UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
1100 Wilson Boulevard. Suite 910
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August 26, 1993

The Honorable Philip R. Sharp
Chairman
Subcommittee on Energy and Power
Committee on Energy and Commerce
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Richard Lehman
Chairman
Subcommittee on Energy and Mineral Resources
Committee on Natural Resources
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairmen Sharp and Lehman:

I join Drs. Allen and Price and the other members of the Nuclear Waste Technical Review Board (the Board) in thanking you for providing us an opportunity at the joint hearing on July 1 to present the findings and recommendations contained in our *Special Report.* We also appreciate very much your gracious comments regarding the contribution of the Board to the civilian radioactive waste program.

Enclosed are the Board's answers to the follow-up questions forwarded by Chairman Lehman, and Representatives Hastert and Vucanovich. The questions are both thoughtful and thought provoking. We hope that the Board's responses will prove helpful. Should you require additional information or clarification, please contact me.

The Board looks forward to continuing to work with the Subcommittees to make improvements to and speed progress in this important program.

Sincerely yours,

John E. Cantlon

John E. Cantlon
Chairman

Enclosure

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POST-HEARING QUESTIONS FOR THE NWTRB

Questions from Chairman Lehman

Question #1

You state that the management & operations contractor for the program is not being used as effectively as it could be.

a) How could the M&O contractor be used more effectively, in your view?

b) To what extent, if any, do you think the M&O contractor contributes to the excessive emphasis on program infrastructure which you cite?

Board response to question #1

a) In the Board's view, the principal functions of the management and operating (M&O) contractor should be (1) developing a technically supportable basis for prioritizing program activities; (2) integrating the program's many and diverse activities related to scientific research and development, engineering, and construction; and (3) helping the Department of Energy (DOE) ensure that the program as a whole will achieve its goals in the most cost-effective and timely manner possible. Currently, however, it is not clear that the M&O has been given the authority to carry out these functions effectively. Furthermore, there seems to be substantial duplication of effort between the M&O and other DOE contractors. During the start-up phase for the M&O, some duplication was unavoidable. Now, however, the DOE needs to be more aggressive in assigning clear responsibilities and in eliminating redundancies.

b) It is unclear to what extent the M&O contributes to the program's high infrastructure costs. However, redundancies in the program and continuing problems with setting priorities will naturally affect program costs. We believe that this question and the other issues raised above should be addressed as part of the independent review of the management and organizational structure of the Office of Civilian Radioactive Waste Management (OCRWM) called for in the Board's *Special Report.*

Question #2

What is the appropriate degree of technical conservatism in a program of this kind? Is it appropriate for the program to embrace a higher degree of conservatism than is considered technically necessary in order to help address the public acceptance problems of the program?

Board response to question #2

To determine the appropriate degree of conservatism in a program of this kind, one must consider several factors. Among these are (1) purely technical issues, (2) the consequences of failure, and (3) the level of uncertainty the public is willing to accept. In general, the overall level of conservatism need not be very different from that which the nation has found acceptable for other critical, and often controversial facilities. Critical facilities are those facilities that society needs but whose failure could lead to serious consequences.

The DOE faces the challenge of siting and building a first-of-a-kind geologic repository that can safely isolate radioactive waste for thousands of years. The best approach, as required in the Nuclear Waste Policy Act of 1982, is to develop a repository system that relies on multiple barriers. Such barriers could include a long-lived waste package, favorable geology, and a favorable hydrologic regime, all of which can act independently and together to isolate the waste. The pivotal question facing those involved in repository development should not be the elimination of *all* scientific uncertainty; there will always be uncertainties in such a venture. Rather, the DOE should strive to increase the robustness of the repository system, or its capacity to protect the public and the environment, in the presence of these uncertainties.

Public acceptance, however, may be linked only tenuously to the ability of the technical community to ensure safety and demonstrate conservatism. Beyond some as of yet undetermined point, increasing conservatism will have little or no effect on public acceptance.

Question #3

In your Special Report, you noted that other factors beyond DOE's control could also contribute significantly to further delays in program progress.

a) Could you provide us with some insights to the kind of technical or institutional problems that could occur?

b) Are the kinds of delays you would expect in terms of years or decades?

Board response to question #3

According to the DOE,[1] to meet its 2010 deadline for beginning repository operation, it must assume the *absence* of the following:

- political or legal obstruction;
- difficulty in clearly resolving site suitability issues;
- difficulty in resolving licensing issues;
- continuing evolution of regulatory requirements;
- insufficient program funding levels.

