SAND2017-5235PE

Spent Fuel and Waste Science and Technology

Introduction to Defense Waste Repository (DWR) R&D

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SFWST Working Group Meeting
Las Vegas, Nevada
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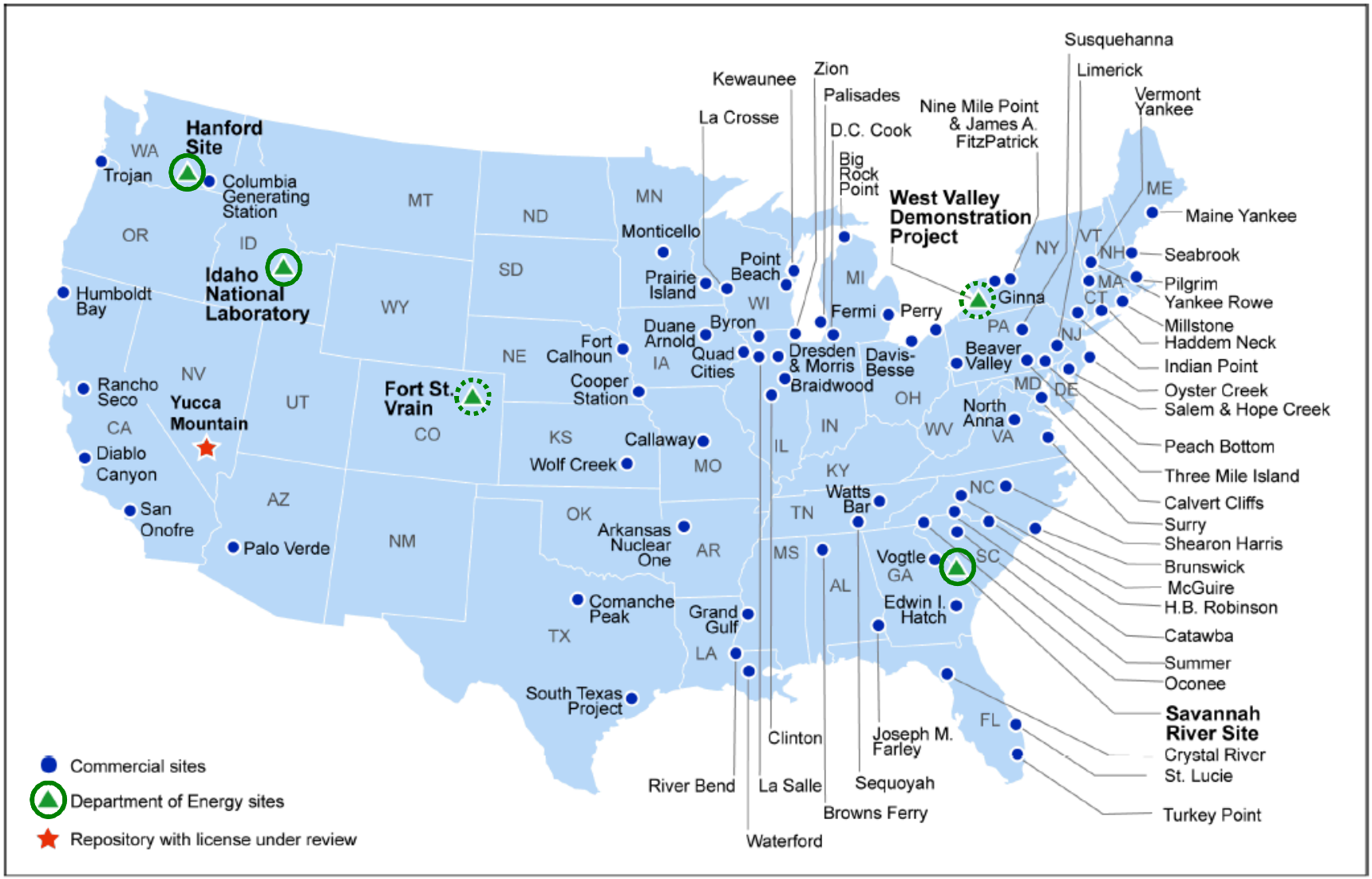
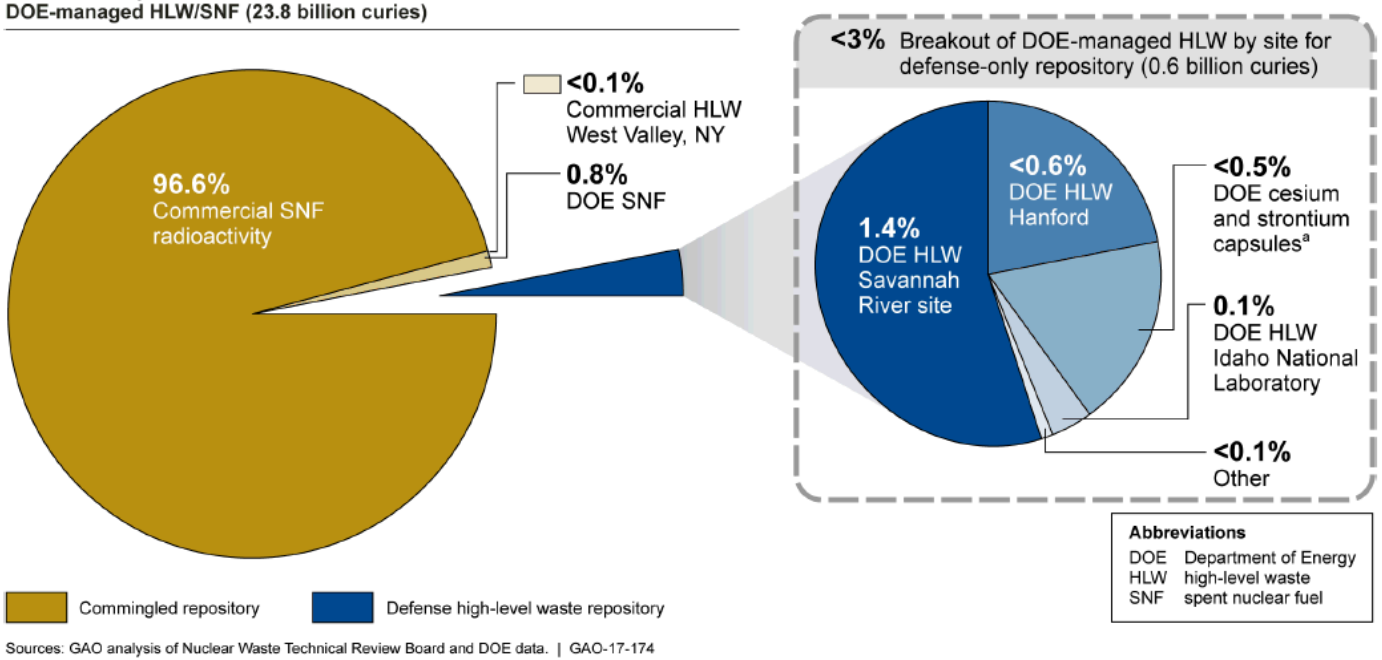
Storage Sites for U.S. SNF and HLW*



