Appendix G
U.S. Nuclear Waste Technical Review Board Strategic Plan: Fiscal Years 2003–2008

Statement of the Chairman

The Nuclear Waste Policy Amendments Act of 1987 directed the U.S. Department of Energy (DOE) to characterize one site, at Yucca Mountain in Nevada, to determine its suitability as the location of a permanent repository for disposing of spent nuclear fuel and high-level radioactive waste. The Act also established the U.S. Nuclear Waste Technical Review Board as an independent agency within the executive branch of the United States Government. The Act requires the Board to evaluate continuously the technical and scientific validity of activities undertaken by the Secretary of Energy related to implementing the Act and to report its findings and recommendations to the Secretary and Congress at least twice yearly. Congress created the Board to perform ongoing independent and unbiased technical and scientific evaluation—crucial for public acceptance of decisions related to nuclear waste disposal.

In 2002, Congress approved the President's recommendation that the DOE proceed to develop a license application for constructing a repository at Yucca Mountain. As a result, the DOE plans to prepare and submit an application to the Nuclear Regulatory Commission (NRC) for repository construction. The DOE plans to have the application ready for submittal to the NRC in December 2004. After the application is submitted, the NRC will have 3 years, with the option for a fourth, to review the application.

This strategic plan includes the Board's goals and objectives for fiscal years 2003 through 2008. During that period, the DOE will develop a license application and will undertake important technical and scientific activities related to (a) gaining a better understanding of the potential behavior of a Yucca Mountain repository; (b) developing a repository design; (c) reducing technical uncertainties; (d) confirming estimates of repository performance; and (e) developing and implementing plans for a waste management system that incorporates waste transportation, handling, and packaging and repository operations. In accordance with its statutory mandate, the Board will continue its evaluation of the technical and scientific validity of the DOE's work in these areas. Because many crucial technical and scientific decisions will be made throughout this period, the Board's "systems view" of repository and waste management activities and its ongoing independent technical and scientific review of the DOE's efforts will continue to be critically important.

On behalf of the Board,

Michael L. Corradini
Chairman

Mission

The Board's mission, established in the Nuclear Waste Policy Amendments Act (NWPAA) of 1987 (Public Law 100-203), is to "…evaluate the technical and scientific validity of activities [for management of high-level radioactive waste] undertaken by the Secretary after the date of the enactment of the Nuclear Waste Policy Amendments Act of 1987…" By law, the Board shall cease to exist not later than one year after the date on which the Secretary begins disposal of high-level radioactive waste or spent nuclear fuel in a repository.

Vision

By performing ongoing and independent technical and scientific review of the highest quality, the Board makes a unique and essential contribution to the implementation of the Nuclear Waste Policy Act (NWPA), to the credibility of the scientific effort, to Congress's understanding of technical and scientific issues, and to the public's access to technical and scientific issues and information related to the disposal of spent nuclear fuel and high-level radioactive waste. The Board performs critical technical and scientific peer review of the DOE's work related to (a) gaining a better understanding of the potential behavior of a repository at Yucca Mountain; (b) developing a repository design for safe and efficient repository operations; (c) establishing a program for confirming estimates of repository performance; and (d) developing and implementing plans for a waste management system that incorporates waste transportation, handling, and packaging and repository operations.

Values

To achieve its goals, the Board conducts itself according to the following values:

- The Board strives to ensure that its members and staff have no conflicts of interest—real or perceived—related to the Secretary of Energy's efforts to implement the DOE's nuclear waste program.
- The Board members arrive at their conclusions on the basis of objective evaluations of the technical and scientific validity of the Secretary's activities.
- The Board's practices and procedures are open and conducted so that the Board's integrity and objectivity are above reproach.
- The Board's findings, conclusions, and recommendations are technically and scientifically sound and are based on the best available technical analysis and information.
- The Board's findings, conclusions, and recommendations are communicated clearly and in time for them to be most useful to Congress, the Secretary, and the public.
- The Board encourages public comment and discussion of DOE activities and Board findings, conclusions, and recommendations.

Goals and Strategic Objectives

National Goals

The nation's goals related to the disposal of spent nuclear fuel and high-level radioactive waste were set forth by Congress in the Nuclear Waste Policy Act of 1982 (NWPA). The goals are to develop a repository or repositories for disposing of high-level radioactive waste and spent nuclear fuel at a suitable site or sites and to establish a program of research, development, and demonstration for the disposal of such waste.

The Nuclear Waste Policy Amendments Act of 1987 (NWPAA) limited repository development activities to a single site at Yucca Mountain in Nevada. The NWPAA also established the Board and charged it with evaluating the technical and scientific validity of the Secretary of Energy's activities associated with implementing the

NWPA. The activities include characterizing the Yucca Mountain site and packaging and transporting spent nuclear fuel and high-level radioactive waste.

The Board's general goals have been established in accordance with its statutory mandate and with congressional action in 2002 authorizing the DOE to proceed with the development of an application to be submitted to the NRC for constructing a repository at Yucca Mountain. The Board's goals reflect the continuity of the Board's ongoing technical and scientific evaluation and the Board's "systems view" of the repository and of waste management activities.

General Goals of the Board

To accomplish its congressional mandate, the Board has established four general goals:

1. Evaluate the technical and scientific validity of activities undertaken by the DOE related to understanding, testing, analyzing, and modeling geologic and other natural components of a proposed Yucca Mountain repository system.

2. Evaluate the technical and scientific validity of activities undertaken by the DOE related to modeling, understanding, testing, and analyzing the engineered components of a proposed Yucca Mountain repository system.

3. Evaluate the technical and scientific validity of activities undertaken by the DOE related to understanding and modeling the interactions of natural and engineered repository system components, estimating the performance of the proposed repository system, and integrating scientific and engineering activities.

4. Evaluate the technical and scientific validity of activities undertaken by the DOE related to planning, integrating, and implementing a waste management system, including the transportation, packaging, and handling of spent nuclear fuel and high-level radioactive waste and the operation of a repository.

Strategic Objectives of the Board

To achieve its general goals, the Board has established the following long-term objectives:

1. Objectives Related to the Natural System

1.1 Evaluate the technical and scientific validity of data and analyses related to the contributions of the natural barriers to waste isolation in a Yucca Mountain repository.

1.2. Monitor DOE analyses and investigations related to hydrologic, geologic, geotechnical, seismic, volcanic, climatic, biological, and other natural features, events, and processes at the Yucca Mountain site and at related analogue sites.

1.3. Monitor DOE efforts to increase fundamental understanding of the potential behavior of the repository in a natural system.

1.4. Evaluate DOE and other studies and analyses related to repository tunnel environments.*

1.5. Review DOE integration of technical and scientific activities related to the natural system.

1.6. Review DOE efforts to confirm estimates of natural-system performance, including tests of models and assumptions and the pursuit of independent lines of evidence.

2. Objectives Related to the Engineered System

2.1. Evaluate the technical and scientific validity of DOE data and analyses related to the contribution of the engineered system to waste isolation in a Yucca Mountain repository.

2.2. Evaluate DOE and other studies and analyses related to repository tunnel environments.*

* This is a shared objective under the natural system and the engineered system.

2.3. Assess DOE efforts to increase understanding of fundamental corrosion processes in a proposed repository.

2.4. Review waste package designs, including the performance attributes and technical bases for such designs, and assess the need to revise waste package designs on the basis of the results of ongoing technical and scientific studies.

2.5. Evaluate the integration of science and engineering in the DOE program, especially the integration of new data into repository and waste package designs.

2.6. Review DOE activities related to confirming the predicted performance of the engineered system.

3. Objectives Related to Repository System Performance and Integration

3.1. Evaluate the technical and scientific validity of the DOE's technical basis for its estimates of repository system performance.

3.2. Review the technical and scientific validity of DOE models used to predict repository system performance.

3.3. Evaluate DOE efforts to increase confidence in its estimates of repository performance.

3.4. Evaluate the technical and scientific validity of DOE efforts to gain a more realistic understanding of the interaction of the natural and engineered components of a repository system.

