



**UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD**

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

May 28, 2013

Mr. David Huizenga
Senior Advisor for Environmental Management
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Huizenga:

On behalf of the U.S. Nuclear Waste Technical Review Board, I thank you for the participation and support of Department of Energy (DOE) Office of Environmental Management (EM) personnel at the Board's meeting in Richland, Washington, on April 16, 2013. Important technical issues were discussed at the meeting, including the eventual disposal of the DOE-owned spent nuclear fuel (SNF) and high-level radioactive waste (HLW) that currently is stored at the Hanford site. The Board regrets that you could not join us, but we appreciate that Mr. Kenneth Picha was able to present the EM program at the meeting.

Complex-Wide Overview of the DOE Office of Environmental Management

Mr. Picha provided a broad and informative overview of EM activities and responsibilities, including the strategy for managing different types of radioactive wastes, the ongoing collaboration between EM and DOE's Office of Nuclear Energy (NE) on disposal-related research concerning the feasibility of a generic salt repository, and some of the impacts on the DOE program caused by the delay in implementing a geologic repository. The overview helped the Board understand better the extent of EM's responsibilities, challenges, and accomplishments.

Classification of Wastes

A recurring and important issue that was not addressed in presentations at the meeting relates to the classification of wastes at Hanford, including the proposed separation of tank wastes into different streams for processing. Establishing the classification of the wastes would provide a technical and regulatory basis for determining the appropriate processing and disposal requirements for each waste stream. After the meeting, DOE did provide some additional information on the classification of waste incidental to reprocessing and on DOE's waste-classification authority in Guide 435.1-1. However, the information did not include a breakdown of all the waste streams at Hanford that will be subject to determinations according to the process in the Guide. Also, the waste-determination process itself was not described. Consequently, the Board requests that EM provide information on activities that have been undertaken or are planned on the classification of wastes at Hanford and other EM sites and the results of these activities to date. This will help clarify the basis for classifying the wastes that will be vitrified and disposed of in the Integrated Disposal Facility (IDF) at Hanford as low-activity waste, rather than as HLW. Classification of the wastes also will help the Board determine the extent of its technical review authority related to wastes at EM sites, including Hanford.

Vitrification as a Complex-Wide Management Strategy

Dr. Carol Jantzen, Consulting Scientist, Environmental and Chemical Process Technology at Savannah River National Laboratory (SRNL), gave an excellent and informative summary presentation on complex-wide management practices for vitrifying HLW and noted some contrasts between the approaches used at Hanford, the Savannah River Site (SRS), and the West Valley Demonstration Project (WVDP) in New York. Her presentation of detailed technical information was a *tour de force*, making complex chemistry and physics understandable to meeting attendees, many of whom are not experts in this field.

Dr. Jantzen's presentation was followed by a panel discussion on technical experience with vitrification. Panel members Dr. Stéphane Gin of the Commissariat à l'énergie atomique (representing French experience); Mr. William Hamel, Waste Treatment Plant Assistant Manager for Office of River Protection and Federal Project Director, DOE (representing the experience of the WVDP); Mr. Jonathan Bricker, Defense Waste Processing Facility Continuous Improvement Manager SRS (representing the SRS experience); and Dr. Albert Kruger, Glass Scientist, Waste Treatment Plant Start-Up and Commissioning Integration, DOE (representing Hanford) discussed their various experiences and perspectives on vitrification. The panel was ably moderated by Dr. Werner Lutze from the Vitreous State Laboratory at The Catholic University of America (CUA).

Based on Dr. Jantzen's presentation and the panel discussion, it is clear that there are considerable differences between the chemistry of the wastes that will be vitrified at Hanford and the wastes that have been vitrified at the SRS and at the WVDP. Nonetheless, the Board believes strongly that closer collaboration among EM sites involved in waste vitrification would be mutually beneficial and recommends increased integration of their programs, possibly including the establishment of an advisory panel with representation from all three sites, to ensure that relevant experiences and lessons learned at one site are shared with the other sites. For example, it would be worthwhile for the sites to share information and/or compare approaches on (1) feed processing as undertaken at the SRS and Hanford sites, (2) feed sampling and characterization at SRS and Hanford, and (3) repository waste-acceptance criteria for glass produced complex-wide.

DOE Technology Development Programs on Waste Forms

DOE's technology development programs on waste forms also were discussed in a panel format. The panel was composed of Dr. David Peeler, Senior Fellow Engineer at SRNL; Dr. Ian Pegg, Professor of Physics and Director of the Vitreous State Laboratory at CUA; and Dr. John Vienna, Research Scientist, Pacific Northwest National Laboratory (PNNL). This panel was also moderated by Dr. Werner Lutze.

