Appendix F

Nuclear Waste Technical Review Board Strategic Plan FY 2008-2013

Nuclear Waste Technical Review Board Strategic Plan FY 2008–2013

Summary Statement of the Board

The Nuclear Waste Policy Amendments Act (NWPAA) 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 commercial spent nuclear fuel and defense high-level radioactive waste. The NWPAA also established the U.S. Nuclear Waste Technical Review Board as an independent agency within the executive branch of the United States Government. The NWPAA requires the Board to evaluate the technical and scientific validity of activities undertaken by the Secretary of Energy related to implementing the Nuclear Waste Policy Act (NWPA) and to report its findings and recommendations to the Secretary and Congress at least twice yearly. The Board only can make recommendations; it cannot compel DOE to comply with its recommendations.

Congress created the Board to perform ongoing independent technical and scientific evaluation—crucial for confidence in decisions related to disposing of spent nuclear fuel and high-level radioactive waste. The Board strives to provide Congress and the Secretary of Energy with unbiased, credible, and timely technical and scientific evaluations and recommendations achieved through peer review of the highest quality. By law, the Board will 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.

This strategic plan includes the Board's goals and objectives for fiscal years (FY) 2008 through 2013. During that period, DOE plans to submit to the U.S. Nuclear Regulatory Commission (NRC) an application for authorization to construct a repository. Although the Board realizes that DOE's efforts will be focused on compliance activities, in conducting its evaluation, the Board will encourage DOE through its science and technology program to undertake research and analyses that will increase basic understanding of the potential performance of the entire waste-management system. The Board believes that improving basic understanding will increase confidence in DOE's performance estimates and make them more realistic.

The Board has organized its review of DOE activities into three technical areas: preclosure operations, including surface-facility design and operations and the transport of spent nuclear fuel and high-level radioactive waste from nuclear utility reactors or storage facilities to the repository site; postclosure repository performance issues, including the nature of the source term and the movement of the radionuclides most significant to dose through

the engineered and natural barriers; and integration of science and engineering and preclosure and postclosure activities, including the effects of temperature on repository performance and the effects of waste package designs on the temperatures in the repository. The Board's strategic goals and objectives have been organized around these three technical areas, and the Board's panels have been realigned to help facilitate and focus the Board's review.

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 disposing of high-level radioactive waste] undertaken by the Secretary after the date of the enactment of the Nuclear Waste Policy Amendments Act of 1987, including—

(1) site characterization activities; and

(2) activities relating to the packaging or transportation of high-level radioactive waste or spent nuclear fuel."

By law, the Board will 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 peer review of the highest quality, the Board makes a unique and essential contribution to increasing the technical validity of DOE activities related to disposing of the nation's spent nuclear fuel and high-level radioactive waste. The Board provides vital technical and scepeat ientific information to decision-makers in Congress and at DOE and to the public on issues related to disposing of, packaging, and transporting spent nuclear fuel and high-level radioactive waste.

Values

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

- The Board strives to ensure that its members have no real or perceived conflicts of interest related to the outcome of the Secretary's efforts to implement the Nuclear Waste Policy Act (NWPA).
- Board members arrive at their conclusions on the basis of objective and unbiased evaluations of the technical and scientific validity of the Secretary's activities.
- The Board's deliberations are conducted in such a way 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

The nation's goals related to disposing of spent nuclear fuel and high-level radioactive waste were set forth by Congress in 1982 in the 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 disposing of such waste.

In 1987, the NWPAA limited site-characterization and 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 Board's general goals were established in accordance with its statutory mandate and with congressional action in 2002 authorizing DOE to proceed with the preparation and submittal of an application to the Nuclear Regulatory Commission (NRC) for authorization to construct a repository at Yucca Mountain.

General Goals of the Board

The Board believes that the nuclear waste-management system includes all elements of waste management and disposal. To accomplish its congressional mandate, the Board has organized its review around three technical areas: preclosure operations, including surface-facility design and operations and the transport of spent nuclear fuel and high-level radioactive waste from nuclear utility reactors or storage facilities to the repository site; postclosure repository performance issues, including the nature of the source term and the movement of the radionuclides most significant to dose through the engineered and natural barriers; and integration of science and engineering and preclosure and postclosure activities, including the effects of temperatures on repository performance and the effects of waste package designs on the temperatures in the repository.

The Board's general goals for FY 2008–2013 reflect the importance of gaining a realistic understanding of the potential performance of the proposed repository and the interdependence and interactions of all elements of the nuclear waste management system. The Boards general goals for FY 2008–2013 are the following:

1. Evaluate the technical and scientific validity of activities undertaken by DOE related to preclosure operations.
2. Evaluate the technical and scientific validity of activities undertaken by DOE related to postclosure repository performance.
3. Evaluate the technical and scientific validity of activities undertaken by DOE related to integrating science and engineering and cross-cutting preclosure and postclosure issues.

Strategic Objectives of the Board

To achieve its general goals, the Board has established the following 5-year objectives.

1. Objectives Related to the Preclosure Period

1.1 Evaluate the technical and scientific validity of DOE efforts to implement its canister-based transportation, aging, and disposal (TAD) concept.

1.2. Evaluate DOE efforts to design and construct surface facilities and infrastructure at the proposed repository site.

1.3. Review DOE efforts to develop a plan for transporting waste from nuclear utility reactors or federal storage sites to the proposed repository.

2. Objectives Related to the Postclosure Period

2.1. Evaluate DOE studies and analyses related to determining the source term—the release of dose-contributing radionuclides as a function of time from the engineered-barrier system.

2.2. Encourage DOE to develop realistic performance models and review the technical and scientific validity of DOE efforts to gain a more realistic understanding of potential repository performance.

2.3. Evaluate the technical and scientific validity of DOE data and analyses related to infiltration, flow and transport through the natural system, and seepage into drifts.

2.4. Assess DOE efforts to increase understanding of repository tunnel environments and the potential for localized corrosion of waste packages in the proposed repository.

2.5. Review DOE activities related to predicting the potential effect on dose of disruptive events.

3. Objectives Related to System Integration

3.1. Evaluate DOE efforts to develop thermal criteria for the repository and a strategy for managing the effects of heat on preclosure operations and postclosure repository performance.

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

3.3. Review DOE integration of operational and performance models.

3.4. Review DOE analysis and integration of issues and designs related to receipt, processing, aging, and emplacement of spent nuclear fuel and high-level radioactive waste (e.g., TAD and Yucca Mountain surface facilities).

Achieving Board 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 the Board considers appropriate. At the request of the Board and subject to existing law, the NWPAA directs 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, Congress provided such access with the expectation that the Board will review and comment on DOE decisions, plans, and actions as they occur, not after the fact.

By law, no nominee to the Board may be an employee of DOE, a National Laboratory, or DOE contractors performing activities involving high-level radioactive waste or spent nuclear fuel. The Board has the power, under current law, to achieve its goals and objectives.

Board Panels

To facilitate and focus the Board's review, the Board has established three panels. The respective focus of the panels corresponds to the Board's general goals.

1. Panel on Preclosure Operations

Panel Focus—Evaluate the technical and scientific validity of activities undertaken by DOE related to waste-management system activities and operations before repository closure.

2. Panel on Postclosure Repository Performance

Panel Focus—Evaluate the technical and scientific validity of activities undertaken by DOE related to understanding, analyzing, and modeling the performance of geologic and engineered components of a proposed Yucca Mountain repository after repository closure.

3. Panel on System Integration

Panel Focus—Evaluate the technical and scientific validity of activities undertaken by DOE related to integrating scientific and engineering activities, operational and performance issues, and preclosure and postclosure design and strategies.

Information Gathering

Much of the Board's information gathering occurs at open public meetings arranged by the Board. At each meeting, 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 meetings for comments from members of the public and interested parties. The full Board usually meets three times each year. The Board's panels and smaller Board cohorts meet as needed to investigate specific issue areas. Typically, two of the three full Board meetings are held in Nevada each year.

The Board also gathers information from 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 analogs.

Technical Analysis

Technical analysis is performed by Board members with assistance from the full-time technical staff. When necessary, the Board hires special expert consultants to perform in-depth reviews of specific technical and scientific topics.

Cross-Cutting Functions

As discussed in the following paragraphs, the Board's ongoing peer review complements the activities of other organizations involved in disposing of and managing spent nuclear fuel and high-level radioactive waste.

- *Congress and the Administration, including the Secretary of Energy,* make decisions on and establish national policies for nuclear waste disposal. They also determine how such decisions and policies 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 as context for their decision-making.
- *Other federal agencies* with roles in disposing of and managing spent nuclear fuel and high-level radioactive waste include DOE, the NRC, the Environmental Protection Agency (EPA), the Department of Transportation (DOT), and the United States Geological Survey. 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 having 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.
- *State and local governments* comment on and perform oversight of DOE activities, and other interest groups monitor DOE activities related to a Yucca Mountain repository. The Board's technical evaluation is at once different from and complementary to the activities of these groups 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 an independent federal agency with Board members who are nominated by the National Academy of Sciences and appointed by the President on the basis of their expertise in the various disciplines represented in the DOE program.

Key External Factors

Some factors are beyond the Board's control and 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 peer-review body that makes recommendations to DOE. According to the legislative history, Congress expected that DOE would accept the Board's recommendations or indicate why the recommendations could not or should not be implemented. However, DOE is not legally obligated to accept any of the Board's recommendations. If DOE does not accept a Board recommendation, the Board's recourse is to advise Congress or reiterate its recommendation to DOE, or both. The Board's recommendations and DOE's responses are included in Board reports to Congress and the Secretary.

- *Legislation and budget considerations could affect nuclear waste policy.* 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 by DOE in a given year or over time. In addition, it is not possible to predict if legislation related to nuclear waste disposal will be enacted or how the Board might be affected by such legislation.

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 Board recommendations with improvements in the technical and scientific validity of DOE activities would be ideal. However, the Board cannot compel DOE to comply with its recommendations. Consequently, a judgment about whether a specific recommendation had a positive outcome as defined above may be (1) subjective or (2) an imprecise indicator of Board performance because implementation of Board recommendations 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. Did the Board undertake the reviews, evaluations, and other activities needed to achieve its goal?
2. Were the results of the Board's reviews, evaluations, and other activities communicated in a timely, understandable, and appropriate way to Congress and the Secretary of Energy?

If both measures were met in relation to a specific goal, the Board's performance in meeting that goal will be judged effective. If only one measure was 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. If the goals are deferred, that will be noted in the evaluation.

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 DOE's program, to develop its annual performance objectives and performance-based budget request for subsequent years. The results of the Board's performance evaluation are included in its annual summary report.

Consultations

In developing its original strategic plan, the Board consulted with the Office of Management and Budget, 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 first solicited public comment and presented its strategic plan at a session held expressly for that purpose during a public Board meeting in Amargosa Valley, Nevada,

on January 20, 1998. During 2003, the Board again solicited and received comment on its revised strategic plan and performance plan, which were incorporated in an earlier revision. Comments on this revised strategic plan will be solicited on the Board's Web site: www.nwtrb.gov.

Appendix G

Nuclear Waste Technical Review Board
Fiscal Year (FY) 2007 Budget Request Submittal

Including Performance Evaluation for FY 2005 and Supplementary Information about the Board

Nuclear Waste Technical Review Board Fisal Year (FY) 2007 Budget Request Submittal

Summary and Highlights

This is the U.S. Nuclear Waste Technical Review Board's performance-based budget request for fiscal year (FY) 2007. The request will support the Board efforts to achieve its performance goals for the year. The performance goals are listed in the budget document and have been established in accordance with the Board's congressional mandate: Conduct an independent evaluation of the technical and scientific validity of U.S. Department of Energy (DOE) activities related to disposing of commercial spent nuclear fuel and defense high-level radioactive waste. These activities include evaluating the proposed Yucca Mountain repository site in Nevada and packaging and transporting the waste. The Board's ongoing peer review is vital to the credibility of the DOE's technical and scientific activities.

In 2002, Congress approved the President's recommendation of Yucca Mountain and authorized the DOE to proceed with preparing an application that will be submitted to the U. S. Nuclear Regulatory Commission (NRC) for a license to construct a repository at Yucca Mountain. Throughout this process, the Board has evaluated the technical and scientific validity of DOE work and has reported its findings to Congress and the Secretary of Energy.

The Board's performance goals for FY 2007 have been updated to reflect expected DOE activities during that period. For example, the Board will review DOE activities related to increasing understanding of the natural system, developing a radionuclide risk profile derived from Total System Performance Assessment (TSPA), analyzing the implications of DOE plans for a transportation, aging, and disposal canister system, and assessing issues relevant to thermal loading and waste-package lifetime. The Board also will review DOE activities related to planning and implementing a waste management system and designing, planning, and developing repository surface facilities. The Board is requesting $3,670,000 to support these activities in FY 2007.