3.5. Evaluate the integration of science and engineering with performance assessment.

3.6. Evaluate the technical bases for the DOE's repository safety case, including efforts to integrate the safety case with multiple lines of evidence and performance confirmation.

3.7. Monitor the development of DOE plans and activities for performance confirmation.

4. Objectives Related to the Waste Management System

4.1. Review DOE efforts related to the interaction of components of the waste management system from a life-cycle systems perspective, including at-reactor storage, waste acceptance, transportation, and repository design and operations.

4.2. Review the technical and scientific validity of the DOE's plans for safely handling and packaging spent nuclear fuel and high-level radioactive waste for transport to a permanent repository and for disposal in a permanent repository.

4.3. Review the technical and scientific aspects of the DOE's transportation plans.

4.4. Review the technical and scientific validity of the DOE's plans for developing a transportation infrastructure.

4.5. Evaluate design and engineering of the facility components or subsystems that involve innovative features, assumptions, and approaches.

4.6. Review the process through which the DOE provides technical and scientific information to stakeholders and includes stakeholders in the development of waste management plans.

Achieving the Goals and Objectives

The NWPAA grants significant investigatory powers to the Board. In accordance with the NWPAA, the Board may hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it considers appropriate. By law, no nominee to the Board may be an employee of the DOE, a National Laboratory, or DOE contractors performing activities related to high-level radioactive waste or spent nuclear fuel.

At the request of the Board and subject to existing law, the NWPAA directs the DOE to provide all records, files, papers, data, and information requested by the Board, including drafts of work products and documentation of work in progress. According to the legislative history, in providing this access, Congress expected that the Board would review and comment on DOE decisions, plans, and actions as they occurred, not after the fact. The Board has the power, under current law, to achieve its goals and objectives.

In conducting its ongoing technical and scientific review, the Board takes a systems view of the repository and of waste management activities. Consistent with this approach, the Board has established the following four panels with purviews corresponding to the Board's general goals:

1. *Panel on the Natural System*

   Panel Goal: Evaluate the technical and scientific validity of activities undertaken by the DOE related to understanding, testing, analyzing, and modeling geologic and other natural components of a proposed Yucca Mountain repository system.

2. *Panel on the Engineered System*

   Panel Goal: Evaluate the technical and scientific validity of activities undertaken by the DOE related to modeling, understanding, testing, and analyzing the engineered components of a proposed Yucca Mountain repository system.

3. *Panel on Repository System Performance and Integration*

   Panel Goal: Evaluate the technical and scientific validity of activities undertaken by the DOE related to understanding and modeling the interactions of natural and engineered repository system components, estimating the performance of the proposed repository system, and integrating scientific and engineering activities.

4. *Panel on the Waste Management System*

   Panel Goal: Evaluate activities undertaken by the DOE related to planning, integrating, and implementing a waste management system, including the transportation, packaging, and handling of spent nuclear fuel and high-level radioactive waste and the operation of a repository.

Much of the Board's information gathering occurs at open public meetings arranged by the Board. At each meeting, the DOE, its contractors, and other program participants present technical information according to an agenda prepared by the Board. Board members and staff question presenters during the meetings. Time is provided at the meeting for comments from members of the public and interested parties. The full Board holds three or four meetings each year, usually in Nevada. The Board's panels meet as needed to investigate specific issue areas.

The Board also gathers information through field trips to the Yucca Mountain site, visits to contractor laboratories and facilities, and meetings with individuals working on the project. Board members and staff attend national and international symposia and conferences related to the science and technology of nuclear waste disposal. From time to time, Board members and staff also visit programs in other countries to review best practices, perform benchmarking, and assess potential analogues.

Although the Board's information-gathering activities are carried out primarily to further the Board's review, they often have the collateral benefit of promoting communication and integration of technical information within the DOE program and facilitating the dissemination of information among interested parties outside the program. Analyses are performed primarily by Board members and the Board's staff. When necessary, the Board hires special expert consultants to perform in-depth reviews of specific technical and scientific topics.

Crosscutting Functions

Several entities and agencies are involved in developing a system for safely packaging, transporting, and disposing of spent nuclear fuel and high-level radioactive waste in a geologic repository at a suitable site. As discussed in the following paragraphs, the Board's ongoing peer review and systems approach is unique among those involved in managing spent nuclear fuel and high-level radioactive waste.

- Congress and the Administration, including the Secretary of Energy, make decisions on national policy and goals and how they will be implemented. The Board's role in this process is to help ensure that policy-makers receive unbiased and credible technical and scientific analyses and information.

- *State and local governments* comment on and oversee DOE activities. The Board's oversight activities are different in that they are (1) unconstrained by any stake in the outcome of the endeavor besides the credibility of the scientific and technical activities; (2) confined to scientific and technical evaluations; and (3) conducted by individuals nominated by the National Academy of Sciences and expressly chosen by the President for their expertise in the various disciplines represented in the DOE program.

- *Other federal agencies* (in addition to the Board) with roles in the waste management program include the DOE, the NRC, the Environmental Protection Agency (EPA), the Department of Transportation (DOT), and the United States Geological Survey (USGS). The DOE and its contractors are responsible for developing and implementing waste management plans and for conducting analytical and research activities related to licensing, constructing, and operating a repository. The NRC is the regulatory body with responsibility for licensing the construction and operation of a proposed repository and for certifying transportation casks. The EPA is responsible for issuing radiation safety standards that the NRC uses to formulate its repository regulations. The DOT is responsible for regulating the transporters of the waste. The USGS participates in site-characterization activities at the Yucca Mountain site. The Board's role and its systems approach are unique among these federal agencies: perform ongoing, independent review and expert oversight of the technical and scientific validity of the Secretary of Energy's activities relating to civilian radioactive waste management and communicate its findings and recommendations to Congress, the Secretary, and the public. The Board's technical and scientific evaluations enhance the work of other agencies involved in achieving the national goal.

Key External Factors

Some factors that are beyond the Board's control could affect its ability to achieve its goals and objectives. Among them are the following:

- *The Board has no implementing authority.* The Board is by statute a technical and scientific review body that can only make recommendations to the DOE. Congress expected that the DOE would accept the Board's recommendations or indicate why the recommendations could not or should not be implemented. However, the DOE is not legally obligated to accept any of the Board's recommendations.

To increase its effectiveness, the Board has developed procedures for increasing the relevance of its findings and recommendations for Congress, the Secretary, DOE program managers, and the public. The Board's recommendations and the DOE's responses are included in Board reports to Congress and the Secretary. If the DOE does not accept a Board recommendation, the Board's recourse is to advise Congress or reiterate its recommendation to the DOE, or both.

- *Legislation and budget considerations could affect nuclear waste policy.* Congress has considered nuclear waste legislation several times in the last few years. The effects of such legislation, if enacted, on the program or the Board's activities are not currently known. In addition, the level of funding provided to the Board affects

its ability to comprehensively review DOE activities. Funding levels for the program also may influence activities undertaken in a given year or over time.

The Board will evaluate the status of these external factors, identify any new factors, and, if warranted, modify the "external factors" section of the strategic plan as part of the annual program evaluation described below.

Evaluating Board Performance

The Board believes that measuring its effectiveness by directly correlating improvements in the DOE program with Board actions and recommendations would be ideal. However, the Board has no implementing authority. Consequently, a judgment about whether a specific recommendation had a positive outcome for the DOE program is, in most cases, (1) subjective and (2) an imprecise indicator of Board performance because implementation of Board recommendations by the DOE is outside the Board's direct control. Therefore, to measure its performance in a given year, the Board has developed performance measures. For each annual performance goal, the Board considers the following.

1. Were the reviews, evaluations, and other activities undertaken under the auspices of the goal completed?

2. Were the results of the reviews, evaluations, and other activities communicated in a timely, understandable, and appropriate way to Congress and the Secretary of Energy?

If both measures are met, the Board's performance in meeting the annual goal will be judged effective. If only one measure is met, the performance of the Board in achieving that goal will be judged minimally effective. Failing to meet both performance measures without sufficient and compelling explanation will result in a judgment that the Board has been ineffective in achieving that performance goal.

