THE NUCLEAR WASTE TECHNICAL REVIEW BOARD: ITS ORIGIN, ORGANIZATION, AND ACTIVITIES*

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ABSTRACT

The Nuclear Waste Technical Review Board (the Board) was established by the Nuclear Waste Policy Amendment Act (NWPAA) of 1987 as an independent body within the executive branch. The Board's principal responsibility is to evaluate the technical and scientific validity of site-characterization activities and activities relating to the transportation and disposal of high-level radioactive waste and spent nuclear fuel. In this role the Board functions as a source of expert advise to the DOE and the Congress on issues relating to the nation's program for the disposal of civilian radioactive waste.

The NWPAA specifies that the Board consist of eleven members appointed by the President from candidates nominated by the National Academy of Sciences. Nominees are to be eminent in a field of science or engineering, including environmental sciences, and selected solely on the basis of established records of distinguished service. To date, nine members have been appointed. The Board is supported by professional and administrative staff, as well as consultants who provide expertise in their respective fields.

The Board reports its findings, conclusions, and recommendations to Congress twice a year. It submitted its First Report to the U.S. Congress and the U.S. Secretary of Energy in March 1990, and its Second Report in late October 1990. The recommendations from both reports are detailed in the paper.

The Board has formed seven panels: 1) Structural Geology & Geoengineering; 2) Hydrogeology & Geochemistry; 3) Risk & Performance Analysis; 4) Transportation & Systems; 5) Environment & Public health; 6) Engineered Barrier System; and 7) Quality Assurance. To date, there have been seventeen panel meetings and technical information exchanges, and six full Board meetings. Board members also spent seven days (May 26-June 2, 1990) investigating Swedish and German plans and procedures for handling and storing spent nuclear fuel and high-level radioactive waste. Beginning in August 1990, the Board has scheduled an number of public hearings that focus on issues including transportation and the environment and public health. The Board's future and on-going activities are discussed in the paper.

INTRODUCTION

As you know, the Nuclear Waste Policy Act of 1982 and its amendments of 1987 provide the framework for the Department of Energy's (DOE) program to manage civilian high-level radioactive waste. Under this program, the DOE Office of Civilian Radioactive Waste Management (OCRWM) is carrying out the process of high-level radioactive waste disposal. One of OCRWM's first responsibilities is to characterize the site chosen by Congress at Yucca Mountain, Nevada, to determine if it is suitable as a location for a repository.

Congress also provided for the establishment of an oversight agency to monitor the technical and scientific validity of DOE activities as it characterizes Yucca Mountain and develops and implements a U.S program to dispose of high-level radioactive waste. That agency, the Nuclear Waste Technical Review Board (Board), of which I am chairman, is the government agency responsible for continuous evaluation of the technical and scientific aspects of the DOE's waste management efforts.

The Board's activities are supported by the Nuclear Waste Fund, which was created by Congress in the 1987 amendments to fund the program through a fee levied on users of nuclear-produced electric power.

There are other organizations, such as the National Academy of Sciences, that play advisory roles for various agencies, including the DOE. Ours is the only *completely independent* government agency functioning as a source of expert advice to Congress and to the Secretary of Energy on the technical and scientific validity of the DOE's program.

The Board has been directed by Congress to focus on (1) site-characterization activities and (2) activities relating to the packaging and transport of high-level radioactive waste.

Our legislation provides for a total of 11 members to serve on the Board concurrently. President Reagan appointed eight members to the Board in January 1989; a ninth member was appointed by President Bush in May 1990. We look forward to two additional appointments in the coming months. Members serve four-year terms. The Board, whose offices are located in the Washington, D.C., area, has hired a small technical staff to support its activities.

One of the Board's first acts was to establish panels to review pertinent issues. There are currently seven panels organized around the following topics: (1) structural geology and geoengineering; (2) hydrogeology and geochemistry; (3) engineered barrier system; (4) transportation and systems; (5) environment and public health; (6) risk and performance analysis; and (7) quality assurance.

The panels provide input and recommendations to the Board. Board members participate on a regular basis in panel meetings, technical information exchanges, and informal discussions with representatives from the DOE and with experts from the public and private sectors. Input from the individual panels becomes part of a broader spectrum of information used by the Board to prepare its biannual reports to the U.S. Congress and the Secretary of Energy with its findings and recommendations.

To date, two reports have been published. In the *First Report*, published in March 1990, the Board detailed its charge under the law, the history of legislation controlling repository development, and the major areas of concern that it identified in its first 10 months of operation. It also outlined its long- and short-term plans. The Board made a number of recommendations to Congress and the Secretary of Energy on what it identified as "issues of concern."

The Board made a total of 24 recommendations submitted in three categories: (1) technical and scientific recommendations, (2) strategic technical and nontechnical recommendations, and (3) science policy recommendations. I will not attempt to enumerate all of them, but will give you some examples.

Technical and Scientific Recommendations

Here, the Board's objective was to identify the most important technical and scientific issues that the DOE should analyze further and to specify possible courses of action. Seventeen recommendations were presented in this category. Here are four examples.

- Use mechanical excavation techniques

  The Board recommended that the DOE maximize the use of the most modern mechanical excavation techniques in the recently initiated studies of alternative shaft and tunnel construction methods. Mechanical excavation techniques will reduce disturbance to the rock walls and achieve greater economy of time and cost.

- Intersect the Ghost Dance Fault at more than one location

  The Board recommended that the Ghost Dance Fault be intersected with an exploratory drift (or tunnel) at more than one location to obtain a better three-dimensional picture of the fault's physical properties.

- Plan early exploratory drifting

  The Board recommended that the DOE plan an additional early exploratory drift across the Yucca Mountain block to reduce geologic uncertainties and to allow early determination of site suitability.