U.S. Nuclear Waste Technical Review Board

Salaries and Expenses (Including Transfer of Funds)

For necessary expenses of the Nuclear Waste Technical Review Board, as authorized by Public Law 100-203, section 5051, $3,670,000 to be transferred from the Nuclear Waste Fund and to remain available until expended.

(2006 Energy and Water Development Appropriations Act, P.L. 109-103)

Board Budget Request for FY 2007

Background

Approximately 2,000 metric tons of spent nuclear fuel are produced each year by nuclear reactors and are stored at more than 70 sites nationwide. By the time the presently operating reactors reach the end of their scheduled 40-year lifetimes (at some time in the 2030's), approximately 87,000 metric tons of spent fuel will have been produced. (This estimate does not include spent nuclear fuel from plants that may be granted license renewals by the NRC.) In addition, high-level radioactive waste (HLW) from defense activities has been stored at numerous federal facilities throughout the country. Disposal of the spent nuclear fuel and HLW in a deep geologic repository is the primary approach being pursued by the United States and other countries.

In early 2002, the Secretary of Energy recommended approval of the Yucca Mountain site to the President. The President then recommended the site to Congress. The State of Nevada later disapproved the recommendation. Both the U.S. House of Representatives and the U.S. Senate went on to approve the site recommendation. Since that time, the DOE has focused on preparing an application to be submitted to the NRC for authorization to construct a repository at the Yucca Mountain site. Throughout this process, the Board has evaluated the technical basis of the DOE's work and communicated Board views to Congress and the Secretary of Energy in letters, reports, and congressional testimony.

The Board's Continuing Role

The Board was established by Congress in the Nuclear Waste Policy Amendments Act of 1987 (NWPAA). The Board is charged with evaluating the technical and scientific validity of activities undertaken by the Secretary of Energy, including site-characterization activities and activities related to the packaging and transportation of HLW and spent nuclear fuel. Board technical and scientific findings and recommendations are included in reports that are submitted at least twice each year to Congress and the Secretary. In creating the Board, Congress realized that an ongoing independent and expert evaluation of the technical and scientific validity of the DOE's site-evaluation and other waste-management activities would be crucial to acceptance by the public and the scientific community of any approach for disposing of spent nuclear fuel and HLW.

The Board's Funding Requirement for FY 2007: $3,670,000

The Board's budget request of $3,670,000 for FY 2007 represents the funding needed to accomplish the Board's performance goals for the year. During FY 2007, the Board intends to continue its evaluation of the technical and scientific validity of DOE activities,

including those related to increasing understanding of the natural system, developing a radionuclide risk profile derived from TSPA, analyzing tradeoffs between preclosure and postclosure risks, assessing issues relevant to thermal loading and waste-package lifetime, and evaluating the implications of plans for a transportation, aging, and disposal canister system. The Board also will review DOE activities related to planning and implementing a waste management system and designing, planning, and developing repository surface facilities. The amount requested will support the work of the Board members who will conduct the comprehensive review described above, enable the Board to comply with extensive federal security requirements related to the Board's information systems, and allow the Board to undertake a financial audit in accordance with the Accountability of Tax Dollars Act (ATDA).

Performance-Based Budget for FY 2007

The nation's goals related to the disposal of spent nuclear fuel and HLW were set forth by Congress in the NWPA. The goals are to develop a deep geologic repository or repositories for disposing of HLW 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 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 NWPAA. Such activities include characterizing the Yucca Mountain site and packaging and transporting spent nuclear fuel and HLW.

The Board's general goals and strategic objectives are set forth in its strategic plan for FY 2004–2009. They have been established in accordance with the Board's statutory mandate and with congressional action in 2002 authorizing the DOE to proceed with developing an application to the NRC for authorization to construct a repository at Yucca Mountain. The Board's performance goals for FY 2007 have been established in accordance with its general goals and objectives. The Board's performance-based budget for FY 2007 has been developed to enable the Board to meet its performance goals for the year.

The Board will accomplish its goals by doing the following:

- Holding up to three public meetings with the DOE and DOE contractor personnel involving the full Board and holding meetings of the Board panels, as needed.
- When appropriate, holding fact-finding sessions involving small groups of Board members who will focus in depth on specific technical topics.
- Reviewing critical documents provided by the DOE and its contractors, including TSPA, preclosure safety analyses (PCSA), contractor reports, analysis and modeling reports (AMR), and design drawings and specifications.
- When appropriate, visiting and observing ongoing investigations, including those conducted at the national laboratories or potential analog sites.
- Visiting programs in other countries and attending national and international symposia and conferences.

The Board's performance goals for FY 2007, which are described below, are divided into four topical areas that correlate with the purviews of the Board's panels. The numbering system has been simplified, and performance goals have been updated from previous years to reflect current activities. Amounts have been allocated preliminarily to each set of performance goals for FY 2007.

Performance Goals for FY 2007

1. Performance Goals Related to the Natural System

(Dollars in Thousands)		
FY 05	**FY 06**	**FY 07**
839	893	917

1.1. Review DOE activities related to natural-system performance, including tests of models and assumptions, and pursuit of independent lines of evidence.

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.

1.3. Review DOE efforts in addressing questions related to possible seismic and igneous events and consequences.

1.4. Evaluate data and test results obtained from testing in the enhanced characterization of the repository block (ECRB) and other facilities.

1.5. Evaluate DOE efforts to analyze the source term and to estimate what radionuclides will be mobilized and transported through the natural system at what time periods.

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

1.7. Recommend additional work needed to address uncertainties related to estimates of the rate and distribution of water seepage into repository tunnels, given anticipated infiltration rates.

1.8. Review DOE efforts in integrating results of scientific studies related to the behavior of the natural system into repository designs.

1.9. Review plans and studies undertaken by the Office of Science & Technology and International (OSTI) related to the natural system.

2. Performance Goals Related to the Engineered System

(Dollars in Thousands)		
FY 05	**FY 06**	**FY 07**
1,006	1,071	1,101

2.1. Review DOE activities related to the engineered system in response to changes in the regulatory compliance period.

2.2. Review thermal-mechanical and rock-stability testing on potential conditions in repository tunnels.

2.3. 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.

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

2.5. Review DOE analyses of facilities, systems, and component designs, including the transportation, aging, and disposal canister.

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

2.7. Evaluate the integration of subsurface and repository designs, layout, and operational plans into an overall thermal management strategy.

2.8. Assess the integration of scientific studies into engineering designs for the repository and the waste package.

2.9. Evaluate the plans and activities of the OSTI related to the engineered system.

3. Performance Goals Related to Repository System Performance and Integration.

(Dollars in Thousands)		
FY 05	**FY 06**	**FY 07**
671	714	735

3.1. Identify technical and scientific activities that are on the critical path to reconciling uncertainties related to DOE performance estimates in light of changes in the regulatory compliance period.

3.2. Evaluate strengths and weaknesses of TSPA.

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

3.4. Evaluate activities undertaken by the DOE to develop a risk profile for specific radionuclides.

3.5. Evaluate DOE efforts to develop a realistic analysis of repository performance.

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

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

3.8. Evaluate DOE efforts to develop a feedback loop among performance-confirmation activities and TSPA models and data.

3.9. Monitor the DOE's proposed performance-confirmation plans to help ensure that uncertainties are addressed.

3.10. Review plans and studies undertaken by the OSTI related to overall performance of the repository.

4. Performance Goals Related to the Waste Management System

(Dollars in Thousands)		
FY 05	**FY 06**	**FY 07**
839	894	917

4.1. Evaluate the integration of the repository facility, including the surface and subsurface components.

4.2. Evaluate the design of surface facilities, including the fuel handling and aging facilities, and how the design affects and is affected by the thermal management of the repository.

4.3. Review DOE procedures for ensuring that waste accepted for disposal has been suitably characterized.

4.4. Monitor DOE efforts to implement Section 180 (c) of the NWPA.

4.5. Monitor the DOE's progress in developing and implementing a transportation plan for shipping spent nuclear fuel and HLW to a Yucca Mountain repository.

4.6. Review DOE efforts to develop criteria for routing decisions.

4.7. Evaluate logistics capabilities of the transportation system.

4.8. Monitor progress in implementing new technologies for improving transportation safety for spent nuclear fuel, including transportation, aging, and disposal canisters and casks.

4.9. Evaluate DOE plans for enhancing safety capabilities along transportation corridors, and review DOE planning and coordination activities, accident prevention activities, and emergency response activities.

4.10. Review the potential and limits of the total system model.

Budget Request by Object Class

Object Class 11.1, Full-Time Staff: $1,724,000

The amount requested for full-time permanent staff is based on the requirement to fund a total of 15 positions. Because the Board's technical and scientific evaluations are conducted by Board members supported by professional staff, the Board's enabling legislation authorizes the Board chairman to appoint and fix the compensation of not more than 10 senior professional staff members. This request assumes the use of all 10 positions under this authority. In addition, the chairman is authorized to appoint such clerical and administrative staff as may be necessary to discharge the responsibilities of the Board. The other 5 positions funded under this object class are support staff engaged in clerical, secretarial, and administrative activities; development and dissemination of Board publications; information technology, including maintenance of the Board's Web site; public affairs; and meeting logistics for the Board. The small administrative staff supports the very active part-time Board members and full-time professional staff.

The estimate assumes a 1.022 percent combined cost-of-living adjustment and locality raise in January 2007 for both General Schedule and Executive Schedule employees.

Object Class 11.3, Other than Full-Time Permanent Staff: $376,000

The amount requested for this category includes compensation for Board members. Each Board member will be compensated at the rate of pay for Level III of the Executive Schedule for each day that the member is engaged in work for the Board. The 11 Board members serve on a part-time basis equaling 2 full-time equivalent positions. The budget assumes that each member will attend 3 full Board meetings, 2 panel meetings, and an average of 2 additional meetings or field trips during the year. This estimate represents an average of 57 workdays per member in

FY 2007. This estimate also assumes a 1.022 percent increase in Executive Schedule compensation for employees in this category for FY 2007 (effective January 2007).

Object Class 11.5, Other Personnel Compensation: $47,000

The amount requested for this category covers approximately 80 hours of staff overtime and performance awards under the Performance Management System approved by the Office of Personnel Management (OPM). Most Board and panel meetings require considerable overtime for on-site meeting logistics and other preparations.

Object Class 12.1, Civilian Personnel Benefits: $441,000

The estimate for this category represents the government's contribution for employee benefits at the rate of 25.75 percent for staff and 7.65 percent for members.

Object Class 21.0, Travel: $298,000

The amount requested for this object class includes travel costs for Board members, staff, and consultants traveling to Board and panel meetings, to other meetings (including professional meetings, conferences, and orientation activities) and sites to acquire technical and scientific data, and to Yucca Mountain in Nevada to review site activities within the scope of the Board's mission. The request is based on 11 Board members attending 3 Board and 2 panel meetings and making an average of 2 other trips during the year at an average length of 3 days each, including travel time. In addition, the 10 professional staff members will travel on similar activities an average of 8 trips during the year at an average of 3 days per trip. In FY 2007, the expectation is that the DOE may increase its activities related to planning for transportation and packaging of the waste and designing the repository surface and subsurface facilities. The Board's meetings will increase commensurately and will be held in parts of the country affected by the DOE action.

Object Class 23.1, Rental Payments to the General Services Administration (GSA): $197,000

The estimate for this object class represents the amount that the Board will pay to the GSA for rental of office space totaling 6,288 sq. ft. at an annual rate of $31.34 per sq. ft.

Object Class 23.3, Communications, Utilities, Miscellaneous: $24,000

The requested amount represents estimates for telephone service, postage, local courier services, video teleconferencing, FTS long-distance telephone service, the Internet, and mailing services related to management and use of the Board's mailing list.

Object Class 24.0, Printing and Reproduction: $22,000

The major items in this object class are the publication of reports to the U.S. Congress and the Secretary of Energy, publication of meeting notices in the Federal Register, production of press releases announcing meetings and report publication, and production of other informational materials for Board members and the public. All Board meeting are open to the public, and copies of meeting materials are provided. Members of the public who live in rural areas and who do not have Web access may be interested in obtaining printed copies of Board documents.

Object Class 25.1, Consulting Services: $103,000

Consultants will be hired when necessary to support and supplement Board and staff analysis of specific technical and scientific issues. This will enable the Board to conduct the kind of comprehensive technical and scientific review mandated by Congress.