The Board will use its evaluation of its own performance from the current year, together with its assessment of current or potential key issues of concern related to the DOE program, to establish its annual performance objectives and develop its budget request for subsequent years. The results of the Board's performance evaluation are included in its annual summary report.

Congressional and Stakeholder Consultations

In developing its original strategic plan, the Board consulted with the Office of Management and Budget, the DOE, congressional staff, and members of the public and provided a copy of the plan to the NRC and to representatives of state and local governments. The Board solicited public comment and presented its strategic plan at a session held expressly for this purpose during a public Board meeting in Amargosa Valley, Nevada, on January 20, 1998. The Board is soliciting pubic comment on its revised strategic plan and performance plan for fiscal year 2004. Copies of the Board's strategic plan and annual performance plans and forms for providing comment are available on the Board's Web site: www.nwtrb.gov.

Appendix H

U.S. Nuclear Waste Technical Review Board Performance Plan and Evaluation: Fiscal Year 2002

The NWTRB's General Goals and Strategic Objectives

The national goal for radioactive waste management established by Congress in the Nuclear Waste Policy Act of 1982 (NWPA) and the Nuclear Waste Policy Amendments Act of 1987 is safe disposal of civilian spent nuclear fuel and high-level radioactive waste in a permanent geologic repository at a suitable site or sites. In the acts, Congress directed the U.S. Department of Energy (DOE) to characterize a site at Yucca Mountain, Nevada, to determine its suitability as the potential location of a permanent repository for spent nuclear fuel and high-level radioactive waste. Congress charged the U.S. Nuclear Waste Technical Review Board with reviewing the technical and scientific validity of the Secretary of Energy's activities associated with implementing the NWPA, including characterizing the Yucca Mountain site and packaging and transporting the waste. The Board's general goals have been established in accordance with its congressional mandate.*

General Goals

To accomplish its congressional mandate, the Board has established four general goals.

1. Ensure that technical and scientific activities undertaken by the DOE related to characterizing and analyzing the natural components of a potential Yucca Mountain repository and predicting the performance of a potential repository establish a sound technical basis for a decision on whether to recommend the site for repository development.

2. Ensure that technical and scientific activities undertaken by the DOE related to evaluating and designing the repository and waste packages are well integrated and establish a sound technical basis for designing the repository system, including the engineered barrier system (EBS).

3. Ensure that technical and scientific activities undertaken by the DOE related to packaging, handling, and transporting spent nuclear fuel and high-level radioactive waste to a potential repository are well integrated and establish a sound technical basis for designing and operating a waste management system.

4. Ensure that technical and scientific performance-confirmation activities undertaken by the DOE establish a sound technical basis for operating a repository, reducing uncertainties related to repository performance, and revising repository and waste package designs. (Will apply only if the site recommendation is approved.)

* In February 2002, the Secretary of Energy and the President recommended the Yucca Mountain site for repository development. If the State of Nevada disapproves the recommendation, Congress will debate a "Resolution of Approval" later this year. The Board's goals and objectives will be revised to reflect the outcome of these deliberations.

Strategic Objectives

To achieve its general goals, the Board has established the following long-term objectives.

1. Objectives Related to the Natural Components of the Repository System and Predicting Repository Performance

1.1. Evaluate the technical and scientific validity of DOE studies, testing, and analyses supporting a decision on whether to recommend the Yucca Mountain site.

1.2. Evaluate the analyses and investigations pertaining to hydrologic and other natural processes at the Yucca Mountain site and at related analogue sites that establish the foundation for predicting repository performance.

1.3. Review the technical and scientific validity of models used to predict repository performance.

1.4. Evaluate the DOE's progress in developing a safety strategy for the Yucca Mountain site.

1.5. Monitor progress in completing development of standards and regulatory guidelines for a potential Yucca Mountain repository.

1.6. Review the *Record of Decision* and maintain awareness of legal challenges to the final environmental impact statement for a potential Yucca Mountain repository.

2. Objectives Related to the Engineered Components of the Repository System

2.1. Evaluate repository and waste package designs, including the technical bases for the designs.

2.2. Review the progress or results of materials testing being conducted to address uncertainties about waste package performance.

2.3. Assess the integration of science and engineering in the DOE program, paying particular attention to the effects of site-characterization studies (e.g., modeling, testing, and analyses of thermal and mechanical effects) on repository and waste package designs.

3. Objectives Related to the Waste Management System

3.1. Evaluate the accuracy and reasonableness of analyses, methods, and major assumptions used by the DOE in estimating health and safety risks associated with transporting spent nuclear fuel and high-level radioactive waste.

3.2. Review the adequacy of DOE plans for developing the transportation infrastructure and determine the effort needed to develop a large-scale transportation capability.

3.3. Review the adequacy of the DOE's plans for safely handling and packaging spent nuclear fuel and high-level radioactive waste for transport to a permanent repository.

3.4. Evaluate the effectiveness of the DOE's efforts to integrate the various components of the waste management system (packaging, handling, transport, storage, and disposal of the waste).

3.5. Review the DOE's plans for addressing public safety concerns and for enhancing safety capabilities along transportation corridors. This includes activities related to development of plans (e.g., route selection), coordination, accident prevention (e.g., improved inspections and enforcement), and emergency response.

4. Objectives Related to Confirmatory Testing (Will apply only if the site recommendation is approved.)

4.1. Monitor performance-confirmation activities, including performance-confirmation planning, undertaken by the DOE that are

designed to reduce uncertainties related to repository performance.

4.2. Monitor performance-confirmation activities undertaken by the DOE, and evaluate the need to revise repository or waste package designs on the basis of the results of such activities.

Performance Goals for FY 2002

The Board's performance goals for fiscal year (FY) 2002 have been developed to further the achievement of the Board's general goals and strategic objectives. Because some of the general goals and strategic objectives relate to work and activities that will be undertaken in the future, they may not have corresponding annual performance goals in any given year. For example, the following performance goals for FY 2002 relate primarily to DOE activities supporting a DOE decision on whether to recommend the Yucca Mountain site to the President, the design of a potential repository and waste package, and transportation planning.

1. Performance Goals Related to Site Suitability and Predicting Repository Performance and Strategy for Achieving Performance Goals

PERFORMANCE GOALS

1.1.1. Review for technical validity the technical and scientific components of a DOE site recommendation report (if applicable).

1.1.2. Monitor the DOE's efforts to quantify uncertainties related to estimates of repository performance.

1.2.1. Monitor the results of flow-and-transport studies being conducted to obtain information on the potential performance of the saturated zone as a natural barrier in the repository system.

1.2.2. Evaluate geologic, hydrologic, and geochemical information obtained from the enhanced characterization of the repository block at Yucca Mountain.

1.3.1. Determine the strengths and weaknesses of the total system performance assessment (TSPA).

1.3.2. On the basis of an evaluation of the natural processes at work at the Yucca Mountain site, recommend additional work needed to address uncertainties, paying particular attention to estimates of the rate and distribution of water seepage into the proposed repository under proposed repository design conditions.

1.3.3. Evaluate the DOE's quantification of uncertainties and conservatisms used in TSPA.

1.3.4. Recommend additional measures for strength ening the DOE's repository safety case.

1.3.5. Evaluate data from the drift-scale heater test.

1.4.1. Review plans and work carried out on natural and engineered analogs.

STRATEGY FOR ACHIEVING GOALS

The strategy for achieving performance goals for FY 2002 is similar to that used and proven successful in previous years. The Board will accomplish its goals by doing the following.

- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, TSPA for site recommendation, and the site recommendation.
- Meeting with contractor's principal investigators on technical issues, including those related to climate change, flow and transport in the unsaturated and saturated zones, seepage, and the biosphere.
- Holding public meetings with DOE and contractor personnel at least three times a year involving the full Board and holding several meetings with individual Board panels.

- Visiting and observing ongoing laboratory investigations, including the facilities at Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, Sandia National Laboratories, and the engineered-barrier test facility. Observing field investigations.

