



**UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD**

2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201-3367

August 25, 2017

Mr. Edward McGinnis
Acting Assistant Secretary for Nuclear Energy
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Dear Mr. McGinnis:

In a meeting on February 8, 2017¹, Ned Larson of the Department of Energy (DOE), and Ken Sorenson of the Sandia National Laboratories (SNL) charged Sylvia Saltzstein of SNL with generating an overall integrated approach to the sister rod² testing plan to support the High Burnup Dry Cask Storage Research and Development Program (HDRP). On August 2, 2017, Ms. Saltzstein distributed³ the revised test plan, "EPRI/DOE High Burnup Fuel Sister Pin Test Plan Simplification and Visualization" (SAND2017-7597, July 2017) to the participants in the February 8th meeting and others for review and comment. This letter transmits the comments generated by the Nuclear Waste Technical Review Board (Board) during its review of the test plan. The Board appreciates the opportunity to offer its comments.

The Board believes the simplified, phased approach defined in the plan improves its transparency and flexibility, and constitutes a prudent approach to this unique opportunity for destructive characterization of high-burnup fuel (HBF) rods. DOE clearly sought external input and reflected it in the technical content of the report.

The proposed tests appear appropriate and reasonable, and we agree with the recommendation to use ASTM or Nuclear Regulatory Commission (NRC) test methods such as ring compression testing and testing with the Cyclic Integrated Reversible-Bending Fatigue Tester (CIRFT). This action addresses one of our previous concerns. In addition, the Board believes it is prudent that other testing details will be decided in a stepwise approach. These details include which tests need to be conducted, how many tests will be conducted, and where the tests will be conducted. The plans to use sections near the top and bottom of the rods to get a range of burnups and to perform mechanical testing at room temperature and 200°C are appropriate.

¹ Dr. Lee Peddicord of the Board, and Dr. Einziger of the staff attended this meeting.

² A "sister rod" is a rod that has been determined to have very similar characteristics to one that will be stored in the HDRP Cask. There are two potential donor fuel assembly sources for sister rods: assemblies having similar operating histories to those assemblies that have been chosen for storage in the HDRP Cask and actual fuel assemblies selected for storage. Properties that must be similar in order to be considered a "sister" are the cladding type (e.g., Zircaloy-4, Zirlo, M5), the initial enrichment, the relative reactor core location, and the reactor operating history when the fuel was being irradiated.

³ Sylvia Saltzstein e-mail August 2, 2017 – "EPRI/DOE Sister Pin Simplified Test Plan"

The Board also offers some suggestions to further strengthen and clarify the test plan:

1. On page 12, the plan says it will “narrow the focus of the sister-pin test plans to two goals:
1. Identify types and number of tests to provide a core set of material property and physical data that can be compared to the ten-year stored rods”, and “2. Provide core baseline data of the pre-stored rods for comparison to post stored-rods”. The planned heat treatment (cask drying simulation) tests to be conducted at 400°C are not related to either of these goals because the temperature of the ten-year-old, pre-stored, and post-stored rods will be much less than 400°C. The plan would be improved by including the technical goals to be met by the tests at 400°C.
2. Based on previous discussions and report reviews, the Board notes that one of the purposes of the heat treatment tests is to provide data to support modeling efforts that will allow the test results to be extended to other types of HBF. However, the plan does not address how test results will be used in the modeling efforts. It would be useful to identify the models and the test data that the models will use.
3. In several bullets in Sec 4.2, the plan says, “test using 6-inch defueled segments and at least one grid spacer”. Indication of whether this means that portions of grid spacers will be tested, or that rod segments at the axial location of the grid spacer will be tested, would provide more clarity.
4. The HDRP sister rods constitute a valuable resource for research and development to meet presently unforeseen needs related to spent nuclear fuel management and disposal. The Board is pleased that the plan recognizes this and says that “After the high priority testing, if there is time and budget, more data can be obtained from the 25 high burnup sister rods.” How the rods will be stored so that their characteristics do not change during storage and how documentation on these rods will be preserved for future use need to be considered in the near term.
5. The time sequence of executing the planned tests may be important. The plan should define and provide the logic for the time sequence of executing the planned tests.

Once again, the Board thanks you for the opportunity to review this sister rod characterization and testing plan. We look forward to reviewing the evolving technical details of how testing will be accomplished in a practical, relevant manner and how the results will be linked to modeling efforts.

Sincerely,



Jean M. Bahr
Chair

cc: Jack Wheeler (DOE, Office of Nuclear Energy)
Bill Boyle (DOE, Office of Nuclear Energy)
Ned Larson (DOE, Office of Nuclear Energy)
Sylvia Saltzstein (SNL)