

# Nuclear Waste Technical Review Board FY 2000 Performance Plan and Evaluation (Revised March 2001)

## NWTRB General Goals and Objectives

The national goal for radioactive waste management established by Congress in the Nuclear Waste Policy Act of 1982 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 civilian spent nuclear fuel and high-level radioactive waste. Congress charged the Nuclear Waste Technical Review Board with reviewing the technical and scientific validity of the Secretary of Energy's activities associated with achieving this goal, including characterizing the 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 determining the suitability of the Yucca Mountain site as the possible location of a permanent 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 designing a 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 permanent repository are well integrated and establish a sound technical basis for designing and operating a waste management system.
4. Ensure that long-term technical and scientific activities undertaken by the DOE, including performance confirmation and design modifications, establish a sound technical basis for reducing uncertainties related to repository performance, operating a repository, and revising repository and waste package designs. (Will apply only if the site is found suitable and a site recommendation is approved.)

## Strategic Objectives

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

### 1. Objectives Related to Site Suitability 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 hydrologic, geologic, chemical, and other natural processes at the Yucca Mountain site 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 Review the *Record of Decision* for the final environmental impact statement (EIS) for a potential Yucca Mountain site.

### 2. Objectives Related to the Engineered Repository System

- 2.1 Evaluate repository and waste package designs, including the technical bases for the designs.
- 2.2 Review the progress and 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, mechanical, and chemical 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 requirements for developing the transportation infrastructure necessary to move significant amounts of spent nuclear fuel from individual reactor sites to a DOE storage or disposal site. Compare these requirements with current transportation capabilities, 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 Long-Term Activities

(Will apply only if the site is found suitable and a site recommendation is ratified)

- 4.1 Monitor performance-confirmation activities undertaken by the DOE that are designed to reduce uncertainties related to repository performance, including corrosion testing.
- 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 2000

The Board's performance goals for FY 2000 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 2000 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 Identify and evaluate uncertainties that need to be addressed for making a technically supportable site-suitability decision in preparation for a possible site recommendation.
- 1.1.2 On the basis of an evaluation of the natural processes at work at the Yucca Mountain site, recommend additional needed information, paying particular attention to estimates of the rate and distribution of water seepage into the proposed repository.
  - 1.2.1 Evaluate geologic, hydrologic, and geochemical information obtained from the enhanced characterization of the repository block (ECRB) at Yucca Mountain.
  - 1.2.2 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.
  - 1.3.1 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.
  - 1.3.2 Determine the strengths and weaknesses of the total system performance assessment (TSPA).
  - 1.3.3 Evaluate the DOE's use of risk assessment and quantification of uncertainty, and determine whether they are being used appropriately.

#### *Strategy for Achieving Goals*

The strategy for achieving performance goals for fiscal year 2000 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, the TSPA for site recommendation, and the site recommendation.

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

Holding public meetings with the DOE and contractor personnel at least three times a year with the full Board and 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 Laboratory, and the engineered barrier test facility.

Observing field investigations, including the niche, alcove, and sealed cross drift (ECRB) studies and Busted Butte.

Meeting with other entities carrying out research on, or providing input to, scientific and technical issues related to waste disposal, including the NRC and its contractors the Southwest Research Institute, the Nye County Early Warning Drilling Program, the University of Nevada at Las Vegas project on fluid inclusions, the Environmental Protection Agency, and the State of Nevada Nuclear Waste Projects Office.

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

### *Performance Goals*

- 2.1.1 Monitor and evaluate the DOE's progress in analyzing alternatives to the reference design for the waste package and the repository.
- 2.2.1 Evaluate the results of corrosion studies on materials being proposed for the EBS.
- 2.3.1 Assess the effects of site-characterization studies on the EBS design.

### *Strategy for Achieving Goals*

The Board will accomplish its goals by doing the following.

Evaluating the technical bases for EBS design by reviewing technical documents and databases, particularly the technical bases for making and inspecting final closure welds of the waste package and the methods for making drip shield sections. Meetings will be held as necessary with project personnel to obtain clarification and confirmation.

Evaluating the technical bases for repository design by reviewing 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 satisfactory technical basis.

Evaluating the DOE's technical bases for 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 site recommendation decision.

