SAND2016-0233PE

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Deep Borehole Field Test: Pre-Kickoff Meeting

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Outline

- **Introductions**
  - DOE, Sandia National Laboratories, Battelle Team
- **Deep Borehole Field Test (DBFT)**
  - Objectives and High-Level DBFT Schedule and Milestones
- **Test-Site Characterization**
  - Characterization Objectives and Characterization Borehole (CB) Conceptual Design
- **Scope of February Kick-Off Meeting**
- **Project Communication Protocol/Logistics/DBFT Team Member List**
- **Available Sandia Reports/Presentations**
- **Open Discussion/Questions**
- **Close and Action Items**

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Introductions

- **DOE Idaho Operations Office**
  - Gordon McClellan, Deep Borehole Field Test Contract, Supervisor
  - Brad Heath, Deep Borehole Field Test Contract
- **DOE NE-53**
  - Tim Gunter, Deep Borehole Field Test Federal Program Manager
  - Mark Tynan, Deep Borehole Field Test Program Lead
- **SNL – DBFT Project Technical Lead**
  - Robert MacKinnon, Manager
  - Geoff Freeze, Project Lead and Safety Assessment
  - David Sassani, Site Evaluation and Data Integration Lead
  - Kris Kuhlman, Site Characterization Lead
  - Ernie Hardin, Test Package/Emplacement Engineering Lead
- **DBFT Laboratory Participants**
  - LANL – Regional geology, geoscience, site characterization
  - LBNL – Geoscience, site characterization
  - ORNL – Surface site characteristics GIS (OR-SAGE) and engineering support
  - INL – Web visualization/interface for geoscience data
  - PNNL – Site characterization support

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Deep Borehole Field Test

The projected cost for the deep borehole field test is approximately $80 million over the five-year life of the test

- **Major components of deep borehole field test include:**
  - **Field Test Site Selection**
  - **Borehole Drilling and Construction**
  - **Science Thrust**
  - **Engineering Thrust**
- **Science thrust includes hydrogeological, geophysical, and geochemical investigations of deep borehole environment and engineered materials behavior**
- **Engineering thrust includes drilling, canister testing, simulated waste handling, simulated waste emplacement and retrieval operations, and seals design**

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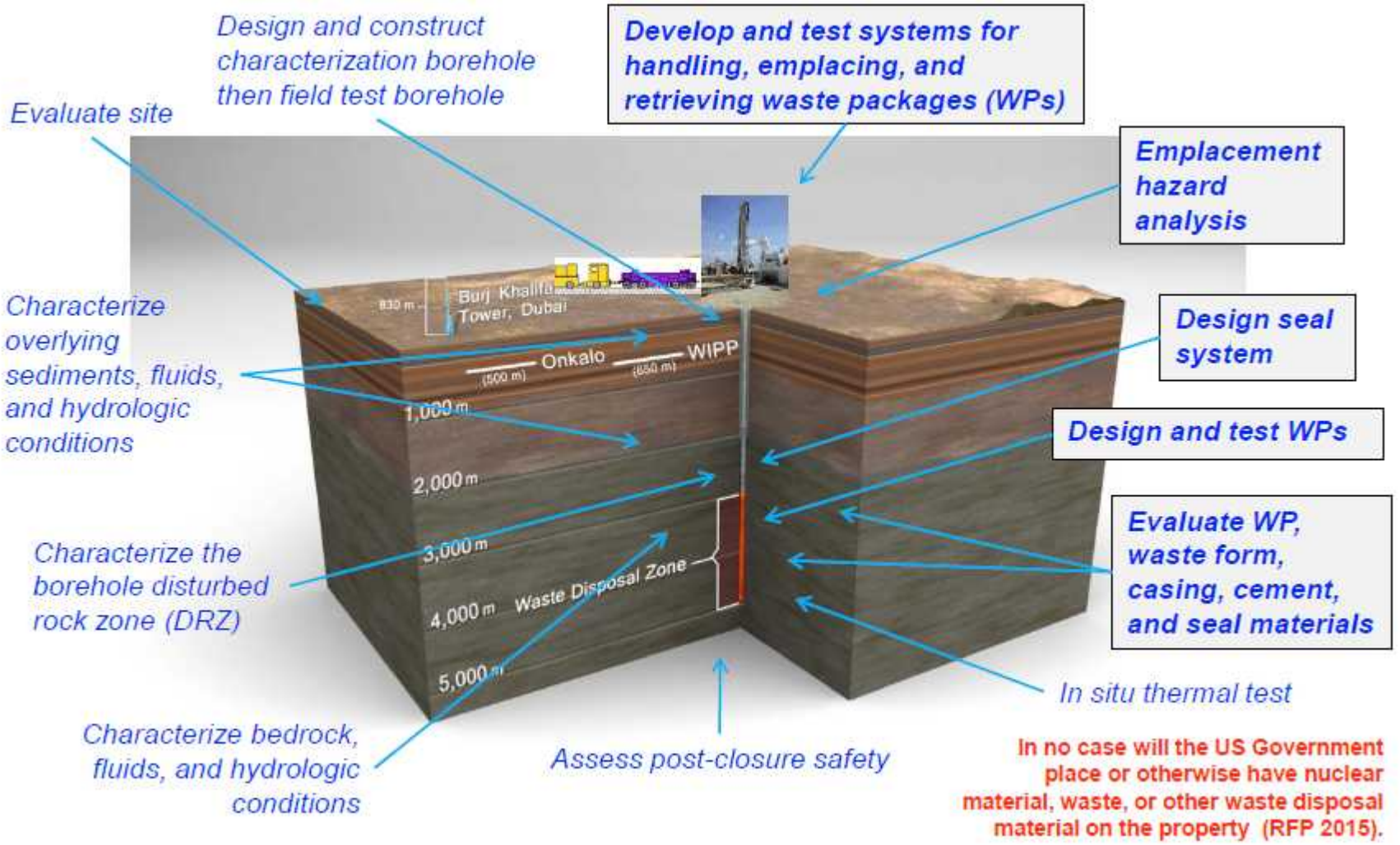
Objectives of the Deep Borehole Field Test

