



## Department of Energy

Washington, DC 20585

APR 01 2002

Dr. Jared L. Cohon  
Chairman  
Nuclear Waste Technical Review Board  
2300 Clarendon Boulevard  
Arlington, VA 22201-3367

Dear Dr. Cohon:

This letter transmits the U. S. Department of Energy's response to the Nuclear Waste Technical Review Board January 24, 2002, letter which provided the Board's comments on the Department's technical and scientific work related to a decision on a Yucca Mountain, Nevada, site recommendation.

The Department has developed technical analyses and regulatory evaluations that account for our understanding of the scientific and technical work in the Site Recommendation documents. Based on the analytical results and sound scientific principles, the Department has confidence that a Yucca Mountain repository would likely meet all applicable radiation protection standards.

The Board's letter recommends specific actions that the Department should consider if the Yucca Mountain site is designated, including:

- Systematically integrating new data and analyses from science and engineering investigations;
- Monitoring performance before, during, and after waste emplacement;
- Developing a strategy for modifying or stopping repository development if potential significant unforeseen circumstances are encountered; and
- Continued external review of the Department's technical activities.



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The Department agrees with these recommendations. If the site is designated, the Department will continue to integrate the results of ongoing data and analyses from the science and engineering investigations. The Department's Test and Evaluation Plan, and supporting Performance Confirmation Plan, provide the preliminary strategy for continued testing and for monitoring performance before, during, and after waste emplacement. The Department also has procedures in place to modify or delay work if potential significant unforeseen circumstances are encountered. For example, our procedure for *Reportable Geologic Condition* (which was used to address Chlorine 36) defines a systematic process for evaluating technically significant conditions, including conditions that could adversely impact the waste isolation capability of the site, could be a potential radiological hazard, or could result in a deviation from the Project's design bases. For significant conditions, the procedure requires a decision to modify the testing program or to delay work, depending on the nature of the observation. Should the evaluation of conditions warrant it, the Department would define activities for stopping repository development.

The Department has implemented a number of external reviews of the scientific testing and analysis completed for the Yucca Mountain site. Recent examples include the ongoing peer review of the waste package materials performance, the International Peer Review of the Total System Performance Assessment (TSPA) for Site Recommendation, ongoing reviews by the U. S. Nuclear Regulatory Commission and the Board, reviews by Project Oversight Boards, and the recent Biosphere Peer Review. These reviews have provided beneficial feedback to the Project and resulted in improvements in the scope of testing activities and analytical approaches. If the site is designated, the Department will continue to use external reviews to increase confidence in our scientific and engineering work and improve the technical basis for a potential license application.

Over the past two years, the Department has focused considerable effort on the Board's four priority areas for Site Recommendation. A brief summary of each of these areas and of the Board's recommendation for continued study of the natural hydrogeologic barriers is provided in the following paragraphs.

*Meaningful quantification of conservatisms and uncertainties*

The Department began an effort to quantify previously unquantified uncertainties and conservatisms in the TSPA in 2000. You noted that we have made significant progress in this area. We are committed to continue quantifying uncertainties in performance assessment models, documenting the technical basis for these assessments, exploring avenues for reducing uncertainties, and defining ways to communicate uncertainty to decision-makers. The proposed guidance for continued work to quantify uncertainties

and conservatisms is documented in the *Uncertainty Analysis and Strategy* document, issued in November of 2001. This guidance has been further developed in the “Guidelines for Developing and Documenting Alternative Conceptual Models, Model Abstractions, and Parameter Uncertainty in the TSPA for Potential License Application,” (March 2002). The guidance will be implemented throughout the performance assessment models and in the *TSPA Methods and Assumptions* document that is being developed for the TSPA for License Application, if the site is designated.

*Progress in understanding the underlying fundamental waste package processes*

The Department agrees with the Board that we have made significant progress in understanding fundamental corrosion processes. Consistent with the Board’s recommendation to continue efforts in this area, the Department has an ongoing comprehensive program for materials testing, which has been reviewed with the Board, that will continue if the site is designated. The Waste Package Peer Review panel has recently completed its report. The Department expects to incorporate many of the recommendations from that panel in its materials testing program.

*Evaluation and comparison of the base-case repository design with a low temperature design*

The Department continues to focus on the refinement of a design that can function effectively over a range of thermal conditions. The Department believes that this course of action preserves the ability to react to new information and evolving technology. Until sufficient information is available to make a decision on optimal thermal operating conditions, and until this decision is necessary, the Department will maintain the flexibility to operate in either a higher or lower thermal condition. At the appropriate time, the Department will select a preferred thermal condition, based on postclosure performance, preclosure safety, cost and schedule, and future national policy decisions. The Department has ongoing research and analysis to strengthen the technical basis for both a higher and a lower temperature operating mode. This work will provide a stronger basis for any future decision on the postclosure thermal conditions.

*Development of multiple lines of evidence that are independent of performance assessment*

As noted by the Board, the Department has increased its use of analogs over the last three years and is now placing greater reliance on analogs to support parameter development and ranges of parameter values for some process models. If the site is designated, the

Department will continue to evaluate natural analogs and alternative models to provide independent lines of evidence to increase confidence in the conclusions reached in its safety assessments. The Department is also planning to complete "one-on" analyses in the fall time frame to provide insight on the effectiveness of individual barriers. These analyses will support our evaluation of defense-in-depth.

*Natural hydrogeologic barriers*

The Board recommends that the Department continue scientific studies to develop more realistic and technically defensible predictions of fluid flow and transport in the unsaturated and saturated zones at Yucca Mountain for the range of radionuclides that may be emplaced at Yucca Mountain. The Board's confidence in the Department's analyses of fluid flow and transport could be substantially increased if the Department completes a concentrated research effort over the next few years. Bechtel SAIC Company, LLC, is defining the work scope that will lead to a License Application in 2004. The scientific investigations and analyses necessary to support License Application will be prioritized and considered with other project activities, such as design, to produce a balanced program within the funding constraints dictated by our budget. As indicated above, additional scientific investigations and analyses to improve our understanding and confidence in how natural and engineered systems work is planned to continue during License Application preparation and beyond.

The Department has benefited from the constructive views of the Board leading to the development of the technical basis for the Secretary's Site Recommendation decision. If the site is designated and the Department proceeds to develop a License Application, we look forward to continuing our dialogue on these important issues with the Board.

Sincerely,



Dr. Margaret S. Y. Chu, Director  
Office of Civilian Radioactive  
Waste Management