Object Class 25.2, Other Services: $177,000

This category includes court-reporting services for an estimated five Board or panel meetings, meeting-room rental and related services, maintenance agreements for equipment, professional development, and services from commercial sources. In addition, the Board will contract with part-time technical consultants to supplement and support in-house operations in systems management, Web site management, report production, and editing. Costs of a financial audit to comply with the Accountability of Tax Dollars Act also are included in this category.

Object Class 25.3, Services from Other Government Agencies: $108,000

This category includes GSA administrative support services (payroll, accounting, personnel, etc.), legal advice from GSA, security clearances through OPM, and other miscellaneous interagency agreements.

Object Class 26.0, Supplies and Materials: $62,000

Anticipated expenses include routine office supplies, subscriptions and library materials, and off-the-shelf technical reports and studies.

Object Class 31.0, Equipment: $91,000

This estimate is for miscellaneous equipment costs, including audiovisual equipment and computer hardware, and computer-network software maintenance. In addition, funds are included to support the Federal Information Security Act, which requires federal agencies to periodically test and evaluate the effectiveness of their information security policies, procedures, and practices. The category also includes continued upgrades to IT security and continuity of operations (COOP) availability, support to E-Gov telecommuting efforts, and technical support of the management of electronic records and e-mails.

Nuclear Waste Technical Review Board
Projected 2007 Expenditures

Object Classifications

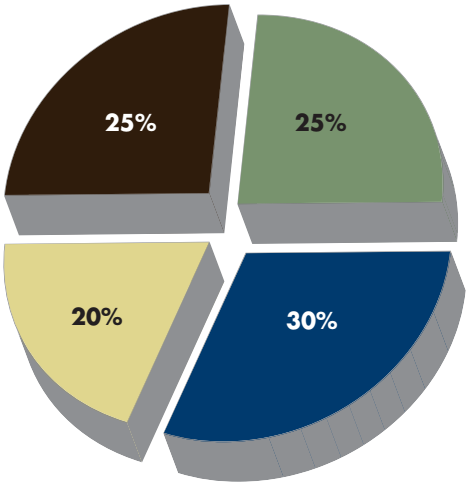
(in thousands of dollars)

Identification Code 48-0500-0-1-271		FY05 ACT	FY06 EST	FY07 REQ
Expenditures				
11.1	Full-Time Permanent	$1,605	$1,686	$1,724
11.3	Other than Full-Time Permanent	364	366	376
11.5	Other Personnel Compensation	30	47	47
12.1	Civilian Personnel Benefits	401	430	441
21.0	Travel and Transportation	328	312	298
23.1	Rental Payments to GSA	185	184	197
23.3	Communication, Utilities, Miscellaneous	24	26	24
24.0	Printing and Reproduction	16	20	22
25.1	Consulting Services	101	103	103
25.2	Other Services	169	148	177
25.3	Services from Government Accounts	59	69	108
26.0	Supplies and Materials	42	61	62
31.0	Equipment	31	120	91
99.9	Total Obligations	$3,355	$3,572	$3,670

Nuclear Waste Technical Review Board Salaries and Expenses

Personnel Summary

Identification Code 48-0500-0-1-271	05 ACT	06 EST	07 REQ
Total Number of Full-Time Permanent Positions	17	17	17
Total Compensable Work-Years: Full-Time Equivalents	17	17	17



Natural System (natural barriers at Yucca Mt.)	25%
Engineered System (engineered barriers at Yucca Mt.)	30%
Repository System Performance and Integration	20%
Waste Management System (including transportation)	25%

ADDENDUM A

Nuclear Waste Technical Review Board Performance Evaluation

Fiscal Year 2005

The U.S. Nuclear Waste Technical Review Board

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 commercial spent nuclear fuel and defense high-level radioactive waste. The Act also established the U.S. Nuclear Waste Technical Review Board (Board) as an independent agency within the executive branch of the United States Government. The Act directs the Board to evaluate continually the technical and scientific validity of activities undertaken by the Secretary of Energy related to disposing of, transporting, and packaging the waste and to report its findings and recommendations to Congress and the Secretary of Energy at least twice yearly. The Board only can make recommendations; it cannot compel the DOE to comply. The Board strives to provide Congress and the Secretary of Energy with completely independent, credible, and timely technical and scientific program evaluations and recommendations achieved through peer review of the highest quality.

Board Performance Criteria and Method of Evaluation

The Board believes that measuring its effectiveness by directly correlating Board recommendations with improvements in the technical and scientific validity of DOE activities would be ideal. However, the Board cannot compel the DOE to comply with its recommendations. Consequently, a judgment about whether a specific recommendation had a positive outcome as defined above may be (1) subjective or (2) an imprecise indicator of Board performance because implementation of Board recommendations is outside the Board's direct control. Therefore, the Board has developed the following criteria to measure its annual performance in achieving individual performance goals.

1. Did the Board undertake the reviews, analyses, or other activities needed to evaluate the technical and scientific validity of the DOE activity identified in the performance goal?

2. Were the results of the Board's evaluation communicated in a timely, understandable, and appropriate way to Congress, the Secretary of Energy, the Office of Civilian Radioactive Waste Management (OCRWM), or the public?

If both measures are met in relation to a specific goal, the Board's performance in meeting that 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. If the goals are deferred or outdated, it will be noted in the evaluation.

The Board will use this evaluation of its own performance from fiscal year (FY) 2005, together with its assessment of current or potential key technical issues of concern related to the DOE program, to develop its annual performance objectives and to inform spending allocations in its performance-based budget for subsequent years.

Performance Evaluation for FY 2005

The Board's performance goals for FY 2005 were developed to achieve the general goals and strategic objectives in the Board's strategic plan for fiscal years 2004–2009. The goals also were 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 U. S. Nuclear Regulatory Commission (NRC) for authorization to construct 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 efforts to evaluate program activities, taking into account the interdependence of components of the repository system and the waste management system.

This evaluation will be submitted to the Office of Management and Budget (OMB), attached to the Board's budget request to Congress for FY 2007, included in the Board's summary report for 2005, and posted on the Board's Web site (www.nwtrb.gov). The reliability and completeness of the performance data used to evaluate the Board's performance relative to its annual performance goals are high and can be verified by accessing the referenced documents on the Board's Web site.

Strategy for Achieving Performance Goals

To evaluate DOE activities and achieve its performance goals, the Board engages in the following activities in any given year:

- Holding public meetings of the full Board and of Board panels.
- Reviewing the common DOE database, including scientific literature and laboratory and field data, contractor reports, analysis and model reports, and total system performance assessment (TSPA).
- Meeting with DOE contractor principal investigators on technical issues, observing ongoing tests and laboratory and field investigations, and visiting potential analog sites.
- Visiting nuclear waste disposal programs in other countries and attending national and international symposia and conferences.

In addition, in FY 2005, small contingents of Board members and staff held fact-finding meetings with the DOE, its contractors, and key stakeholders (e.g., representatives of the rail and trucking industries, the nuclear utilities, and logistics service providers). The fact-finding meetings enabled the Board to engage in concentrated discussions of important technical issues and to understand better how the DOE applies fundamental methods of analysis. Those meetings facilitated and enhanced the Board's evaluation of current issues of importance to the DOE program and helped identify additional technical issues that will be the focus of the Board's evaluation of DOE activities in coming years. In the following evaluation of the Board's performance for FY 2005, the meetings are referenced by date and the topics discussed.

For this evaluation, the Board's performance goals for FY 2005 have been organized and numbered to correlate with appropriate strategic objectives in the Board's strategic plan for FY 2004–2009.

FY 2005 Board Performance Goals and Evaluation

1. The Natural System

1.1.1. Review the technical activities and agenda of the DOE's science and technology program.

Evaluation of 1.1.1: Effective. *Explanation: During FY 2005, the Board engaged in several fact-finding meetings at which activities of the Office of Science & Technology and International (OSTI) were discussed. In its letter dated November 30, 2004, to OCRWM director, Dr Margaret Chu, the Board commented on the importance of the science and technology program. In its December 30, 2004, letter report to Congress and the Secretary of Energy, the Board again commented on the importance of the science and technology effort.*

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

Evaluation of 1.1.2: Effective. *Explanation: The Board held a fact-finding meeting on SZ flow and transport on September 7-8, 2005. The DOE's work related to understanding SZ flow and transport was discussed in some detail at the meeting. The Board's December 2004 report to Congress and the Secretary described studies and analyses under way indicating that the natural system might be an effective barrier against radionuclide migration and identifying a better understanding of the waste-isolation characteristics and behavior of the natural system as an area requiring more attention.*

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.

Evaluation of 1.1.3: Effective. *Explanation: The Board commented on DOE efforts to increase fundamental understanding of the Yucca Mountain site in its November 2004 letter to Dr. Chu. The Board's December 2004 report to Congress and the Secretary described studies and analyses under way indicating that the natural system might be an effective barrier against radionuclide migration and identifying a better understanding of the waste-isolation characteristics and*

behavior of the natural system as an area requiring more attention. In the same letter report, the Board stated that estimates of the performance of the natural barriers should be based on multiple lines of evidence. The Board held two fact-finding meetings during FY 2005, at which the SZ and the unsaturated zone (UZ) were discussed in detail.

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

Evaluation of 1.2.1: Effective. *Explanation: The Board commented on the DOE's progress in developing realistic ground-motion estimates in its November 2004 letter to Dr. Chu and noted that OSTI was undertaking work in this area. The Board included its comments on realistic ground-motion estimates in its December 2004 letter report to Congress and the Secretary. In the same report, the Board noted the completion of an aeromagnetic survey that could shed light on igneous activity at Yucca Mountain and commented on the need to improve modeling of volcanic consequences.*

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

Evaluation of 1.3.1: Effective. *Explanation: The Board commented on the importance of maintaining access to the ECRB in its November 2004 letter to Dr. Chu. The Board held a fact-finding meeting on June 27-28, 2005, at which issues relevant to testing in the ECRB were discussed. The Board will comment on the need to complete studies in the ECRB in its December 2005 report to Congress and the Secretary.*

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

Evaluation of 1.3.2: Effective. *Explanation: The Board commented on the importance of completing the drift-scale heater test in its November 2004 letter to Dr. Chu. The Board held a fact-finding meeting on the UZ in June 2005 at which issues relevant to the drift-scale heater test were discussed. The Board will comment on the need to complete the drift-scale test in its December 2005 report to Congress and the Secretary.*

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

Evaluation of 1.3.3: Minimally effective/deferred. *Explanation: The DOE did not report on its activities in this area during FY 2005. The Board will comment on the need to continue testing at the Peña Blanca analog site in its December 2005 letter report to Congress and the Secretary.*

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.

Evaluation of 1.3.4: Effective. *Explanation: The Board discussed with the OCRWM ways to reduce technical and scientific uncertainty and make performance estimates more realistic at several fact-finding meetings held in 2005. The Board commented on the need for a clear explanation and understanding of repository conditions after closure in its December 2004 letter report to Congress and the Secretary. In the same*

report, the Board cited the need to address uncertainties related to the pervasiveness of capillary and thermal barriers, which will affect seepage into repository tunnels. The Board commented on the DOE's climate studies using opal dating in its April 19, 2005, letter to OCRWM director, Theodore Garrish.

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

Evaluation of 1.4.1: Minimally Effective/deferred. *Explanation: The Board discussed tunnel stability at its fact-finding meeting with the DOE on surface/subsurface facility design and operations held on September 19-20, 2005. Plans are under way for a small fact-finding meeting with the OCRWM in early 2006 to discuss research results from OSTI work.*

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

Evaluation of 1.5.1: Effective. *Explanation: The Board discussed these issues with the OCRWM at a fact-finding meeting on surface/subsurface facility design on Sept 19-20, 2005. The Board commented on the need for such integration in its November 2004 letter to Dr. Chu. Integration of TSPA and repository design was discussed at a meeting of the full Board held on February 9–10, 2005.*

2. The Engineered System

2.1.1. Monitor the DOE's performance allocation studies.

Evaluation of 2.1.1: Outdated goal. *Explanation: No such DOE studies were performed in FY 2005 or are expected. This goal will be eliminated in FY 2006.*

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

Evaluation of 2.2.1: Effective. *Explanation: The DOE's thermal management strategy was discussed at a meeting of the full Board in February 2004. The Board held fact-finding meetings with the OCRWM on thermal management on September 20–21, 2005, and on surface/subsurface facility design on September 19-20, 2005, at which these issues were discussed.*

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.