- Meeting with other entities carrying out research on, or providing input to, scientific and technical issues related to waste disposal, including the Nuclear Regulatory Commission (NRC) and its contractors, the Southwest Research Institute, The Nye County Early Warning Drilling Program, the Environmental Protection Agency, and the State of Nevada Nuclear Waste Projects Office.

2. Performance Goals Related to the Engineered Repository System and Strategy for Achieving Performance Goals

PERFORMANCE GOALS

2.1.1. Monitor the DOE's development of analytical tools for assessing the differences between different repository designs.

2.1.2. Evaluate the accuracy and completeness of the technical bases for repository and waste package designs.

2.1.3. Evaluate the extent to which the DOE is using the technical bases for modifying repository and waste package designs.

2.1.4. Monitor and evaluate the DOE's progress in developing a technical basis for modified or novel design features.

2.2.1. Evaluate data from studies of corrosion and the waste package environment on the predicted performance of materials being proposed for the EBS.

2.3.1. Assess the integration of scientific studies with engineering designs for the repository and the waste package. In particular, monitor the results of ongoing thermal tests and evaluate DOE plans for using the test results to support models of the thermally disturbed region near the repository and for deciding on spacing between emplacement drifts, degree of preclosure ventilation, and closure date of the potential repository.

2.3.2. Evaluate the DOE's efforts in identifying natural and engineered analogs.

STRATEGY FOR ACHIEVING GOALS

The Board will accomplish its goals by doing the following.

- Evaluating the technical bases for the EBS design by reviewing technical documents and databases (e.g., the controlled design assumption document and the technical database), paying particular attention to the technical bases for making and inspecting final closure welds of the waste package and methods for making sections of the drip shields. Meetings will be held with project personnel as necessary to obtain clarification and confirmation.

- Evaluating the technical bases for repository design by reviewing DOE documents and databases, paying particular attention to design features developed to promote drainage, control ventilation, and protect workers in the exhaust end of the ventilation system.

- Evaluating repository and waste package designs to identify which parts (if any) of the designs do not have a technical basis.

- Evaluating the technical basis for the DOE's work on alternative design features.

- After identifying the corrosion mechanisms most important to performance of the overall repository system, reviewing the common database (literature, laboratory, and field data) and judging the adequacy of the database for a decision on site recommendation.

3. Performance Goals Related to the Waste Management System and Strategy for Achieving Performance Goals

PERFORMANCE GOALS

3.1.1. Monitor efforts by the NRC to update estimates of risk associated with transportation of spent nuclear fuel and high-level radioactive waste.

3.1.2. Evaluate the operation of the entire repository facility, including the surface and subsurface components.

3.2.1. Evaluate the effects of "off-normal" events at the surface facility and how the events could affect the ability of the facility to receive waste shipments.

3.2.2. Evaluate the effects of reduced receiving capacity at the repository surface facility on the nationwide transportation system.

3.3.1. Examine the ability of storage casks and containers, including multipurpose canisters, to serve as disposal casks and containers in a repository.

3.3.2. Evaluate effects of human errors on risks associated with packaging and transporting spent nuclear fuel.

3.4.1. Evaluate logistics capabilities of the transportation system.

3.4.2. Monitor progress in implementing new technologies for improving transportation safety for spent fuel (e.g., electronic braking, wheel-bearing monitoring).

3.4.3. Review criteria for waste acceptance for storage to ensure that accepted material has been suitably characterized for subsequent disposal.

3.4.4. Evaluate the DOE's plans for enhancing safety capabilities along transportation corridors, and review the DOE's planning and coordination activities (e.g., route selection), accident prevention activities (e.g., improved inspections and enforcement), and emergency response activities.

STRATEGY FOR ACHIEVING GOALS

The Board will accomplish its goals by doing the following.

- Meeting with the American Association of Railroads, individual railroad companies, and railroad infrastructure manufacturers to determine the current state of rail infrastructure, and noting the effects of a sustained transportation campaign on the railroad industry.

- Attending meetings of the DOE-sponsored Transportation External Working Group to determine how well the DOE is working to implement Section 180(c) of the Nuclear Waste Policy Act.

- Holding meetings of the Board's Panel on the Waste Management System, as appropriate.

4. Performance Goals Related to Long-Term Activities and Strategy for Achieving Performance Goals (Will apply only if the site is found suitable and a site recommendation is ratified.)

PERFORMANCE GOALS

4.1.1. Monitor the DOE's proposed plans for performance confirmation to help ensure that uncertainties identified as part of the site recommendation process are addressed.

4.1.2. Monitor design modification activities undertaken by the DOE.

STRATEGY FOR ACHIEVING GOALS

The Board will accomplish its goals by doing the following.

- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, TSPA for site recommendation, and the site recommendation.

- Reviewing performance-confirmation plans and meeting with DOE personnel to discuss aspects of the plans.

Evaluation of the Board's Performance During 2002

The Board believes that measuring its effectiveness by directly correlating improvements in the DOE program with Board actions and recommendations would be ideal. However, the Board has no implementing authority, so it cannot compel the DOE to comply with its recommendations. Consequently, a judgment about whether a specific recommendation had a positive outcome for the DOE program is, in most cases, (1) subjective and (2) an imprecise indicator of Board performance because implementation of Board recommendations by the DOE is outside the Board's direct control. Therefore, to measure its performance in a given year, the Board has developed performance measures. For each annual performance goal, the Board considers the following.

1. Were the reviews, evaluations, and other activities undertaken under the auspices of the goal completed?

2. Were the results of the reviews, evaluations, and other activities communicated in a timely, understandable, and appropriate way to Congress and the Secretary of Energy?

If both measures are met, the Board's performance in meeting the annual goal will be judged effective. If only one measure is met, the performance of the Board in achieving that goal will be judged minimally effective. Failing to meet both performance measures without sufficient and compelling explanation will result in a judgment that the Board has been ineffective in achieving that performance goal.

The Board will use its evaluation of its own performance from the current year, together with its assessment of current or potential key issues of concern related to the DOE program, to establish its annual performance objectives and develop its budget request for subsequent years. The results of the Board's performance evaluation are included in the Board's annual summary report to Congress and the Secretary.

On the basis of the following evaluation and consistent with the performance measures described in the previous section, the Board's performance for 2002 was found to be effective. However, the Secretary's activities related to the waste management program were very limited in 2002. Therefore, most of the Board's 2002 goals in that area have been deferred until 2003.

1. Performance Goals and Evaluation Related to Site Suitability and Predicting Repository Performance

PERFORMANCE GOALS

1.1.1. Review for technical validity the technical and scientific components of a DOE site recommendation report.

- Evaluation of 1.1.1: The Board submitted a letter to Congress and the Secretary on January 24, 2002, giving the Board's evaluation of the DOE's technical and scientific work. The Board found the DOE's technical basis for its performance estimates to be weak to moderate. On the same date, the Board sent answers to questions raised by Senators Harry Reid and John Ensign and by Representatives Joe Barton and John Shimkus on the DOE's technical and scientific activities related to site recommendation. On April 18, 2002, Chairman of the Board Jared Cohon testified before the House Subcommittee on Energy and Air Quality, Committee on Energy and Commerce, on issues related to the DOE's technical basis for its performance estimates. On May 23, 2002, Chairman Cohon testified before the Senate Committee on Energy and Natural Resources on the same subject. The Board received follow-up questions from the House Subcommittee and the Senate Committee. The Board sent its responses to the follow-up questions to Representative Joe Barton on May 22, 2002, and to the Committee on Natural Resources on May 31, 2002.

1.1.2. Monitor the DOE's efforts to quantify uncertainties related to estimates of repository performance.

- Evaluation of 1.1.2: The Board reiterated its recommendation for the DOE to quantify uncertainties in the Board's January 24, 2002, letter report to Congress and the Secretary and in a June 20, 2002, letter to the director of the DOE's Office of Civilian Radioactive Waste Management (OCRWM), Margaret Chu.

1.2.1. Monitor the results of flow-and-transport studies being conducted to obtain information on the potential performance of the saturated zone as a natural barrier in the repository system.

