

# Used Fuel Disposition R&D Campaign

## Introduction to the *DOE-Managed Spent Nuclear Fuel and High Level Waste Research* (aka Defense Repository)

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**Sandia National Laboratories**

**Used Fuel Disposition Working Group Meeting**  
**Las Vegas, Nevada**  
**June 7-9, 2016**

# Outline for this Introduction

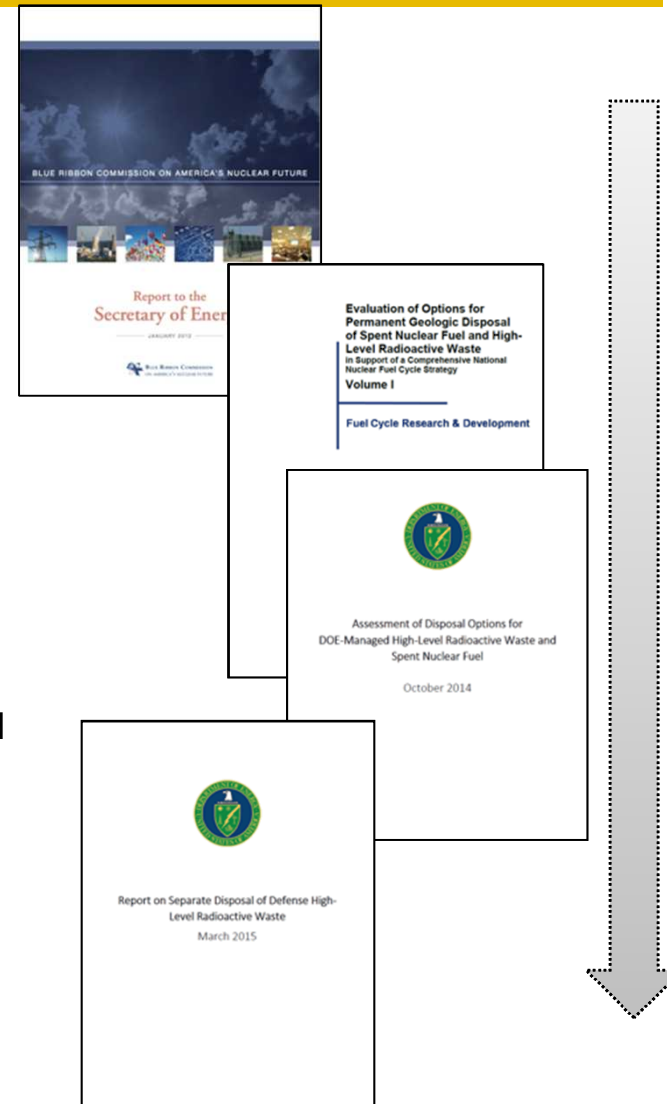
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- **Overview and background**
  - Timeline leading up to March 2015 decision
  - Separate repository
- **Structure of the DOE-managed SNF/HLW R&D program**
  - Major technical components
- **What is DOE Managed HLW & SNF?**
  - Volumes and thermal characteristics
  - Options for disposal
- **UFD WG Agenda for DOE Managed HLW & SNF discussions and presentations**

# Used Fuel Disposition

## Recent Timeline for Separate Repository

- **January 2012 Blue Ribbon Commission (BRC) on America's Nuclear Future report to the Secretary of Energy**
  - Recommends review of “single repository” policy, whereby defense-related and commercial wastes are commingled
- **April 2014 UFD report “Evaluation of Options for Disposal...”**
  - Concludes that both commingled and separate repositories are technically feasible
- **October 2014 DOE report “Assessment of Disposal Options...”**
  - Recommends that the DOE begin implementation of a phased, adaptive, and consent-based strategy with development of a separate repository for some DOE-managed HLW and SNF
  - Also recommends the DOE retain flexibility to consider deep borehole disposal of some DOE-managed waste forms
- **March 2015 DOE report “...Separate Disposal of Defense High-Level Radioactive Waste”**
  - Presents the basis for a decision in the context of the Nuclear Waste Policy Act