Evaluation of 2.2.2: Effective. *Explanation: Several Board members participated in three fact-finding meetings with the OCRWM at which these issues were discussed. The Board commented on the corrosion resistance of Alloy-22 in magmas and the potential for stress-corrosion cracking in its November 2004 letter to Dr. Chu. In its December 2004 letter report to Congress and the Secretary, the Board noted that a major issue involving deliquescence-induced localized corrosion had been addressed by the DOE. In the same report, the Board raised several other corrosion issues that require continued attention, including the presence of ammonium ion in repository tunnels and potential stress-corrosion cracking of the drip shield.*

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

Evaluation of 2.3.1: Effective. *Explanation: See evaluation of 2.2.2.*

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

Evaluation of 2.3.2: Deferred. *Explanation: The DOE did not engage in such activities during FY 2005.*

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

Evaluation of 2.4.1: Effective. *Explanation: At the Board's February 2004 meeting, the DOE presented information related to the integration of TSPA results into repository design efforts. Several members of the Board participated in a September 2005 fact-finding meeting with the DOE on surface and subsurface facility design at which these issues were discussed.*

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.

Evaluation of 2.4.2: Effective. *Explanation: At the Board's February 2004 meeting, the DOE presented information related to the integration of TSPA results with repository design efforts. Several members of the Board participated in a September 2005 fact-finding meeting on surface and subsurface facility design at which these issues were discussed. In its November 2004 letter to Dr. Chu, the Board commented on the need to analyze engineering design using TSPA.*

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

Evaluation of 2.4.3: Effective. *Explanation: See evaluation of 2.4.2.*

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

Evaluation of 2.5.1: Effective. *Explanation: Several members of the Board participated in a September 2005 fact-finding meeting with the OCRWM on surface and subsurface facility design at which these issues were discussed. The Board commented on the need to analyze and integrate engineering design using TSPA in its November 2004 letter to Dr. Chu.*

3. Repository System Performance and Integration

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

Evaluation of 3.1.1: Effective. *Explanation: During 2005, Board members participated in fact-finding meetings with the DOE designed to provide detailed information on technical and scientific issues currently important to the DOE repository program. The Board's December 2004 letter report to Congress and the Secretary provided an overview of the Board's views on areas of progress and issues requiring additional attention.*

3.1.2. Determine the strengths and weaknesses of TSPA.

Evaluation of 3.1.2: Effective. *Explanation: Several Board members participated in a fact-finding meeting with the OCRWM on TSPA in August 2005 at which*

these issues were discussed at length. The Board commented on issues related to integration and model validation in its November 2004 letter to Dr. Chu. The Board commented further on these issues in its December 2004 report to Congress and the Secretary. In its April 2005 letter to Mr. Garrish, the Board noted that TSPA will need to address relevant hydrologic processes that may be significant beyond 10,000 years and that technical and scientific elements of TSPA might change if the standard is modified.

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

Evaluation of 3.1.3: Effective. *Explanation: Several Board members participated in a fact-finding meeting with the DOE on TSPA in August 2005 at which these issues were discussed. In its November 2004 letter to Dr. Chu, the Board pointed out that engineering design and operations should be analyzed using TSPA to determine the potential significance of changes on the overall repository system. The Board used as an example that if the repository is modified to mitigate the effects of igneous activity, the modifications should be evaluated for their effects on repository performance. The Board also commented on the DOE's progress in making its ground-motion estimates more realistic. The same issues were raised in the Board's December 2004 letter report to Congress and the Secretary.*

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

Evaluation of 3.2.1: Minimally Effective. *Explanation: Several Board members participated in a fact-finding meeting with the DOE on TSPA in August 2005 at which these issues were discussed.*

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

Evaluation of 3.2.2: Effective. *Explanation: Several Board members participated in a fact-finding meeting with the DOE on TSPA in August 2005 at which these issues were discussed. In its April 2005 letter to Mr. Garrish, the Board noted that TSPA will need to address relevant hydrologic processes that may be significant beyond 10,000 years and that technical and scientific elements of TSPA might change if the standard is modified.*

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

Evaluation of 3.3.1: Effective. *Explanation: Several Board members participated in a fact-finding meeting on TSPA in August 2005 at which these issues were discussed. The Board will comment in its year-end report in December 2005 that the DOE should prepare a parallel analysis that can be used by policy-makers, the public, and the technical and scientific community to understand how the natural and engineered components of a repository would work together to isolate waste and to gauge the degree of conservatism of TSPA assumptions and estimates.*

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

Evaluation of 3.3.2: Effective. *Explanation: See Evaluation of 3.3.1.*

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

Evaluation of 3.3.3: Deferred. *Explanation: The DOE did not present any information to the Board on this topic in FY 2005.*

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

Evaluation of 3.4.1: Effective. *Explanation: In its December 2004 letter report to Congress and the Secretary, the Board encouraged the DOE to continue studies that will lead to a better understanding of the contribution of the natural system. The Board will comment in its year-end report in 2005 that the DOE should prepare a parallel analysis that can be used by policy-makers, the public, and the technical and scientific community to understand how the natural and engineered components of a repository would work together to isolate waste and to gauge the degree of conservatism of TSPA assumptions and estimates.*

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.

Evaluation of 3.5.1: Minimally effective. *Explanation: In September 2005, several Board members participated in a fact-finding meeting with the DOE on surface and subsurface facility design at which these issues were discussed. This performance goal will be modified in FY 2006.*

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

Evaluation of 3.6.1: Effective. *Explanation: In its April 2005 letter to Mr. Garrish, the Board stated that program integration is of continuing Board interest and could affect the DOE's safety case. The Board will comment in its year-end report in December 2005 that the DOE should prepare a parallel analysis that can be used by policy-makers, the public, and the technical and scientific community to understand how the natural and engineered components of a repository would work together to isolate waste and to gauge the degree of conservatism of TSPA assumptions and estimates.*

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

Evaluation of 3.7.1: Effective. *Explanation: The DOE updated the Board on its performance-confirmation (PC) plans at the Board's February 2004 meeting. In the Board's April 2005 letter to Mr. Garrish, the Board observed that many activities identified to be undertaken as part of PC can be used for validating modeling assumptions that form the basis of TSPA. The Board noted that rather than being integrated, PC is operating independently of TSPA and of the ongoing work on repository design.*

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

Evaluation of 3.7.2: Effective. *Explanation: See evaluation of 3.7.1.*

4. The Waste Management System

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

Evaluation of 4.1.1: Effective. *Explanation: Several Board members participated in a fact-finding meeting with the DOE in September 2005 on surface and subsurface facility design and operations at which these issues were discussed in detail. In a November 2004 letter to Dr. Chu, the Board discussed integration of the total waste management system. The Board commented on integration of the waste management system in its December 2004 letter report to Congress and the Secretary, indicating that planning and design of an integrated waste management system would remain a top priority for the Board. The DOE presented an overview of waste management-system integration at the Board's February 2005 meeting. The Board commented again on these issues in its April 2005 letter to Mr. Garrish.*

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

Evaluation of 4.1.2: Effective. *Explanation: See evaluation of 4.1.1.*

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.

Evaluation of 4.1.3: Effective. *Explanation: See evaluation of 4.1.1.*

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

Evaluation of 4.1.4: Effective. *Explanation: See evaluation of 4.1.1.*

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

Evaluation of 4.1.5: Minimally effective/deferred. *Explanation: Some discussion of these issues took place at a fact-finding meeting with stakeholders in October 2005. The Board will review whatever activities the DOE undertakes in this area in FY 2006.*

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

Evaluation of 4.2.1: Effective. *Explanation: The Board's Panel on the Waste Management System held a meeting in October 2004 at which the DOE's development of Section 180(c) programs was discussed, including reactions to the DOE efforts by state and regional stakeholders. In a follow-up letter to Dr. Chu, the Board observed that emergency planning through the 180(c) program appeared to be based on funding formulas and not enough on ensuring that adequate emergency response capacity exists along all selected routes. The issue was raised again at a fact-finding meeting with stakeholders in October 2005.*

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.

Evaluation of 4.3.1: Effective. *Explanation: The Board's panel on the Waste Management System met with the DOE and stakeholders in October 2004. The*

meeting agenda was devoted entirely to this topic. The Board sent a letter to Dr. Chu in December 2004 following up on issues identified at the October panel meeting. Some issues discussed in the letter included transportation planning—the Board recommended a systematic approach; security and emergency response planning; transportation risk assessment—the Board suggested a more risk-based approach; route selection; and program integration. The Board's December 2004 letter to Congress and the Secretary acknowledged transportation as an area where the DOE had made progress. Development of the waste management system was identified as a top priority for future Board review. In February 2005, the Board held a panel meeting on transportation—specifically, the Nevada branch line—in Caliente, Nevada. The Board sent a letter to Mr. Garrish on these subjects in April 2004.

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

Evaluation of 4.3.2: Effective. *Explanation: This topic was discussed at the Board's October 2004 panel meeting and in the December 2004 follow-up letter to the DOE. The Board indicated that it was advisable to involve state regional and tribal groups in developing the criteria. The Board noted that of particular importance was that technical issues are identified and that sound methods for addressing them are developed and applied.*

4.3.3. Evaluate logistics capabilities of the transportation system.

Evaluation of 4.3.3: Effective. *Explanation: In the Board's April 2005 letter to the DOE, the total system model was mentioned as having potential for planning and integrating the waste management system. In its December 2004 letter, the Board suggested that the DOE work with utilities in designing the waste management system. This topic was discussed at a fact-finding meeting with transportation service providers in October 2005. In the Board's December 2005 letter to Congress and the Secretary, the Board suggested that the DOE should determine first-hand the logistics capabilities at the reactor sites.*

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

Evaluation of 4.3.4: Effective. *Explanation: In the Board's April 2005 letter to the DOE, the total system model was mentioned as having potential for planning and integrating the waste management system. This topic also was discussed at a fact-finding meeting with transportation service providers in October 2005.*

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.

Evaluation of 4.3.5.: ***Effective.*** *Explanation: See evaluation of 4.3.4.*

ADDENDUM B

Supplementary Information on the Nuclear Waste Technical Review Board

The U.S. Nuclear Waste Technical Review Board was established on December 22, 1987, in the Nuclear Waste Policy Amendments Act (NWPAA) as an independent agency in the executive branch of the federal government. The Board is charged with evaluating the technical and scientific validity of activities undertaken by the Secretary of Energy, including the following:

- site characterization
- activities related to packaging and transporting high-level radioactive aste and spent nuclear fuel.

The Board was given broad latitude to review activities undertaken by the Secretary of Energy in implementing the Nuclear Waste Policy Act. However, the Board was not given authority to require the DOE to implement Board recommendations.[1]

Board Members

The NWPAA authorized a Board of 11 members who serve on a part-time basis; are eminent in a field of science or engineering, including environmental sciences; and are selected solely on the basis of distinguished professional service. The law stipulates that the Board shall represent a broad range of scientific and engineering disciplines relevant to nuclear waste management. Board members are appointed by the President from a list of candidates recommended by the National Academy of Sciences. To prevent gaps in the Board's comprehensive technical review, Board members whose terms have expired continue serving until they are reappointed or their replacements assume office. The first members were appointed to the Board on January 18, 1989. Current members were appointed by President George W. Bush.

The names and affiliations of the current 10 Board members are listed below.

[1] Taken from Legislative History of the Nuclear Waste Policy Amendments Act of 1987, February 26, 1998.

- B. John Garrick, Ph.D., P.E., is chairman of the Board. A founder of PLG, Inc., he retired from the firm in 1997 and is a private consultant. His areas of expertise include probabilistic risk assessment and application of the risk sciences to technology-based industries.
- Mark Abkowitz, Ph.D., is a professor in the Department of Civil & Environmental Engineering and director of the Vanderbilt Center for Environmental Management studies at Vanderbilt University. His areas of expertise include risk management, transportation of hazardous materials, emergency preparedness, and applications of advanced information technology.
- William Howard Arnold, Ph.D., P.E., a private consultant, retired from Louisiana Energy Services in 1996. He holds a doctorate in experimental physics and has special expertise in nuclear project development.
- Thure Cerling, Ph.D., is a professor in the Department of Geology and Geophysics at the University of Utah. His areas of expertise include terrestrial geochemistry.
- David Duquette, Ph.D., is professor and head of the Department of Materials Science and Engineering at Rensselaer Polytechnic Institute in New York. His areas of expertise include the physical, chemical, and mechanical properties of metals and alloys.
- George M. Hornberger, Ph.D., is Ernest H. Ern Professor of Environmental Sciences in the Department of Environmental Sciences at the University of Virginia. His areas of expertise include catchment hydrology and hydrochemistry and transport of colloids in geologic media.
- Andrew C. Kadak, Ph.D., is a Professor of the Practice in the Nuclear Engineering Department of the Massachusetts Institute of Technology. His areas of expertise include nuclear engineering and the development of advanced reactors.
- Ron Latanision, Ph.D., is a professor at the Massachusetts Institute of Technology with joint appointments in the Department of Materials Science and Engineering and the Department of Nuclear Engineering. His areas of expertise include materials processing and corrosion of metals and other materials in aqueous environments.
- Ali Mosleh, Ph. D., is professor of reliability engineering at the University of Maryland. His areas of expertise include risk and safety assessment reliability analysis and decision analysis.
- Henry R. Petroski, Ph.D., P.E., is professor of civil engineering and professor of history at Duke University. His areas of expertise include failure analysis and design theory.