However, any number of factors substantially, if not entirely, beyond the DOE's control could invalidate this already very optimistic set of assumptions. For example:

- *Legal challenges could be raised by the State of Nevada or other intervenors.* The controversial nature of the repository may continue to generate opposition by the State of Nevada or other opponents of the repository. Legal challenges to the development of the repository cannot be ruled out.

- *There could be difficulties or delays in resolving site-suitability and licensing issues.* Insufficient time has been allowed in the schedule to acquire and analyze the data necessary to resolve scientific uncertainties associated with geologic features that will likely be encountered once underground exploration and testing is initiated. Furthermore, to accommodate the 2010 date for repository operation, the DOE assumes that the Nuclear Regulatory Commission (NRC) will accept its data and analyses and issue a license to construct a repository within a three-year period. Given the first-of-a-kind nature of this facility, this time frame may be optimistic.

- *Changes in radiation-safety standards may affect licensing requirements.* In 1992, Congress passed legislation establishing a three-year process for promulgating a radiation-safety standard and for revising the NRC's criteria and technical requirements for waste disposal at Yucca Mountain. It now seems likely that three years may not be adequate to complete this process. In addition, changes in the Environmental Protection Agency (EPA) standard and the NRC requirements could affect the waste package design and the time required to conduct some scientific tests.

- *Annual appropriation levels have been less than the program says it needs to meet current program deadlines.* The DOE has indicated that to meet its schedule for site evaluation it will need $700 million per year, just for site-characterization activities, to apply for a license to construct the repository

[1] John Bartlett, DOE, January 7, 1991, Board meeting, transcript pages 21-24 and associated viewgraphs.

by 2001. However, annual budgets for the program have been considerably below this amount. This situation is not strictly outside the DOE's control since it has never requested anything approaching this amount for the program. However, it is unclear whether Congress would approve such substantial increases in program funding.

b) It is difficult to predict how long it could take to resolve any one or all of these issues, should they arise. However, it is safe to say that any one of these uncertainties, especially a legal challenge, has the potential of delaying the program for periods of time ranging from a few months to several years or more. In view of such uncertainties, the Board has suggested that *real* program progress can be measured more meaningfully by setting and achieving realistic intermediate goals, such as getting underground, completing critical testing, and determining site suitability.

Question #4

Your Special Report states that the waste package is a key component of the waste management system, and several earlier reports urged DOE to place greater emphasis on this component of the waste system. Contrary to your recommendations, DOE has reduced funding for R&D in this area for the last 3 years.

a) Please discuss what effect this strategy could have on overall safe disposal of nuclear waste.

b) In your view, what degree of reliance would be appropriate to assign to a robust, long-lived waste package when planning the overall repository design?

c) Is the current NRC standard requiring a 300 to 1,000-year period of substantially complete containment of waste in the waste packages adequate?

Board response to question #4

a) The DOE has recently indicated interest in considering a much more robust waste package than is included in the 1988 baseline plan. However, the DOE's pattern of significantly underfunding necessary waste package research is shortsighted. To validate the selection of container materials for the waste package, short- and long-term tests of the materials proposed to be used in the waste package will be required. Citing budget constraints, the DOE has underfunded this area, which has resulted in delays in initiating these tests. Under the current schedule, there may be insufficient time to complete long-term testing. This could result in the preemptive rejection of potentially superior, or more cost-effective, materials, which require longer test periods, or in the DOE's inability to demonstrate credibly the long-term performance of these materials. The former

could result in greater cost and/or reduced repository safety performance, the latter in licensing problems.

b) The Board believes that the use of engineered barriers *in combination* with a well-characterized and suitable site is the most effective way to increase our confidence in predictions of repository performance over thousands of years. One of the most important components of the engineered barrier system is the waste package. The Board sees no technical reasons why a waste package with a lifetime of several thousand years, and perhaps more, cannot be developed by the U.S. program. Indeed, some programs in other countries the Board has visited provide for a waste package lifetime that is considerably longer than this.

The Board does *not* believe that the waste package with a lifetime of 300-1,000 years in DOE's baseline design meets the criteria for a robust, long-lived waste package. We hope that the DOE's recent efforts related to a multipurpose container will include the development of a robust, long-lived waste package.

c) The Board believes that the current NRC repository criteria that include a radionuclide containment requirement of 300 - 1,000 years should be viewed as a minimum standard and that the program should strive to exceed this requirement. One way to do this is to design a robust, long-lived waste package that by itself could be shown to have a reasonable assurance of containing radioactive waste for thousands of years.

Questions from Representative Vucanovich

Question #1

In the Report you say that "Safely storing spent fuel does not appear to present any serious technical problems... The Board has long advocated the development of alternative container concepts." Does this mean the Board would support on-site storage as an acceptable alternative to an interim nuclear waste facility until a high-level waste repository is built?

