



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

November 30, 2004

Dr. Margaret S. Y. Chu
Director
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Dr. Chu:

On behalf of the Nuclear Waste Technical Review Board, I thank you and your team of DOE staff and contractors for participating in the Board's meeting on September 20, 2004, in Las Vegas, Nevada. We appreciated both your program overview and your welcome to the new Board members. The information presented at the meeting was very useful, and the field trip to Yucca Mountain on September 22 was a worthwhile and valuable experience for the new members.

In this letter, the Board provides follow-up comments on the information presented at the meeting.

Waste Management System

The Board believes strongly that waste handling and surface storage at Yucca Mountain should be viewed and analyzed as parts of an integrated waste management system that begins when waste is selected for shipment at reactor and other sites and that ends after placement of the waste in a repository. Because the many elements of a waste management system are interdependent, integrated analyses are needed to understand the viability of the system, identify possible safety and operational concerns, and optimize the system.

Issues raised in the presentation on the design of surface and underground facilities at Yucca Mountain illustrate the vital importance of integrating waste management activities as a part of facility design. For example, under current plans, fuel assemblies could be handled up to four times at Yucca Mountain before being emplaced in the repository. The Board believes that the DOE should analyze ways to minimize the number of times that fuel assemblies are handled. The Board also encourages the DOE to analyze how the aging of spent fuel in surface storage at Yucca Mountain would be used to achieve thermal goals as part of a clearly articulated thermal management strategy. Evaluating the implications of various aging scenarios should be included in this analysis.

Science and Engineering

Need for Integration. The value of integrating program activities also extends to scientific and engineering activities. In particular, changes in engineering design or operations should be analyzed using Total System Performance Assessment (TSPA) to determine the potential level of significance of the effects of the changes on the overall repository system. For example, as the Board pointed out in its June 30, 2003, letter, if the repository design is modified to mitigate the effects of igneous activity, such modifications should be evaluated for their effects on repository operation and performance.

Increasing Fundamental Understanding. In the past, the DOE has increased its fundamental understanding of Yucca Mountain through a large number of scientific and engineering investigations that were part of the site characterization program. Appropriately, much of this work continues in one form or another to address existing and future scientific and technical issues. In addition, you have established the Science and Technology (S&T) program to increase fundamental understanding and to explore concepts that could improve the waste management system. Because the objectives of the S&T program are so important, the Board believes that sustaining the S&T program at or above its current level is very important.

Because several significant scientific issues remain unresolved, maintaining access to the Exploratory Studies Facility and the Enhanced Characterization of the Repository Block (ECRB) for ongoing scientific and engineering investigations is important. For example, the Drift-Scale Test, which is planned to run for 8 years, is presently in its 4-year cool-down phase. Observations of hydrogeologic changes in response to heat fluxes in this test will be needed to evaluate models that predict repository performance. Similarly, water collected in the ECRB and the possible presence of bomb-pulse chlorine-36 at the repository horizon continue to raise questions about water flow inside Yucca Mountain.

Corrosion Issues. The Electric Power Research Institute (EPRI) reported at the meeting that preliminary short-term tests with synthetic magma indicate that Alloy 22 may have significant corrosion resistance to some magmas. However, the chemical compositions of possible magmas at Yucca Mountain vary widely. Therefore, the Board believes that EPRI's results, although very important as an early indicator, do not provide a sufficient technical basis for determining the corrosion resistance of Alloy 22 in magma.

The possibility of stress corrosion cracking of the titanium drip shield also was mentioned at the meeting. The Board looks forward to receiving more information on the technical basis for the DOE's conclusions that stress corrosion cracks that completely penetrate the drip shield would be rare and that, if they did occur, would be narrow and plugged by mineral precipitates or overcome by capillary forces. We also recommend that the DOE determine the likelihood that conditions necessary for stress corrosion cracking of the drip shield would occur at Yucca Mountain.

These two issues need to be addressed within the context of other corrosion tests that should be carried out in environments that closely approximate the various conditions to which Alloy 22 and titanium will be exposed and in environments that reasonably bound those conditions. For example, the Board's July 28, 2004, letter mentions the need for further investigation of the possibilities of localized corrosion. The extent to which the DOE has characterized likely waste package environments accurately is unclear at this point.

Progress on Ground-Motion Estimates. The seismic update made clear that the program has taken significant steps toward developing realistic estimates of ground motions. The Board encourages the DOE to continue these efforts using sound physical principles to limit the proposed, very low-probability earthquake ground motions. We understand that the DOE's S&T program also is addressing this issue over a longer time frame. Of importance is that all currently planned work is continued and that short- and long-term seismic efforts are well integrated. Because of the challenging nature of the task, the analyses should be submitted to external peer review.

Total System Performance Assessment

The afternoon session of the meeting was devoted primarily to a presentation on TSPA, which provided an overview of significant issues and the TSPA process for the new Board members. The importance of TSPA as a part of the repository safety assessment highlights the critical need to complete the testing and validation of the process computer models and methods that support TSPA.

Within the context of TSPA, the Board has three specific interests for future Board meetings. First, we would like to review the results of the TSPA that will be submitted as part of the license application, i.e., TSPA-LA. Second, we would like to understand better the technical and integration problems associated with TSPA and model validation activities (as indicated by the red zones in the August 2004 Annunerator Panel) and how they are being resolved. Finally, the Board would like to know how TSPA and other technical activities will be affected by the court's decision to vacate the 10,000-year time period associated with the EPA standard.

Once again, I thank you and the DOE's staff and contractors for participating in the Board's September meeting. We look forward with interest to further interactions with the DOE on the topics discussed in this letter.

Sincerely,

A handwritten signature in black ink, appearing to read 'B. John Garrick', with a long horizontal line extending to the right.

B. John Garrick
Chairman