



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy**

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# **Overview of the DOE-NE Used Nuclear Fuel Disposition Disposal R&D Program**

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Research & Development**

**NWTRB Winter Board Meeting  
Washington, DC  
November 20, 2013**



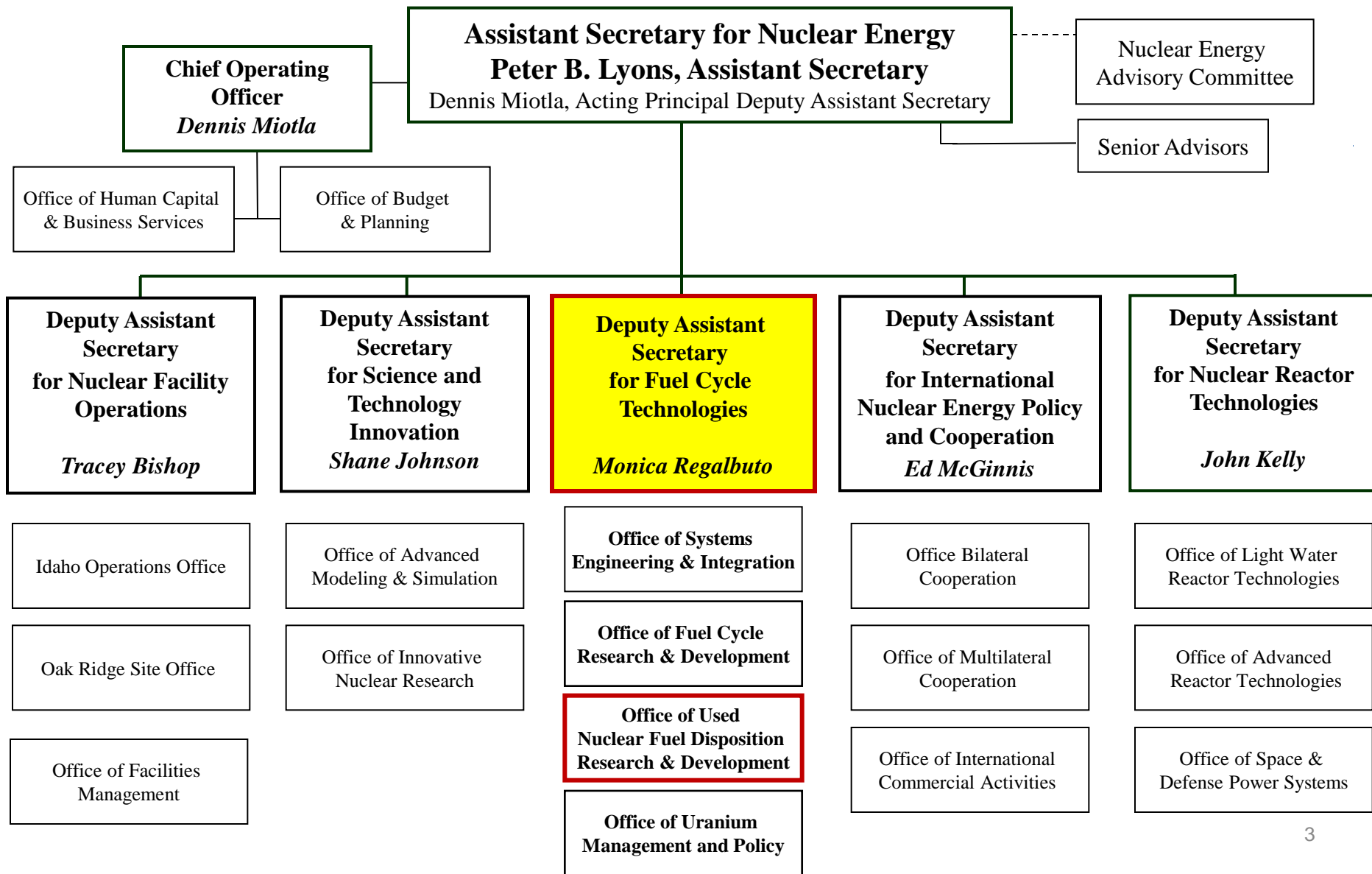
# UFD Disposal R&D Overview Outline

- Organizational Overview
- Used Fuel Disposition (UFD) Campaign
- UFD Disposal R&D