Board Staff

The NWPAA limits the Board's professional staff to 10 positions. An additional 5 full-time employees provide administrative support to Board members and the professional staff. Because of the comprehensive nature of the program, the diversity of Board member experience and expertise, and the part-time availability of Board members, the small, highly qualified staff is employed to its full capacity in supporting the Board's review of the DOE program. The Board's offices are in Arlington, Virginia.

Board Reporting Requirements

As required under the NWPAA, the Board reports to the U.S. Congress and the Secretary of Energy at least two times each year. The reports include Board recommendations related to improving the technical and scientific validity of activities undertaken by the Secretary of Energy under the civilian radioactive waste management program. The DOE's written responses to Board recommendations are published in the Board's annual summary reports.

Board Activities

The Board and its panels sponsor meetings and technical exchanges with program participants and interested parties, including representatives of the DOE and its contractors, the U.S. Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, the U.S. Geological Survey, the U.S. Department of Transportation, the State of Nevada, affected units of local governments, Native American tribes, nuclear utilities, environmental groups, state utility regulators, and members of the public. Board members and staff attend relevant technical conferences, meetings, symposia, and workshops. They participate in field trips and occasionally visit foreign programs to gain insights from the experience of other countries' repository development efforts.

Board and panel meetings are open to the public and are announced in the Federal Register four to six weeks before each meeting. To facilitate access for program participants and the public, the Board holds the majority of its meetings in the State of Nevada, and time is set aside for public comment at each meeting. Transcripts of Board and panel meetings and all Board reports, correspondence, and congressional testimony are available to the public via telephone or written request or can be obtained from the Board's Web site: www.nwtrb.gov.

Appendix H

Nuclear Waste Technical Review Board
Fiscal Year (FY) 2008 Budget Request Submittal

Including Performance Evaluation for FY 2006 and Supplementary Information about the Board

Nuclear Waste Technical Review Board Fiscal Year (FY) 2008 Budget Request Submittal

Summary and Highlights

The U.S. Nuclear Waste Technical Review Board's performance-based budget request for fiscal year (FY) 2008 will support Board activities related to achieving its performance goals for the year. The Board's general goals, strategic objectives, and annual performance goals are listed in the budget document and have been established in accordance with the Board's congressional mandate to conduct an independent evaluation of the technical and scientific validity of U.S. Department of Energy (DOE) activities related to disposing of commercial spent nuclear fuel and defense high-level radioactive waste. Such activities include developing performance estimates for, designing, and potentially constructing a repository at Yucca Mountain in Nevada. The Board also is mandated to review DOE activities related to packaging and transporting the waste to the proposed repository site. The Board's ongoing peer review is vital to the credibility of DOE's technical and scientific activities.

In FY 2007, the Board organized its review of DOE activities into three technical areas: *preclosure operations*, including surface-facility design and operations and the transport of spent nuclear fuel and high-level radioactive waste from nuclear utility reactors or storage facilities to the repository site; *postclosure* repository performance issues, including the nature of the source term and the movement of the radionuclides most significant to dose through the engineered and natural barriers; and the *integration* of science and engineering and preclosure and postclosure activities, including the effects of temperatures on repository performance and the effects of waste package designs on the temperatures in the repository.

The Board's strategic goals and objectives have been organized around these three technical areas and the Board's panels have been realigned to help facilitate and focus the Board's review. In addition, the Board's performance goals for FY 2008 have been updated to reflect the reorganization of the Board's approach to evaluation and expected DOE activities during the period. For example, the Board will review DOE activities related to developing realistic models of repository performance; determining the source term—the release of dose-contributing radionuclides as a function of time from the engineered-barrier system; implementing the transportation, aging, and disposal (TAD) program; analyzing the potential for localized corrosion of waste packages; and developing a

technically-based and integrated thermal management strategy. The Board is requesting $3,621,000 to support its comprehensive technical review in FY 2008.

U.S. Nuclear Waste Technical Review Board

Salaries and Expenses (Including Transfer of Funds)

For necessary expenses of the Nuclear Waste Technical Review Board, as authorized by Public Law 100-203, section 5051, $3,621,000 to be transferred from the Nuclear Waste Fund and to remain available until expended.

Note. — The regular FY 2007 appropriation for this account had not been enacted at the time the budget was prepared; therefore, this account is operating under a Continuing Resolution (P.L. 109-289, Division B, as amended). The amounts included for FY 2007 in this budget reflect the levels provided by the Continuing Resolution.

(2006 Energy and Water Development Appropriations Act, P.L. 109-103)

Board Performance-Based Budget Request for FY 2008

Background

Approximately 2,000 metric tons of spent nuclear fuel are produced each year by nuclear reactors and are stored at more than 70 sites nationwide. By the time the presently operating reactors reach the end of their scheduled 40-year lifetimes (at some time in the 2030's), approximately 87,000 metric tons of spent fuel will have been produced. (This estimate does not include spent nuclear fuel from plants that may be granted license renewals by the NRC.) In addition, high-level radioactive waste (HLW) from defense activities has been stored at numerous federal facilities throughout the country. Disposal of the spent nuclear fuel and HLW in a deep geologic repository is the primary approach being pursued by the United States and other countries.

In early 2002, the Secretary of Energy recommended approval of the Yucca Mountain site to the President. The President then recommended the site to Congress. The State of Nevada later disapproved the recommendation. Later that same year, both the U.S. House of Representatives and the U.S. Senate formally approved the site recommendation. Since that time, DOE has focused on preparing an application to be submitted to NRC for authorization to construct a repository at the Yucca Mountain site. Throughout this process, the Board has evaluated the technical basis of DOE's work and communicated Board views to Congress and the Secretary of Energy in letters, reports, and congressional testimony.

The Board's Continuing Role

The Board was established by Congress in the Nuclear Waste Policy Amendments Act (NWPAA) of 1987. The Board is charged with evaluating the technical and scientific validity of activities undertaken by the Secretary of Energy, including site-characterization activities and activities related to the packaging and transportation of HLW and spent nuclear fuel.[1] Board technical and scientific findings and recommendations are included in reports that are submitted at least twice each year to Congress and the Secretary. In creat-

[1] 42 U.S.C. 10263

ing the Board, Congress realized that an ongoing independent and expert evaluation of the technical and scientific validity of DOE's site-evaluation and other waste-management activities would be crucial to acceptance by the public and the scientific community of any approach for disposing of spent nuclear fuel and HLW.

Board Funding Requirement for FY 2008: $3,621,000

The Board's budget request of $3,621,000 for FY 2008 represents the funding needed to accomplish the Board's performance goals for the year. During FY 2008, the Board will continue to review DOE activities, including those related to developing realistic models of repository performance; determining the source term—the release of dose-contributing radionuclides as a function of time from the engineered-barrier system; implementing the transportation, aging, and disposal (TAD) concept; analyzing the potential for localized corrosion of waste packages; and developing a technically-based and integrated thermal management strategy. The amount requested will support the work of the Board members who will conduct the comprehensive review described above and enable the Board to comply with extensive federal security requirements related to the Board's information systems.

Board General Goals and Strategic Objectives for FY 2007–2012

The Board's general goals and strategic objectives were revised in its strategic plan for FY 2007–2012. They have been established in accordance with the Board's statutory mandate and with anticipated DOE activities during the five-year period.

General Goals

The Board's general goals for FY 2007–2012 reflect the importance of gaining a realistic understanding of the potential performance of the proposed repository and the interdependence and interactions of all elements of the nuclear waste management system.

The following are the Board's general goals for FY 2007–2012.

1. Evaluate the technical and scientific validity of activities undertaken by DOE related to preclosure operations.
2. Evaluate the technical and scientific validity of activities undertaken by DOE related to postclosure repository performance.
3. Evaluate the technical and scientific validity of activities undertaken by DOE related to integrating science and engineering and cross-cutting preclosure and postclosure issues.

Strategic Objectives

To achieve its general goals, the Board has established the following 5-year objectives.

1. Objectives Related to the Preclosure Period

1.1 Evaluate the technical and scientific validity of DOE efforts to implement its TAD canister concept.

1.2. Evaluate DOE efforts to design and construct surface facilities and infrastructure at the proposed repository site.

1.3. Review DOE efforts to develop a plan for transporting waste from reactor or federal storage sites to the proposed repository.

2. Objectives Related to the Postclosure Period

2.1. Evaluate DOE studies and analyses related to determining the source term of the release of dose-contributing radionuclides as a function of time from the engineered-barrier system.

2.2. Encourage DOE to develop realistic performance models and review the technical and scientific validity of DOE efforts to gain a more realistic understanding of potential repository performance.

2.3. Evaluate the technical and scientific validity of DOE data and analyses related to infiltration, flow and transport through the natural system, and seepage into drifts.

2.4. Assess DOE efforts to increase understanding of repository tunnel environments and the potential of localized corrosion of waste packages in the proposed repository.

2.5. Review DOE activities related to predicting the potential effect on dose of disruptive events.

3. Objectives Related to System Integration

3.1. Evaluate DOE efforts to develop thermal criteria for the repository and a strategy for managing the effects of heat on preclosure operations and postclosure repository performance.

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

3.3. Review DOE integration of operational and performance models.

3.4. Review DOE analysis and integration of issues and designs related to receipt, processing, aging, and emplacement of spent nuclear fuel and high-level radioactive waste (e.g., TAD and Yucca Mountain surface facilities).

Board Performance Goals for FY 2008

The Board's performance goals for FY 2008 have been established in accordance with its general goals and strategic objectives. The Board's performance-based budget for FY 2008 has been developed to enable the Board to meet its performance goals for the year.

The Board will accomplish its goals by doing the following:

- Holding up to three public meetings with DOE and DOE contractor personnel involving the full Board and holding meetings of the Board panels and technical workshops, as needed.
- When appropriate, holding fact-finding sessions involving small groups of Board members who will focus in depth on specific technical topics.
- Reviewing critical documents provided by DOE and its contractors, including TSPA, preclosure safety analyses (PCSA), contractor reports, analysis and modeling reports (AMR), and design drawings and specifications.

- When appropriate, visiting and observing ongoing investigations, including those conducted at the national laboratories or potential analog sites.
- On occasion, visiting programs in other countries and attending national and international symposia and conferences.

The Board's performance goals for FY 2008, which are described below, are divided into three technical areas that correlate with the Board's recently reorganized panel structure. The numbered goals also correspond with the Board's strategic objectives. Funding allocations for fiscal years 2006, 2007, and 2008 are indicated for each set of performance goals.

1. Performance Goals Related to Preclosure Operations

(Dollars in Thousands)		
FY 06	**FY 07**	**FY 08**
898	**917**	**905**

1.1.1. Review DOE analyses of facilities, systems, and component designs related to implementation of the TAD.

1.1.2 Review DOE procedures for ensuring that waste accepted for disposal has been suitably characterized.

1.2.1 Evaluate the design of surface facilities, including the fuel handling and aging facilities, and how the design affects and is affected by the thermal management of the repository.

1.3.1 Evaluate DOE's analysis of the comparative risks of alternative transportation modes and routes.

1.3.2. Review DOE efforts to develop criteria for routing decisions.

1.3.3 Evaluate logistics capabilities of the transportation system.

1.3.4. Evaluate DOE plans for enhancing safety capabilities along transportation corridors, review DOE planning and coordination activities, accident prevention activities, and emergency response activities.

2. Performance Goals Related to Postclosure Repository Performance

(Dollars in Thousands)		
FY 06	**FY 07**	**FY 08**
1,796	**1,835**	**1,811**

2.1.1. Evaluate DOE efforts to analyze the source term and to estimate the length of time it will take for radionuclides to be mobilized and transported through the natural system.

2.1.2. Evaluate activities undertaken by DOE to develop a risk profile for specific radionuclides.

2.2.1. Review updates of Total System Performance Assessment (TSPA) models; identify models and data that should be updated.

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

2.2.3. Evaluate results of studies undertaken by the science and technology program related to reducing uncertainties about the performance of the natural and engineered components of the repository.

2.2.4. Evaluate information from the science and technology program on secondary mineral phases and neptunium and plutonium mobilization.