# The March 24, 2015 Decision

The White House

Office of the Press Secretary

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For Immediate Release

March 24, 2015

## **Presidential Memorandum -- Disposal of Defense High-Level Radioactive Waste in a Separate Repository**

MEMORANDUM FOR THE SECRETARY OF ENERGY

SUBJECT: Disposal of Defense High-Level Radioactive Waste in a Separate Repository

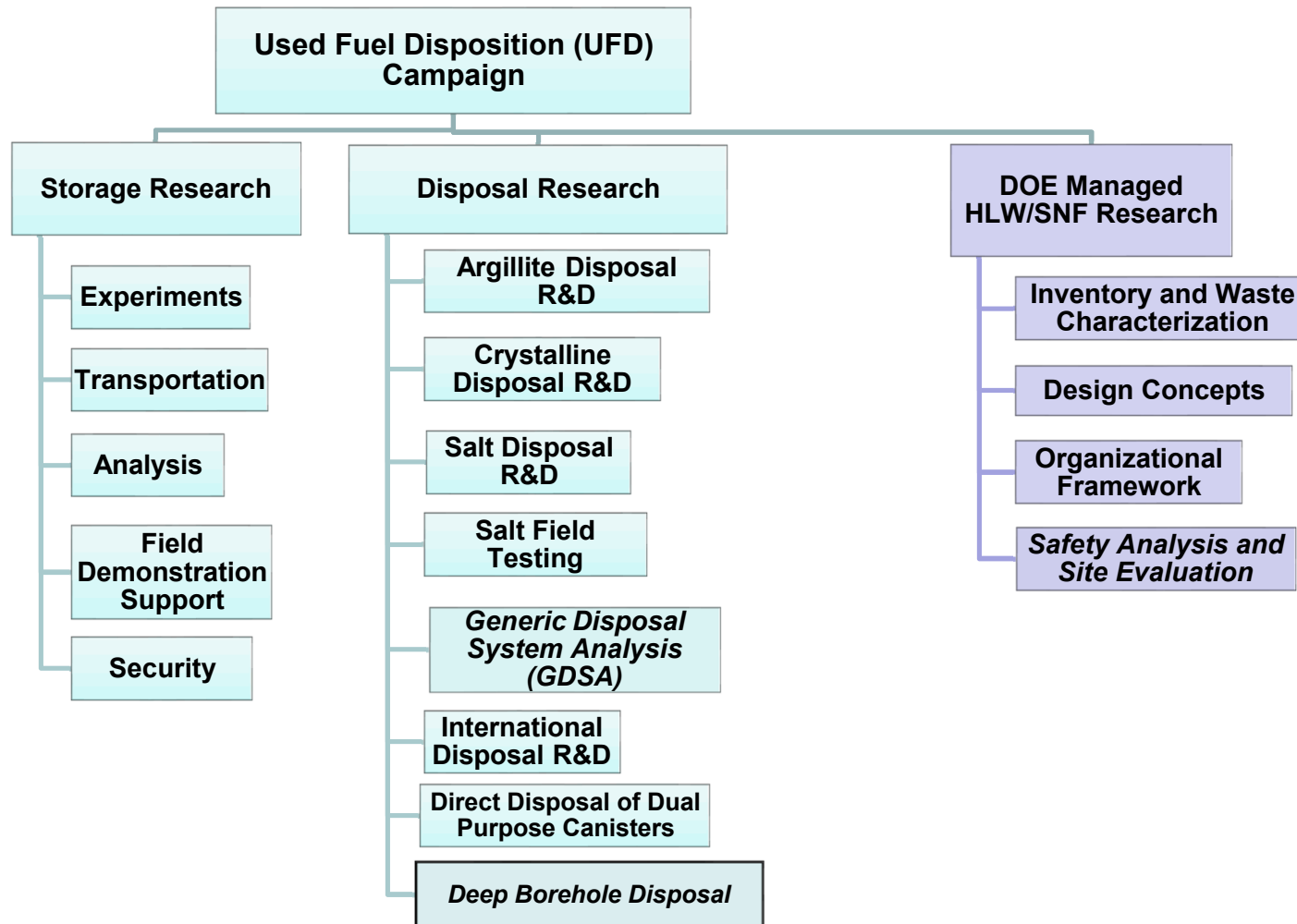
Your memorandum and accompanying report of January 9, 2015, analyze the factors enumerated in section 8 of the Nuclear Waste Policy Act of 1982 (the "Act") concerning disposal of high-level radioactive waste resulting from atomic energy defense activities, conclude that a strong basis exists to find a separate repository is required pursuant to section 8 of the Act, and recommend that I make this finding.