Synthesize field test activities, test results, and analyses into a comprehensive evaluation of concept feasibility



In no case will the US Government place or otherwise have nuclear material, waste, or other waste disposal material on the property (RFP 2015).

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Deep Borehole Field Test Schedule

	FY15	FY16	FY17	FY18	FY19
Site & Characterization Borehole – Issue Draft RFP	◆ 04/07/15				
Field Test – Award Engineering Services Task Order	◆ 06/22/15				
Site & Characterization Borehole – Issue Final RFP	◆ 07/09/15				
Documentation – Borehole and Field Test Design	◆ 09/15/15				
Site & Characterization Borehole – Proposals Due	◆ 09/23/15				
Site & Characterization Borehole – Award Site, Management, and Drilling Services Contract		◆ 01/29/16			
Characterization Borehole – Start Drilling		◆	09/01/16		
Field Test Borehole – Award Management and Drilling Services Contract			◆ 01/13/17		
Characterization Borehole – Complete			◆ 02/27/17		
Field Test Borehole – Start Drilling			◆ 07/07/17		
Field Test Borehole – Complete				◆ 01/07/18	
Field Test – Start Emplacement Demonstration				◆ 01/17/18	
Field Test – Complete Emplacement Demonstration				01/17/19 ◆	
Documentation – Field Test Analyses and Evaluation				09/30/19 ◆	

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Deep Borehole Field Test (DBFT)

- **Two 5-km Boreholes**
  - **Characterization Borehole (CB): 21.6 cm [8.5”] @ TD**
  - **Field Test Borehole (FTB): 43.2 cm [17”] @ TD**
- **DBFT CB Objectives:**
  - **Determine if crystalline basement *groundwater is old, saline, and reducing***
  - **Determine if *ambient fluid potential gradients exists* to drive flow up from disposal zone to shallow subsurface**
  - **Determine if permeabilities of host rock and DRZ are acceptably low**
  - **Reduce uncertainty to acceptable levels regarding host rock and DRZ parameter values used in site-specific numerical models**

