- Alternative geologies
- Alternative waste forms

Optimize Through Systems Analysis and Engineering



Fuel Cycle Technical Focus Areas

Nuclear Energy

Fuel Resources

- *Conventional production - support uranium enrichment operations.*
- *Innovative approaches - developing alternative technologies that can provide significant quantities of fuel resources at an economically-viable cost.*

Advanced Fuels

- *Developing next generation light water reactor fuels for improved operating margins, accident tolerance, and high burnup.*
- *Developing transmutation metal fuel with a high degree of tolerance to accident conditions that represent advances in resource utilization and reduced waste.*

Separations and Waste Forms

- *Developing next generation separations and waste management technologies that enable a sustainable fuel cycle.*
- *Developing fuel disposal conditioning technologies.*
- *Developing recycling technologies with minimal processing, waste generation, and potential for material diversion.*

Materials Protection, Accounting, and Control Technology

- *Developing instrumentation capable of real-time measurement of group transuranics in advanced fuel systems.*
- *Developing proliferation risk analyses applied to advanced fuel cycles.*

Used Nuclear Fuel Disposition

- *Developing technologies for storing, transporting, and disposing of used nuclear fuel*
- *Assessing performance of high-level waste forms in the associated storage and disposal environments.*

Systems Analysis and Integration – *Providing a systematic and objective process to prioritize research and development activities and inform programmatic decisions.*



Key Challenges to Success & Out Year Considerations



Blue Ribbon Commission

- Recommendations could lead to near term program shifts and a major restructuring in the longer term.
- Potential to consider interim storage and associated transport to centralized storage location.



Fukushima Event

- May lead to shifting program priorities while also dealing with reduced overall program funding.
- Severe accident tolerant fuel.



FY 2011-12 Budget Summary

Nuclear Energy

Dollars in thousands

Activity/Sub-Activity	FY 2011 Current	FY 2012 (a) Request	FY 2012 (a) Appropriation
Separations and Waste Forms	37,133	36,893	32,420
Advanced Fuels	50,648	40,443	59,000
Transmutation R & D	5,721	3,109	0
Modeling and Simulation	22,350	0	10,000 (b)
Systems Analysis and Integration	23,775	20,466	17,132
MPACT	6,674	7,864	5,176
Used Nuclear Fuel Disposition	32,535	37,249	60,000 (c)
Fuel Resources	3,592	4,646	3,623
Total	182,428	150,670	187,351

- a. Does not include SBIR/STTR contribution.
- b. Assess issues related to the aging and safety of storing spent nuclear fuel in fuel pools and dry storage casks.
- c. \$10M for development and licensing of standardized casks,
\$3M for developing models for potential partnerships to manage waste,
\$7M for characterizing potential geologic repository media,



Integration within NE and Other Offices

Within NE

- Coordinates with Reactor Technologies in crosscutting areas:
 - NEAMS
 - LWRS
 - Nuclear data
 - Proliferation risk assessment
- Facilities Management funds crosscutting facilities required by FCR&D: ATR, advanced PIE capability, and transient testing capability.

NNSA

- Safeguards - close coordination with large NNSA programs:
 - NA-24's Next Generation Safeguards Initiative: Technology and Concepts
 - NA-22's Nonproliferation R&D: Global Safeguards

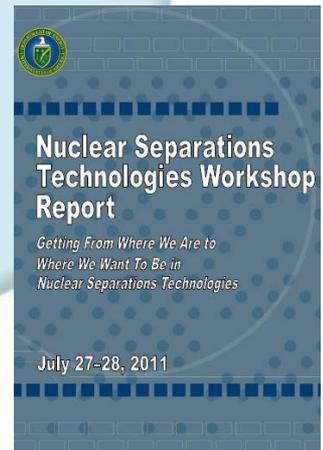
EM

- Coordinated R&D is conducted in:
 - Disposal technologies
 - Waste forms

SC

- Coordinated R&D is conducted in:
 - Modeling and simulation
 - Materials
 - Nuclear physics
 - Separations

NE lead separations workshop aimed at identifying the crosscutting needs of DOE for separations technologies and to speed development, examining opportunities to leverage R&D across DOE.





Evaluation and screening process:

- Provides a systematic and objective process to prioritize R&D activities
- Informs programmatic decisions