- Evaluation of 1.2.1: The Board received an update on the DOE's flow-and-transport models on the site-scale saturated zone model at the Board's January 2002 meeting. The Board also commented on the DOE's efforts to determine whether the natural system makes a greater contribution to isolating and containing waste in its November 22, 2002, letter to OCRWM director Margaret Chu.

1.2.2. Evaluate geologic, hydrologic, and geochemical information obtained from the enhanced characterization of the repository block (ECRB) at Yucca Mountain.

- Evaluation of 1.2.2: The Board was updated on the status of ECRB studies at its September 2002 meeting. In the Board's November 22, 2002, letter to Margaret Chu, the Board commented on the need to find an explanation for moisture discovered in the closed-off section of the tunnel.

1.3.1. Determine the strengths and weaknesses of TSPA.

- Evaluation of 1.3.1: The Board discussed TSPA in its January 24, 2002, letter report to the Secretary of Energy and Congress. The Board held a session on TSPA at its January 2002 meeting and a session on barrier analysis at its September 2002 meeting. The Board commented on TSPA in its November 22, 2002, letter to Margaret Chu.

1.3.2. On the basis of an evaluation of the natural processes at work at the Yucca Mountain site, recommend additional work needed to address uncertainties, paying particular attention to estimates of the rate and distribution of water seepage into the proposed repository under proposed repository design conditions.

- Evaluation of 1.3.2: In its January 24, 2002, letter report, the Board commented on ways to increase confidence and decrease uncertainties, including increasing fundamental understanding and, potentially, lowering repository temperatures. In its November 22, 2002, letter to Margaret Chu, the Board encouraged the DOE to reconcile contradictory data about the presence of chlorine-36 at the repository horizon and urged the DOE to complete experiments, such as the drift-scale thermal test, before drawing conclusions about whether uncertainties have been estimated properly.

1.3.3. Evaluate the DOE's quantification of uncertainties and conservatisms used in TSPA.

- Evaluation of 1.3.3: The Board evaluated the DOE's quantification of uncertainties in the Board's January 24, 2002, letter report to Congress and the Secretary. The Board was updated at its January meeting on the DOE's uncertainty analysis and strategy report. The Board commented on other aspects of the DOE's analyses of uncertainties in its November 22, 2002, letter to Margaret Chu.

1.3.4. Recommend additional measures for strengthening the DOE's repository safety case.

- Evaluation of 1.3.4: The Board commented on the DOE's safety case in its January 24, 2002, letter to Congress and the Secretary. The Board held a session devoted to the DOE's safety case at its May 2002 meeting. The Board again commented to the DOE on the need for a defensible safety case that includes multiple lines of evidence supporting TSPA projections in a letter to Margaret Chu dated June 20, 2002.

1.3.5. Evaluate data from the drift-scale heater test.

- Evaluation of 1.3.5: The Board made the recommendation that the DOE complete and analyze the data from the drift-scale heater test in the Board's letter to Margaret Chu dated November 22, 2002.

1.4.1. Review plans and work carried out on natural and engineered analogs.

- Evaluation of 1.4.1: The Board reiterated the importance of finding natural analogs in its November 24, 2002, letter to Congress and the Secretary and in letters to Margaret Chu dated June 20, 2002, and November 22, 2002.

2. Performance Goals and Evaluation Related to the Engineered Repository System

PERFORMANCE GOALS

2.1.1. Monitor the DOE's development of analytical tools for assessing the differences between different repository designs.

- Evaluation of 2.1.1: The Board discussed issues related to repository design at its May meeting and received an update on repository design at its November meeting. The Board commented on the DOE's analysis of the differences in performance associated with different repository designs in its November 22, 2002, letter to Margaret Chu.

2.1.2. Evaluate the accuracy and completeness of the technical bases for repository and waste package designs.

- Evaluation of 2.1.2: The Board discussed issues related to repository design at its May meeting and received an update on repository design at its November meeting. The Board commented on the DOE's technical analysis of repository designs in its November 22, 2002, letter to Margaret Chu.

2.1.3. Evaluate the extent to which the DOE is using the technical bases for modifying repository and waste package designs.

- Evaluation of 2.1.3: The Board discussed issues related to repository design at its May meeting and received an update on repository design at its November meeting. The Board commented on the DOE's technical analysis of repository designs in its November 22, 2002, letter to Margaret Chu.

2.1.4. Monitor and evaluate the DOE's progress in developing a technical basis for modified or novel design features.

- Evaluation of 2.1.4: The Board discussed issues related to repository design at its May 2002 meeting and received an update on repository design at its November 2002 meeting.

2.2.1. Evaluate data from studies of corrosion and the waste package environment on the predicted performance of materials being proposed for the EBS.

- Evaluation of 2.2.1: The Board was updated on the DOE's corrosion studies at its January 2002 and September 2002 meetings. The Board commented specifically on tunnel environments and their influence on the performance of the waste package in its letter to Margaret Chu dated June 20, 2002.

2.3.1. Assess the integration of scientific studies with engineering designs for the repository

and the waste package. In particular, monitor the results of ongoing thermal tests and evaluate DOE plans for using the test results to support models of the thermally disturbed region near the repository and for deciding on spacing between emplacement drifts, degree of preclosure ventilation, and closure date of the potential repository.

- Evaluation of 2.3.1: The Board was updated on the DOE's corrosion studies at its January 2002 and September 2002 meetings. The Board commented on waste package spacing and ventilation concepts in its letter to Margaret Chu dated June 20, 2002.

2.3.2. Evaluate the DOE's efforts in identifying natural and engineered analogs.

- Evaluation of 2.3.2: The Board commented on the importance of identifying natural and engineered analogs in its January 24, 2002, letter to the Secretary and Congress and in letters to Margaret Chu dated June 20, 2002, and November 22, 2002.

3. Performance Goals and Evaluation Related to the Waste Management System

Performance Goals

3.1.1. Monitor efforts by the NRC to update estimates of risk associated with transportation of spent nuclear fuel and high-level radioactive waste.

- Evaluation of 3.1.1: The Board monitored the progress of the NRC's ongoing package performance study.

3.1.2. Evaluate the operation of the entire repository facility, including the surface and subsurface components.

- Evaluation of 3.1.2: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.2.1. Evaluate the effects of "off-normal" events at the surface facility and how the events could affect the ability of the facility to receive waste shipments.

- Evaluation of 3.2.1: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.2.2. Evaluate the effects of reduced receiving capacity at the repository surface facility on the nationwide transportation system.

- Evaluation of 3.2.2: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.3.1. Examine the ability of storage casks and containers, including multipurpose canisters, to serve as disposal casks and containers in a repository.

- Evaluation of 3.3.1: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.3.2. Evaluate the effects of human errors on risks associated with packaging and transporting spent nuclear fuel.

- Evaluation of 3.3.2: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.4.1. Evaluate logistics capabilities of the transportation system.

- Evaluation of 3.4.1: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.4.2. Monitor progress in implementing new technologies for improving transportation safety for spent fuel (e.g., electronic braking, wheel-bearing monitoring).

- Evaluation of 3.4.2: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.4.3. Review criteria for waste acceptance for storage to ensure that accepted material has been suitably characterized for subsequent disposal.

- Evaluation of 3.4.3: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

3.4.4. Evaluate the DOE's plans for enhancing safety capabilities along transportation corridors, and review the DOE's planning and coordination activities (e.g., route selection), accident prevention activities (e.g., improved inspections and enforcement), and emergency response activities.

- Evaluation of 3.4.4: Because of limited DOE activity in this area, the Board's performance goal was deferred until 2003.

4. Performance Goals and Evaluation Related to Long-Term Activities

PERFORMANCE GOALS

4.1.1. Monitor the DOE's proposed plans for performance confirmation to help ensure that uncertainties identified as part of the site recommendation process are addressed.

