

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

Outline for this Introduction

■ 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

- **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



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

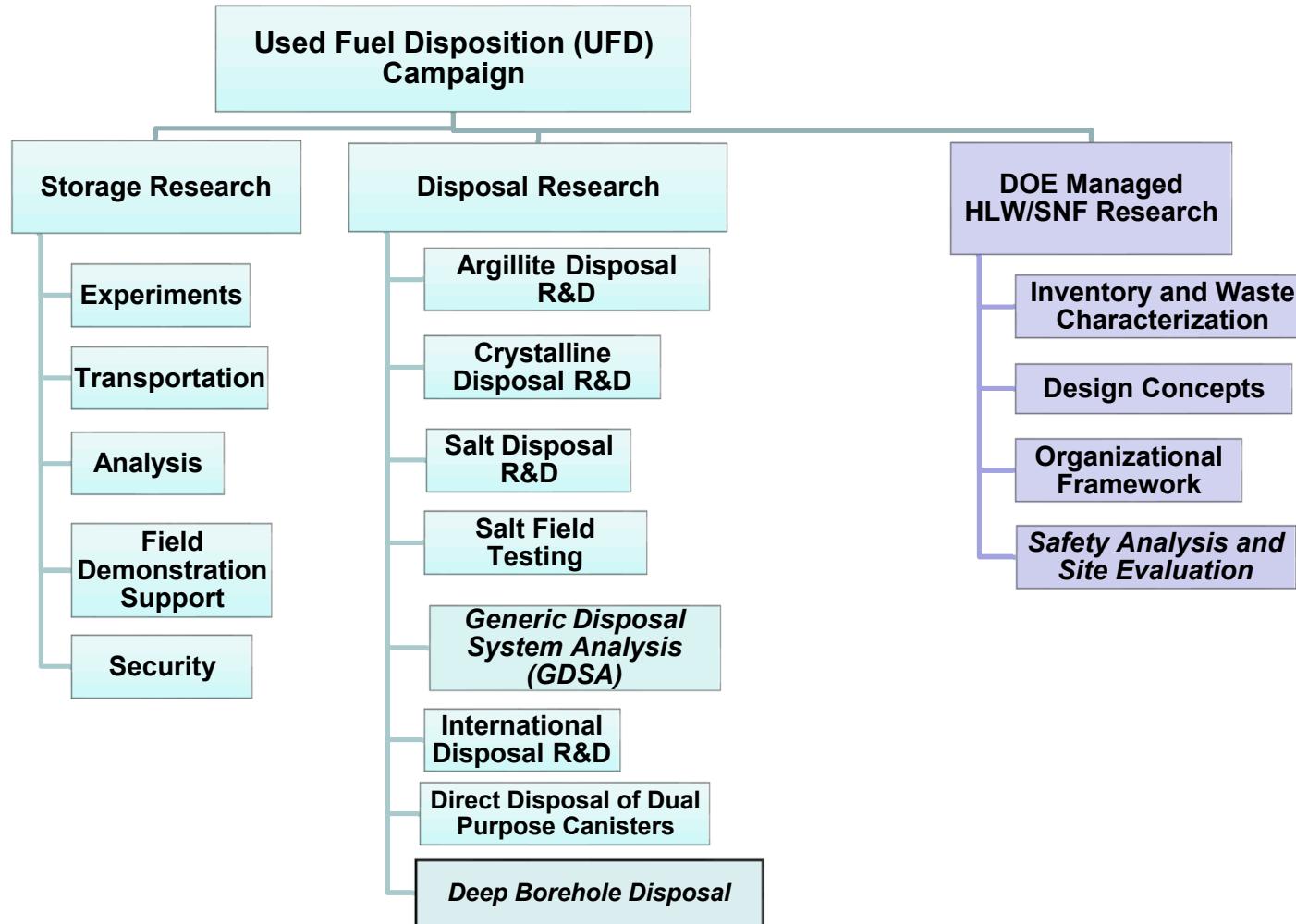
SUBJECT: Disposal of Defense High-Level Radioactive Waste in a Separate Repository