- Continue studies of a exploratory ramp

  The Board recommended that the DOE continue the studies for incorporating an exploratory ramp entering the Yucca Mountain geologic block from the east. Such a ramp would allow the known fault zones and the different tuff units that occur between the surface facilities and the repository area in Yucca Mountain to be crossed and inspected at depth.

Strategic Technical and Nontechnical Recommendations

The strategic technical recommendations made in the First Report involved value judgments about technical and nontechnical factors: For example, (1) When there is enough technical information and analyses to make decisions about repository development? (2) Are the current decision-making and operational structures adequate to successfully carry the nation through repository construction and operation over the next several decades? On such matters, the Board attempted to explain the issues more clearly. The Board suggested possible mechanisms or processes for addressing and/or resolving these issues. The Board developed specific recommendations when it felt an issue needed to be addressed by the DOE.

Two strategic recommendations focused on the need to enhance safety by incorporating system safety and human factors engineering principles into the transportation portion of the program. Another recommendation suggested that the DOE develop a systems approach to the study of the Yucca Mountain ecosystem and integrate individual studies into an overall environmental program.

Science Policy Recommendations

The Board's science policy recommendations involved decisions typically dealt with in the upper echelons of the executive branch or in Congress. Such issues include the development of the Environmental Protection Agency (EPA) standards and the Nuclear Regulatory Commission (NRC) regulations; and the repository licensing process.

One recommendation addressed the Board's concerns with the structure and content of the EPA and NRC standards and regulations for the performance of geologic repositories. The Board later reiterated these initial concerns during presentations to the *National Academy* of Sciences (NAS) and the NRC Advisory Committee on Nuclear Waste. In addition, the Board has written to Chairman Carr of the NRC and Administrator Reilly of the EPA suggesting that the two agencies coordinate their regulatory activities to ensure that their respective standards and regulations are mutually consistent and supportive.

Another recommendation suggested that the DOE request the NRC and the EPA to consider the inherent uncertainties and limitations in geologic information and data when requiring that performance projections be made for such long periods of time, and when defining acceptable and realistic environmental radiation protection standards.

Our *Second Report*, published in November 1990, was a result of Board activities from January 1 to July 31, 1990. During this period, members met with, among others, representatives of the DOE and its contractors, the Fish and Wildlife Service, the NRC, the National Park Service, the State of Nevada, the Soil Conservation Service, the U.S. Geological Survey, the Western Shoshone National Council, and representatives of the utilities. The Board addressed many of the issues it identified in its First Report. In some cases, the Board made additional recommendations. In others, it simply reported its findings to date.

As in the *First Report*, recommendations covered technical, strategic, and policy matters, but were not separated into those categories. The recommendations in the Second Report were divided among seven broad categories: (1) effects of seismicity and faulting, (2) site-suitability testing, (3) performance assessment, (4) long-lived waste packages, (5) waste package studies, (6) environmental studies, and (7) transport and handling of spent fuel. A total of 20 individual recommendations were made. They ranged in scope from highly specific items, such as the desirability of developing a dry-drilling technique for inclined holes, to programmatic concerns such as investigating the development of a robust, long-lived engineered barrier system and the potential use of data from natural analogues to calculate performance assessment.

The Board's third report is in preparation and is scheduled for release in May, 1991.

The Board's actions have not been limited to Board- or panel-sponsored meetings. Members have attended and participated in DOE-NRC information exchanges, the NAS symposium on waste management regulation, and ACNW meetings. In addition, the entire Board visited waste management and R & D facilities in Sweden and Germany. Furthermore, on October 2, 1990, I joined with other members of the scientific and government community involved with the disposal of high-level radioactive waste in testifying on waste management regulation issues before Senator Graham's Subcommittee on Nuclear Regulation, Senate Committee on Environment and Public Works.

The Board's plans for the future include the continued evaluation of the DOE's undertakings in technical and scientific areas. Although we expect to continue to advise the DOE on specific technical issues of narrow scope, Board activities will increasingly involve issues that span the purviews of more than one panel. Thermal loading constraints, for example, which we plan to investigate in the coming months, will be of interest to most of the panels.

The DOE's plans to characterize the site at Yucca Mountain are of concern to us. The Board has joined others in recommending an early determination of site-suitability and discovering as soon as possible whether or not there are major flaws in the site. The Board also has recommended that extensive drifting be performed at both the repository horizon and the major geologic barrier, the Calico Hills unit.

The Board expects to continue its examination of the potential advantages of a long-lived engineered barrier system. To that end, Board members hope to continue to meet with members of the international technical community who can provide information in this area. For example, the Board plans to visit the Canadian laboratories at the Whiteshell Establishment in Manitoba sometime this year, and Board members will be participating in technical exchanges in Europe in the near future.

As the Board's work continues, its activities increasingly focus on two general areas of concern. First – Is the site at Yucca Mountain suitable? Recommendations relating to exploration techniques, seismic criteria, volcanic activity, hydrology, and prioritization of site-characterization tests generally address this question.

The second area addresses those items that are applicable to any geologic repository: (1) Can and should an engineered barrier system be developed with a projected retention time of several thousand years? (2) What consideration should be given to the use of natural analogues in calculating a performance assessment? (3) What levels of risk are acceptable, given the geologic and experimental data being collected and the need for responsible consideration of human welfare?

In summary, it may be said that although our efforts to evaluate the DOE's program formally culminate in the recommendations we sent twice a year to Congress and the Secretary, the Board's real value is in its long-term, advisory capacity of *ongoing* interaction with the DOE and with others involved in the process of developing a program. The Board helps to define the major issues *as they evolve*. Because it is the only independent agency with this unique responsibility, the Board's task is particularly challenging.