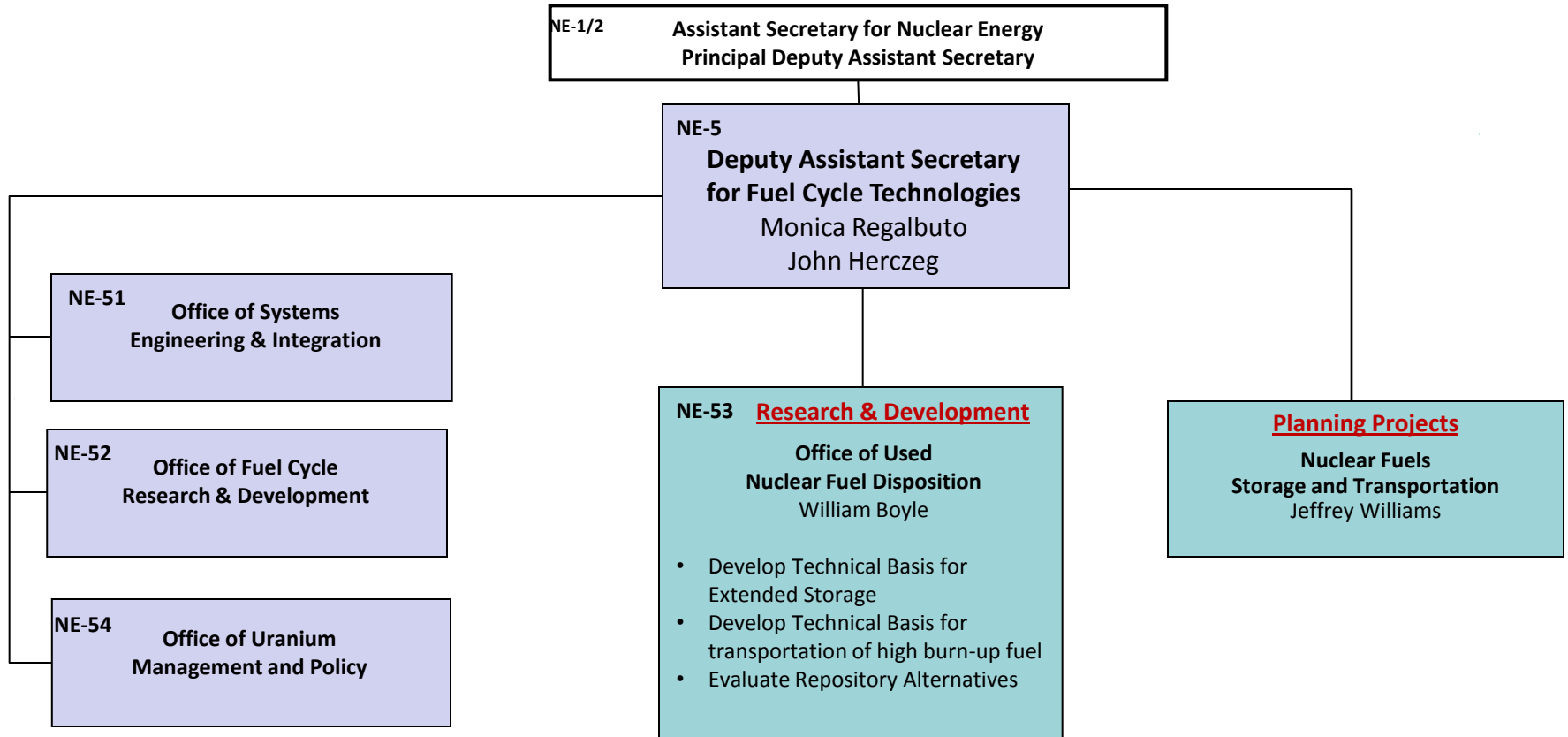


# Office of Nuclear Energy Organization Overview





# Fuel Cycle Technologies (NE-5) Organization Overview

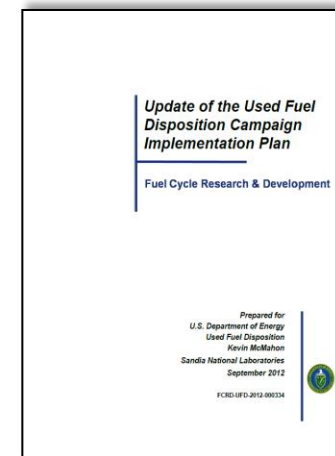




# Used Fuel Disposition Campaign

**Campaign Mission: 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.**

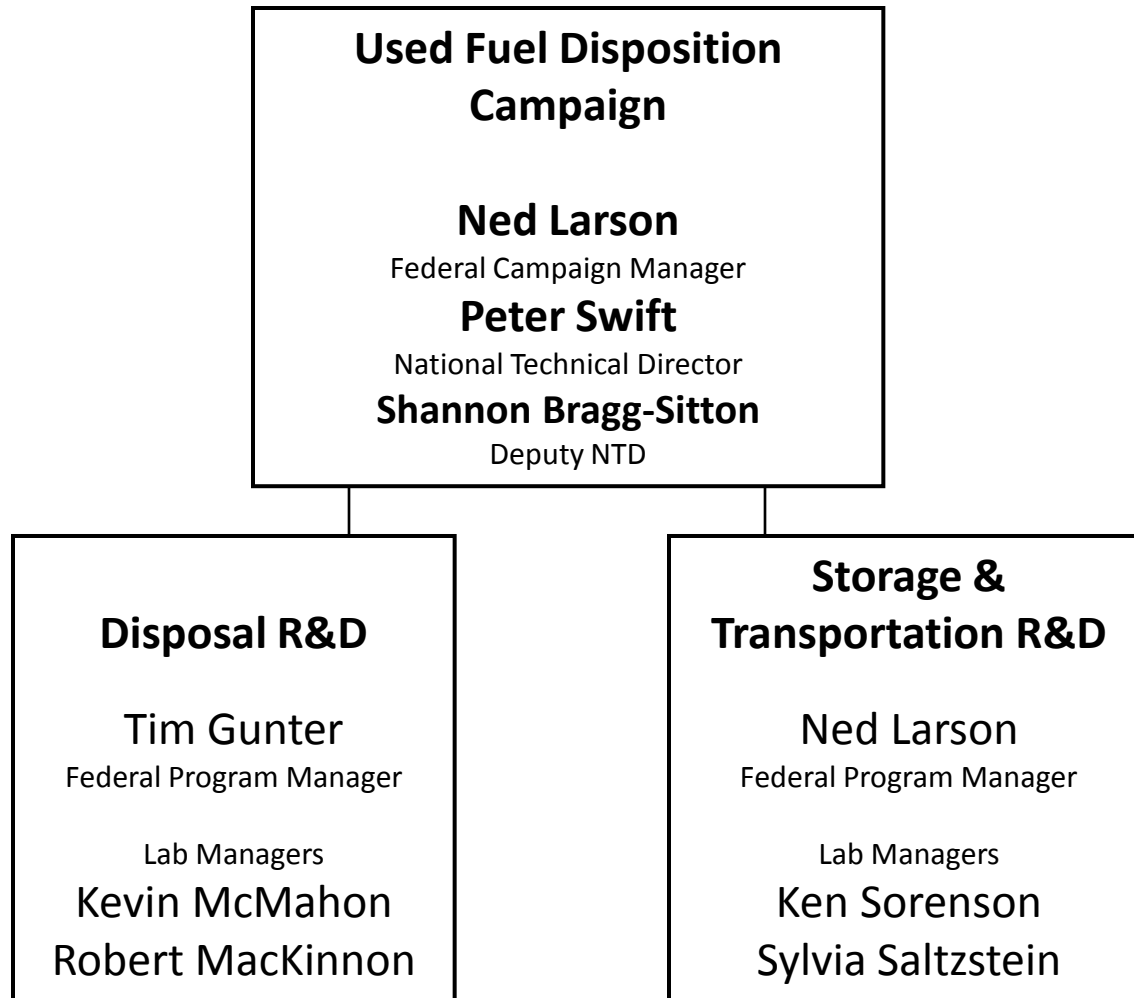
**Campaign challenge:** to provide a sound technical basis for implementation of a new national policy for managing the back end of the nuclear fuel cycle, including the identification and evaluation of safe and secure options for storage, transportation, and permanent disposal of radioactive wastes resulting from existing and future fuel cycles.