2.2.5. Review DOE efforts to develop and articulate a repository safety case.

2.3.1. 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.

2.3.2. Review new infiltration work undertaken in response to questions about QA procedures used to obtained previous infiltration estimates.

2.4.1. 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.

2.4.2. Review thermal-mechanical and rock-stability testing on potential conditions in repository tunnels.

2.5.1. Review DOE efforts in addressing questions related to possible seismic and igneous events and consequences.

3. Performance Goals Related to System Integration

(Dollars in Thousands)		
FY 06	**FY 07**	**FY 08**
897	**918**	**905**

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

3.1.2. Evaluate the integration of subsurface and repository designs, layout, and operational plans into an overall thermal management strategy.

3.2.1. Assess the integration of scientific studies into engineering designs for the repository and the waste package.

3.2.2. Review DOE efforts in integrating results of scientific studies related to the behavior of the natural system into repository designs.

3.2.3. Evaluate the integration of the repository facility, including the surface and subsurface components.

3.3.1. Review the potential and limits of the Total System Model (TSM).

3.4.1. Review DOE analyses and integration of designs for facilities, systems, and repository components, including TAD.

3.4.2. Evaluate DOE efforts to assess and integrate information on surface facilities and infrastructure at nuclear utility reactor sites.

FY 2008 Budget Request by Object Class

Object Class 11.1, Full-Time Staff: $1,810,000

The amount requested for full-time permanent staff is based on the requirement to fund 15 total positions. Because the Board's technical and scientific evaluations are conducted by Board members supported by professional staff, the Board's enabling legislation authorizes the Board chairman to appoint and fix the compensation of not more than 10 senior professional staff members. This request assumes the use of all 10 positions under this authority. In addition, the chair is authorized to appoint such clerical and administrative staff as may be necessary to discharge the responsibilities of the Board. The other 5 positions funded under this object class are support staff engaged in clerical, secretarial, and administrative activities; development and dissemination of Board publications; information technology, including maintenance of the Board's Web site; public affairs; financial and meeting logistics for the Board. The small administrative staff supports the very active part-time Board members and full-time professional staff.

The estimate assumes a 1.031 percent combined cost-of-living adjustment and locality raise in January 2008 for both General Schedule and Executive Schedule employees.

Object Class 11.3, Other than Full-Time Permanent Staff: $361,000

The amount requested for this category includes compensation for Board members. Each Board member will be compensated at the rate of pay for Level III of the Executive Schedule for each day that the member is engaged in work for the Board. The 11 Board members serve on a part-time basis equaling 2 full-time equivalent positions. The budget assumes that each member will attend 3 full Board meetings, 1 panel meeting, and an average of 3 additional meetings or field trips during the year. This estimate represents an average of 54 workdays per member in FY 2008. This estimate also assumes a 1.031 percent increase in Executive Schedule compensation for employees in this category for FY 2008 (effective January 2008).

Object Class 11.5, Other Personnel Compensation: $36,000

The amount requested for this category covers performance awards under the Performance Management System approved by the Office of Personnel Management (OPM).

Object Class 12.1, Civilian Personnel Benefits: $468,000

The estimate for this category represents the government's contribution for employee benefits at the rate of 25.6 percent for staff and 7.65 percent for members.

Object Class 21.0, Travel: $283,000

The amount requested for this object class includes travel costs for Board members, staff, and consultants traveling to Board and panel meetings, to other meetings (including professional meetings, conferences, and orientation activities) and sites to acquire technical and scientific data, and to Yucca Mountain in Nevada to review site activities within the scope of the Board's mission. The request is based on 11 Board members attending 3 Board and 1 panel meeting and making an average of 3 other trips during the year at an average length of 3 days each, including travel time. In addition, the 10 professional staff members will travel on similar activities an average of 9 trips during the year at an average of 3 days per trip. In FY 2008, the expectation is that DOE may increase its activities

related to planning for transportation and packaging of the waste and designing the repository surface and subsurface facilities. The Board's meetings will increase commensurately and will be held in parts of the country affected by DOE action.

Object Class 23.1, Rental Payments to the General Services Administration (GSA): $202,000

The estimate for this object class represents the amount that the Board will pay to the GSA for 6,288 square feet of office space.

Object Class 23.3, Communications, Utilities, Miscellaneous: $21,000

The requested amount represents estimates for telephone service, postage, local courier, video teleconferencing, FTS long-distance telephone service, the Internet, and mailing services related to management and use of the Board's mailing list.

Object Class 24.0, Printing and Reproduction: $17,000

The major items in this object class are the publication of reports to the U.S. Congress and the Secretary of Energy, publication of meeting notices in the Federal Register, production of press releases announcing meetings and report publication, and production of other informational materials for Board members and the public. All Board meetings are open to the public, and copies of meeting materials are provided at the meetings. Members of the public who live in rural areas and who do not have Web access receive the Board's material upon request.

Object Class 25.1, Consulting Services: $41,000

Consultants will be hired to support and supplement Board and staff analysis of specific technical and scientific issues. This will enable the Board to conduct the kind of comprehensive technical and scientific review mandated by Congress.

Object Class 25.2, Other Services: $145,000

This category includes court-reporting services for an estimated four Board or panel meetings, meeting-room rental and related services, maintenance agreements for equipment, professional development, and services from commercial sources. In addition, the Board will contract with part-time technical consultants to supplement and support in-house operations in systems management, Web site management, report production, and editing. Costs of a financial audit to comply with the Accountability of Tax Dollars Act also are included in this category.

Object Class 25.3, Services from Other Government Agencies: $100,000

This category includes GSA administrative support services (payroll, accounting, personnel, etc.), legal advice from GSA, security clearances through OPM, and other miscellaneous interagency agreements.

Object Class 26.0, Supplies and Materials: $54,000

Anticipated expenses include routine office supplies, subscriptions and library materials, and off-the-shelf technical reports and studies.

Object Class 31.0, Equipment: $83,000

This estimate is for miscellaneous equipment costs, including computer hardware, and computer-network software maintenance. In addition, funds are included to support the Federal Information Security Act, which requires federal agencies to periodically test and evaluate the effectiveness of their information security policies, procedures, and practices. The category also includes continued upgrades to IT security and continuity of operations (COOP) availability, support to E-Gov telecommuting efforts, and technical support of the management of electronic records and e-mails.

Nuclear Waste Technical Review Board

Projected 2008 Expenditures

Object Classifications

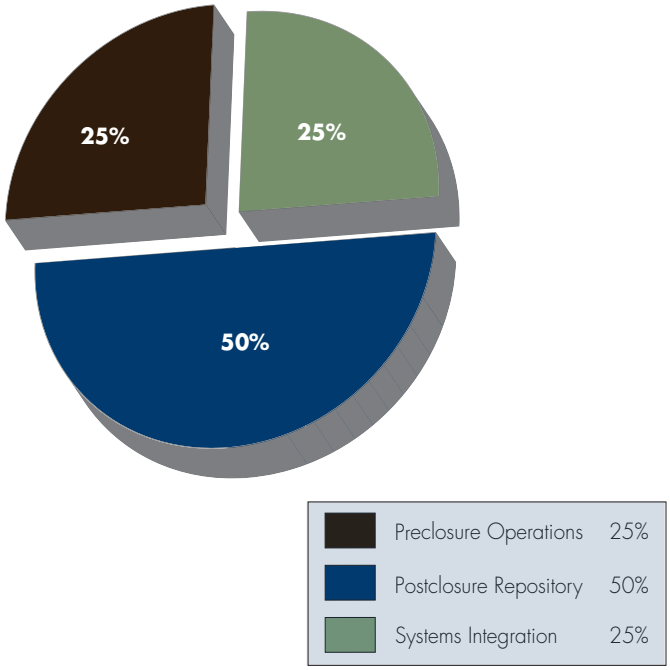
(in thousands of dollars; numbers are rounded)

Identification code 48-0500-0-1-271	FY 06 ACT	FY 07 REQ	FY 07 CR	FY 08 REQ
Expenditures				
Full-time Permanent	$1,558	$1,724	$1,725	$1,810
Board Members	362	367	365	361
Other Personnel Compensation	46	56	41	36
Total Personnel Compensation	**$1,966**	**$2,147**	**$2,131**	**$2,207**
Civilian Personnel Benefits	392	441	446	468
Travel and Transportation	336	298	250	283
Rental Payments to GSA	190	197	197	202
Communication, Utilities, Miscellaneous	25	24	26	21
Printing and Reproduction	9	23	16	17
Consulting Specialists	93	103	83	41
Other Services	291	177	233	145
Services from Government Accounts	102	108	89	100
Supplies and Technical Publications	52	62	58	54
IT Equipment and upgrades	135	91	80	83
Total Obligations	**$3,591**	**$3,670**	**$3,608**	**$3,621**

NOTE: FY 07 CR - salaries based on 2007 pay raise according to government guidelines.

Identification Code 48-0500-0-1-271	06 ACT	07 REQ	08 REQ
Total Number of Full-Time Permanent Positions	16	17	17
Total Compensable Work-Years: Full-Time Equivalents	16	17	17

FY 2008 Budget Request Resource Allocation



ADDENDUM A

Nuclear Waste Technical Review Board

Performance Evaluation

Fiscal Year 2006

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 commercial spent nuclear fuel and defense 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 directs the Board to evaluate continually the technical and scientific validity of activities undertaken by the Secretary of Energy related to disposing of, transporting, and packaging the waste and to report its findings and recommendations to Congress and the Secretary of Energy at least twice yearly. The Board only can make recommendations; it cannot compel DOE to comply. The Board strives to provide Congress and the Secretary of Energy with completely independent, credible, and timely technical and scientific program evaluations and recommendations achieved through peer review of the highest quality.

Board Performance Criteria and Method of Evaluation

The Board believes that measuring its effectiveness by directly correlating Board recommendations with improvements in the technical and scientific validity of DOE activities would be ideal. However, the Board cannot compel DOE to comply with its recommendations. Consequently, a judgment about whether a specific recommendation had a positive outcome as defined above may be (1) subjective or (2) an imprecise indicator of Board performance because implementation of Board recommendations is outside the Board's direct control. Therefore, the Board has developed the following criteria to measure its annual performance in achieving individual performance goals.

1. Did the Board undertake the reviews, analyses, or other activities needed to evaluate the technical and scientific validity of DOE activity identified in the performance goal?
2. Were the results of the Board's evaluation communicated in a timely, understandable, and appropriate way to Congress, the Secretary of Energy, the Office of Civilian Radioactive Waste Management (OCRWM), or the public?

If both measures are met in relation to a specific goal, the Board's performance in meeting that 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. If the goals are deferred or outdated, it will be noted in the evaluation.

The Board uses its annual performance evaluations, together with its assessment of current or potential key technical issues of concern related to DOE program, to develop its annual performance objectives and to inform spending allocations in its performance-based budget for subsequent years. The Boards evaluation of its success in achieving its performance goals for FY 2006 will be submitted to the Office of Management and Budget (OMB), attached to the Board's budget request to Congress for FY 2008, included in the Board's summary report for 2006, and posted on the Board's Web site (www.nwtrb.gov).

Performance Evaluation for FY 2006

The Board accomplishes its goals by doing some or all of the following:

- Holding up to three public meetings with DOE and DOE contractor personnel involving the full Board and holding meetings of the Board panels, as needed.
- When appropriate, holding fact-finding sessions involving small groups of Board members who will focus in depth on specific technical topics.
- Reviewing critical technical documents provided by DOE and its contractors, including TSPA, preclosure safety analyses (PCSA), contractor reports, analysis and modeling reports (AMR), and design drawings and specifications.
- When appropriate, visiting and observing ongoing technical and scientific investigations, including those conducted at the national laboratories or potential analog sites.
- Visiting programs in other countries and attending national and international symposia and conferences.

The Board's performance goals for FY 2006 that are listed below are divided into four topical areas that correspond to the Board's panel structure as it was organized in FY 2006. The numbering of the performance goals also correlates with the Board's general goals and strategic objectives set forth in its strategic plan for FY 2004-2009. Each performance goal is followed by a bullet that contains an evaluation of the Board's performance in achieving the performance goal and an explanation of the basis for the evaluation.

The reliability and completeness of the performance data used to evaluate the Board's performance relative to its annual performance goals are high and can be verified by accessing the referenced documents on the Board's Web site.

1. Performance Goals and Evaluation Related to the Natural System

1.1.1. Review the technical activities and plans for DOE's science and technology (S&T) program.

Evaluation of 1.1.1: Effective. *The Board commented on the importance of work undertaken by the S&T program in its December 19, 2005, letter to OCRWM acting director, Paul Golan. In the Board's December 30, 2005, letter report to*

Congress and the Secretary, the Board recommended that DOE integrate corrosion data from work undertaken by the S&T program into repository performance estimates. In the same report, the Board signaled its intention to review S&T work related to an enhanced technical basis for predictions of the behavior of water in the repository environment. Board Chairman John Garrick encouraged the continuation of S&T work on the source term in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006.

