



U.S. DEPARTMENT OF  
**ENERGY**

Nuclear Energy

# Used Nuclear Fuel Disposition R & D Program

**Dr. Patrick R. Schwab, Acting Director,  
Office of Used Nuclear Fuel Disposition  
Research and Development**

**Technology Innovation and International  
Partnership Workshop on DOE Used  
Nuclear Fuel and High-Level Waste  
Arlington, VA  
September 14, 2010**



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# Future of Nuclear Energy

Nuclear Energy

**“Virtually every analysis of energy supply and demand ... has concluded that nuclear energy must grow beyond the current 20% share of electricity generation in the U.S. to meet the nation’s energy and environmental goals. ”**

Dr. Warren “Pete” Miller  
Assistant Secretary for Nuclear Energy  
November 20, 2009.





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## Office of Nuclear Energy Mission

- **The primary mission of NE is to advance nuclear power as a resource capable of meeting the nation's energy, environmental, and national security needs by resolving technical, cost, safety, security and proliferation resistance issues, through research, development, and demonstrations, as appropriate.**



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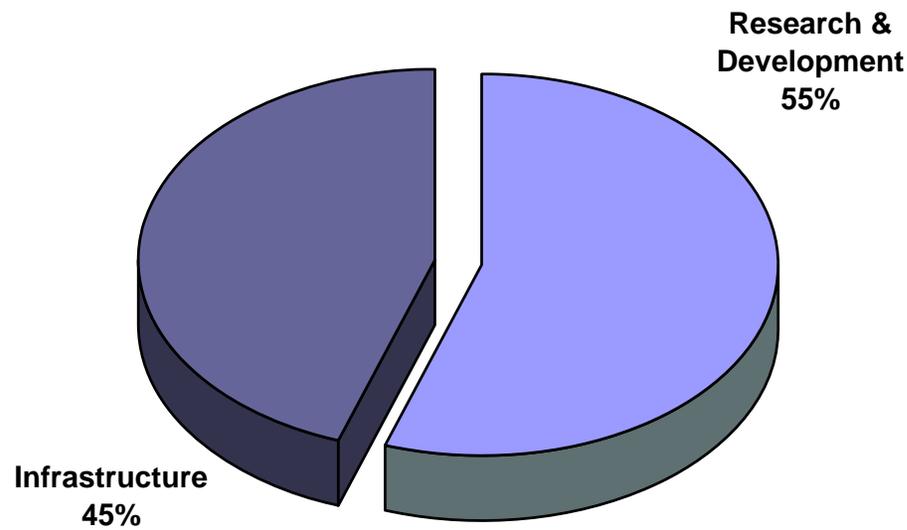


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## FY2011 Budget Request

Nuclear Energy

**Total: \$912,252,000**





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# Nuclear Energy Objectives

- 1. Improve the reliability, sustain the safety, and extend the lives of the current reactors**
- 2. Develop improvements in the affordability of new reactors**
- 3. Develop sustainable nuclear fuel cycles**
- 4. Understand and minimize the risks of nuclear proliferation and terrorism**



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## Blue Ribbon Commission

- On January 29, 2010, Secretary Chu announced the formation of the Blue Ribbon Commission on America's Nuclear Future.
- The Commission will provide advice and make recommendations on issues including alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel and nuclear waste.
- Interim report July 2011.
- Final report January 2012.





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## Office of Fuel Cycle Technologies Technical Areas

- **Fuel Cycle Systems Analysis**
- **Fuel Resources**
- **Fuels Technology**
- **Separations Technology**
- **Waste Forms Technology**
- **Used Nuclear Fuel Disposition**
- **Transmutation Technology (including advanced reactors)**
- **Materials, Protection, Control, and Accountability Technology**



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## UFD Mission Statement

- **The Used Fuel Disposition Campaign will 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.**



## ■ The Used Fuel Disposition

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## FY 2011 Budget Request

### Used Nuclear Fuel Disposition R&D Appropriations

**FY 2010 Appropriation:                      \$9,124,000**

**FY 2011 Request:                              \$45,000,000**

**This represents an increase of almost 400%.**



## Transfers of RW functions

- **Technical R & D from the DOE Office of Civilian Radioactive Waste Management (RW) to NE-UFD**
- **Standard Contracts with utilities from RW to GC**
- **Fee Adequacy Report from RW to GC**
- **Litigation Support from RW to GC**
- **Records Retention from RW probably to the DOE Office of Legacy Management, with funding from NE**
- **Closure of the Yucca Mountain site from RW to the DOE Office of Environmental Management**



## Collaboration on Storage

**The Electric Power Research Institute has initiated the Extended Storage Collaboration Program.**

- **Purpose of the program is to provide the technical bases to ensure safe, long-term used fuel storage and future transportability.**
- **Includes representatives from EPRI, DOE-NE, DOE-EM, NRC, cask vendors, utilities, NEI, and national laboratories.**



## Used Fuel Disposition: Storage

**Extend the technical basis to allow:**

- **storage of LWR fuel to 100 years or more**
- **storage of high burnup LWR fuels**
- **different fuel types and waste forms**



**Connecticut Yankee ISFSI**



## Used Fuel Disposition: Storage

- Evaluate concepts for distributed, regional, and centralized storage.
- No site-specific investigations.