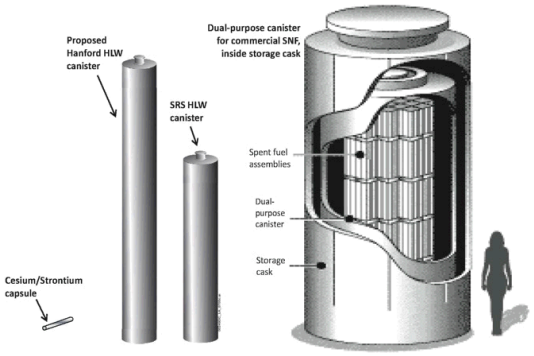
** GAO (U.S. Government Accountability Office) 2017. Benefits and Costs Should Be Better Understood Before DOE Commits to a Separate Repository for Defense Waste, GAO-17-174, Jan. 2017.*

Projected Volumes/Curies of U.S. HLW/SNF

Figure 3: Radioactivity of High-Level Waste (HLW) and Spent Nuclear Fuel (SNF) Planned for Separate Defense and Subsequent, Mostly Commercial Repositories (by Curie and Type of Repository)



Sources: GAO analysis of Nuclear Waste Technical Review Board and DOE data. | GAO-17-174



DOE-Managed Waste	Total Volume (m^3)
Savannah River Site — vitrified HLW	6,957
Hanford — vitrified HLW	14,089
INL — Calcine HLW	3,661
INL — Sodium-bearing waste after treatment by fluidized bed steam reforming	721
Hanford — Post-vitrification volume of cesium (Cs) and strontium (Sr) currently in capsules	453
INL — Electrometallurgically Treated HLW[4]	132
Hanford — Federal Republic of Germany HLW glass	3
INL — Naval SNF[5]	4,600
DOE-managed SNF[6]	1,800

Timeline for Defense Waste Repository (DWR)

- 1982 – U.S. Nuclear Waste Policy Act (NWPA) – U.S. law governing a mined geologic repository for HLW/SNF
- 1985 – U.S. President Reagan's commingling decision ("Common NWPA Repository" for commercial and defense waste)
- 1987 – NWPA "as Amended" chooses Yucca Mountain (YM) only, which is on Federal land adjacent to the Nevada Test Site
- 1998 – DOE issues YM "Viability Assessment" and DOE misses contractual deadline for acceptance of SNF/HLW—has paid $5.3 billion reimbursement to utilities by end of FY2015 (from the U.S. Treasury Judgment Fund)
- 2002 – U.S. President Bush issues the Site Recommendation for YM
- 2008 – DOE submits to NRC the YM License Application (LA) for Construction Authorization (but only to accept about half of the total 14,000 MTHM of DOE-managed waste—see DOE/RW-0406*)
- 2009 – U.S. President Obama declines to fund YM (in collaboration with Senate Majority Leader Harry Reid); calls it "unworkable"
- 2010 – DOE files a motion with NRC to withdraw YM License Application
- 2012 – BRC (Blue Ribbon Commission on America's Nuclear Future) espouses consent-based siting; recommends that DOE further review "commingling"