Update of the Used Fuel Disposition Campaign Implementation Plan  
FCRD-UFD-2012-000334, September 2012



# Used Fuel Disposition Campaign Organization



# Used Fuel Disposition Campaign FY14 Structure for Disposal R&D

**Used Fuel Disposition managed through multiple control accounts :**

- **Campaign Management (Peter Swift)**
- **Disposal R&D Control Accounts (Kevin McMahon, Robert MacKinnon)**
  1. Argillite Disposal R&D
  2. Crystalline Disposal R&D
  3. Salt Disposal R&D
  4. Deep Borehole Disposal R&D
  5. International Disposal R&D
  6. Generic Disposal System Analysis
  7. Regional Geology
  8. Engineered Material Performance
  9. Disposal of Dual Purpose Canisters
  10. UNF and HLW Disposal Options



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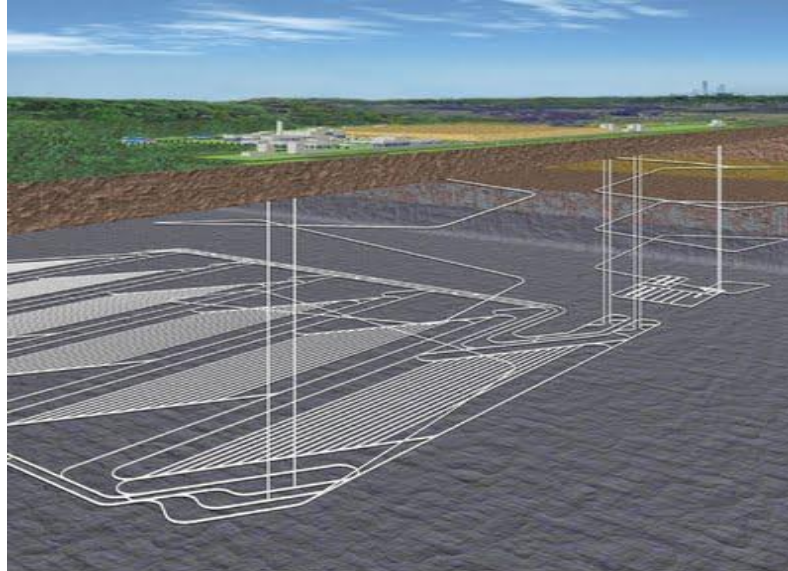
# Used Nuclear Fuel Disposition Disposal R&D



# UFD Disposal R&D Objectives

## Objectives:

1. Provide a sound technical basis for the assertion that the U.S. has multiple viable disposal options
2. Increase confidence in the robustness of generic disposal concepts



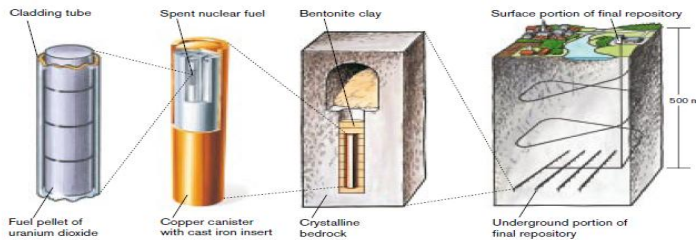
Disposal concept – Nuclear Waste Management Organization of Japan