In accordance with the Act, I find the development of a repository for the disposal of high-level radioactive waste resulting from atomic energy defense activities only is required.

BARACK OBAMA

# Used Fuel Disposition

## Work Structure for the R&D Program

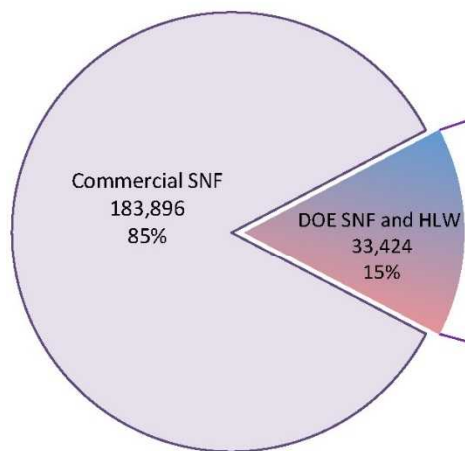


# Used Fuel Disposition

# Projected Volumes of DOE-managed HLW and SNF in 2048

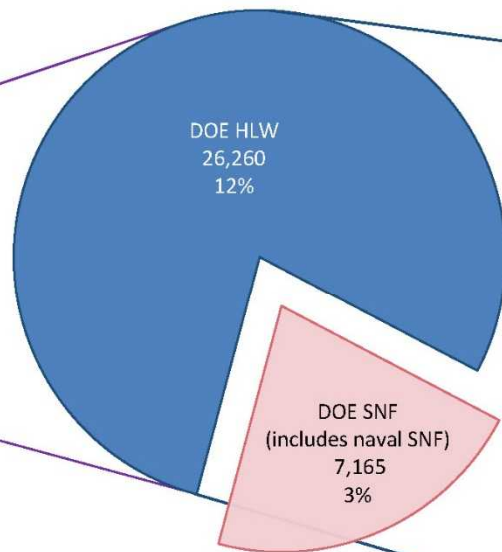
Projected volumes in m<sup>3</sup>

**Commercial and DOE-Managed  
HLW and SNF**



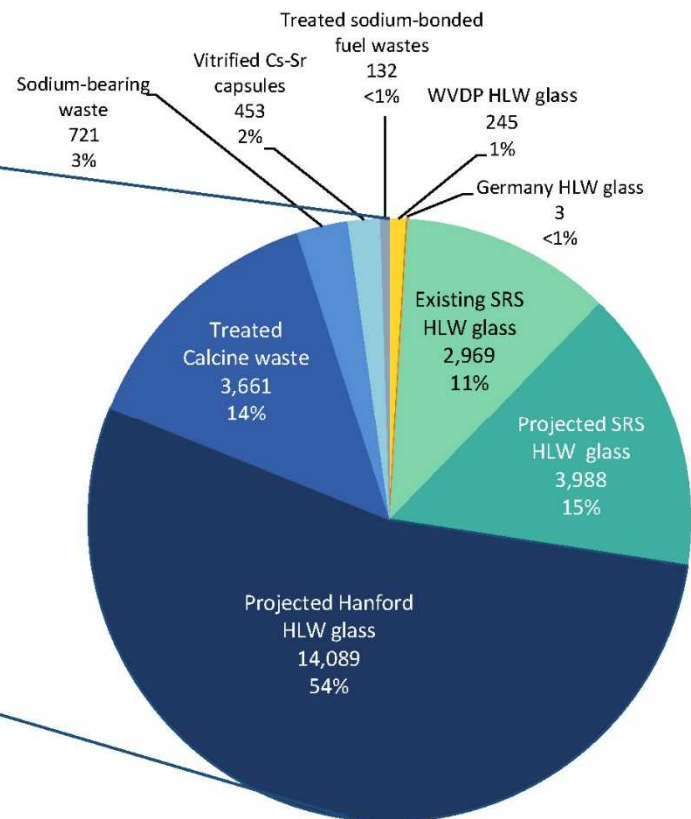
Commercial SNF volume estimated assuming constant rate of nuclear power generation and packaging in dual purpose canisters of existing design