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.

Evaluation of 1.1.2: Effective. *The Board expressed concern to DOE about chlorine-36 studies that affect the technical basis for predictions of water flow in its December 19, 2005, letter to Paul Golan, acting director of OCRWM. The Board reiterated the concern in its letter report to Congress and the Secretary dated December 30, 2005. The issues of water flow and radionuclide transport were discussed at the Board's February 1, 2006, meeting. In testimony before the Senate Energy and Natural Resources Committee on May 16, 2006, Dr. Garrick reported that the Board believes that DOE has made progress in obtaining information on groundwater flow in the unsaturated and saturated zones under ambient temperature conditions. However, Chairman Garrick pointed out that the Board continues to believe that additional information is needed on secondary minerals and on colloid-facilitated radionuclide transport. The Board commented extensively on these issues in its June 2006 report to Congress and the Secretary.*

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.

Evaluation of 1.1.3: Effective. *The Board received a science update at its meeting on November 8, 2005, and commented on a number of issues in a follow-up letter to OCRWM acting director Paul Golan on December 19, 2005, including the conclusion of large-scale tests, work at the Piña Blanca analog site, and the need to develop a realistic analysis of potential repository performance in parallel with a compliance case. In its December 30, 2005, letter report to Congress and the Secretary, the Board commented on the importance of determining the nature of the source term for predications of repository performance, raised questions about the "multi-scale" water flow model; and reiterated the need for a realistic analysis of repository performance. These issues were discussed at the Board's February 1, 2006, meeting, and in a March 6, 2006, letter to Paul Golan following the meeting. They also were touched on in Dr. Garrick's May 16, 2006, testimony before the Senate Energy and Natural Resources Committee and in Board answers to follow-up questions from members of the Committee after the hearing. The issues were discussed extensively in the Board's June 2006 report to Congress and the Secretary.*

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

Evaluation of 1.2.1: Ineffective. *The Board did not review or comment on DOE's work in this area during the period covered by the evaluation.*

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

Evaluation of 1.3.1: Effective. *The Board commented on the conclusion of a number of major tests, including those conducted behind the bulkhead in the ECRB, in its letter to OCRWM acting director Paul Golan dated December 19, 2005. The Board recommended that DOE complete and fully assess post-test characterization. The Board reiterated its comments in a report to Congress and the Secretary of Energy on December 30, 2005.*

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

Evaluation of 1.3.2: Effective. *The Board commented on the conclusion of a number of major tests, including the drift-scale heater test in its letter to OCRWM acting director Paul Golan on December 19, 2005. The Board recommended that DOE complete and fully assess post-test characterization data and use the information to supplement understanding of thermal-chemical-hydrologic effects. The Board reiterated its comments in a report to Congress and the Secretary of Energy on December 30, 2005.*

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

Evaluation of 1.3.3: Effective. *The Board commented on DOE's efforts to assess natural analogs in its letter to Paul Golan dated December 19, 2005; in its December 30, 2005, report to Congress and the Secretary; and in its June 2006 report to Congress and the Secretary.*

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.

Evaluation of 1.3.4: Effective. *In a December 19, 2005, letter to Paul Golan, OCRWM acting director, the Board recommended testing in the unsaturated and saturated zones and a continuation of analog-site studies on the potential performance of natural barriers; testing on secondary minerals and colloid-facilitated radionuclide transport; and a resolution of discrepancies among chlorine-36 studies. Those recommendations were reiterated in the Board's December 30, 2005, letter report to Congress and the Secretary. The topic of water seepage into repository drifts was discussed at the Board's February 1, 2006, meeting. In its follow-up letter to OCRWM acting director Paul Golan, dated March 6, 2006, the Board recommended continuation of studies relating to the source term. Chairman Garrick commented on the need for more information on the source term in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006. The Board also stated its recommendations in its report to Congress and the Secretary of Energy released in June 2006.*

1.4.1. Evaluate tunnel-stability studies undertaken by DOE.

Evaluation of 1.4.1: Deferred. *The Board did not review DOE efforts in this area but signaled its intention to do so in the future in its letter to Congress and the Secretary dated December 30, 2005.*

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

Evaluation of 1.5.1: Effective. *In a letter dated December 19, 2005, to Paul Golan, OCRWM acting director, the Board urged DOE to determine the factors that will affect drip-shield performance and incorporate them into designs and operational plans. The Board recommended that the implications of thermal constraints be considered in designing elements of the waste management system, including the waste package and repository surface and subsurface facilities in its December 30, 2005, letter report to Congress and the Secretary. In the same letter and report, the Board noted the importance of assessing the results of recently concluded tests that may increase understanding of how the natural barrier will affect the performance of the engineered barriers. Chairman Garrick mentioned the importance of considering the system-wide implications of DOE's thermal-management strategy in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006. These issues also were discussed at-length in the Board's June 2006 report to Congress and the Secretary.*

2. Performance Goals and Evaluation Related to the Engineered System

2.1.1. Monitor DOE's performance-allocation studies.

Evaluation of 2.1.1: Eliminated. *DOE did not undertake such work in the timeframe being evaluated. There is no indication that such work will be undertaken in the future.*

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

Evaluation of 2.2.1: Effective. *In its December 19, 2005, letter to Paul Golan, OCRWM acting director, and in its December 30, 2005, letter report to Congress and the Secretary, the Board commented on the need to obtain additional data on thermal conductivity of repository rocks.*

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.

Evaluation of 2.2.2: Effective. *DOE presented information on corrosion testing at the Board's November 8, 2005, meeting. The Board commented in a December 19, 2005, follow-up letter to OCRWM acting director Paul Golan that the Board has continuing concerns about DOE's technical basis for screening out localized corrosion from Total System Performance Assessment for license application (TSPA-LA). The Board reiterated the concern in its letter report to Congress and the Secretary dated December 30, 2005, in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006, and in its report to Congress and the Secretary of Energy released in June 2006. The Board held a workshop on*

these issues in September 2006 and will send its findings and recommendations to OCRWM and Congress and the Secretary in FY 2007.

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

Evaluation of 2.3.1: Effective. *DOE presented information on corrosion testing at the Board's November 8, 2005, meeting. The Board commented in a December 19, 2005, follow-up letter to OCRWM acting director Paul Golan that the Board has continuing concerns about DOE's technical basis for screening out localized corrosion from TSPA-LA. The Board reiterated the concern in its letter report to Congress and the Secretary dated December 30, 2005, in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006, and in its report to Congress and the Secretary of Energy released in June 2006. The Board held a workshop on these issues in September 2006 and will send its findings and recommendations to OCRWM and Congress and the Secretary in FY 2007.*

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

Evaluation of 2.3.2: Deferred. *DOE did not undertake such work during the period being evaluated.*

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

Evaluation of 2.4.1: Effective. *DOE assessed differences in repository surface facility designs using the Total System Model (TSM). The Board discussed the TSM at its November 8, 2005, meeting and commented on the use and potential of the model in its follow-up letter to OCRWM acting director Paul Golan on December 19, 2005, and its report to Congress and the Secretary dated December 30, 2005. The Board discussed repository surface-facility designs at its meeting on May 9, 2006, and commented on the use of TSM to help guide surface-facility design in its letter to Paul Golan dated June 14, 2006. The Board also discussed these issues in its report to Congress and the Secretary released in June 2006.*

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

Evaluation of 2.4.2: Effective. *As part of its review of DOE's transportation, aging, and disposal (TAD) canister concept, the Board commented on the need to integrate TAD into a waste-management system that effectively balances preclosure safety and long-term repository performance in its December 19, 2005, letter to Paul Golan, acting director of OCRWM. Similar points were made by the Board in its December 30, 2005, letter report to Congress and the Secretary, testimony before the Senate Energy and Natural Resources Committee on May 16, 2006, and in the Board's report to Congress and the Secretary released in June 2006. The focus of the Board's May 9, 2006, meeting was TAD, and in a follow-up letter to Paul Golan, the Board underscored its interest in the performance specification for the TAD canister and its relationship to the postclosure thermal-management strategy.*

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

Evaluation of 2.4.3: Effective. *In its December 19, 2005, letter to Paul Golan, acting director of OCRWM, the Board emphasized that the success of the TAD concept depended on the integration of the TAD into a waste-management system that effectively balances preclosure safety and long-term repository performance. Similar points were made by the Board in its December 30, 2005, letter report to Congress and the Secretary, in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006, and in the Board's report to Congress and the Secretary released in June 2006. The focus of the Board's May 9, 2006, meeting was TAD, and in a June 14, 2006, follow-up letter to Paul Golan, the Board underscored its interest in the performance specification for the TAD canister and the relationship of the specification to the postclosure thermal-management strategy.*

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

Evaluation of 2.5.1: Effective. *The Board emphasized the importance of integrating the TAD concept into a waste-management system that effectively balances preclosure safety and long-term repository performance in its December 16, 2005, letter to Paul Golan, acting director of OCRWM. Similar points were made by the Board in its December 30, 2005, letter report to Congress and the Secretary, in testimony before the Senate Energy and Natural Resources Committee on May 16, 2006, and in the Board's report to Congress and the Secretary released in June 2006. The focus of the Board's May 9, 2006, meeting was TAD, and in a follow-up letter to Paul Golan on June 14, 2006, the Board underscored its interest in the TAD canister and its relationship to the postclosure thermal-management strategy.*

3. Performance Goals and Evaluation Related to Repository System Performance and Integration

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

Evaluation of 3.1.1: Effective. *In its December 19, 2005, letter to OCRWM acting director Paul Golan, the Board discussed a number of issues related to uncertainties in repository performance estimates, including in-drift environments following repository closure, thermal conductivity of the repository rock, understanding the source term, and the potential for localized corrosion of waste packages. The issues were reiterated in the Board's December 30, 2005, report to Congress and the Secretary along with the effects of climate change, and retardation and retention of radionuclide colloids in the alluvium. In a letter dated March 6, 2006, the Board commented on the importance of continuing research on the source term exiting the engineered system as a matter of time. These issues were presented in testimony by Dr. John Garrick on May 16, 2006, to the Senate Energy and Natural Resources Committee. A detailed discussion of the issues is included in the Board's Report to Congress and the Secretary released in June 2006.*

3.1.2. Determine the strengths and weaknesses of TSPA.

Evaluation of 3.1.2: Effective. *The Board discussed TSPA at its meeting on November 8, 2005. In its December 19, 2005, letter to Paul Golan, OCRWM acting director, the Board commented on DOE's use of multiple conservatisms in dealing with uncertainties in TSPA and recommended that in addition to its compliance case, DOE develop a realistic assessment of repository performance. The Board also expressed concerns about DOE's technical basis for screening out localized corrosion of the waste packages from TSPA-LA. Similar points were made in the Board's December 30, 2005, letter to Congress and the Secretary. At its February 1, 2006, meeting the Board discussed peak-dose sensitivity analysis. The Board commented in a March 6, 2006, letter to Paul Golan that some methods used by DOE produce results that are inconsistent or unrealistic. The Board recommended a more risk-informed analysis of repository performance. Chairman Garrick commented on the potential for unrealistic results of TSPA at a hearing before the Senate Energy and Natural Resources Committee on May 16, 2006. The Board discussed these issues at length in its report to Congress and the Secretary released in June 2006.*

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

Evaluation of 3.1.3: Ineffective. *The Board did not review or comment on these issues in the period covered by the evaluation.*

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

Evaluation of 3.2.1: Effective. *(See explanation of 3.1.2)*

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

Evaluation of 3.2.2: Effective. *(See explanation of 3.1.2)*

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

Evaluation of 3.3.1: Effective. *The Board discussed TSPA at its meeting on November 8, 2005. In its December 19, 2005, letter to Paul Golan, acting OCRWM director, the Board commented on DOE's use of multiple conservatisms in dealing with uncertainties in TSPA and recommended that in addition to its compliance case, DOE develop a realistic assessment of repository performance so that decision makers and the public would have important information on how conservative DOE's performance estimates are. Similar points were made in the Board's December 30, 2005, letter to Congress and the Secretary. At its February 1, 2006, meeting the Board discussed peak-dose sensitivity analysis. The Board commented in a March 6, 2006, letter to Paul Golan that some methods used by DOE produce results that are inconsistent or unrealistic. The Board recommended a more risk-informed analysis of repository performance. Chairman Garrick commented on the potentially unrealistic results of TSPA at a hearing before the Senate Energy and Natural Resources Committee on May 16, 2006. The Board discussed these issues at length in its report to Congress and the Secretary released in June 2006.*