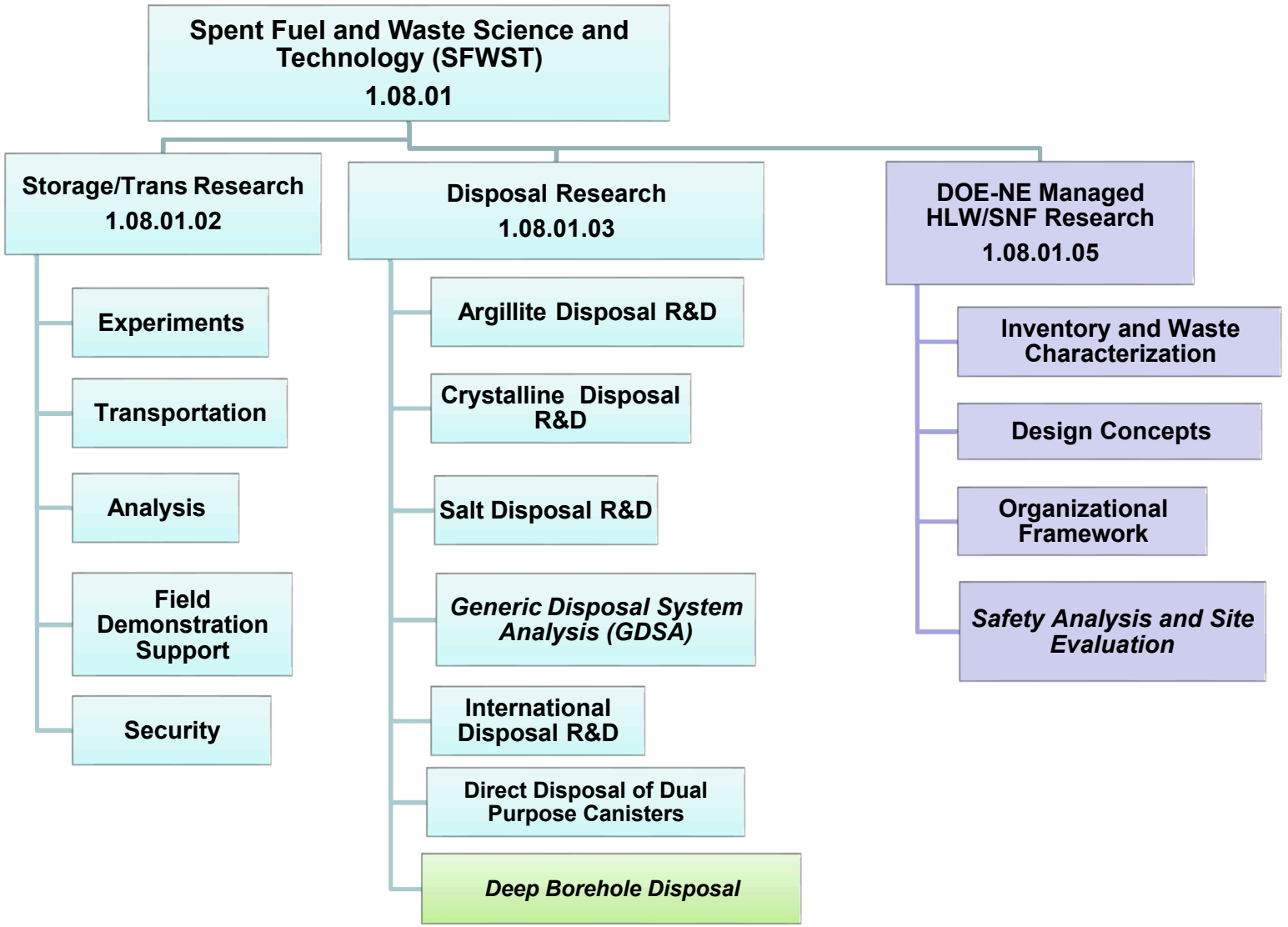
** DOE 2007. Civilian Radioactive Waste Management System Requirements Document (CRD), DOE/RW-0406, Revision 8, ICN 0.*

Timeline for Defense Waste Repository (DWR) – continued

- **2013 – U.S. Court of Appeals in D.C. orders NRC to finish their YM License review**
- **2014 – NRC finishes review of the YM LA (their SER) and "finds, with reasonable expectation, that DOE has demonstrated compliance with the NRC regulatory requirements for postclosure safety"**
- **2015 – U.S. President Obama reverses Reagan's 1985 commercial/defense waste commingling decision for the following reasons (considering also the six evaluation factors in the NWPA: cost efficiency, health and safety, regulation, transportation, public acceptability, and national security:**
  - Lack of availability of a "Common NWPA Repository" before probably 2048
  - End of Cold War (i.e., end of weapons production waste)
  - New environmental laws and agreements (RCRA, CERCLA, Idaho Settlement Agreement, Hanford Tri-Party)
- **2016 – DOE Issues Draft DWR Plan for public comments at https://www.energy.gov/ne/downloads/draft-plan-defense-waste-repository**
- **2017 (January) – GAO issues their critical report on "Benefits and Costs" of a DWR (GAO-17-174)***
- **2017 (May) and beyond ???**

