

Used Fuel Disposition Campaign

Deep Borehole Field Test (DBFT) FY15 Site Evaluation Overview

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■ Deep Borehole Field Test (DBFT) Project Overview

- Objectives
- Participants
- Scope
- Background

■ Site Evaluation Update

- Status
- Process

■ DBFT Technical Site Guidelines

- **Recently initiated DBFT will assess viability of the DBH disposal concept**
 - Drill and construct deep borehole(s)
 - *Characterization hole*
 - *Field Test hole*
 - Verify deep hydrogeochemical conditions via characterization and testing
 - Evaluate canister designs
 - Develop engineering methods for downhole canister emplacement/retrieval, and seals deployment
 - Identify concept variations for different waste types
- **The DBFT will be used to validate proof of concept, but will NOT involve the disposal of actual waste**

■ DOE

- NE-53 (NV): Tim Gunter, Lam Xuan
- DOE-ID Procurement: Gordon McClellen, Bradley Heath

■ SNL – DBFT Project Technical Lead

- Bob MacKinnon, Geoff Freeze, Dave Sassani, Kris Kuhlman, Ernie Hardin, (Bill Arnold), Pat Brady, Jack Tillman, Mark Rigali

■ LANL – Geoscience, GIS

- Frank Perry, Rich Kelley

■ LBNL – Geoscience, characterization

- Jim Houseworth, Pat Dobson, Jens Birkholzer

■ PNNL

- Brady Hanson

■ INL – GIS Support to LANL siting database

- Dan Jensen

■ ORNL – GIS surface siting characteristics (OR-SAGE)

- Randy Belles, Rob Howard

■ 5 Primary Activities

- Site Evaluation (Sassani)
- Site Characterization (Kuhlman)
- Field Test Design (Hardin)
- Project Management and Regulatory (Freeze)
- Procurement (DOE-ID)

■ 3 SNL FY15 Level 2 Milestones

- **06/04/15: - Site Selection Evaluation for Deep Borehole Field Test**
 - *plan/approach to evaluation of technical information*
- 09/15/15: Report – Deep Borehole Field Test Specifications
- 09/29/15: Report – Conceptual Design and Requirements for Characterization and Field Test Boreholes

- 2009-2014 numerous reports: SNL LDRD + UFD projects
 - Brady et al. (2009) [SAND2009-4401](#) *Deep Borehole Disposal of High-Level Radioactive Waste*
 - Arnold et al., (2011) [SAND2011-6749](#) *Reference Design and Operations for Deep Borehole Disposal of High-Level Radioactive Waste*
 - Arnold et al., (2013) [SAND 2013-9490P](#) *Deep Borehole Disposal Research: Demonstration Site Selection Guidelines, Borehole Seals Design, and RD&D Needs*
- April 15, 2014: UFD Report on Evaluation of Disposal Options
 - ["Evaluation of Options for Permanent Geologic Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste"](#)
 - *Study conclusions include: 1) deep borehole disposal option is a good option for small waste forms and provides flexibility for disposal*
- Oct 22: DOE issued Disposal Options report:
 - ["Assessment of Disposal Options for DOE-Managed High-Level Radioactive Waste and Spent Nuclear Fuel"](#)
 - *Pursue alternative disposal methods for some YM-bound waste*
 - *Develop a research and development plan for DBD*

- Oct 24, 2014: DOE issued Deep Borehole RFI:
 - [“Request for Information \(RFI\) - Deep Borehole Field Test”](#)
 - *Solicitation Number: DE-SOL-0007705*
 - *Consistent with its Fiscal Year 2015 Budget Request, the Department of Energy is proposing to conduct a demonstration of the Deep Borehole (DBH) disposal concept*
 - Responses received Dec 8, 2014
- Jan 7, 2015: Site Evaluation/Selection Workshop:
 - Reviewed and updated Technical Site Guidelines
 - Decision to utilize Request for Proposal (RFP) process to procure site and site management/operations team
- Draft RFP released April 7, 2015 requesting feedback
 - ["Deep Borehole Field Test: Site and Characterization Borehole Investigations"](#)
 - *Solicitation Number: DE-SOL-0008071*
 - Feedback received May 5, 2015
 - Revisions to finalize RFP in process

■ Three Technical Criteria:

- Criterion 1. Availability and Geologic Conditions of Proposed DBFT
 - *Site Technical site guidelines*
- Criterion 2. Organization and Qualifications
 - *Site management team experience, expertise, knowledge, and capabilities*
- Criterion 3. Proposed Approach
 - *Methodology for successful accomplishment*

■ Three Additional Criteria

- Nontechnical criteria for DOE procurement

■ The site area should be sufficient to accommodate:

- two drilling operations with boreholes nominally separated by at least 200 m;
- surface facilities
 - to support the drilling operations;
 - for sample management and on-site data collection;
 - for evaluation of handling operations for surrogate (mock-up) waste containers; and
 - for site operation needs
- Sites with ample open area surrounding the drilling site would be preferred.
- The site area should be outside of wetlands areas and should be outside of 100-year flood zones, with ample access for heavy equipment needs.

■ Depth to crystalline basement –

- Less than 2 km (1.2 miles) depth to crystalline basement

■ Lack of conditions associated with fresh ground water flow at depth –

- Geologic information and bases should include conditions/features (and the technical bases for those identified) that provide evidence of the absence of recharge at depth. This could include (but is not limited to) for example
 - Lack of significant topographic relief that would drive deep recharge,
 - Evidence of ancient groundwater at depth, and/or
 - Data suggesting high-salinity groundwater at depth

■ Geothermal heat flux –

- Geologic information and bases should include evidence of the geothermal gradient and/or geothermal heat flux at the proposed site
 - A heat flux of less than 75 mW/m² is preferred

■ Low seismic/tectonic activity –

- Less than 2% probability within 50 years of peak ground acceleration greater than 0.16 g (generally indicative of area of tectonic stability)
- Distance to Quaternary age volcanism or faulting greater than 10 km
- Geologic information and bases should provide evidence of the aspects listed above, as well as any evidence that is available on
 - Existence, and orientation, of any foliation in the crystalline basement rocks
 - The horizontal stress state at depth in the crystalline basement rocks
 - Lack of steeply dipping foliation or layering is preferred
 - Low differential horizontal stress is preferred

■ Crystalline basement structural simplicity –

- Lack of known major regional structures, major crystalline basement shear zones, or major tectonic features
- Geologic information and bases should include identification of major regional structures, basement shear zones, or other tectonic features within 50 km of the proposed site

■ Low potential for interference with testing from other surface and subsurface usage –

- Information and bases provided for the proposed site should identify any *previous or current* uses of the surface and/or subsurface that could interfere with the test investigations. Such activities include but are not limited to
 - Wastewater disposal by deep well injection,
 - CO₂ injection,
 - Oil and gas production,
 - Mining,
 - Underground drinking water extraction, and
 - Strategic petroleum reserve sites
- Absence of potential resources in the crystalline basement and sedimentary overburden is preferable
- The information and bases provided for the proposed site should identify existing drinking water aquifers and any previous or current uses of the surface and/or subsurface (such as listed above) within 30 km of the proposed site as far back as available records indicate

■ **Lack of *existing/previous* surface or subsurface anthropogenic radioactive or chemical contamination –**

- Information and bases provided for the proposed site should identify any *previous or current* anthropogenic radioactive or chemical contamination within 10 km of the proposed site