**DOE-Managed  
HLW and SNF**



DOE waste volume estimated assuming calcine is treated by hot isostatic pressing, Na-bonded fuels undergo electrometallurgical treatment, Na-bearing wastes undergo fluidized bed steam reforming, and all other HLW wastes are vitrified. Naval SNF estimated as of 2035

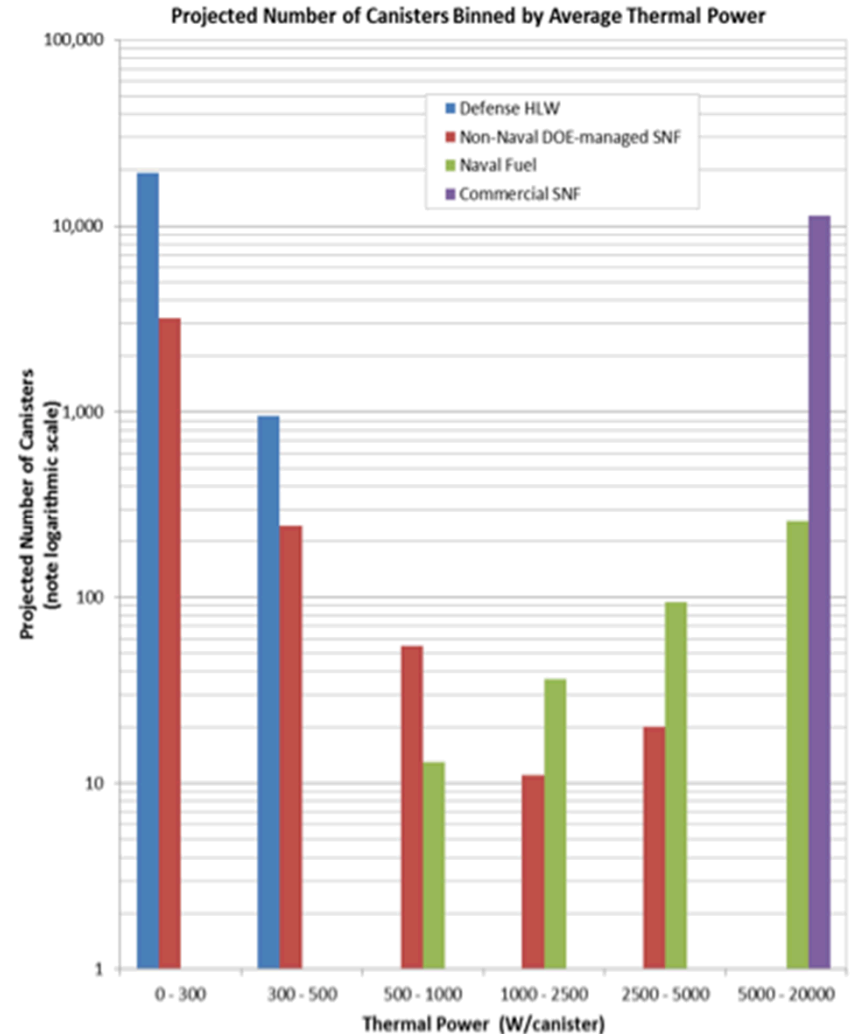
**DOE-Managed HLW**



## ■ Repository designs and operational concepts can be engineered to address waste-form thermal characteristics:

- All Defense HLW is relatively cold: less than 500 W per canister
- Most DOE-managed SNF is relatively cold: less than 1000 W per canister
- All commercial SNF has comparatively high thermal output
- Some naval SNF is comparable in thermal power to commercial SNF