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

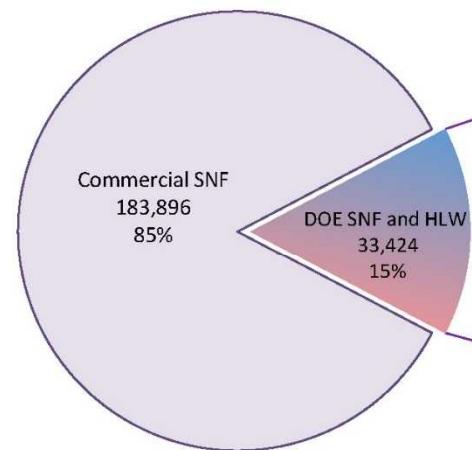
Work Structure for the R&D Program



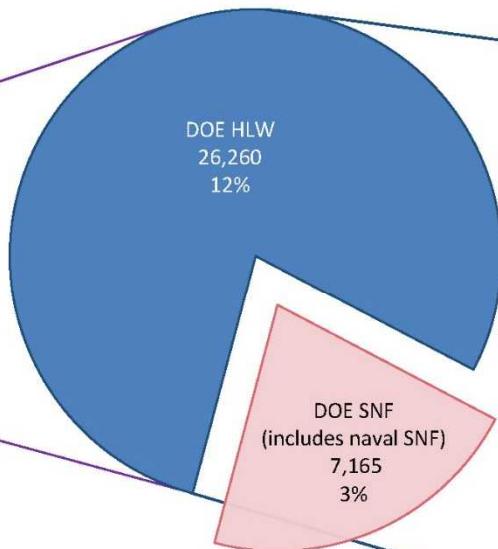
Projected Volumes of DOE-managed HLW and SNF in 2048

Projected volumes in m^3

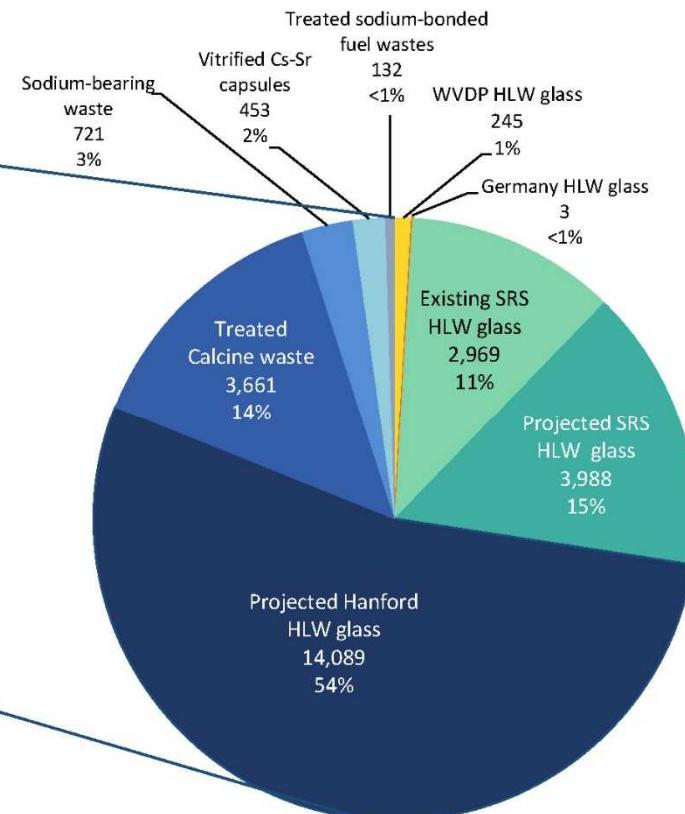
Commercial and DOE-Managed HLW and SNF



DOE-Managed HLW and SNF



DOE-Managed HLW



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

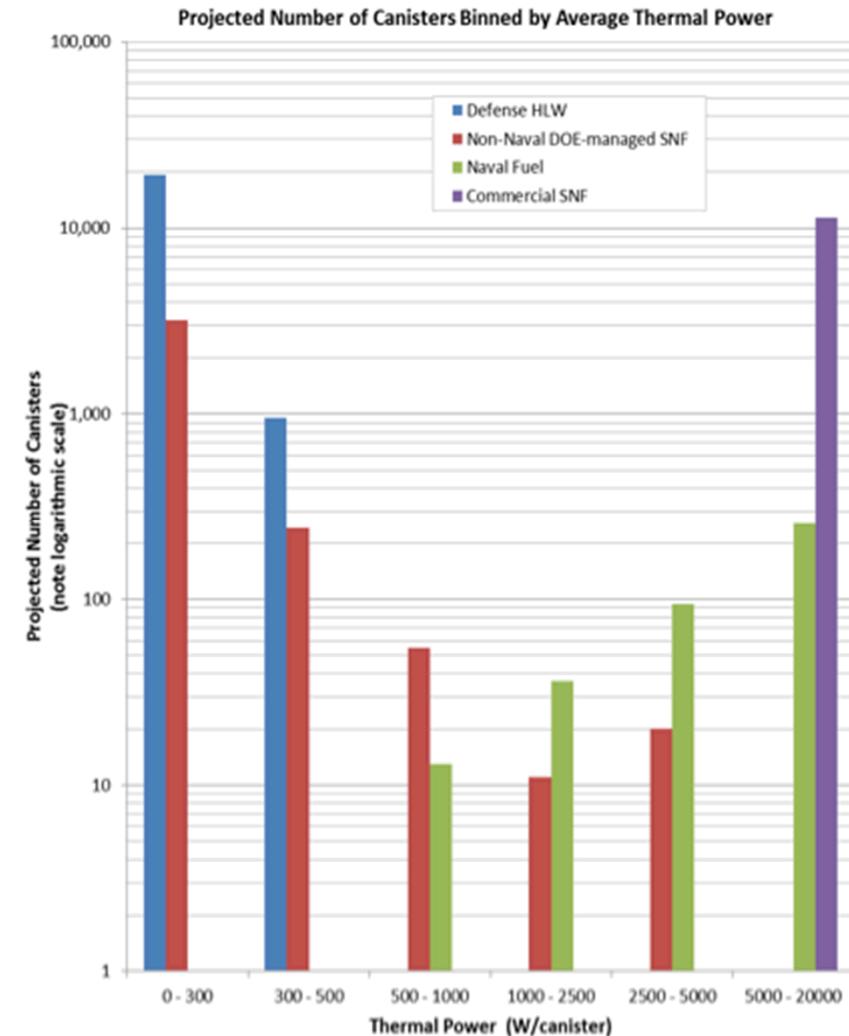
DOE waste volume estimated assuming calcine is treated by hot isostatic pressing, Na-bonded fuels undergo electrometallurgical treatment, Na-bearing wastes undergo fluidized bed steam reforming, and all other HLW wastes are vitrified. Naval SNF estimated as of 2035

