



## Department of Energy

Washington, DC 20585

QA: N/A

December 14, 2005

B. John Garrick, Ph.D.  
Chairman  
Nuclear Waste Technical Review Board  
2300 Clarendon Boulevard  
Arlington, VA 22201-3367

Dear Dr. Garrick:

Thank you for your April 19, 2005, letter providing the Nuclear Waste Technical Review Board's (Board) response to the information presented by the U.S. Department of Energy (Department) at the Board's meetings on February 9, 2005, in Las Vegas, Nevada, and on February 10, 2005, in Caliente, Nevada. I apologize for the lateness of this response.

In your letter, you asked what changes might be made in the Department's Total System Performance Assessment (TSPA) as a result of modifications to the U.S. Environmental Protection Agency (EPA) standard. As you know, on August 22, 2005, the EPA published a proposed rule to revise the "Public Health and Environmental Radiation Protection Standards for Yucca Mountain." Subsequently, on September 8, 2005, the U.S. Nuclear Regulatory Commission (NRC) published its proposed changes to its regulation, 10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geological Repository at Yucca Mountain, Nevada," to ensure its consistency with the EPA proposal. The Department's path forward for the TSPA will be guided by the outcome of the EPA and NRC rulemakings. Under the proposed changes, the Department's 10,000-year calculation would be extended to time of peak dose within the period of geologic stability (up to one million years) with treatment of seismic, volcanic, and climate scenarios specified.

Features, events, and processes that pertain to the effects of seismic activity on the Yucca Mountain repository natural barrier system to date have been excluded over the 10,000-year period based on low consequence. The justifications for excluding these features, events, and processes for 10,000 years are also applicable to the period beyond 10,000 years because they are not time dependent. Therefore, the Department would not plan to consider the effects of seismic activity beyond those that result in damage to the engineered barrier system. The consequences of seismic activity, properly weighted by probability of occurrence, likely will not have a significant effect on the peak median annual dose. Current analyses indicate that the magnitude and timing of the peak median annual dose depends much more on the degradation of the engineered barriers, primarily the waste package, through general corrosion.

Dike intrusion and volcanic eruption events may occur, and their consequences, properly weighted by probability, should be assessed in an evaluation of repository performance. Current analyses indicate that the mean annual probability of an igneous dike intrusion event is  $1.7 \times 10^{-8}$  per year, which is slightly higher than the  $10^{-8}$  per year regulatory limit. The probability of an

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eruption in the case where a dike intersects the repository is about 0.8. Sensitivity analyses indicate that an igneous intrusion could potentially affect repository performance over a one million-year period. However, these analyses indicate that the weighted consequences of igneous intrusion likely will not have a significant effect on the peak median annual dose. These analyses indicate that the magnitude and timing of the peak annual dose depends much more on the degradation of the engineered barriers, primarily the waste package, through general corrosion. Analyses also indicate that the greatest risk due to a volcanic eruption will occur within the first 10,000 years. The inventory of radionuclides that dominate the risk from a volcanic eruption decay significantly within and beyond the 10,000-year period following repository closure.

Analyses of past climate conditions in the Yucca Mountain area indicate that climatic conditions will change over the period of geologic stability; however, it is not possible to know or predict with certainty precisely when the climate states with peak precipitation will occur. Further, there are too many uncertainties and permutations available in trying to project a future set of climate conditions, and it is difficult to identify specific times when discrete pulses of precipitation should be included in the modeling. The Department expects to use a long-term average climate infiltration rate to address this, as specified in the proposed rules.

With regard to your comments on program integration, the Department is considering different design concepts that will allow receipt of waste as well as concepts that will streamline the handling of waste through the overall process of transportation, aging, and disposal and will keep the Board informed as these concepts mature.

The Department decided last year to proceed with planning for “mostly rail” shipments based on a Final Environmental Impact Study that considered various modes of transportation, including single mode and combined modes. Therefore, we have not undertaken any additional work on an intermodal facility. The Department does recognize, however, that even under the mostly rail scenario, a few reactor plants will be unable to accommodate rail shipments and that there will need to be truck shipments using legal weight and over weight trucks. The Department does not plan to use heavy haul truck shipments to the repository, although heavy haul shipments from reactor sites to a railhead will be considered.

The intent of the Performance Confirmation (PC) Program is to confirm the performance of the barriers and total system as documented in the TSPA for the license application; the PC Program is documented in the PC Plan. The cognizant performance assessment analysts have reviewed the current suite of activities in the PC Program to verify that the Program is focused on processes that are important to performance. Following the completion of the TSPA for the license application and associated supporting documents, additional analyses will be performed to develop parameter selection and/or recommend new PC activities such that the PC Program is contemporary with the information used to support the license application.

The Department will provide the Board with copies of any implementation plans for construction, management, and operation of the repository and transportation systems as they are developed.

The Department continues to benefit from the constructive views of the Board, and we look forward to further dialog on the repository and related issues.

Sincerely,



Paul M. Golan  
Principal Deputy Director  
Office of Civilian Radioactive  
Waste Management