

**Statement of
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U.S. Nuclear Waste Technical Review Board
Before the
Subcommittee on Energy and Air Quality
Committee on Energy and Commerce
U.S. House of Representatives
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Good morning, Mr. Chairman and members of the Subcommittee. I am David Duquette, and I chair the U.S. Nuclear Waste Technical Review Board's executive committee. All members of the Board are appointed by the President and serve on a part-time basis. I am Department Head and Professor of Materials Science and Engineering at Rensselaer Polytechnic Institute.

I am pleased to be here today to present the Board's comments on technical and scientific issues that continue to be of interest related to the proposed repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain in Nevada. We hope that the Subcommittee will find the Board's testimony useful in its oversight of activities related to a Yucca Mountain repository. With your permission, Mr. Chairman, I will make a brief oral statement, and I request that my full statement be included in the hearing record.

Background

As you may 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 implementing the Nuclear Waste Policy Act. The Board reviews Department of Energy (DOE) activities related to the disposal, transportation, and packaging of

spent nuclear fuel and high-level radioactive waste. Most of the spent nuclear fuel comes from the commercial generation of electricity, but some comes from defense activities. Virtually all of the high-level radioactive waste comes from defense activities.

Since the Board was established, its primary focus has been evaluating the DOE's efforts to characterize the Yucca Mountain site in Nevada to determine its suitability as the location of a potential repository for spent nuclear fuel and high-level radioactive waste. Since the site recommendation was approved by Congress in 2002, the Board has continued its review of the validity of the DOE's technical and scientific efforts and has increased its involvement in the important area of waste management, including transportation and packaging of the waste and plans for constructing and operating a repository. To gather information for its evaluation, the Board and its panels hold public meetings several times a year with the DOE and other interested parties.

Overview of Technical Issues

One of the two topics for today's hearing is a review of the DOE's Yucca Mountain program. And so today, Mr. Chairman, I will present a brief overview of some of the important technical and scientific issues that the Board has commented on in reports to Congress and the Secretary and in letters to the DOE in the nearly two years since we last testified before this Subcommittee. I will not comment on the second topic of this hearing relating to alterations in the Nuclear Waste Fund. That issue is outside the Board's technical purview.

In conducting its technical and scientific evaluation, the Board makes an effort to take an integrated look at how one part of the proposed repository system might affect another. The two major components of the repository subsurface system are the engineered system and the natural

system. We have taken a similar approach in reviewing waste management activities, considering, for example, how the type of transportation packages selected by the DOE might affect the design of the repository surface facilities.

The following are a few examples of some of the important technical issues that the Board has commented on in the last year. To make the technical issues more relevant and understandable, I have organized them so that they roughly align with elements of the systems that I just described. I will begin with examples of Board comments on the engineered elements of the repository system.

The Engineered System

An important engineered component of the repository system is the waste package that will be used to dispose of spent nuclear fuel and high-level radioactive waste in a repository. As part of its technical review, at a meeting held last May, the Board invited the DOE to discuss how the repository tunnels would work with the waste packages to provide waste isolation. Based on information from that meeting, the Board sent a letter to the DOE last October, followed by a detailed technical report in November on the potential for corrosion of the waste packages during the period called the “thermal pulse.” These two documents composed a Board letter to Congress and the Secretary that was issued in December, and they, like all Board letters and reports, are available on the Board’s Web site: www.nwtrb.gov.

The thermal pulse is the period of roughly 1,000 years following repository closure during which temperatures will be high in repository tunnels. The Board has voiced concerns about the effects of high temperatures on repository performance almost continuously since the Board was established about 15 years ago.

The main focus of the Board's October letter and November technical report was the potential of salts deposited on the waste packages to absorb moisture from the air inside repository tunnels, resulting in corrosion of the metal packages. I will briefly summarize the major points in the Board's letter and technical report.

Based on the Board's review of data gathered and presented by the DOE and the Nuclear Regulatory Commission's Center for Nuclear Waste Regulatory Analyses, the Board believes that all the conditions necessary to initiate localized corrosion of the waste packages will likely be present during the thermal pulse, resulting in corrosion of the waste packages. Once started, the corrosion would likely propagate rapidly even after conditions necessary for initiation are no longer present. The result would be perforation caused by localized corrosion and possible release of radionuclides.

From a technical perspective, in the Board's opinion, the problems related to localized corrosion that I have just described could be avoided if the repository design and operation were modified. The data currently available indicate that perforation of the waste packages caused by localized corrosion is unlikely if temperatures are kept below boiling.

