TESTIMONY OF JARED L COHON
ON BEHALF OF
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD

BEFORE THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
U.S. SENATE

MAY 23, 2002

Good morning, Mr. Chairman and members of the Committee. I am Jared Cohon, Chairman of the Nuclear Waste Technical Review Board. All members of the Board are appointed by the President and serve on a part-time basis. In my case, I also am president of Carnegie Mellon University in Pittsburgh, Pennsylvania.

I am pleased to be here today to present the Board's technical and scientific evaluation of the Department of Energy's work related to the recommendation of a site at Yucca Mountain in Nevada as the location of a permanent repository for spent nuclear fuel and high-level radioactive waste and to respond to questions posed by the Committee in its invitation letter. We hope that the Committee and other policy-makers will find the Board's testimony useful as you consider the various issues that will affect a decision on whether to proceed with repository development. With your permission, Mr. Chairman, I will summarize the Board's findings, and I request that my full statement and the Board's January 24, 2002, letter report to Congress and the Secretary of Energy be included in the hearing record.

As you know, Mr. Chairman, Congress created the Board in the 1987 amendments to the Nuclear Waste Policy Act. Congress charged the Board with performing an ongoing independent evaluation of the technical and scientific validity of activities undertaken by the Secretary of Energy related to disposing of spent nuclear fuel and high-level radioactive waste. The Board also reviews the DOE's activities related to transporting and packaging such waste. Since the Board was established, its primary focus has been the DOE's efforts to characterize a site at Yucca Mountain in Nevada to determine its suitability as the location of a potential repository. Early last year, Secretary of Energy Spencer Abraham indicated that he would make a decision at the end of 2001 on whether to recommend the Yucca Mountain site for repository development. As the Secretary's decision approached, the Board decided it was important to comment to the Secretary and Congress, within the context of the Board's ongoing evaluation of the technical and scientific validity of DOE activities, on the DOE's work related to a site recommendation. So, in November 2001, the Board met to review comprehensively the DOE's efforts in this area. In December 2001, the Board sent a letter to the Secretary indicating that the Board would provide its comments within a few weeks. The Board conveyed those comments in a letter, which included attachments with supporting details, that was sent to Congress and the Secretary on January 24, 2002.

I will now summarize the Board's review procedures and the results of the Board's evaluation. Questions posed by the Committee in its invitation letter are addressed in the context of the Board's evaluation.

The Board's evaluation of the DOE's work represents the collective judgment of its members and was based on the following:

· The results of the Board's ongoing review of the DOE's Yucca Mountain technical and scientific investigations since the Board's inception · An evaluation of the DOE's work on the natural and engineered components of the proposed repository system, using a list of technical questions identified by the Board

· A comprehensive Board review of draft and final documents supplied by the DOE through mid-November 2001

· Field observations by Board members at Yucca Mountain and related sites.

To focus its review, the Board considered the following 10 questions for components of the repository system:

1. Do the models used to generate input to the total system performance assessment (TSPA) and the representations of processes and linkages or relationships among processes within TSPA have a sound basis?

2. Have uncertainties and conservatisms in the analyses been identified, quantified, and described accurately and meaningfully?

3. Have sufficient data and observations been gathered using appropriate methodologies?

4. Have assumptions and expert judgments, including bounding estimates, been documented and justified?

5. Have model predictions been verified or tested?

6. Have available data that could challenge prevailing interpretations been collected and evaluated?

7. Have alternative conceptual models and model abstractions been evaluated, and have the bases for accepting preferred models been documented?

8. Are the bases for extrapolating data over long times or distances scientifically valid?

9. Can the repository and waste package designs be implemented so that the engineered and natural barriers perform as expected?

10. To the extent practical, have other lines of evidence, derived independently of performance assessments, been used to evaluate confidence in model estimates?

In evaluating the DOE's work related to individual natural and engineered components of the proposed repository system, the Board found varying degrees of strength and weakness. For example, the Board considers the DOE's estimates of the probabilities of volcanic events and earthquakes at Yucca Mountain strengths and the lack of data related to corrosion of materials proposed for the waste packages under conditions that would likely be present in the repository and the very short experience with these materials weaknesses.

This kind of variability is not surprising, given that the Yucca Mountain project is a complex, and, in many respects, a first-of-a-kind undertaking. An important conclusion in the Board's January letter is that when the DOE's technical and scientific work is taken as a whole, the Board's view is that the technical basis for the DOE's repository performance estimates is weak to moderate at this time. However, if all the recommendations in the Board's January 24, 2002, letter report are implemented and no surprises are found, the Board's view of the technical basis would likely improve. The predicted repository performance, however, might be either better or worse, depending on what is discovered.

