



UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201
703-235-4473

AGENDA

Spring 2024 Board Meeting

May 21-22, 2024

Hilton Downtown Knoxville Hotel
501 West Church Avenue, Knoxville, TN 37902

<https://preconvirtual.com/nwtrb-gov-05-20-2024/>

Tuesday, May 21, 2024 (Salon ABC)

- 8:00 a.m. EDT** **Call to Order and Introductory Statement**
Nathan Siu, Board Chair
- 8:15 a.m. EDT** **Opening Remarks**
Timothy Gunter, U.S. Department of Energy-Nuclear Energy (DOE-NE), Office of Disposal Research & Development
- 8:30 a.m. EDT** **Overview of Disposal Research and Development (R&D) Activities**
David Sassani, Sandia National Laboratories

TOPICS/QUESTIONS TO BE ADDRESSED:

- What criteria are applied to determine the completion of a task or activity?
- What tools and mechanisms are being used for effective integration of related R&D activities?
- What is the status of the features, events, and processes tracking tool?
- What are the overall objectives of Geologic Disposal Safety Assessment (GDSA)? Please explain how the current reference cases relate to conducting a formal performance assessment that would support a licence application for construction authorization of a repository.

9:15 a.m. EDT *Questions, discussion*

Note: The questions have been provided to the speakers in advance of the meeting to convey the Board's primary interests in the agenda topics and to aid in focusing the presentations.

9:30 a.m. EDT **Overview of Activities Related to Disposal in Crystalline Host Rock**
Emily Stein and Yifeng Wang, Sandia National Laboratories

TOPICS/QUESTIONS TO BE ADDRESSED:

- What are the most important technical issues related to spent nuclear fuel (SNF) and high-level radioactive waste disposal in crystalline host rocks in the R&D program?
- What are the features of a repository in crystalline host rock in your reference case?
- What are the favorable properties of crystalline rocks for disposal? Are some crystalline rocks better for containing waste than others, and how is that determined?
- What are important flow and transport processes being considered in the conceptual model(s) for disposal in crystalline host rocks?

10:15 a.m. EDT *Questions, discussion*

10:30 a.m. EDT **Break**

10:40 a.m. EDT **Geophysical Techniques for Site and Excavated Disturbed Zone (EDZ) Characterization**

Patrick Dobson, Lawrence Berkeley National Laboratory

TOPICS/QUESTIONS TO BE ADDRESSED:

- What are the challenges in using geophysical techniques to characterize crystalline rocks for deep geological repositories?
- Are there any lessons learned from other industries (e.g., geothermal, carbon sequestration, oil & gas industries)?
- How does the laboratory and modeling work support the representation of EDZ in process models and reference cases developed for analysis using GDSA?
- What is the impact of EDZ on flow and transport processes in the host rock?

11:20 a.m. EDT *Questions, discussion*

11:35 a.m. EDT **Physical and Geochemical Processes that Impact Flow and Transport in Crystalline Host Rock**

Matthew Sweeney, Los Alamos National Laboratory

TOPICS/QUESTIONS TO BE ADDRESSED:

- What are the important flow and transport processes being considered for crystalline host rocks?
- What are the different methodologies being considered to represent fractured media?
- What are the upscaling methods being used for modeling flow in crystalline host rocks?

12:05 p.m. EDT Questions, discussion

12:15 p.m. EDT Lunch

01:15 p.m. EDT **Buffer Extrusion, Erosion, and Clogging**
Yifeng Wang, Sandia National Laboratories

TOPICS/QUESTIONS TO BE ADDRESSED:

- What are the factors that impact buffer erosion?
- How does coagulation and clogging in the buffer impact the flow in the crystalline host rock?
- What is the impact of high temperature on buffer erosion, coagulation and clogging?

01:45 p.m. EDT Questions, discussion

01:55 p.m. EDT **R&D Activities to Address High Temperature and High pH Conditions in the Engineered Barrier**
Yifeng Wang, Sandia National Laboratories

TOPICS/QUESTIONS TO BE ADDRESSED:

- What is the range of temperatures being considered in the thermal stability analysis for buffer materials?
- How does pH impact the barrier capability of the buffer material?