- Evaluation of 4.1.1: The Board referred to the need to develop performance confirmation activities as one of the confidence builders in its January 24, 2003, letter to Congress and the Secretary. The Board held a session on performance confirmation at its May 2002 meeting. In its June 20, 2002, letter to Margaret Chu, the Board questioned the DOE's goal for performance confirmation and its methods for validating its predictions. The Board said that performance confirmation should focus on evaluating the validity of estimates of long-term repository performance. The Board expressed similar sentiments in its November 22, 2002, letter to Margaret Chu.

Board Operations

The Board is composed of 11 members appointed by the President who serve on a part-time basis; are eminent in a relevant field of science or engineering, including environmental sciences; and are appointed solely on the basis of distinguished service. Because of the comprehensive nature of the program and the part-time availability of the members, Congress authorized the Board to maintain a small professional staff of 10 full-time employees to support the Board's comprehensive review of the DOE program. In addition to the members and professional staff, the Board maintains a small administrative staff that supports its activities.

The full Board meets three or four times each year. The Board has organized itself into panels that meet as needed. The Board also gathers information from field trips to the Yucca Mountain site, visits to contractor laboratories and facilities, and informal meetings with individuals working on the project. On the basis of the information gathered throughout the year, the Board issues its findings in letters and reports.

Appendix I

U.S. Nuclear Waste Technical Review Board Performance Plan: Fiscal Year 2003

The NWTRB's General Goals and Strategic Objectives

The national goal for radioactive waste management established by Congress in the Nuclear Waste Policy Act of 1982 (NWPA) and the Nuclear Waste Policy Amendments Act of 1987 is safe disposal of civilian spent nuclear fuel and high-level radioactive waste in a permanent geologic repository at a suitable site or sites. In the acts, Congress directed the U.S. Department of Energy (DOE) to characterize a site at Yucca Mountain, Nevada, to determine its suitability as the potential location of a permanent repository for spent nuclear fuel and high-level radioactive waste. Congress charged the U.S. Nuclear Waste Technical Review Board with reviewing the technical and scientific validity of the Secretary of Energy's activities associated with implementing the NWPA, including characterizing the Yucca Mountain site and packaging and transporting the waste. The Board's general goals have been established in accordance with its congressional mandate.*

General Goals

To accomplish its congressional mandate, the Board has established four general goals.

1. Ensure that technical and scientific activities undertaken by the DOE related to characterizing and analyzing the natural components of a potential Yucca Mountain repository and predicting the performance of a potential repository establish a sound technical basis for a decision on whether to recommend the site for repository development.

2. Ensure that technical and scientific activities undertaken by the DOE related to evaluating and designing the repository and waste packages are well integrated and establish a sound technical basis for designing the repository system, including the engineered barrier system (EBS).

3. Ensure that technical and scientific activities undertaken by the DOE related to packaging, handling, and transporting spent nuclear fuel and high-level radioactive waste to a potential repository are well integrated and establish a sound technical basis for designing and operating a waste management system.

4. Ensure that technical and scientific performance-confirmation activities undertaken by the DOE establish a sound technical basis for operating a repository, reducing uncertainties related to repository performance, and revising repository and waste package designs. (Will apply only if the site recommendation is approved.)

* In February 2002, the Secretary of Energy and the President recommended the Yucca Mountain site for repository development. If the State of Nevada disapproves the recommendation, Congress will debate a "Resolution of Approval" later this year. The Board's goals and objectives will be revised to reflect the outcome of these deliberations.

Strategic Objectives

To achieve its general goals, the Board has established the following long-term objectives.

1. Objectives Related to the Natural Components of the Repository System and Predicting Repository Performance

1.1. Evaluate the technical and scientific validity of DOE studies, testing, and analyses supporting a decision on whether to recommend the Yucca Mountain site.

1.2. Evaluate the analyses and investigations pertaining to hydrologic and other natural processes at the Yucca Mountain site and at related analogue sites that establish the foundation for predicting repository performance.

1.3. Review the technical and scientific validity of models used to predict repository performance.

1.4. Evaluate the DOE's progress in developing a safety strategy for the Yucca Mountain site.

1.5. Monitor progress in completing development of standards and regulatory guidelines for a potential Yucca Mountain repository.

1.6. Review the *Record of Decision* and maintain awareness of legal challenges to the final environmental impact statement for a potential Yucca Mountain repository.

2. Objectives Related to the Engineered Components of the Repository System

2.1. Evaluate repository and waste package designs, including the technical bases for the designs.

2.2. Review the progress or results of materials testing being conducted to address uncertainties about waste package performance.

2.3. Assess the integration of science and engineering in the DOE program, paying particular attention to the effects of site-characterization studies (e.g. modeling, testing, and analyses of thermal and mechanical effects) on repository and waste package designs.

3. Objectives Related to the Waste Management System

3.1. Evaluate the accuracy and reasonableness of analyses, methods, and major assumptions used by the DOE in estimating health and safety risks associated with transporting spent nuclear fuel and high-level radioactive waste.

3.2. Review the adequacy of DOE plans for developing the transportation infrastructure and determine the effort needed to develop a large-scale transportation capability.

3.3. Review the adequacy of the DOE's plans for safely handling and packaging spent nuclear fuel and high-level radioactive waste for transport to a permanent repository.

3.4. Evaluate the effectiveness of the DOE's efforts to integrate the various components of the waste management system (packaging, handling, transport, storage, and disposal of the waste).

3.5. Review the DOE's plans for addressing public safety concerns and for enhancing safety capabilities along transportation corridors. This includes activities related to development of plans (e.g., route selection), coordination, accident prevention (e.g., improved inspections and enforcement), and emergency response.

4. Objectives Related to Confirmatory Testing (Will apply only if the site recommendation is approved.)

4.1. Monitor performance-confirmation activities, including performance-confirmation planning, undertaken by the DOE that are

designed to reduce uncertainties related to repository performance.

4.2. Monitor performance-confirmation activities undertaken by the DOE, and evaluate the need to revise repository or waste package designs on the basis of the results of such activities.

Performance Goals for FY 2003

The Board's performance goals for fiscal year (FY) 2003 have been developed to further the achievement of the Board's general goals and strategic objectives. Because some of the general goals and strategic objectives relate to work and activities that will be undertaken in the future, they may not have corresponding annual performance goals in any given year.

1. Performance Goals Related to Site Suitability and Predicting Repository Performance and Strategy for Achieving Performance Goals

Performance Goals

1.1.1 Review for technical validity the technical and scientific components of the DOE's ongoing site investigations (if applicable).

1.1.2. Monitor the DOE's efforts to quantify uncertainties related to estimates of repository performance.

1.2.1. Monitor the results of flow-and-transport studies being conducted to obtain information on the potential performance of the saturated zone as a natural barrier in the repository system.

1.2.2. Evaluate geologic, hydrologic, and geochemical information obtained from the enhanced characterization of the repository block at Yucca Mountain.

1.3.1. Determine the strengths and weaknesses of the total system performance assessment (TSPA).

1.3.2. On the basis of an evaluation of the natural processes at work at the Yucca Mountain site, recommend additional work needed to address uncertainties, paying particular attention to estimates of the rate and distribution of water seepage into the proposed repository under proposed repository design conditions.

1.3.3. Evaluate the DOE's quantification of uncertainties and conservatisms used in TSPA.

1.3.4. Recommend additional measures for strengthening the DOE's repository safety case.

1.3.5. Evaluate data from the drift-scale heater test.

1.4.1. Review plans and work carried out on natural and engineered analogs to the repository system.

Strategy for Achieving Goals

The strategy for achieving performance goals for FY 2003 is similar to that used and proven successful in previous years. The Board will accomplish its goals by doing the following.

- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, and TSPA.

- Meeting with contractor's principal investigators on technical issues, including those related to climate change, flow and transport in the unsaturated and saturated zones, seepage, and the biosphere.

- Holding public meetings with DOE and contractor personnel at least three times a year involving the full Board and holding several meetings with individual Board panels.

- Visiting and observing ongoing laboratory investigations, including the facilities at Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, Sandia National Laboratories, and the engineered-barrier test facility. Observing field investigations.