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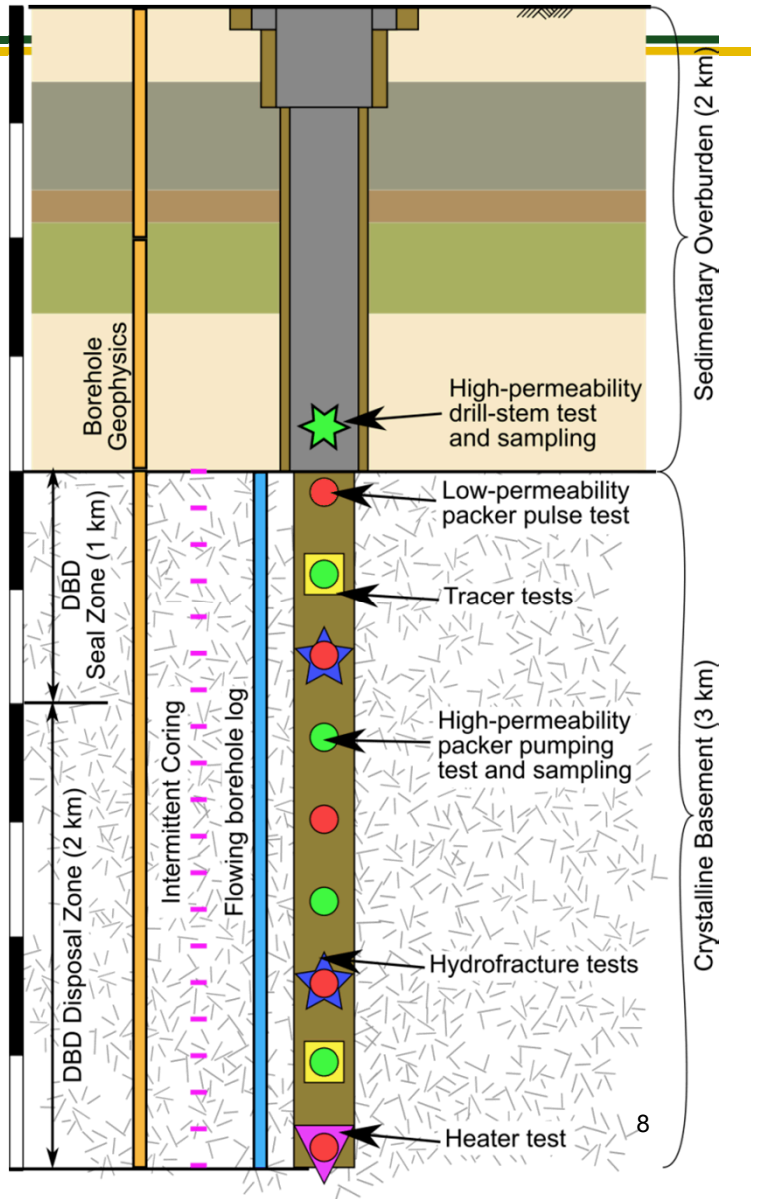
Characterization Borehole (CB)

- 8.5” diam. ≤ geothermal experience
- Characterization of Basement
  - Sampling downhole
    - *Mud logging, fluid (water/gas) sampling, rock samples*
    - *Core ~150 m (5%) of basement*
      - Additional where major variations occur
  - Borehole geophysics suite
    - *Electrical methods*
    - *Sonic/seismic methods*
    - *Nuclear methods*
    - *Temperature methods*
  - *In situ* packer testing
    - *Hydrofracture testing*
    - *Low perm pulse/slug tests*
    - *Higher perm pumping/sampling*
    - *Tracer tests*
    - *Heater test*
- Char. of Lower Overburden ?



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DBFT Data for Success

- **Will Delineate Detailed Data Quality Objectives in the Test Drilling and Test Plan**
- **Need to acquire profiles of:**
  - **Water chemistry (from in situ samples + fluids extracted from cores)**
    - ***Helium-4, stable-water isotopes & major anions/cations***
  - **Transient + equilibrium temperature profiles**
  - **Borehole mechanical/fracture conditions (caliper/image logs)**
  - **Borehole geophysics**
  - **In situ stress state with depth**
  - **Formation permeability and static formation pressure**
- **Additional data include:**
  - **Profiles of other Isotopic ratios: (e.g., noble gases, atmospheric radioisotope tracers, U & Sr isotopic ratios)**
  - **Profiles of pore fluid redox state & pH**
  - **In situ tracer test results**
  - **In situ heater test results**