The DOE does not believe that conditions in repository tunnels will promote significant corrosion. The DOE also maintains that the conditions under which localized corrosion might occur are extreme and unlikely. The Board has looked at the information provided by the DOE supporting these assertions and has not found it compelling. However, we are devoting most of the time at our upcoming public meeting, to be held May 18-19 in Washington, D.C., to further discussion of these issues. We have offered broad latitude to the DOE to present additional data, analyses, and arguments related to localized corrosion and estimates of conditions in the

repository tunnels. The Board is looking forward to an open and thorough exchange of information and views on these subjects.

The Natural System

The Board has long had an active interest in the fundamental understanding of the geologic systems that act as natural barriers to radioactivity migrating from a repository. The Board uses a combination of field excursions, laboratory visits, information-gathering, and formal meetings to conduct its evaluation of DOE activities in this area. Over the years, the Board has made numerous recommendations related to increasing fundamental understanding of and enhancing confidence in predictions of natural-barrier performance. Technical and scientific topics covered by those recommendations include hydraulic characteristics of major faults, colloid-facilitated transport of radionuclides, matrix diffusion, the nature and spatial extent of alluvial sediments, the scientific bases of computer models, and the use of natural analogs.

The Board continues to review DOE activities in this area. For example, at a Board panel meeting held two weeks ago, the DOE presented a variety of observations and experiments suggesting that natural barriers might provide waste isolation for time periods as long as the regulatory period and possibly longer for some radionuclides. The Board has not yet formally commented to the DOE on the information presented at the meeting, but we believe that geologic barriers are very important. Addressing uncertainties associated with specific aspects of the natural system can enhance confidence in predictions of natural-barrier performance.

The movement of water through the Yucca Mountain site is one of the most important factors affecting waste isolation. Several years ago, studies on chlorine-36 traces found at places in the exploratory studies facility seemed to imply the existence of “fast paths” where water might have moved from the surface to the level of the repository in about 50 years—a very short

time. However, studies conducted since then have both supported and contradicted the first results. Because this issue is important to fundamental understanding and to the credibility of the DOE's scientific program, the Board has encouraged the DOE to reconcile the various study results. The DOE has commissioned a third-party review to help address the discrepancies. The Board agrees with this decision.

Another issue related to the natural system that the Board has commented on recently is the DOE's earthquake hazard analysis. Based on presentations made at a February 2003 Board panel meeting, the Board found that the DOE's analysis is generally sound. However, extending the analysis to exceedingly unlikely and, quite possibly, physically unrealistic seismic events raises serious questions related to understanding how the repository system will behave and what factors are important to safety. Among other things, it also could cast unwarranted doubt on much of the excellent work carried out by scientists working for the DOE in this area. In June 2003, the Board sent a letter to the DOE with details of its findings and recommendations. The DOE is continuing its efforts to address these issues. The Board will review and comment on the results of the DOE's work.

The Waste Management System

Over the last year, DOE activities related to transportation of spent nuclear fuel, design of surface facilities, and its plans for surface and underground repository operations have expanded conspicuously. During that time, the Board's involvement in these important areas has increased commensurately. The Board's Panel on the Waste Management System has held two meetings in the last 12 months, and the plan is to hold more in the future.

Several Board recommendations to the DOE came out of the first session. Additional recommendations based on information from the second meeting will soon be transmitted.

Among other things, the Board believes that the DOE should develop and produce a Gantt chart (or its equivalent) showing the schedule for transportation planning activities; conduct a complete and accurate inventory of needed rail, truck, and barge access and egress infrastructure and site interfaces; review its waste inventory and acceptance assumptions; and explicitly consider security planning needs. We expect that over the next few years, the Board will become even more fully engaged in reviewing the activities of the DOE in this critically important area.

Safety Case and Performance Confirmation

Over the years, the Board consistently has pointed out the importance of the concept of a “safety case” in developing an integrated presentation of the various elements of a Yucca Mountain repository and how those elements would work together to contribute to waste isolation. The safety case would include information and arguments independent of performance assessment modeling, such as analog studies, which would provide additional lines of evidence for repository performance estimates. This concept is endorsed strongly by virtually all the major nuclear waste management programs abroad and has considerable merit. The Board believes that a narrative description specifically written to address this concept would make the DOE’s approach to ensuring safety more transparent and understandable.

Another concept with significant potential for enhancing confidence in the DOE’s repository performance estimates is a credible performance confirmation program. The Board has encouraged the DOE to develop a clear understanding of what performance confirmation will entail and to integrate its performance confirmation activities thoroughly with performance assessment and repository design.

Mr. Chairman, these are just a few examples of technical and scientific issues that have been the focus of the Board's work over the last year or so. The Board looks forward to continuing its review and to making recommendations to the DOE on the technical validity of DOE activities.

An equally important part of the Board's mandate is advising Congress on technical and scientific issues related to the DOE's implementation of the Nuclear Waste Policy Act. We take that responsibility very seriously. The Board stands ready to provide its technical perspective whenever appropriate so that policy-makers and members of Congress engaged in oversight can factor technical information into their decision-making.

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