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

### *Performance Goals*

- 3.1.1 Determine the adequacy of the DOE's treatment of transportation in the draft environmental impact statement (DEIS).
- 3.5.1 Monitor progress by the railroad industry in implementing new technologies (e.g., electronic braking, wheel-bearing monitoring).

### *Strategy for Achieving Goals.*

The Board will accomplish its goals by doing the following.

Attending DOE-sponsored public hearings to determine what, in the public's view, are the critical issues not currently addressed or adequately addressed in the DEIS. The Board also will contract with an independent contractor to conduct an analysis of the treatment of transportation in the DEIS. If the Board determines that there are weaknesses in the DEIS, it will provide feedback to the DOE.

Meeting with the American Association of Railroads (AAR) to review draft performance specification and evaluating the potential effect of the performance specification on the safety of the DOE's proposed shipping campaign. The Board will conduct a panel meeting with the AAR, the DOE, the DOT, and others to further evaluate the benefits of the ARR's performance specification. The Board will travel to the ARR's Technology Center in Pueblo, Colorado, to see demonstrations of the latest technologies related to train safety.

## **Measuring Board Performance**

The Board will conduct an annual review of its actions in achieving its performance goals from the previous year. 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 the following performance measures.

In evaluating its performance, the Board will consider (1) whether the reviews, evaluations, and other activities included in its performance goals have been completed; and (2) whether the results of reviews, evaluations, and other activities undertaken under the auspices of program goals have been communicated in a timely, understandable, and appropriate way to the Secretary of Energy and Congress. The results of this evaluation will constitute the Board's assessment of its performance for the year. The Board will regard its performance as minimally effective if the activities, reviews, evaluations, and other activities included in its annual performance goals were completed. The Board will regard its performance as effective if those activities were completed and the results were communicated in a timely way to the Secretary of Energy and Congress.

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 civilian radioactive waste program, to establish its annual performance goals and to 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.

## Performance Evaluation for Fiscal Year 2000

On the basis of the following evaluation and in accordance with the performance measures described above, the Board's overall performance in fiscal year 2000 was effective. However, primarily because DOE engaged in very little transportation-related activity in 2000, the Board's performance in meeting

its two goals related to transportation of spent fuel and high-level radioactive waste was judged minimally effective.

### *1. Performance Goals Related to Site Suitability and Predicting Repository Performance*

- 1.1.1 Identify and evaluate uncertainties that need to be addressed for making a technically supportable site-suitability decision in preparation for a possible site recommendation.

Evaluation of 1.1.1: The Board reviewed DOE efforts to identify uncertainties and recommended that the DOE quantify any remaining uncertainties to increase the transparency of technical evaluations supporting a decision on site suitability. The Board commented on the importance of this issue in testimony before the House Subcommittee on Energy and Power, Committee on Commerce, on June 23, 2000. A comprehensive discussion of program uncertainties was included in Board answers to questions posed by Representative Joe Barton, Chair of the House Subcommittee on Energy and Power, following the congressional hearing. The Board's answers were submitted to Congressman Barton on August 31, 2000. The Board also commented on this issue in letters to Office of Civilian Radioactive Waste Management (OCRWM) director Ivan Itkin on March 20, 2000, on June 16, 2000, and on September 20, 2000, and in its year-end letter report to the U.S. Congress and the Secretary of Energy (December 2000).

- 1.1.2 On the basis of an evaluation of the natural processes at work at the Yucca Mountain site, recommend additional needed information, paying particular attention to estimates of the rate and distribution of water seepage into the proposed repository.

Evaluation of 1.1.2: The Board commented on this issue in letters to OCRWM director, Ivan Itkin on March 20, 2000, and September 20, 2000. This subject was discussed at several Board meetings and was touched on in the answers to questions from Representative Joe Barton (August 31, 2000).

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

Evaluation of 1.2.1: Members of the Board toured the ECRB in 2000. Studies in the ECRB were the subject of discussion during several Board meetings in 2000. The Board commented on studies in the ECRB in letters to OCRWM director Ivan Itkin on March 20, 2000, and September 20, 2000, and in congressional testimony in June 2000.

- 1.2.2 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.

Evaluation of 1.2.2: Results from thermal tests were not available in 2000. The Board will continue to monitor these tests and will evaluate the results when they become available.