02:25 p.m. EDT Questions, discussion

02:35 p.m. EDT Break

02:45 p.m. EDT **GDSA R&D Activities Related to Crystalline Host Rock**
Paul Mariner and Rosie Leone, Sandia National Laboratories

TOPICS/QUESTIONS TO BE ADDRESSED:

- Does GDSA capture the necessary level of detail in its processes to adequately represent the interaction between the crystalline host rock and clay-based engineered barriers?
- What insights were derived from participating in Task F of the DECOVALEX 2023 project, specifically in relation to the comparison of various models and methodologies employed in the post-closure performance assessment of geological repositories situated within crystalline host rocks?

03:45 p.m. EDT Questions, discussion

04:00 p.m. EDT **The Central Role of Geometry in Fracture Behavior**
Laura Pyrak-Nolte, Purdue University

TOPICS TO BE ADDRESSED:

- Advances in rock fracture characterization
- Representation of fractures and fracture networks in flow models
- Insights gained from research experience and future outlook

04:45 p.m. EDT Questions, discussion

05:00 p.m. EDT Public Comments

05:15 p.m. EDT Adjourn Day 1

Wednesday, May 22, 2024 (Salon ABC)

8:00 a.m. EDT Call to Order and Introductory Statement

Nathan Siu, Board Chair

8:05 a.m. EDT Spent Nuclear Fuel Disposal in Crystalline Rock – Current Status and Lessons Learned From Finland

Erika Holt, Valtion Teknillinen Tutkimuskeskus (Finnish Technical Research Centre), Finland

Barbara Pastina, Posiva, Finland

TOPICS TO BE ADDRESSED:

- Overview and current status of the Finnish disposal program
- Numerical models in near-field and far-field (flow and transport) and performance assessment used in the safety case related to crystalline host rock
- Main laboratory and field experiments related to processes in crystalline host rock that support the safety case
- Technical challenges and lessons learned during the generic site selection, site characterization, and construction phases of repository development with respect to performance of crystalline host rock

8:45 p.m. EDT Questions, discussion

9:05 a.m. EDT Crystalline Rock Site Characterization by Canada’s Nuclear Waste Management Organization

Andrew Parmenter, Nuclear Waste Management Organization, Canada

TOPICS TO BE ADDRESSED:

- Overview and status of the Canadian disposal program
- Discussion of NWMO’s key laboratory and field studies related to development of understanding of the crystalline host rock site and in support of the safety case
- Lessons learned during NWMO’s site characterization and its developing confidence in the site
- Next steps if the Wabigoon Lake Ojibway Nation-Ignace site is chosen as the location for the repository

9:45 a.m. EDT Questions, discussion

10:00 a.m. EDT Break

10:10 a.m. EDT Overview of Commercial SNF Degradation Rate Models

Dave Sassani, Sandia National Laboratories

Brady Hanson, Pacific Northwest National Laboratory

TOPICS/QUESTIONS TO BE ADDRESSED:

- What is the status of DOE R&D on commercial SNF (CSNF) corrosion and radionuclide release? How does DOE take CSNF corrosion into account in generic repository performance studies?
- Explain (1) why a mechanistic-based fuel matrix degradation (FMD) model is required for generic repository study, (2) how is the FMD model different from the SNF corrosion models used in other countries, and (3) how accurate the FMD model needs to be in a repository performance assessment.
- What are the remaining technical uncertainties and data gaps in the FMD model? What are the priorities for addressing and reducing the uncertainties and gaps?
- Identify any additional R&D efforts and the value added to the overall program regarding technical basis-value and effect on overall uncertainty.
- How does DOE take international R&D efforts into account?

10:50 a.m. EDT Questions, discussion

11:10 a.m. EDT Fuel Matrix Degradation Modeling and Electrochemical Testing

Paul Mariner, Sandia National Laboratories

Sara Thomas, Argonne National Laboratory

TOPICS/QUESTIONS TO BE ADDRESSED:

- Explain (1) how the FMD model is implemented into the GDSA Framework, (2) why a surrogate model is required, (3) how the surrogate models can be verified and validated, and (4) what modeling improvements are planned.
- Are the model parameters adequately supported by experimental data? Are the models applicable to the full range of CSNF types accounting for different fuel designs and different operation histories in the reactor and during wet and dry storage to be disposed of in the geologic repository?
- Please provide justification for the use of simulated spent fuels (SIMFUEL) for testing to represent actual irradiated SNF in terms of burnup, microstructure, chemical composition, etc., and their corrosion behavior in a repository.
- How are short-term, small-scale tests used to evaluate post-closure waste form degradation in a repository?

11:50 p.m. EDT Questions, discussion

12:10 p.m. EDT Public Comments

12:15 p.m. EDT Adjourn Public Meeting