- Meeting with other entities carrying out research on, or providing input to, scientific and technical issues related to waste disposal, including the Nuclear Regulatory Commission (NRC) and its contractors, the Southwest Research Institute, The Nye County Early Warning Drilling Program, the Environmental Protection Agency, and the State of Nevada Nuclear Waste Projects Office.

2. Performance Goals Related to the Engineered Repository System and Strategy for Achieving Performance Goals

PERFORMANCE GOALS

2.1.1. Monitor the DOE's development of analytical tools for assessing the differences between different repository designs.

2.1.2. Evaluate the accuracy and completeness of the technical bases for repository and waste package designs.

2.1.3. Evaluate the extent to which the DOE is using the technical bases for modifying repository and waste package designs.

2.1.4. Monitor and evaluate the DOE's progress in developing a technical basis for modified or novel design features.

2.2.1. Evaluate data from studies of corrosion and the waste package environment on the predicted performance of materials being proposed for the engineered barrier system.

2.3.1. Assess the integration of scientific studies with engineering designs for the repository and the waste package. In particular, monitor the results of ongoing thermal tests and evaluate DOE plans for using the test results to support models of the thermally disturbed region near the repository and for deciding on spacing between emplacement drifts, degree of preclosure ventilation, and closure date of the potential repository.

2.3.2. Evaluate the DOE's efforts in identifying natural and engineered analogs (see also 1.4.1.).

STRATEGY FOR ACHIEVING GOALS

The Board will accomplish its goals by doing the following.

- Evaluating the technical bases for the EBS design by reviewing technical documents and databases (e.g., the controlled design assumption document and the technical database), paying particular attention to the technical bases for making and inspecting final closure welds of the waste package and methods for making sections of the drip shields. Meetings will be held with project personnel as necessary to obtain clarification and confirmation.

- Evaluating the technical bases for repository design by reviewing DOE documents and databases, paying particular attention to design features developed to promote drainage, control ventilation, and protect workers in the exhaust end of the ventilation system.

- Evaluating repository and waste package designs to identify which parts (if any) of the designs do not have a technical basis.

- Evaluating the technical basis for the DOE's work on alternative design features.

- After identifying the corrosion mechanisms most important to performance of the overall repository system, reviewing the common database (literature, laboratory, and field data) and judging the adequacy of the database for a decision on repository development.

3. Performance Goals Related to the Waste Management System and Strategy for Achieving Performance Goals

PERFORMANCE GOALS

3.1.1. Monitor efforts by the NRC to update estimates of risk associated with transportation of spent nuclear fuel and high-level radioactive waste.

3.1.2. Evaluate the operation of the entire repository facility, including the surface and subsurface components.

3.2.1. Evaluate the effects of "off-normal" events at the surface facility and how the events could affect the ability of the facility to receive waste shipments.

3.2.2. Evaluate the effects of reduced receiving capacity at the repository surface facility on the nationwide transportation system.

3.3.1. Examine the ability of storage casks and containers, including multipurpose canisters, to serve as disposal casks and containers in a repository.

3.3.2. Evaluate effects of human errors in risks associated with packaging and transporting spent nuclear fuel.

3.4.1. Evaluate logistics capabilities of the transportation system.

3.4.2. Monitor progress in implementing new technologies for improving transportation safety for spent fuel (e.g., electronic braking, wheel-bearing monitoring).

3.4.3 Review criteria for waste acceptance for storage to ensure that accepted material has been suitably characterized for subsequent disposal.

3.4.4. Evaluate the DOE's plans for enhancing safety capabilities along transportation corridors, and review the DOE's planning and coordination activities (e.g., route selection), accident prevention activities (e.g., improved inspections and enforcement), and emergency response activities.

STRATEGY FOR ACHIEVING GOALS

The Board will accomplish its goals by doing the following.

- Meeting with the American Association of Railroads, individual railroad companies, and railroad infrastructure manufacturers to determine the current state of rail infrastructure, and noting the effects of a sustained transportation campaign on the railroad industry.

- Attending meetings of the DOE-sponsored Transportation External Coordination Working Group to determine how well the DOE is working to implement Section 180(c) of the Nuclear Waste Policy Act.

- Holding meetings of the Board's Panel on the Waste Management System, as appropriate.

4. Performance Goals Related to Long-Term Activities and Strategy for Achieving Performance Goals (Will apply only if the site is found suitable and a site recommendation is ratified.)

PERFORMANCE GOALS

4.1.1. Monitor the DOE's proposed plans for performance confirmation to help ensure that uncertainties identified as part of the site recommendation process are addressed.

4.1.2. Monitor design modification activities undertaken by the DOE.

STRATEGY FOR ACHIEVING GOALS

The Board will accomplish its goals by doing the following.

- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, and TSPA.

- Reviewing performance-confirmation plans and meeting with DOE personnel to discuss aspects of the plans.

Evaluation of the Board's Performance

The Board believes that measuring its effectiveness by directly correlating improvements in the DOE program with Board actions and recommendations would be ideal. However, the Board has no implementing authority, so it cannot compel the DOE to comply with its recommendations. Consequently, a judgment about whether a specific recommendation had a positive outcome for the DOE program is, in most cases, (1) subjective and (2) an imprecise indicator of Board performance because implementation of Board recom-

mendations by the DOE is outside the Board's direct control. Therefore, to measure its performance in a given year, the Board has developed performance measures. For each annual performance goal, the Board considers the following.

1. Were the reviews, evaluations, and other activities undertaken under the auspices of the goal completed?

2. Were the results of the reviews, evaluations, and other activities communicated in a timely, understandable, and appropriate way to Congress and the Secretary of Energy?

If both measures are met, the Board's performance in meeting the annual goal will be judged effective. If only one measure is met, the performance of the Board in achieving that goal will be judged minimally effective. Failing to meet both performance measures without sufficient and compelling explanation will result in a judgment that the Board has been ineffective in achieving that performance goal.

The Board will use its evaluation of its own performance from the current year, together with its assessment of current or potential key issues of concern related to the DOE program, to establish its annual performance objectives and develop its budget request for subsequent years. The results of the Board's performance evaluation are included in the Board's annual summary report to Congress and the Secretary.

Board Operations

The Board is composed of 11 members appointed by the President who serve on a part-time basis; are eminent in a relevant field of science or engineering, including environmental sciences; and are appointed solely on the basis of distinguished service. Because of the comprehensive nature of the program and the part-time availability of the members, Congress authorized the Board to maintain a small professional staff of 10 full-time employees to support the Board's comprehensive review of the DOE program. In addition to the members and professional staff, the Board maintains a small administrative staff that supports its activities.

The full Board meets three or four times each year. The Board has organized itself into panels that meet as needed. The Board also gathers information from field trips to the Yucca Mountain site, visits to contractor laboratories and facilities, and informal meetings with individuals working on the project. On the basis of the information gathered throughout the year, the Board issues its findings in letters and reports.

Appendix J

U.S. Nuclear Waste Technical Review Board Performance Plan: Fiscal Year 2004

The nation's goals related to the disposal of spent nuclear fuel and high-level radioactive waste were set forth by Congress in the Nuclear Waste Policy Act of 1982. The goals are to develop a repository or repositories for disposing of high-level radioactive waste and spent nuclear fuel at a suitable site or sites and establishing a program of research, development, and demonstration for the disposal of such waste.

The Nuclear Waste Policy Amendments Act of 1987 (NWPAA) limited repository development activities to a single site, Yucca Mountain in Nevada. The NWPAA also established the Board and charged it with evaluating the technical and scientific validity of the Secretary of Energy's activities associated with implementing the NWPA. The activities include characterizing the Yucca Mountain site and packaging and transporting spent nuclear fuel and high-level radioactive waste.

The Board's performance goals for fiscal year (FY) 2004 have been developed to achieve the general goals and strategic objectives in its strategic plan. The goals also have been established in accordance with the Board's statutory mandate and reflect congressional action in 2002 authorizing the U.S. Department of Energy (DOE) to proceed with developing an application to be submitted to the Nuclear Regulatory Commission (NRC) for constructing a repository at Yucca Mountain. The Board's performance goals reflect the continuity of the Board's ongoing technical and scientific evaluation and the Board's "systems view" of the repository and of waste management activities.