## ■ Initial R&D will limit EBS/repository designs to canisters of less than 1000 W

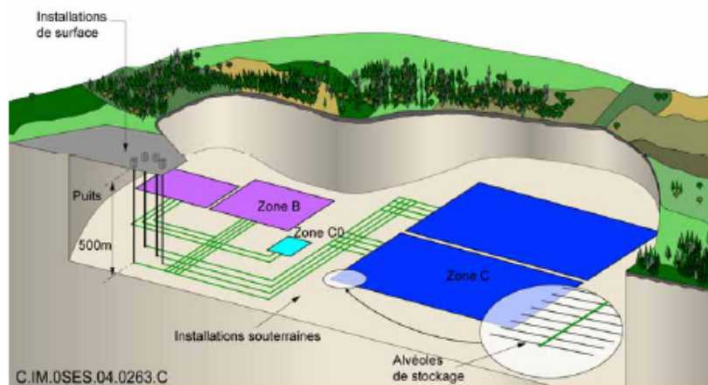




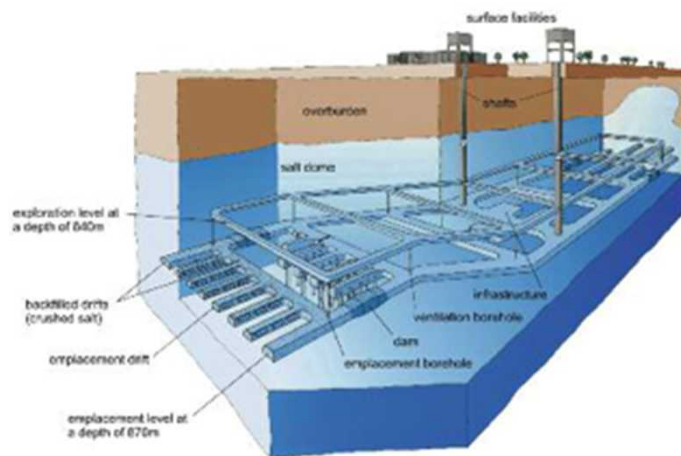
# Used Fuel Disposition

## Potential Disposal Concepts

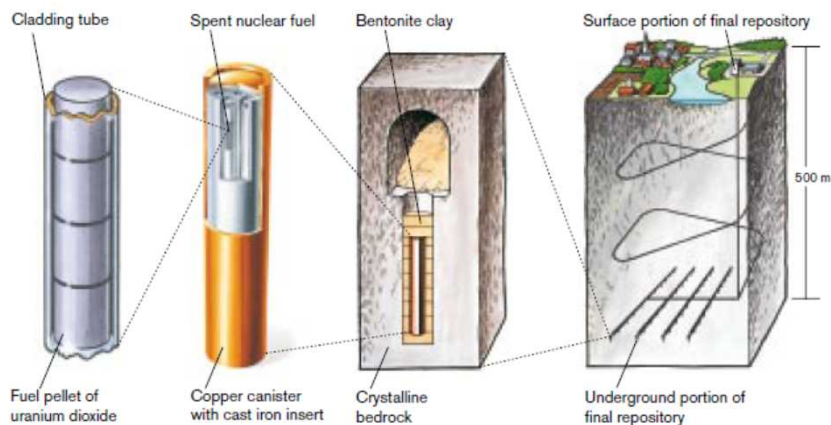
**Mined repository in clay/shale**



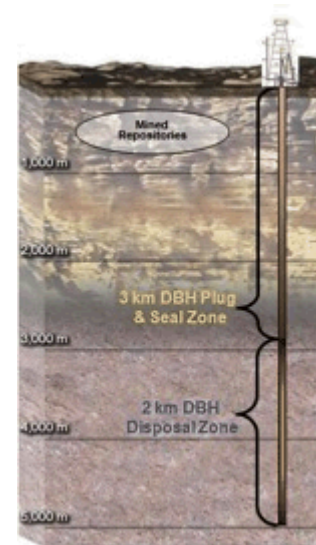
**Mined repository in salt**



**Mined repository in granite or other hard rock**



**Deep borehole in crystalline basement rock**





**Session 1: Defense Inventory and Waste Characterization, 3:30 – 5:20 pm**

3:30 – 3:40: Introduction to Defense Repository R&D – **Sevougian/McMahon**

3:40 – 4:00: Overview of Inventory and Waste Characterization – **Sassani**

4:00 – 4:25: On-Line Waste Library (OWL) Database and Capabilities – **Walkow**

4:25 – 5:00: Decay Heat and Inventory of DOE-Managed Waste – **Carter**

5:00 – 5:20: OWL Hands-on Database Demo – **Walkow**

Used Fuel Disposition (UFD) Campaign

DOE Managed HLW/SNF Research

**Inventory and Waste  
Characterization**

**Design Concepts**

**Organizational  
Framework**

**Safety Analysis and Site  
Evaluation**

# Used Fuel Disposition

## Agenda (continued)

**Session 2:** Thursday, 8:00 – 9:50 am, June 9 – Rm. 1243

**Session 3:** Thursday, 10:10 am – 12:00, June 9 – Rm. 1243

**Session 2: Preliminary EBS Design Concepts, 8:00 – 9:50 am**

8:00 – 8:10: Introduction to Defense Repository R&D – **Sevougian/McMahon**

8:10 – 8:30: Overview of EBS Design Concepts – **Matteo**

8:30 – 8:45: Waste Package Considerations – **Rigali**

8:45 – 9:15: EBS Design Alternatives – **Hardin**

9:15 – 9:30: Preliminary Analysis of the Effect of Decay Heat in the Near Field – **Hadgu**

