UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
2300 Clarendon Boulevard, Suite 1300
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AGENDA
Fall 2018 Board Meeting
Wednesday, October 24, 2018

Albuquerque Marriott
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8:00 a.m. **Call to Order and Introductory Statement**
Jean Bahr, Board Chair

8:15 a.m. **Update on DOE's Spent Fuel and Waste Disposition Program**
William Boyle, DOE, Office of Nuclear Energy

8:30 a.m. *Questions, discussion*

8:45 a.m. **High-Burnup Spent Nuclear Fuel Data Project, Drying, and Thermal Modeling and Analysis**
Brady Hanson, Pacific Northwest National Laboratory, and *Samuel Durbin*, Sandia National Laboratories

Temperature measurements

a. Identify the locations of the thermocouples in the high-burnup spent fuel demonstration cask and present the results of the temperature measurements to date. How do the measured temperatures compare to model predictions? To what do you attribute the differences?
b. How accurately do the temperatures of the cladding and cask need to be known? Why? How does this accuracy compare to the uncertainties in the temperatures predicted by the models?
c. If a comparison between modeled and measured temperatures indicates there is a model uncertainty that previously was not taken into account, how would one know that there are no other uncertainties that have not been accounted for in cases where a cask is stored in another configuration (horizontal) or has a different basket or canister? Will testing of these other situations be necessary?
d. Are there plans to expand the applicability of the temperature models to:
   1) boiling water reactor (BWR) fuels,
   2) pressurized water reactor (PWR) fuels that may reach higher maximum cladding temperatures during drying or storage, e.g., fuel assemblies with integral fuel burnable absorber rods, or
   3) other fuel types known to be planned for loading in U.S. nuclear power plants, e.g., PWR fuels with Russian-specification cladding?

e. Please give an overview of DOE's proposed Phase 3 thermal testing apparatus, its capabilities, and how it will be used.

Drying

a. What was the result of the test to determine the trend of measured internal cask pressures as a function of time, after the test cask was pumped down to a low pressure and then isolated from the vacuum pumping system? What does this result indicate about the amount of water that may remain in the cask?
b. What are the results of the analysis of cask cover-gas samples that were taken, and what do these results indicate about the amount of water that might be left in a cask after fuel loading and drying? Is this amount of water significant? Why?

Plans for the High-Burnup Spent Nuclear Fuel Data Project

a. What are the current plans for: (1) further gas sampling, (2) duration on the storage pad, (3) location and preparedness to open the cask, (4) removal of assemblies/fuel rods, (5) and examination of the fuel rods?

9:45 a.m. *Questions, discussion*

10:05 a.m. **Break**

10:20 a.m. **High-Burnup Spent Nuclear Fuel Data Project Sister Rod Post-Irradiation Examination Program Results and Plans**

Rose Montgomery, Oak Ridge National Laboratory

a. How do the results from non-destructive testing of the sister rods compare with the results from non-destructive testing of other rods?
b. What is the proposed schedule for completing the sister rod destructive testing? When are you expecting to issue a report on the results of the destructive tests? How will the data obtained be used to fill the current technical information needs?
c. What are the plans and timetable for further examination of the sister rods? Will some portions of the rods, or some complete rods, be retained for future use?

10:45 a.m. *Questions, discussion*

11:00 a.m. **Spent Nuclear Fuel Cladding Hydride Reorientation Research and Implications for Fuel Performance During Storage and Transportation**

Michael Billone, Argonne National Laboratory

a. What plans are there to evaluate the potential for hydride reorientation and the consequences of this for spent nuclear fuel cladding integrity during transport, taking account of the following factors:
    1) The sister rod samples being tested in ring compression tests do not contain fuel.
    2) The spent nuclear fuel in the High-Burnup Spent Nuclear Fuel Data Project experienced lower peak cladding temperatures and lower internal rod pressures than originally expected.
    3) There has been limited testing on M5 cladding and on BWR cladding

types.

b. What is a layperson's description of how the offset strain versus temperature curve can be related to the ductility and yield strength of the cladding?
c. What conclusion is DOE reaching on the range of stresses that the high-burnup fuel cladding can expect to see during normal and accident conditions of transport?
d. What is the status of DOE's work related to writing an ASTM standard for hydride reorientation testing?