Performance Goals for FY 2004

The Board's performance goals for FY 2004 have been developed to further the achievement of the Board's general goals and strategic objectives. Because some of the general goals and strategic objectives relate to work and activities that will be undertaken in the future, they may not have corresponding annual performance goals in any given year. The performance goals have been numbered to correlate with appropriate strategic objectives in the Board's strategic plan for FY 2003–2008.

1. Performance Goals Related to the Natural System and Strategy for Achieving the Goals

Performance Goals

1.1.1 Review the technical activities and agenda of the DOE's Cost Reductions and Systems Enhancement effort.

1.1.2. Monitor the results of flow-and-transport studies to obtain information on the potential performance of the saturated zone as a natural barrier in the repository system.

1.1.3. Review DOE efforts to confirm estimates of natural-system performance, including tests of models and assumptions, and the pursuit of independent lines of evidence.

1.2.1. Review DOE efforts to resolve questions related to possible seismic events and igneous consequences.

1.3.1. Evaluate geologic, hydrologic, and geochemical information obtained from the enhanced characterization of the repository block (ECRB) at Yucca Mountain.

1.3.2. Evaluate data from the drift-scale heater test.

1.3.3. Review plans and work carried out on possible analogues for the natural components of the repository system.

1.3.4. Recommend additional work needed to address uncertainties, paying particular attention to estimates of the rate and distribution of water seepage into the repository under proposed repository design conditions.

1.4.1. Evaluate tunnel-stability studies undertaken by the DOE.

1.5.1. Review the DOE's efforts to integrate results of scientific studies on the behavior of the natural system into repository designs.

Strategy for Achieving Goals

The Board will accomplish its goals by doing the following.

- Holding three public meetings with the DOE and DOE contractor personnel involving the full Board and holding meetings of the Panel on the Natural System, as needed.
- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, and total system performance assessment (TSPA).
- Meeting with contractor principal investigators on technical issues, including those related to climate change, seismic and volcanic events, flow and transport in the unsaturated and saturated zones, seepage, and the biosphere.
- Visiting and observing ongoing exploratory studies facility (ESF), ECRB, and laboratory investigations, including the facilities at Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, and Sandia National Laboratories. Observing other field investigations and visiting potential analogue sites. Visiting programs in other countries and attending national and international symposia and conferences.

2. Performance Goals Related to the Engineered System and Strategy for Achieving the Goals

PERFORMANCE GOALS

2.1.1. Monitor the DOE's performance allocation studies.

2.2.1. Review thermal testing and rock stability testing related to potential conditions in repository tunnels.

2.2.2. Evaluate data from studies of the effects of corrosion and the waste package environment on the predicted performance of materials being proposed for engineered barriers.

2.3.1. Review the progress and results of materials testing being conducted to address uncertainties about waste package performance.

2.3.2. Evaluate the DOE's efforts in identifying natural and engineered analogs for corrosion processes.

2.4.1. Monitor the DOE's development of analytical tools for assessing the differences between repository designs.

2.4.2. Evaluate the accuracy and completeness of the technical bases for repository and waste package designs and the extent to which the DOE is using the technical bases for modifying repository and waste package designs.

2.4.4. Evaluate the integration of the subsurface design and layout with thermal management and preclosure facility operations.

2.5.1. Assess the integration of scientific studies with engineering designs for the repository and the waste package.

Strategy for Achieving Goals

The Board will accomplish its goals by doing the following.

- Holding three public meetings with DOE and contractor personnel involving the full Board and holding meetings of the Panel on the Engineered System, as needed.
- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, and TSPA.
- Meeting with contractor principal investigators on technical issues.
- Reviewing DOE documents and databases, paying particular attention to design features developed to promote drainage, control ventilation, and protect workers in the exhaust end of the ventilation system.
- Reviewing the common database (literature, laboratory, and field data) and judging the adequacy of the database for a decision on repository development.
- Visiting and observing ongoing laboratory investigations, including the facilities at Lawrence Livermore National Laboratory and Lawrence Berkeley National Laboratory. Visiting programs in other countries and attending national and international symposia and conferences.

3. Performance Goals Related to Repository System Performance and Integration and Strategy for Achieving Performance Goals

PERFORMANCE GOALS

3.1.1. Identify which technical and scientific activities are on the critical path to reconciling uncertainties related to the DOE's performance estimates.

3.1.2. Determine the strengths and weaknesses of TSPA.

3.1.3. Evaluate the DOE's treatment of seismic and volcanism issues in TSPA.

3.2.1 Evaluate the DOE's quantification of uncertainties and conservatisms used in TSPA.

3.2.2. Review new data and updates of TSPA models, and identify models and data that should be updated.

3.3.1. Evaluate the DOE's efforts to create a transparent and traceable TSPA.

3.3.2. Evaluate the DOE's efforts to develop simplified models of repository performance.

3.3.3. Evaluate the DOE's efforts to identify analogues for performance estimates of the overall repository system.

3.4.1. Evaluate the DOE's efforts to analyze the contribution of the different engineered and natural barriers to waste isolation.

3.5.1. Evaluate technical aspects of value engineering and performance-related trade-off studies, including criteria, weighting factors and decision methodologies for such studies and how technical uncertainties are taken into account.

3.6.1. Recommend additional measures for strengthening the DOE's repository safety case.

3.7.1. Evaluate the DOE's efforts to develop a feedback loop among performance-confirmation activities and TSPA models and data.

3.7.2. Monitor the DOE's proposed plans for performance confirmation to help ensure that uncertainties identified as part of the site recommendation process are addressed.

Strategy for Achieving Goals

The Board will accomplish its goals by doing the following.

- Holding three public meetings with DOE and contractor personnel involving the full Board and holding meetings of the Panel on the Repository System Performance and Integration, as needed.

- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, and the DOE's TSPA.

- Meeting with contractor's principal investigators on technical issues.

- Visiting and observing ongoing laboratory investigations, including the facilities at Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, Sandia National Laboratories, and the engineered-barrier test facility. Observing field investigations. Visiting programs in other countries and attending national and international symposia and conferences.

4. Performance Goals Related to the Waste Management System and Strategy for Achieving the Goals

Performance Goals

4.1.1. Evaluate the operation of the entire repository facility, including the surface and subsurface components.

4.1.2. Monitor the identification of research needs to support improved understanding of the interaction of components of the waste management system.

4.1.3. Review the technical and scientific basis of the DOE's analyses of component interactions under various scenarios, including the degree of integration and redundancy across functional components over time.

4.1.4. Evaluate the effects of reduced receiving capacity at the repository surface facility on the nationwide transportation system.

4.1.5. Review criteria for waste acceptance for storage to ensure that accepted material has been suitably characterized for subsequent disposal.

4.2.1. Monitor the DOE's efforts to implement Section 180 (c) of the NWPA.

4.3.1. Monitor the DOE's progress in developing and implementing a transportation plan for shipping spent nuclear fuel and high-level radioactive waste to a Yucca Mountain repository.

4.3.2 Review the DOE's efforts to develop criteria for transportation mode and routing decisions.

4.3.3 Evaluate logistics capabilities of the transportation system.

4.3.4 Monitor progress in implementing new technologies for improving transportation safety for spent nuclear fuel.

4.3.5 Evaluate the DOE's plans for enhancing safety capabilities along transportation corridors, and review the DOE's planning and coordination activities (e.g., route selection), accident prevention activities (e.g., improved inspections and enforcement), and emergency response activities.

Strategy for Achieving Goals

The Board will accomplish its goals by doing the following.

- Holding three public meetings with DOE and contractor personnel involving the full Board and holding meetings of the Board's Panel on the Waste Management System in appropriate areas of the country.

- Reviewing critical documents provided by the DOE and its contractors, including contractor reports, process model reports, and TSPA.

- Meeting with groups involved in implementing transportation plans, including the NRC, the Department of Transportation, railroad and trucking companies, nonprofit groups, the utilities, and other stakeholders. Visiting programs in other countries and attending national and international conferences and symposia.