Board response to question #1

We see no technical basis for disagreeing with the NRC's determination that spent fuel can be stored safely at reactor sites or at a centralized interim storage facility for at least 100 years. That said, the Board has advocated the development of alternatives to the DOE's baseline container concept and overall high-level waste management system because of the potential to reduce handling of the waste and increase the level of safety in the waste management system. Our position should not be regarded as implicit support for one storage alternative over another. As stated in the *Special Report,* given the current law, even if a centralized interim storage facility is successfully sited and constructed, much spent fuel will likely remain stored at many reactor sites for extended periods. Thus, some on-site storage will almost certainly have to be part of any waste management plan.

Question #2

In your testimony, you indicate that "attempting to meet these unrealistic deadlines (1998 and 2001)...could cause licensing problems, increase overall program costs and ultimately delay the program."

Could you please explain what the licensing problems might be, and particularly what the extent of delay in the program would result?"

Question #3

What do you mean in your testimony that "DOE's repository development schedule may not allow sufficient time to complete these (heater) and other essential scientific tests." What are the heater tests and what type of delay might result in the lack of flexibility in the DOE schedule?"

Board response to questions #2 & #3

Licensing problems could result from a failure to collect scientific data of sufficient duration, quality, and/or quantity to adequately support a license application. Some site-investigation studies need to be carried out over several years or more if they are to produce the information needed to demonstrate repository safety. For example, in-situ heater tests that are needed to choose and scientifically justify the appropriate thermal-loading strategy for the repository could take up to a decade or more to complete. The thermal-loading strategy, which describes how to achieve a given range of temperatures within a repository and in the surrounding rock over a chosen period of time, will affect the size and design of the repository, the ageing of the spent fuel, and the design of the waste package. The Board is concerned that attempting to meet the deadlines in the current schedule could result in shortening the duration of these heater tests or the corrosion tests necessary to demonstrate the performance of materials used in the waste package. This could reduce the scientific quality of test results and cause the NRC to require the DOE to initiate additional testing before a repository license could be obtained.

Question #4

Given your criticisms of the DOE program, what type of independent review do you envision of the DOE program and who do you suggest conduct such a review?

Board response to question #4

The Board has recommended an independent review of OCRWM's management and organizational structure. Such a review should not be conducted or sponsored by the DOE. However, we are unaware of any currently existing entity that would be ideal for this job. Obviously, it would be important to include on such a review panel experts with experience in the management of underground projects of commensurate complexity. The Board strongly believes that *any* review of the program should be conducted concurrently with ongoing site-characterization activities to preserve continuity and facilitate program progress.

Question #5

In the Report, you say "unrealistic deadlines also are forcing the DOE to undertake activities simultaneously that might better be conducted sequentially" What's the impact of this statement on the Board's confidence in the DOE's scientific activities at Yucca Mountain?

Board response to question #5

The Board's concern in this area is that conducting some activities simultaneously could lead to costly mistakes, could create inefficiencies, and could cause further program delays. The Board believes it is very important that the DOE not make decisions or commit to strategies or designs that may rule out options that might later be shown to be preferable. For example, to be able to accept spent fuel at a centralized interim storage facility, the DOE had decided to begin procurement of transportation casks before completing research on alternative container concepts such as the multipurpose container. Earlier this year, the DOE modified its approach, emphasizing the development of a more flexible multipurpose container that could be used to transport, store, and, perhaps, dispose of spent fuel. The Board is encouraged by this change. However, the development of a container concept is now being conducted simultaneously with thermal and materials testing that will take several years, perhaps up to a decade, to complete. Consequently, it is important that the DOE maintain the flexibility to modify its multipurpose container designs based on the outcome of these tests or to develop an multipurpose container that can accommodate a range of thermal-loading alternatives.

Question from Representative Hastert

Question #1

It has been suggested that the Department of Energy should postpone work on the Yucca Mountain site characterization pending a comprehensive review of the high-level waste program. Wouldn't this simply further delay the program in Nevada?

Board response to question #1

The Board has explicitly stated that any review of the program "can and should be accomplished without slowing the progress of important site-characterization activities at Yucca Mountain."[2] The Board does not support postponement of site characterization pending the outcome of a comprehensive review. Postponing this important work, or any significant part of it, such as underground exploration and testing, could increase overall costs, delay the determination of site suitability, and cause substantial additional delays in addressing the problem of disposing of radioactive waste. Such a delay also could affect efforts across the nation to expand on-site storage of spent fuel at reactors. The Board believes that *any* review of the program can and should be conducted concurrently with ongoing site-characterization activities.

[2] **NWTRB, *Special Report to Congress and the Secretary of Energy,* March 1993**