The Board concurs with the consensus within the international scientific community that deep geologic disposal is technically feasible at a suitable site. However, the Board made no judgment in its January letter on the question of whether the Yucca Mountain site should be recommended or approved for repository development. Those judgments, which involve a number of public-policy considerations as well as an assessment of how much technical uncertainty is acceptable at various decision points, go beyond the Board's congressionally established mandate.

Let me explain in a little more detail, Mr. Chairman, the basis for the Board's conclusion on performance estimates. The DOE uses a complex, integrated performance assessment model to project repository system performance. Performance assessment is a useful tool because it assesses how well the repository system as a whole, not just the site or the engineered components, might perform. However, gaps in data and basic understanding cause important uncertainties in the concepts and assumptions on which the DOE's performance estimates are now based. Therefore, while no individual technical or scientific factor has been identified that would automatically eliminate Yucca Mountain from consideration at this point, the Board has limited confidence in current performance estimates generated by the DOE's performance assessment model. But first let me expand a bit on the comment I just made that at this point, no individual technical or scientific factor has been identified that would automatically eliminate Yucca Mountain from consideration. The Board considers this minimum threshold finding to be a necessary, but by itself not a sufficient, condition for a positive determination of site suitability.

How can confidence in the DOE's performance estimates be increased? As noted in the Board's January letter report, the Board believes that a fundamental understanding of the potential behavior of a proposed repository system is very important. Therefore, if policy-makers decide to approve the Yucca Mountain site, the Board strongly recommends that, in addition to demonstrating regulatory compliance, the DOE continue a vigorous, well-integrated scientific investigation to increase its fundamental understanding of the potential behavior of the repository system. Increased understanding could show that components of the repository system perform better than or not as well as the DOE's performance assessment model now projects. In either case, making performance projections more realistic and characterizing the full range of uncertainty could improve the DOE's performance estimates.

The DOE's estimates of repository performance currently rely heavily on engineered components of the repository system, making corrosion of the waste package very important.

As the Board has mentioned in many of its previous reports and letters, we believe that high temperatures in the DOE's base-case repository design increase uncertainties and decrease confidence in the performance of waste package materials. Confidence in projections of waste package and repository performance potentially could increase if the DOE adopts a low-temperature repository design. However, the Board continues to believe that the DOE should complete a full and objective comparison of high- and low-temperature repository designs before it selects a final repository design concept.

Over the last several years, the Board has made several other recommendations that could improve the DOE's projections of repository performance. For example, the Board recommended that the DOE identify, quantify, and communicate clearly the extent of the uncertainty associated with its performance estimates. The Board also recommended that the DOE use additional lines of evidence and argument to supplement the results of its performance assessment. Moreover, the DOE could strengthen its arguments about how multiple barriers in its proposed repository system provide "defense-in-depth" (or redundancy). Although the DOE has made progress in each of these areas, more work is needed.

Other actions that might be considered if policy-makers approve the Yucca Mountain site include systematically integrating new data and analyses produced by ongoing scientific and engineering investigations; monitoring repository performance before, during, and after waste emplacement; developing a strategy for modifying or stopping repository development if potentially significant unforeseen circumstances are encountered; and continuing external review of the DOE's technical and scientific activities.

Mr. Chairman, your letter of invitation asked what the Board's views are on whether sufficient technical information is or will be available to the Nuclear Regulatory Commission to enable it to assess the safety and environmental impact of a repository at Yucca Mountain. This is the Board's answer to that question. The NRC issued the following statement in November 2001, "The NRC believes that sufficient at-depth site

characterization analysis and waste form proposal information, although not available now, will be available at the time of a potential license application such that development of an acceptable license application is achievable." The NRC and the DOE have agreed on a list of "key technical issues" (KTI) that need to be addressed in the DOE's license application. The NRC, not the Board, will judge the adequacy of the DOE's efforts to resolve these issues for a license application. However, the Board believes that given the significant uncertainties associated with the DOE's current performance estimates, addressing all of the KTI's in the 2004 time frame that has been discussed will be an ambitious undertaking.

Mr. Chairman, let me close by observing that eliminating all uncertainty associated with estimates of repository performance would never be possible at any repository site. Policy-makers will decide how much scientific uncertainty is acceptable at the time various decisions are made on site recommendation or repository development. The Board hopes that the information provided in this testimony and in its letter report to Congress and the Secretary will be useful to policy-makers faced with making these important decisions.

Thank you for the opportunity to present the Board's views. I will be happy to respond to additional questions from the Committee.