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

Evaluation of 3.3.2: E*ffective.* *(See explanation of 3.3.1)*

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

Evaluation of 3.3.3: ***Effective.*** *The Board commented on the importance of continuing work at the analog site at Peña Blanca, Mexico in its December 19, 2005, letter to Paul Golan, OCRWM acting director, and in its December 30, 2005, report to Congress and the Secretary.*

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

Evaluation of 3.4.1: Effective. *The Board reviewed DOE activities and commented on various DOE efforts related to the contribution of engineered and natural barriers in most of its letters and reports during FY 2006. The Board was especially interested in DOE work related to the source term exiting the engineered barriers over time and to water flow and radionuclide transport.*

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

Evaluation of 3.5.1: Minimally effective. *The Board discussed the TSM model at its meetings on November 8, 2005, and May 9, 2006. The Board commented on the potential of the model for analyzing systems and tradeoffs in letters to Paul Golan, acting director of OCRWM, on December 19, 2005, and June 14, 2006. The Board also discussed the TSM model in its report to Congress and the Secretary released in June 2006.*

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

Evaluation of 3.6.1: Effective. *In its December 19, 2005, letter to Paul Golan, acting OCRWM director, the Board recommended that in addition to its compliance case, DOE develop a realistic assessment of repository performance. The Board also expressed concerns about DOE's technical basis for screening out localized corrosion of the waste packages from TSPA-LA. Similar points were made in the Board's December 30, 2005, letter to Congress and the Secretary. At its February 1, 2006, meeting the Board discussed peak-dose sensitivity analysis. The Board commented in a March 6, 2006, letter to Paul Golan that some methods used by DOE produce results that are inconsistent or unrealistic. The Board recommended a more risk-informed analysis of repository performance. Chairman Garrick commented on the potentially unrealistic results of TSPA at a hearing before the Senate Energy and Natural Resources Committee on May 16, 2006. The Board discussed these issues at length in its report to Congress and the Secretary released in June 2006. The Board held a meeting on this subject in September 2006, and provided its views on these issues in a letter to OCRQM dated December 14, 2006.*

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

Evaluation of 3.7.1: Effective. *The Board reviewed DOE's latest performance-confirmation plan at a meeting on safety case held in September 2006. The Board communicated its views on performance confirmation in a letter to OCRWM dated December 14, 2006.*

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

Evaluation of 3.7.2: Effective. *The Board reviewed DOE's latest performance-confirmation plan at a meeting on safety case held in September 2006. The Board communicated its views on performance confirmation in a letter to OCRWM dated December 14, 2006.*

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

[Note: Because of DOE budget constraints and the development of the transportation, aging, and disposal (TAD) canister concept, much of DOE's planning related to transporting spent nuclear fuel and high-level radioactive waste was deferred in FY 2006. Consequently, several of the Board's performance goals related to reviewing DOE transportation-planning activities were likewise deferred.]

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

Evaluation of 4.1.1: Effective. *The Board commented on the potential of the TAD canister concept in a letter to Paul Golan, OCRWM acting director, on December 16, 2005, and in a report to Congress and the Secretary on December 30, 2006. The Board focused on operations, specifically TAD, at its May 9, 2006, meeting. In its follow-up letter to DOE dated June 14, 2006, the Board identified a number of issues important to the successful implementation of TAD, including the timing and availability of TADs for storage at reactor sites, the inclusion of the TAD concept in the TSPA-LA, resolving DOE's policy of accepting only bare fuel for disposal, integrating TAD into a the postclosure thermal-management strategy, and constructing a Nevada rail line to the proposed repository site. Many of these issues also were discussed in the Board's report to Congress and the Secretary released in June 2006.*

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

Evaluation of 4.1.2: Effective. *The Board discussed the TSM model at its meetings on November 8, 2005, and May 9, 2006. The Board commented on the potential of the model for analyzing the waste management system in letters to Paul Golan, acting director of OCRWM, on December 19, 2005, and June 14, 2006. The Board also discussed the TSM model in its report to Congress and the Secretary released in June 2006.*

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

Evaluation of 4.1.3: Effective. *The Board discussed the TSM model at its meetings on November 8, 2005, and May 9, 2006. The Board commented on the potential of the model for analyzing the waste management system in letters to Paul Golan, acting director of OCRWM, on December 19, 2005, and June 14, 2006. The*

Board also discussed the TSM model in its report to Congress and the Secretary released in June 2006.

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

Evaluation of 4.1.4: Minimally effective. *The Board did not explicitly address this issue in FY 2006. However, the Board discussed the TSM model at its meetings on November 8, 2005, and May 9, 2006. The Board commented on the potential of the model for analyzing the waste management system in letters to Paul Golan, acting director of OCRWM, on December 19, 2005, and June 14, 2006. The Board also discussed the TSM model in its report to Congress and the Secretary released in June 2006.*

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

Evaluation of 4.1.5: Deferred. *Citing budget constraints, DOE limited its transportation-planning work in FY 2006.*

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

Evaluation of 4.2.1: Deferred. *Citing budget constraints, DOE limited its transportation-planning work in FY 2006.*

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

Evaluation of 4.3.1: Deferred. *Citing budget constraints, DOE limited its transportation-planning work in FY 2006.*

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

Evaluation of 4.3.2: Deferred. *Citing budget constraints, DOE limited its transportation-planning work in FY 2006.*

4.3.3. Evaluate logistics capabilities of the transportation system.

Evaluation of 4.3.3: Effective. *The Board commented on the potential of the TAD canister concept in a letter to Paul Golan, OCRWM acting director, on December 16, 2005, and in a report to Congress and the Secretary on December 30, 2005. The Board focused on operations, specifically TAD, at its May 9, 2006, meeting. In its follow-up letter to DOE dated June 14, 2006, the Board identified a number of issues important to the successful implementation of TAD, including the timing and availability of TADs for storage at reactor sites, the inclusion of TAD in the TSPA-LA, resolving DOE's policy of accepting only bare fuel for disposal, integrating TAD into a the postclosure thermal-management strategy, and constructing a Nevada rail line to the proposed repository site. Many of these issues also were discussed in the Board's report to Congress and the Secretary released in June 2006.*

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

Evaluation of 4.3.4: Deferred. *Citing budget constraints, DOE limited its transpiration-planning work in FY 2006.*

4.3.5. Evaluate DOE's plans for enhancing safety capabilities along transportation corridors, and review 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 4.3.4: Effective: *Related issues were included in the Board's comments on the potential of the TAD canister concept in a letter to Paul Golan, OCRWM acting director, on December 16, 2005, and in a report to Congress and the Secretary on December 30, 2006. The Board focused on operations, specifically TAD, at its May 9, 2006, meeting. In its follow-up letter to DOE dated June 14, 2006, the Board identified a number of issues important to the successful implementation of TAD. Similar issues also were discussed in the Board's report to Congress and the Secretary released in June 2006.*

ADDENDUM B

Supplementary Information on the Nuclear Waste Technical Review Board

The U.S. Nuclear Waste Technical Review Board was established on December 22, 1987, in the Nuclear Waste Policy Amendments Act (NWPAA) as an independent agency in the executive branch of the federal government. The Board is charged with evaluating the technical and scientific validity of activities undertaken by the Secretary of Energy, including the following:

- site characterization
- activities related to packaging and transporting high-level radioactive waste and spent nuclear fuel

The Board was given broad latitude to review activities undertaken by the Secretary of Energy in implementing the Nuclear Waste Policy Act. However, the Board was not given authority to require DOE to implement Board recommendations.[1]

Board Members

The NWPAA authorized a Board of 11 members who serve on a part-time basis; are eminent in a field of science or engineering, including environmental sciences; and are selected solely on the basis of distinguished professional service. The law stipulates that the Board shall represent a broad range of scientific and engineering disciplines relevant to nuclear waste management. Board members are appointed by the President from a list of candidates recommended by the National Academy of Sciences. To prevent gaps in the Board's comprehensive technical review, Board members whose terms have expired continue serving until they are reappointed or their replacements assume office. The first members were appointed to the Board on January 18, 1989. Current members were appointed by President George W. Bush.

The names and affiliations of the current 11 Board members are listed below.

[1] Taken from Legislative History of the Nuclear Waste Policy Amendments Act of 1987, February 26, 1998.

- **B. John Garrick, Ph.D., P.E.,** is chairman of the Board. A founder of PLG, Inc., he retired from the firm in 1997 and is a private consultant. His areas of expertise include probabilistic risk assessment and application of the risk sciences to technology-based industries.
- **Mark D. Abkowitz, Ph.D.,** is professor of civil and environmental engineering and director of the Vanderbilt Center for Environmental Management studies at Vanderbilt University. His areas of expertise include transportation safety and security, systems analysis, all-hazards risk management, and applications of advanced information technologies.
- **William Howard Arnold, Ph.D., P.E.,** a private consultant, retired from Louisiana Energy Services in 1996. He holds a doctorate in experimental physics and has special expertise in nuclear project management, organization, and operations.
- **Thure E. Cerling, Ph.D.,** is Distinguished Professor of Geology and Geophysics and professor of biology at the University of Utah. His areas of expertise include terrestrial geochemistry and geochemistry processes.
- **David J. Duquette, Ph.D.,** is department head and professor of materials engineering at Rensselaer Polytechnic Institute. His areas of expertise include the physical, chemical, and mechanical properties of metals and alloys.
- **George M. Hornberger, Ph.D.,** is Ernest H. Ern Professor of Environmental Sciences in the Department of Environmental Sciences at the University of Virginia. His areas of expertise include catchment hydrology and hydrochemistry and transport of colloids in geologic media.
- **Andrew C. Kadak, Ph.D.,** is Professor of the Practice in the Nuclear Science and Engineering Department at the Massachusetts Institute of Technology. His areas of expertise include nuclear engineering and the development of advanced reactors.
- **Ronald M. Latanision, Ph.D.,** is emeritus professor of materials science and engineering at the Massachusetts Institute of Technology and a principal in Exponent, a science and engineering firm. His areas of expertise include materials processing and corrosion of metals and other materials in aqueous environments.
- **Ali Mosleh, Ph.D.,** is Nicole J. Kim Professor of Engineering, director of the Reliability Engineering Program, and director of the Center for Risk and Reliability at the University of Maryland. His areas of expertise include methods for probabilistic risk analysis and reliability of complex systems.
- **William M. Murphy, Ph.D.,** is associate professor in the Department of Geological and Environmental Sciences at California State University, Chico. His research focuses on geochemistry, including the interactions of nuclear wastes and geologic media.
- **Henry Petroski, Ph.D., P.E.,** is Aleksandar S. Vesic Professor of Civil Engineering and professor of history at Duke University. His areas of expertise include the interrelationship between success and failure in engineering design. He also has a strong interest in invention and in the history of evolution of technology.

Board Staff

The NWPAA limits the Board's professional staff to 10 positions. An additional 5 full-time employees provide administrative support to Board members and the professional staff. Because of the comprehensive nature of the program, the diversity of Board member experience and expertise, and the part-time availability of Board members, the small, highly qualified staff is employed to its full capacity in supporting the Board's review of DOE program. The Board's offices are in Arlington, Virginia.

Board Reporting Requirements

As required under the NWPAA, the Board reports to the U.S. Congress and the Secretary of Energy at least two times each year. The reports include Board recommendations related to improving the technical and scientific validity of activities undertaken by the Secretary of Energy under the civilian radioactive waste management program. DOE's written responses to Board recommendations are published in the Board's annual summary reports.

Board Activities

The Board and its panels sponsor meetings and technical exchanges with program participants and interested parties, including representatives of DOE and its contractors, the U.S. Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, the U.S. Geological Survey, the U.S. Department of Transportation, the State of Nevada, affected units of local governments, Native American tribes, nuclear utilities, environmental groups, state utility regulators, and members of the public. Board members and staff attend relevant technical conferences, meetings, symposia, workshops, participate in field trips, and occasionally visit foreign programs to gain insights from the experience of other countries' repository development efforts.

Board and panel meetings are open to the public and announced in the Federal Register four to six weeks before each meeting. To facilitate access for program participants and the public, the Board holds the majority of its meetings in the State of Nevada, and time is set aside for public comment at each meeting. Transcripts of Board and panel meetings and all Board reports, correspondence, and congressional testimony are available to the public via telephone or written request or from the Board's Web site: www.nwtrb.gov.

U.S. Nuclear Waste Technical Review Board
2300 Clarendon Boulevard, Suite 1300
Arlington, VA 22201