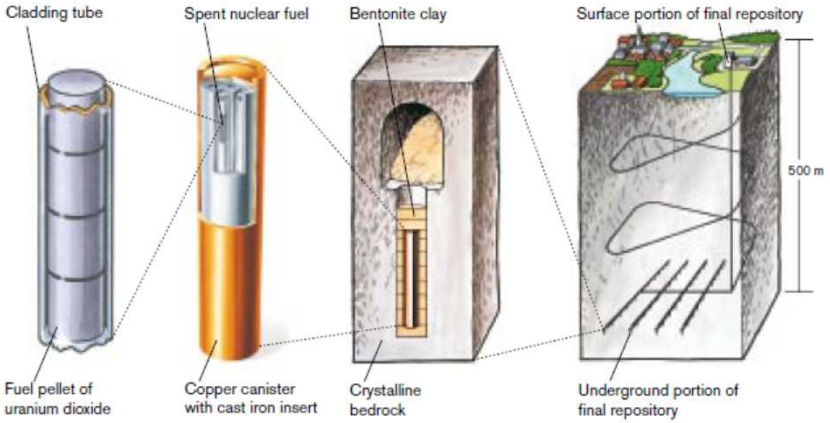
** GAO (U.S. Government Accountability Office) 2017. Benefits and Costs Should Be Better Understood Before DOE Commits to a Separate Repository for Defense Waste, GAO-17-174, Jan. 2017.*

Work Structure for the R&D Program



DWR Potential Disposal Concepts (generic reference cases considered)

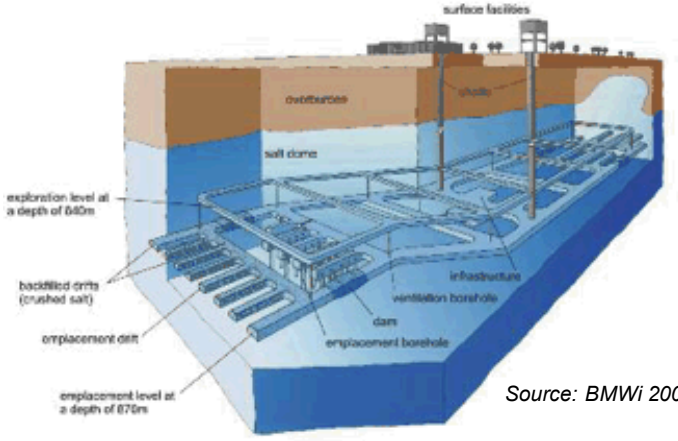
Mined repository in granite or other hard rock



Source: SKB 2011, Figure S-1.

(primary focus of FY16, in conjunction with GDSA work)

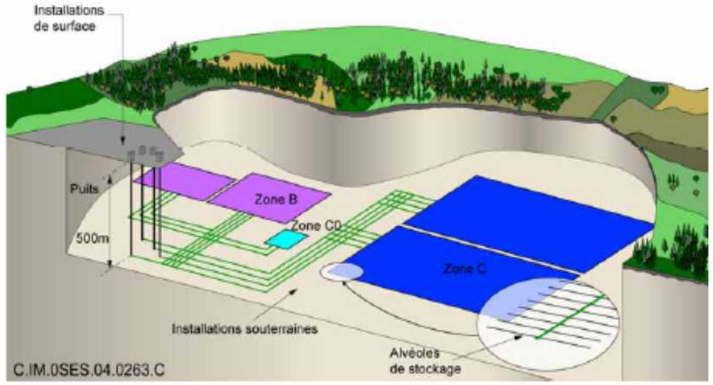
Mined repository in bedded salt



Source: BMWi 2008, Figure 15.

(updated reference case & GDSA simulations in FY16)

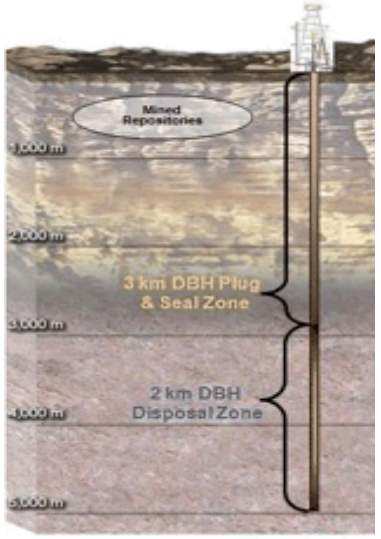
Mined repository in clay/shale/argillite



Source: ANDRA 2005b.