One aspect of vitrification technology development that the Board believes has particular relevance is research on the long-term performance of HLW glass. There is a clear difference between the approach used in the U.S. as presented by Dr. Jantzen and the approach used in France as presented by Dr. Gin. While the U.S. has established waste-specification criteria based on standard tests, the French have recognized that the performance of glass as a waste form can vary dramatically as a function of the dissolution and release mechanisms within the geochemical/hydrologic environments of different repository rock types.

The Board recommends that EM consider carefully the long-term performance of glass in a variety of geologic environments, as well as the interactions of different types of engineered barriers with the glass. A specific effort also should be made to evaluate and demonstrate the long-term performance of the low-activity glass that EM plans to dispose of in the IDF. The performance of glass has been the subject of substantial research in France, and the Board believes that DOE's vitrification program at Hanford will benefit from the broad international collaboration that EM has initiated on this topic. In addition, research on the mechanisms that influence changes in glass corrosion rates with time is essential to evaluating overall repository performance, as is addressing uncertainties that could affect radionuclide release rates. A coordinated experimental and predictive modeling-simulation program could be most productive in gaining an understanding of these mechanisms, particularly in different geologic media.

In addition to the performance of the HLW glass being produced for disposal in a U.S. repository, the Board recommends that EM consider carefully the potential repository performance of the 32 glass "logs" that were produced using Hanford HLW to support the German repository program. It may be possible to evaluate the performance of the logs on the basis of the production records and the coupons that were kept at the time the logs were produced. The logs are in the form of canisters of vitrified material, which are approximately 30 cm in diameter and 120 cm long, and it is not clear that this waste form meets the product specifications for HLW glass that currently is being produced at DOE sites.

Comments by Tribal, State, and Public Organizations: Views on the Most Important Technical Issues Associated with the Eventual Disposal of HLW and SNF Stored at the Hanford Site

Representatives of tribal, state, and public organizations, including Mr. Russell Jim, Project Director of the Yakama Nation Environmental Management and Waste Management Program; Ms. Suzanne Dahl, Manager of the Tank Waste Treatment Section, Washington State Department of Ecology; Mr. Ken Niles, Nuclear Safety Division Administrator, Oregon Department of Energy (ODOE); Mr. Steve Hudson, Chairman of the Hanford Advisory Board; Ms. Pam Larsen, Executive Director of Hanford Communities; Mr. Gary Petersen, Vice President for Hanford Programs of the Tri-City Development Council; and Mr. Allyn Boldt of Hanford Challenge provided their perspectives on issues associated with the management and disposal of the SNF and HLW stored at the Hanford site. The session was moderated by Mr. Roy Gephart, a former senior program manager at PNNL and author of *Hanford: A Conversation About Nuclear Waste and Cleanup*.

Mr. Jim made the case that, because all the waste in the Hanford tanks is HLW, no waste stream resulting from processing of this waste should be reclassified as low-activity waste that would be left for near surface disposal at the site. Some of the session participants indicated they consider material that has leaked from the tanks to be HLW; this was a particular point of concern for the ODOE. While recognizing the reality of budget limitations, ODOE and other stakeholders are frustrated by the lack of progress in dealing with the issues related to Hanford's leaking tanks. The issue of *who has the authority to determine the classification of the waste* is a question that was raised by several of the session participants. In the context of the discussion above on waste classification, the answer to this question also is unclear to the Board.

The Board found the stakeholder representatives to be knowledgeable and their comments to be extremely useful and believes that their views also should be of interest to DOE.

Hanford Site Tour

We appreciate the efforts of all involved in the Board's tour of the Hanford site on Monday, April 15. "Veterans" who have been on such tours in the past noted that this tour was one of the most comprehensive and comprehensible they had experienced. The tour provided important and useful information that helped the Board understand better the many challenges encountered by EM at the Hanford Site, as well as the significant progress that has been made over the years in remediation projects at the site. The Board gives special thanks to Mr. Richard Buel and all the other staff who were involved in planning and coordinating the tour.

Technical Poster Session

This is the first time the Board has arranged a poster session at one of its public meetings and, from the responses of the meeting attendees, the session appears to have created valuable opportunities for interaction among the public and the scientists and technical staff working on the research and development programs supporting the disposition of EM's SNF and HLW. The success of this initial experience encourages the Board to consider organizing similar events at future meetings. The Board appreciates very much the considerable effort made by Dr. Albert Kruger and Dr. John Vienna in organizing and participating in the poster session.

Once again, I thank your team and all the meeting participants who contributed to and supported this very productive meeting.

Sincerely,

{Signed}

Rodney C. Ewing
Chairman