Thermal Characteristics of HLW and SNF Affect Disposal Strategies

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

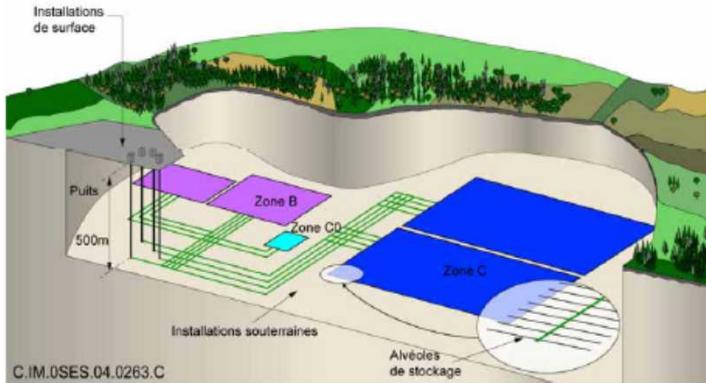
- All Defense HLW is relatively cold: less than 500 W per canister
- Most DOE-managed SNF is relatively cold: less than 1000 W per canister
- All commercial SNF has comparatively high thermal output
- Some naval SNF is comparable in thermal power to commercial SNF

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

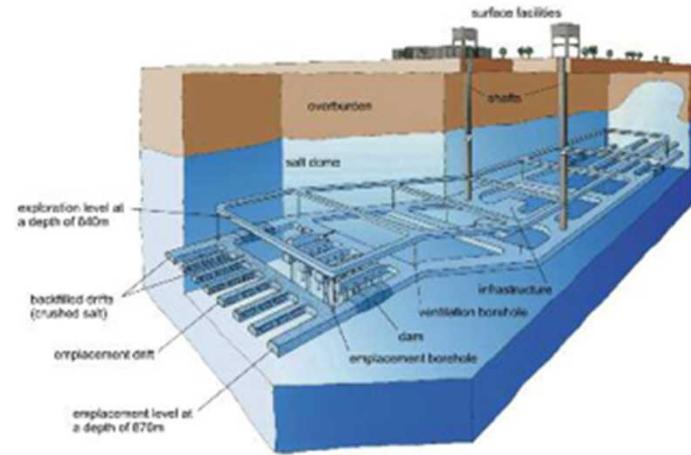


Potential Disposal Concepts

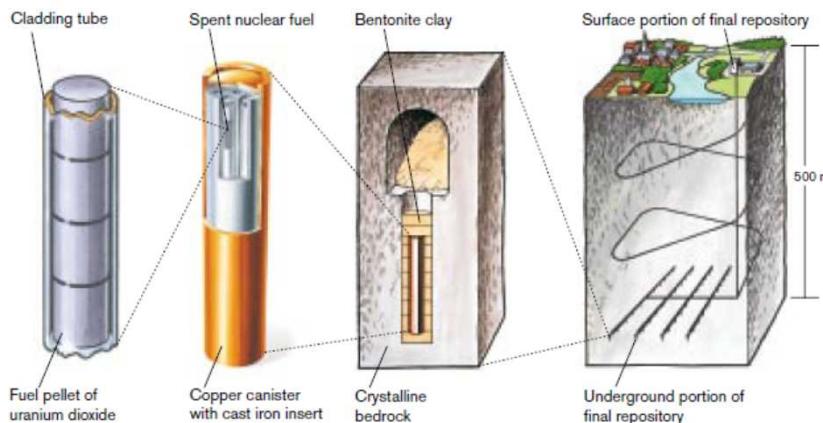
Mined repository in clay/shale



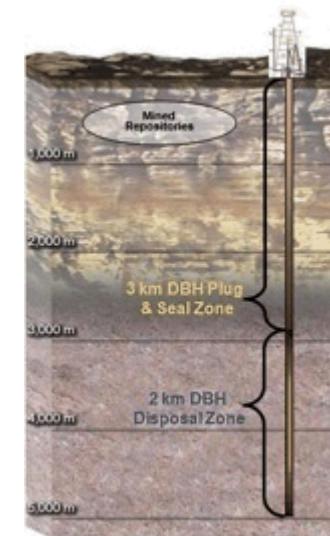
Mined repository in salt



Mined repository in granite or other hard rock