- 1.3.1 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 1.3.1: The Board monitored the progress of flow-and-transport studies conducted by the Nye County Early Warning Drilling program and commented on findings from the studies and on coordination with the DOE in letters to OCRWM director Ivan Itkin on March 20, 2000, and September 20, 2000.

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

Evaluation of 1.3.2: The Board commented extensively on the TSPA during meetings with the DOE, in letters to OCRWM director Ivan Itkin on March 20, 2000, and September 20, 2000, in congressional testimony on June 23, 2000, in answers to questions from Representative Joe

Barton (August 31, 2000), and in its year-end letter report to the U.S. Congress and the Secretary of Energy.

- 1.3.3 Evaluate the DOE's use of risk assessment and quantification of uncertainty, and determine whether they are being used appropriately.

Evaluation of 1.3.3: The Board commented extensively on the need for the DOE to quantify uncertainty in meetings with the DOE, in letters to OCRWM director Ivan Itkin on March 20, 2000, and September 20, 2000, in congressional testimony (June 23, 2000), in answers to questions from Representative Barton, and in its year-end report to the U.S. Congress and the Secretary of Energy (December 2000).

## *2. Performance Goals Related to the Engineered Barrier System*

- 2.1.1 Monitor and evaluate the DOE's progress in analyzing alternatives to the reference design for the waste package and the repository.

Evaluation of 2.1.1: The Board monitored the DOE's efforts in this area and commented extensively on the importance of this issue in letters to Ivan Itkin on March 20, 2000, on June 16, 2000, and on September 20, 2000; in testimony before the House Energy and Power Subcommittee (June 23, 2000); in answers to questions from Representative Barton; and in its year-end report to Congress and the Secretary of Energy (December 2000).

- 2.2.1 Evaluate the results of corrosion studies on materials being proposed for the EBS.

Evaluation of 2.2.1: The Board monitored the progress of corrosion testing conducted by the DOE and its contractors in 2000 and commented on the importance of this issue in its letter to Ivan Itkin on September 20, 2000, and in congressional testimony (June 2000).

- 2.3.1 Assess the effects of site-characterization studies on the EBS design.

Evaluation of 2.3.1: The Board commented on the importance of the waste package environment in a letter to Ivan Itkin on September 20, 2000.

### 3. Performance Goals Related to the Waste Management System

#### 3.1.1 Determine the adequacy of the DOE's treatment of transportation in the draft environmental impact statement (DEIS).

Evaluation of 3.1.1: DOE activities related to transportation of spent nuclear fuel and high-level radioactive waste were very limited. The Board's Panel on the Waste Management System held a meeting in July 2000 during which this topic was discussed.

#### 3.1.2. Monitor progress by the railroad industry in implementing new technologies (e.g., electronic braking, wheel-bearing monitoring).

Evaluation of 3.1.2: There was very little activity in 2000 related to transportation of spent nuclear fuel and high-level radioactive waste. The Board's Panel on the Waste Management System held a meeting in July 2000 during which this topic was discussed briefly.

## 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 profes-

sional 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.

## Resource Allocation for Fiscal Year 2000

The Board's budget request for fiscal year 2000 was \$3,150,000. Of that total, \$2,150,000 was allocated to activities related to site characterization. The allocation included the salaries and benefits of the Board's members and professional staff. It also included the cost of conducting meetings, field trips, and other fact-finding activities and the production of reports related to the activities. Transportation and packaging activities, which include activities similar to those used to evaluate site-characterization efforts, was allocated \$550,000. The balance of \$450,000 was allocated to the management and administrative support of the Board's activities in fiscal year 2000.

The Board's appropriation for fiscal year 2000 was \$2,600,000. As a result of reduction from the Board's budget request, the Board has had to adapt the performance plan to the reduced appropriation level. The revised allocations are as follows: \$1,350,000 for activities related to site characterization; \$500,000 for transportation and packaging activities,\* which include activities similar to those used to evaluate site-characterization efforts; \$200,000 for communications (Congress, public, etc.); and \$550,000 for management support and for administrative and information technology support of the Board's activities in fiscal year 2000.

\* Because of DOE inactivity in the area of packaging and transportation in fiscal year 2000, almost \$400,000 of this amount was reallocated to activities related to site characterization. The remainder was spent on a meeting of the Board's panel on transportation and the waste management system and on reviewing work supporting the Board's FY 2001 transportation goals.