9:30 – 9:45: Brainstorming on Design Alternatives – **All**

**9:45 – 10:10 Break**

**Session 3: Safety Analysis and Organization/Procedural Frameworks, 10:10 am – 12:00 n**

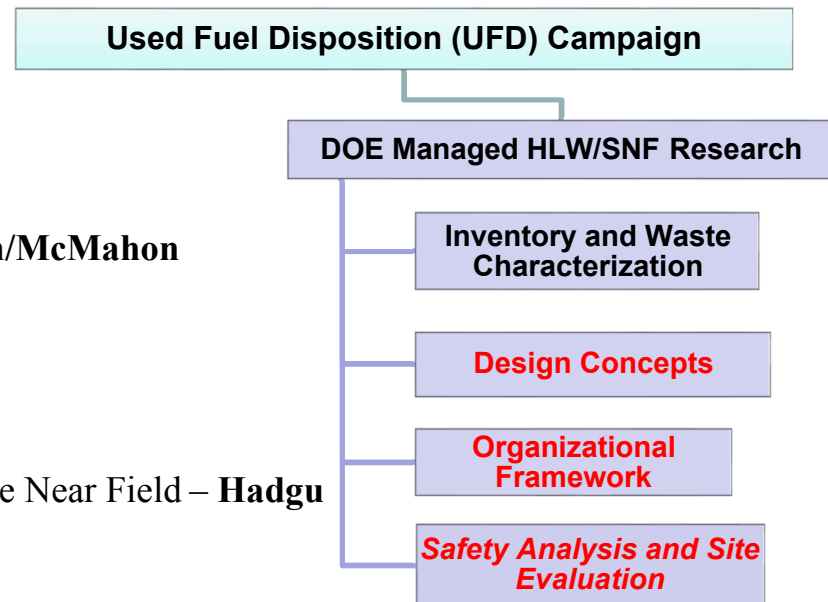
10:10 – 10:30: Overview of D-Repo Safety Analysis R&D – **Sevougian**

10:30 – 10:50: Regional Geology Investigations – **Perry**

10:50 – 11:20: D-Repo Repository Reference Case and Preliminary PA Simulations – **Stein**

11:20 – 11:35: Draft Program Plan: Organizational and Procedural Frameworks – **Swift**

11:35 – 11:50: Wrap-up and Brainstorming on Future Directions – **All**



# **Back-Up Slides**

## Six Factors Analyzed for the Separate Repository Decision

### ■ From March 2015 DOE report “...Separate Disposal of Defense High-Level Radioactive Waste”

- Cost Efficiency: “...on balance, cost efficiency favors development of a Defense HLW Repository.”
- Health and Safety: “...would advance long-term health and safety by eliminating the need for active human control and maintenance of waste at various DOE sites.”
- Regulation: “...could simplify the licensing of a subsequent repository by providing important lessons learned...”
- Transportation: “...an earlier opportunity to develop the institutional processes for the transportation of waste prior to the development of a subsequent repository.”
- Public Acceptability: “would provide useful experience in siting future facilities” (by using the more publically acceptable “phased, adaptive, consent-based siting approach”)
- National Security: “...the likely earlier availability of a Defense HLW Repository could provide additional support to national security objectives...”