**Sellafield HLW Storage**



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# Used Fuel Disposition: Transportation

**Develop the technical basis to allow safe and secure transportation of high-burnup fuels and a variety of waste forms. (To be started in FY 2011.)**





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# Used Fuel Disposition: Disposal

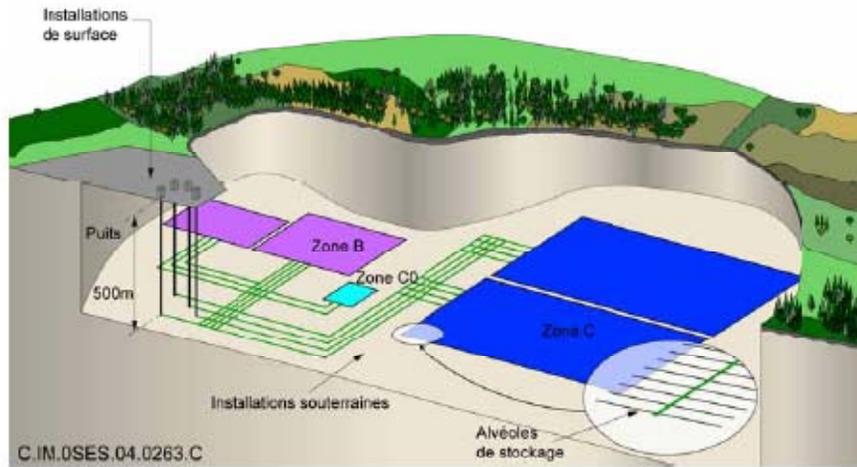
- **Geologic disposal will be required. Period.**
- **Establish the technical bases for a variety of potential disposal environments, including**
  - **Granite**
  - **Clay/Shale**
  - **Salt**
  - **Deep Boreholes**
- **No site-specific investigations.**



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# Detailed Safety Assessments Available Internationally for Repositories in Clay, Granite, and Tuff

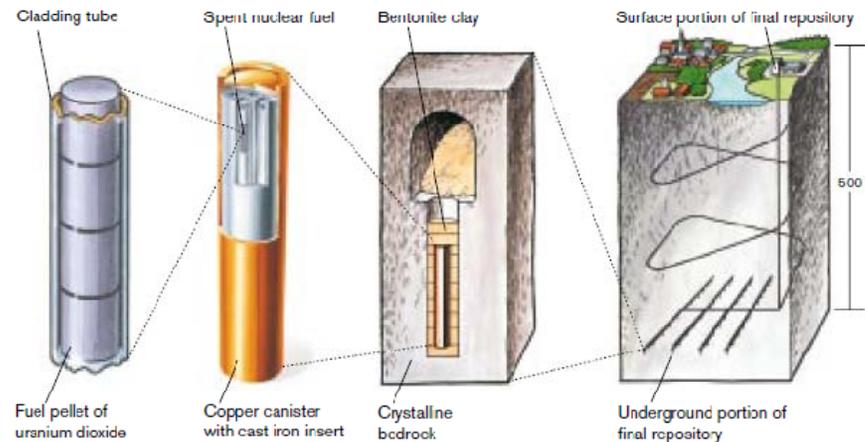


Clay (example from France)

Tuff (USA)



Granite (example from Sweden)





# Future of Disposal: National Repository Plans

## ANTICIPATED START OF REPOSITORY OPERATIONS

| COUNTRY           | DATE  |
|-------------------|---|
| United States     | No decision made.                           |
| Belgium           | Anticipated in roughly the 2040 time-frame. |
| Canada            | No decision made.                           |
| China             | Anticipated in roughly the 2050 time-frame. |
| Finland           | 2020  |
| France            | 2025  |
| Germany           | No decision made.                           |
| Japan             | No decision made.                           |
| Republic of Korea | No decision made.                           |
| Spain             | No decision made.                           |
| Sweden            | 2023  |
| Switzerland       | No sooner than 2040                         |
| United Kingdom    | No decision made.                           |

From: NWTRB Survey  
of National Programs,  
October 2009



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# Used Fuel Disposition R & D: Summary

- **Office structure**
  - Office of Nuclear Energy (NE)
  - Office of Fuel Cycle Technologies (NE-5)
  - Office of Used Fuel Disposition R&D (NE-53)
- **Blue Ribbon Commission on America's Nuclear Future**
- **Examples of ongoing UFD research and development**
  - Storage
  - Transportation
  - Disposal
- **No site-specific investigations**



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# Backup Slides



# Office of Nuclear Energy: New Organization