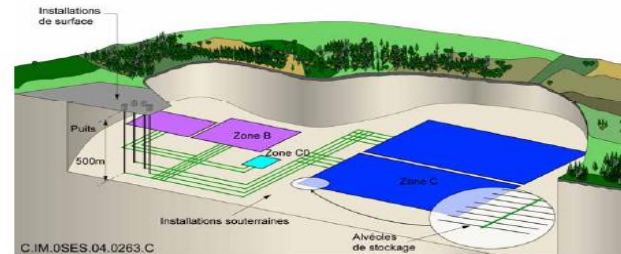
# UFD Disposal R&D Disposal Options

## ■ Disposal R&D is focusing on four basic disposal options

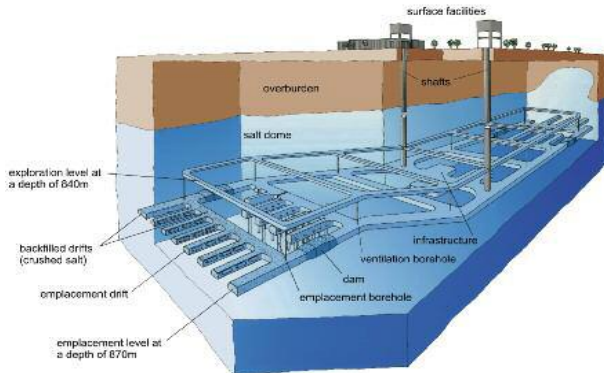
- Three mined repository options (granitic rocks, clay/shale, and salt)
- One geologic disposal alternative: deep boreholes in crystalline rocks



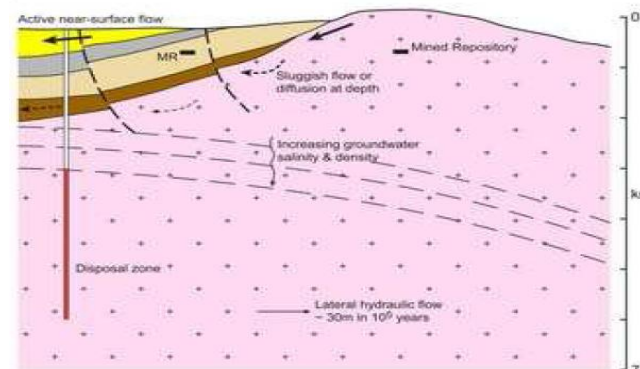
Granite (Sweden)



Clay (France)



Salt (Germany)



Deep Borehole Concept

# UFD Disposal R&D Key Activities

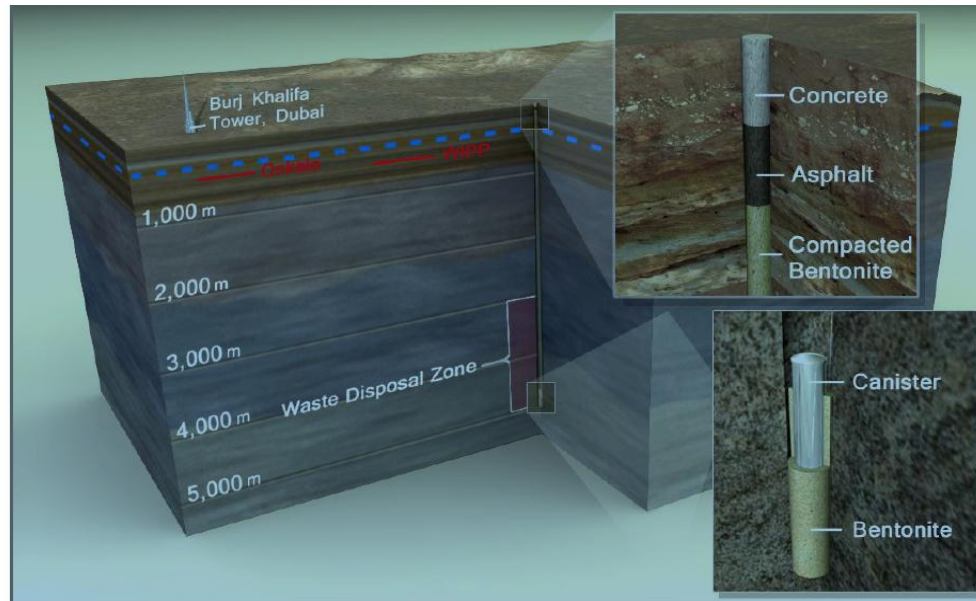
## ■ Work on geologic disposal will include:

- Finalize an R&D and Demonstration plan for the deep borehole disposal concept
- Work with international partners for R&D in salt, granite and clay rocks
- Evaluate feasibility of direct disposal of Dual-Purpose Canisters



# UFD Disposal R&D Deep Borehole Disposal

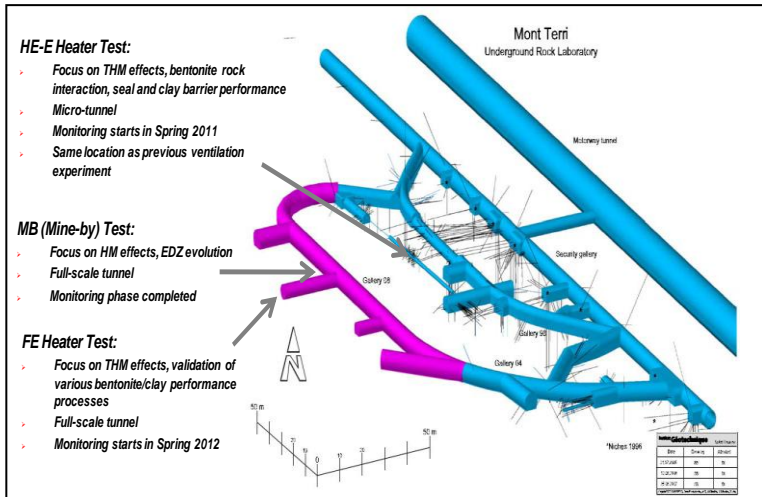
- **The Deep Borehole Disposal (DBH) concept emplaces SNF and high-level radioactive wastes in boreholes at depths from 3 to 5 km beneath the land surface**
  - Provides a potential alternative or complement to mined geological repositories
  - Initiation of demonstration project dependent upon DOE priorities and funding
  - Schedule and budget estimated at five years and \$75 million





# UFD Disposal R&D International Collaboration

## Formal collaborative R&D arrangements with ongoing programs in Europe and Asia



- Mont Terri: Underground research laboratory in clay (Switzerland)
- Grimsel: Colloid Formation and Migration Project in granite (Switzerland)
- DECOVALEX: (Development of Coupled Models and their Validation against Experiments)
- KAERI Underground Research Tunnel: Borehole Geophysics (South Korea)
- SKB: Task Forces on Groundwater Flow and Engineered Barriers at Äspö Hard Rock Laboratory (Sweden)
- BMW: Data exchange for salt repositories at Gorleben and WIPP (Germany)
- ANDRA: Natural and Engineered Barriers in clay and shale (France)



## UFD Disposal R&D

### Direct Disposal of Dual Purpose Canisters

- Direct disposal of dual purpose canisters (DPCs) was the subject of NWTRB workshop earlier this week.
- May offer significant benefits for cost and operational efficiency.
- May also pose engineering challenges, reduce flexibility on repository siting and design, and complicate evaluations of long-term disposal repository performance.
- Preliminary evaluation indicates direct disposal could be technically feasible for certain concepts. Feasibility evaluation and related R&D activities are planned to continue and will inform decision making.





## Conclusion

**The DOE Office of Fuel Cycle Technologies is actively developing used nuclear fuel management strategies and technologies and continues to conduct R&D on both open and closed fuel cycle technologies.**

**Used Fuel Disposition program is laying the foundation for the development of storage, transportation and disposal options.**

**Please visit the Office of Nuclear Energy web site for further program activities and information.**

**<http://energy.gov/ne/office-nuclear-energy>**