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DBFT Data for Success

- **Successful profiles require:**
  - Good quality & adequately preserved basement core
  - Drilling mud tracers to identify/quantify contamination of ambient chemistry
  - Quality geophysical borehole logs
  - Repeatable hydraulic fracture stress measurements
  - High-quality hydraulic pulse testing
    - *adequate packer seals*
    - *leak-free testing system*

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Details to work out in D&T Plan

- **Drilling details**
  - **Borehole diameters**
  - **Drilling circulation**
    - ***Mud type / mudlogging / mud tracer***
- **Sequence of testing/sampling events**
  - ***Coring schedule / preservation methods***
    - ***Advance vs. sidewall schedule and strategy***
  - ***Drill-stem testing***
  - ***Geophysical borehole logs***
  - ***Geochemical sampling***
  - ***Geomechanical hydrofracture testing***
  - ***Packer-based hydraulic testing (flow + tracer)***
- **Test interference and priority**
- **Sample management**
- **Data management**

Scope of February Kick-Off Meeting

C.5.1 Task 1 - Team Kickoff Meeting (from the RFP)

Hold a project kickoff meeting at the DOE Office in Las Vegas, NV to outline the Contractor's detailed approach, schedule, and budget. Any potential risks and mitigation strategies shall also be presented by the Contractor. This meeting will be scheduled on or about four weeks after the contract is awarded, or as otherwise agreed to by the DOE Contracting Officer's Representative (COR); the contractor will schedule this meeting with the COR at least two weeks in advance. In addition, DOE will to the best of its ability with support from the DBFT Project Technical Lead, answer questions on the scientific and data requirements from this effort. The purpose of this kickoff meeting, is for the Contractor to present to DOE its detailed plan and approach to complete the SOW, to answer detailed technical and regulatory questions about such strategy and about the site, and for discussion among DOE, the DBFT Project Technical Lead, and the Contractor to clarify any identified issues.. The deliverables will be briefing material which depicts the Contractor's approach to implementing this SOW and detailed meeting minutes.

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Communications/Interactions

Project Communications

DBFT Technical Team Member List and Contact Information

DOE

- Gordon McClellan (Gordon.McClellan@nuclear.energy.gov) 208-526-5379
- Bradley Heath (heathbk@id.doe.gov) 208-526-3132
- Tim Gunter (Tim Gunter (Timothy.Gunter@nuclear.energy.gov) 702-295-2357
- Mark Tynan (mark.tynan@nuclear.energy.gov) 702-295-2384

SNL

- Ernie Hardin (ehardin@sandia.gov) 505-284-9381
- Sassani, David (dsassan@sandia.gov) 505-284-8967
- Kuhlman, Kris (klkuhlm@sandia.gov) 505-284-3088
- Freeze, Geoff (gafreez@sandia.gov) 505-284-8594
- Mackinnon, Robert (rjmacki@sandia.gov) 505-844-1069
- Laura Connolly (laconno@sandia.gov) Administrative Assistant 505-284-3907

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Available Sandia Reports and Presentations

Reports

Arnold, B.W., P.V. Brady, S.J. Bauer, C. Herrick, S. Pye & J. Finger, 2011. *Reference Design and Operations for Deep Borehole Disposal of High-Level Radioactive Waste.* SAND2011−6749. Albuquerque, NM: Sandia National Laboratories

Kuhlman, K.L., P.V. Brady, R.J. Mackinnon, et al., 2015. *Deep Borehole Field Test: Characterization Borehole Science Objectives*, FCRD-UFD-2015–000131, SAND2015–4424R, Albuquerque, NM: Sandia National Laboratories. June. (Included with RFP)

Kuhlman, K.L., P.V. Brady, R.J. Mackinnon, et al., 2015. *Conceptual Design and Requirements for Characterization and Field Test Boreholes: Deep Borehole Field Test*, FCRD-UFD-2015–000131 Rev 1, Albuquerque, NM: Sandia National Laboratories. September (Revision of above, Not yet approved for unlimited release)

Hardin, E.L., 2015. *Deep Borehole Field Specifications*, FCRD-UFD-2015-000132 Rev. 1

Presentations

Nuclear Waste Technical Review Board Presentations
see - www.nwtrb.gov/meetings/meetings.html

Oct 20-21, 2015 Meeting International Technical Workshop on Deep Borehole Disposal of Radioactive Waste

Open Discussion/Questions

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Action Items