(primary focus of FY17, in conjunction with GDSA work)

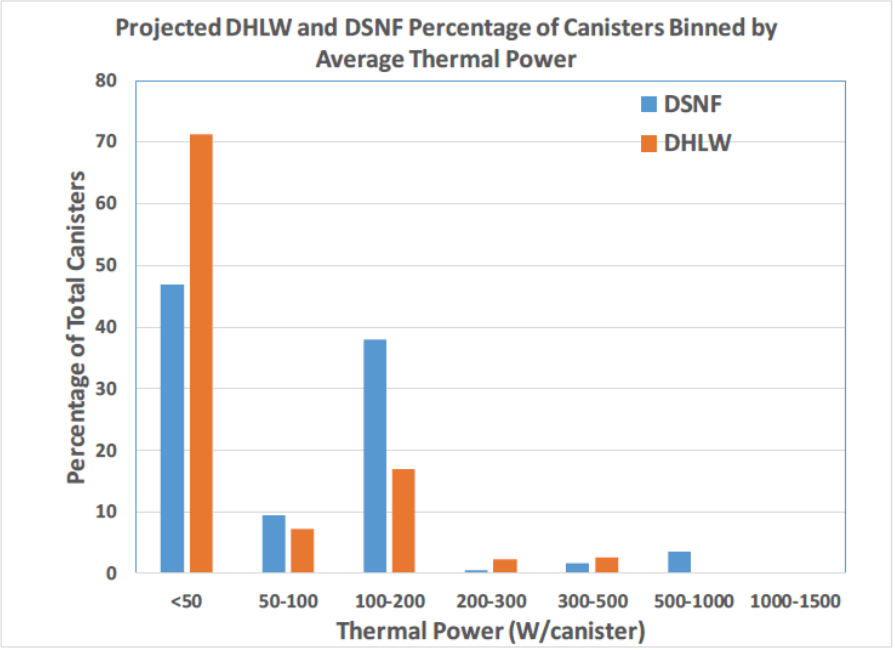
Deep borehole in crystalline basement rock



(R&D conducted under DBFT WPs)

Disposal Strategies Benefit from Thermal Characteristics of Defense HLW/SNF

- **Repository designs and operational concepts can be engineered to use waste-form thermal characteristics, e.g., for argillite host rock:**
  - Keep buffer and host rock temperature below 100°C; assume emplacement in 2038
  - All Defense HLW is relatively cold: less than 500W per canister
    - Emplace 1 canister per waste package (in 100-m-long horizontal boreholes)
  - Most Defense SNF is relatively cold: less than 1000W per canister
    - Emplace 1 canister per waste package (in 100-m-long horizontal boreholes)
    - Emplace all but the 3 hottest DSNF cans
  - Emplace only 13 coolest Navy packages (<1000 W)
  - Emplace cool calcined waste in-drift
- **Initial R&D will limit EBS/repository designs to canisters of approximately less than 1000 W (in 2038)**



Today's Agenda

3:50 – 4:00: **Introduction to Defense Repository R&D –** *Sevougian/McMahon*

4:00 – 4:10: **Inventory and Waste Characterization Overview –** *Sassani*

4:10 – 4:25: **On-Line Waste Library (OWL) Update and Demo –** *Walkow*

4:25 – 4:50: **EBS Design Concepts Update –** *Matteo*

4:50 – 5:05: **Update of DWR Safety Analysis R&D –** *Sevougian*

5:05 – 5:20: **Argillite Regional Geology Investigations –** *Perry*

5:20 – 5:30: **DWR Reference Case and Preliminary PA Simulations –** *Stein*

5:30 – 5:35: **Organizational and Procedural Frameworks Update –** *Swift*

5:35 – 5:45: **Wrap-up Discussion –** *All*