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U.S. NUCLEAR WASTE TECHNICAL  
REVIEW BOARD

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Report to  
The U.S. Congress  
And  
The Secretary of Energy



January to December 1999

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UNITED STATES  
NUCLEAR WASTE TECHNICAL REVIEW BOARD

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

April 2000

The Honorable Dennis Hastert  
Speaker of the House  
United States House of Representatives  
Washington, D.C. 20515

The Honorable Strom Thurmond  
President Pro Tempore  
United States Senate  
Washington, D.C. 20510

The Honorable Bill Richardson  
Secretary  
U.S. Department of Energy  
Washington, D.C. 20585

Dear Speaker Hastert, Senator Thurmond, and Secretary Richardson:

The Nuclear Waste Technical Review Board (Board) submits this *Report to The U.S. Congress and The Secretary of Energy* in accordance with provisions of the Nuclear Waste Policy Amendments Act of 1987, Public Law 100-203, which requires the Board to report its findings and recommendations to Congress and the Secretary of Energy no less than two times each year.

Congress created the Board to evaluate the technical and scientific validity of activities undertaken by the Secretary of Energy in characterizing a site at Yucca Mountain, Nevada, for its suitability as the location of a permanent repository for disposing of spent nuclear fuel and high-level radioactive waste. The Board also reviews the Department of Energy's (DOE) work related to the design of the repository and to the packaging and transport of spent fuel and high-level radioactive waste. In this report, the Board summarizes its major activities during calendar year 1999.

In 1999, the Board published its evaluation of the DOE's report, *Viability Assessment of a Repository at Yucca Mountain*, finding that Yucca Mountain continues to merit study as the candidate site for a permanent geologic repository and that work should proceed to support a decision on whether to recommend the site for repository development. The 2001 date for a decision is very ambitious, and focused study should continue on natural and engineered barriers.

The Board believes that the performance assessment used by the DOE in the viability assessment can be the core analytical tool for estimating long-term repository behavior. However, performance assessment has limits and should be supplemented with other lines of evidence to make a robust safety case for a Yucca Mountain repository.

The Board has recommended evaluation of alternative repository designs, including lower-temperature designs, as a potential way to help reduce the significance of uncertainties related to predictions of repository performance. The Board looks forward to reviewing the design choices that the DOE will soon make.

Thank you for the opportunity to present the Board's views. We believe that this report provides useful technical and scientific information to the Secretary of Energy and Congress as they make important decisions on furthering the goal of safe management of spent fuel and high-level radioactive waste.

Sincerely,

Jared L. Cohon  
Chairman

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# Executive Summary

In 1987, the U. S. Nuclear Waste Technical Review Board (Board) was created as an independent federal agency by Congress in the Nuclear Waste Policy Amendments Act. The Board was charged with evaluating the technical and scientific validity of the U.S. Department of Energy's (DOE) efforts to develop a system for disposing of high-level radioactive waste and spent nuclear fuel. The Board is required to report its findings and recommendations to Congress and the Secretary of the DOE no less than twice a year.

This document describes Board activities undertaken during the 1999 calendar year. It presents the Board's views on the DOE's ongoing characterization of the Yucca Mountain site in Nevada as a potential location for a repository and summarizes other Board activities.

In 1999, the Board published its evaluation of the congressionally mandated report, *Viability Assessment of a Repository at Yucca Mountain (VA)* (DOE 1998a). The DOE report synthesized information collected over the last decade and a half and provided policy-makers with a "snapshot" in time of the following:

- preliminary waste package and repository designs
- estimates of repository performance
- additional research that DOE needs to conduct before deciding whether to recommend to the President that the site be developed as a repository
- total cost of constructing and operating a repository at Yucca Mountain.

The Board believes that Yucca Mountain continues to merit study as the candidate site for a permanent geologic repository and that work should proceed to support a decision on whether to recommend the site to the President for development. The 2001 date anticipated for this decision is very ambitious, and much work remains to be completed. At a minimum, progress on the work identified by the Board in its 1998 report (NWTRB 1998) and by the DOE in volume 4 of the VA (DOE 1998d) will be required to support a technically defensible decision. The Board supports continuing focused studies of both natural and engineered barriers at Yucca Mountain.

The Board believes that the performance assessment (PA) methodology used by the DOE in the VA (DOE 1998c) can be the core analytical tool for estimating long-term repository behavior. However, PA is limited, and the Board urges the DOE to supplement PA with other measures, such as defense-in-depth, to make a robust safety case for a Yucca Mountain repository.

The Board concluded that a credible technical basis does not exist for the repository design described in the VA. High temperatures in the VA design are likely to cause large uncertainties about how the site would behave both before and after repository closure. The Board recommended evaluation of alternative repository designs having lower temperatures of the waste package surface and tunnel walls. Although the Board has some concerns about the study that the DOE subsequently conducted, it is pleased that the DOE has moved toward implementing a lower-temperature design. However, many of the details of that design had not been finalized by the end of 1999. The Board looks forward to reviewing the design choices that the DOE will soon make.