Deep borehole
in crystalline
basement rock



Session 1: Tuesday, 3:30 – 5:20 pm, June 7 – Rm. 1243

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

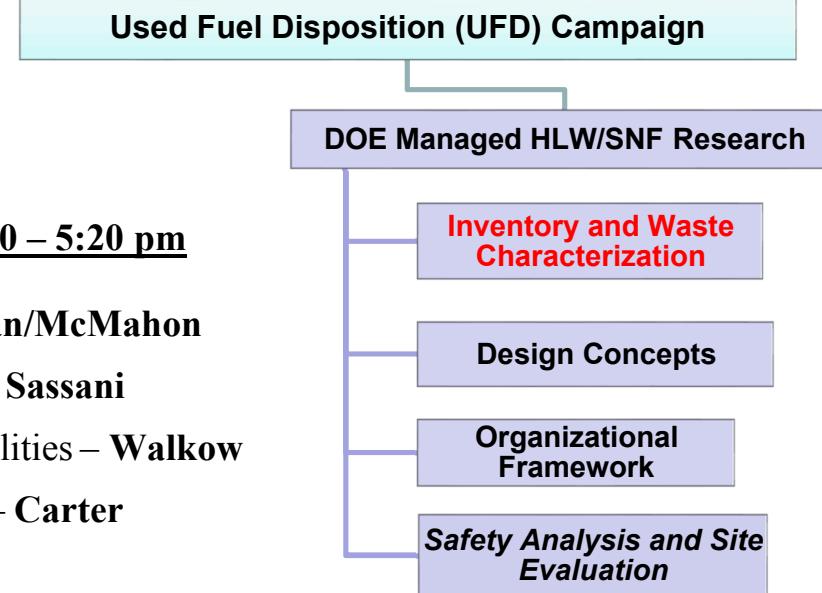
3:30 – 3:40: Introduction to Defense Repository R&D – **Sevougian/McMahon**

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**



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

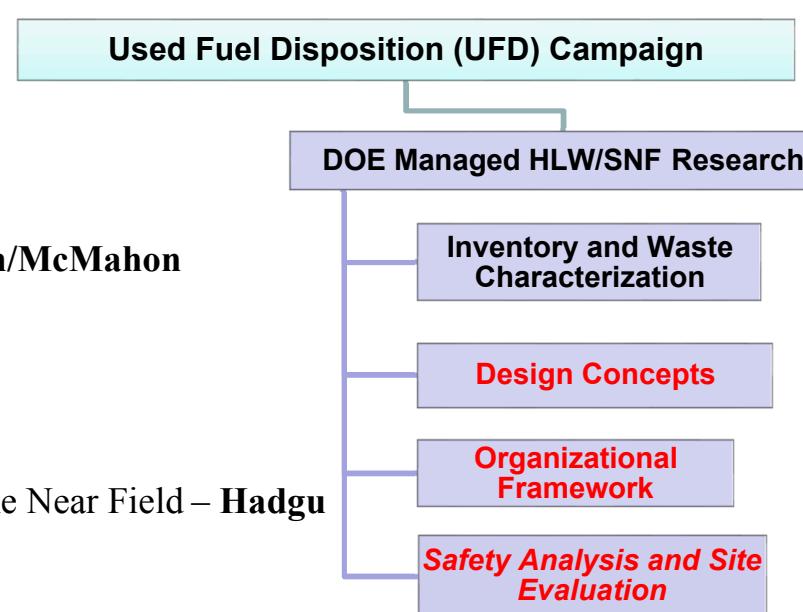
10:10 – 10:30: Overview of D-Repo Safety Analysis R&D – **Sevougian**

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**



Used
Fuel
Disposition

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...”



Report on Separate Disposal of Defense High-Level Radioactive Waste
March 2015