11:40 a.m. *Questions, discussion*

12:00 p.m. **Public Comments**

12:10 p.m. **Lunch Break (1 hour)**

1:10 p.m. **ENSA Cask Multimodal Transportation Test and Related Structural Modeling and Analysis**

Sylvia Saltzstein, Sandia National Laboratories, and *Nicholas Klymyshyn*, Pacific Northwest National Laboratory

a. In a summary fashion, what is the progress on the Equipos Nucleares, S.A. (ENSA) cask transportation test?
b. How were the effects of using surrogate components in the ENSA cask test evaluated to determine if the test results can be applied to a real transportation system? How does the use of a pad, which was placed between the cradle and cask in the test, but which may not be present or may be of different material in other transportation operations, affect the applicability of the ENSA test results to different transportation systems?
c. How will the behavior of real irradiated spent nuclear fuel during transport be evaluated?
d. Considering the relatively large transient impulse loads measured during the rail testing at the Transportation Technology Center compared to the actual rail vibration loads, explain how the effects of large transient impulses will be accounted for when determining the fatigue lifetime of spent nuclear fuel.
e. Was the frequency spectrum observed for the surrogate fuel rods in the ENSA cask test consistent with the frequency spectrum used for the fatigue testing at Oak Ridge National Laboratory? If not, what are the implications of the inconsistency for using the fatigue testing results to model actual transportation operations?

1:50 p.m. *Questions, discussion*

2:10 p.m. **Overview on Work Completed and Path Forward for DOE R&D on Storage and Transportation Activities**

Ned Larson, DOE, Office of Nuclear Energy

a. How will the data obtained from the currently planned research and development (R&D) program be used to conclude that spent nuclear fuel irradiated under different conditions and stored and transported under different conditions from those in recent testing meet the design basis indicated in the Certificates of Compliance for those fuels?

   b. What technical information needs are now closed, and what data support closing the information needs?
   c. What work is still needed to close the remaining technical information needs?

2:25 p.m. *Questions, discussion*

2:40 p.m. **Break**

2:55 p.m. **Direct Disposal of Commercial Spent Nuclear Fuel Dual-Purpose Canisters — Overview of Past R&D and Recommendations for Future R&D**
Tim Gunter, DOE, Office of Nuclear Energy and *Ernest Hardin*, Sandia National Laboratories

   a. What findings and recommendations came out of DOE studies conducted in 2012 to 2016 on the technical feasibility of direct disposal of dual-purpose canisters, particularly regarding the (1) safety of workers and the public, (2) engineering feasibility, (3) thermal management, and (4) postclosure criticality safety?
   b. How were the recommendations from these studies prioritized and addressed in later DOE studies?

3:35 p.m. *Questions, discussion*

3:55 p.m. **Direct Disposal of Commercial Spent Nuclear Fuel Dual-Purpose Canisters — Ongoing DOE Studies**
Laura Price, Sandia National Laboratories and *John Scaglione*, Oak Ridge National Laboratory

   a. How are the findings and recommendations from the independent review of DOE's R&D on direct disposal of dual-purpose canisters (Alsaed, A. 2018, SFWD-SFWST-2018-000491, Rev. 0) being addressed by ongoing DOE studies?
   b. What is the purpose, scope, and current status of DOE studies on
      1) the technical analysis for dual-purpose canister disposal,
      2) dual-purpose canister fillers for postclosure criticality safety,
      3) multi-physics modeling of dual-purpose canister criticality,
      4) postclosure criticality event consequence analysis?
   c. Given the nuclear industry trend of designing and utilizing increasingly larger cask systems, is DOE assessing how large cask systems can be, for different geologic repositories, before the casks no longer can be accommodated in a repository or the complexity and/or the cost of emplacement is too excessive?

4:35 p.m. *Questions, discussion*

4:55 p.m. **Public Comments**

5:10 p.m. **Adjourn Public Meeting**