



UNITED STATES  
NUCLEAR WASTE TECHNICAL REVIEW BOARD  
2300 Clarendon Boulevard, Suite 1300  
Arlington, VA 22201

October 27, 2009

The Honorable Nancy P. Pelosi  
Speaker of the House  
United States House of Representatives  
Washington, DC 20515

The Honorable Robert C. Byrd  
President Pro Tempore  
United States Senate  
Washington, DC 20510

The Honorable Steven Chu  
Secretary  
United States Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585

Dear Speaker Pelosi, Senator Byrd, and Secretary Chu:

This letter is intended to update Congress and the Secretary of Energy on the U.S. Nuclear Waste Technical Review Board's mission, continuing role, and refocused goals as the U.S. approach to managing spent nuclear fuel and high-level radioactive waste (HLW) is evolving. The letter is issued in accordance with provisions of the Nuclear Waste Policy Amendments Act of 1987, Public Law 100-203, which direct the Board to report to Congress and the Secretary of Energy at least two times each year.

### **The Board's Mission**

The Board was established as an independent agency in the executive branch in the 1987 amendments to the Nuclear Waste Policy Act. As described in the legislative history, the purpose of the Board is to provide independent expert advice to Congress and the Secretary of Energy on technical issues and to review U.S. Department of Energy (DOE) efforts to implement the nuclear waste program. Several elements of the Board's congressional mandate combine to make the Board unique among federal agencies: (1) the Board is independent; (2) the Board advises both Congress and the Secretary of Energy on technical issues; and (3) the Board performs an ongoing and integrated technical peer review of all DOE activities related to managing spent nuclear fuel and high-level radioactive waste, including waste acceptance, transportation, packaging and handling, facility operation and design, and waste storage and disposal.

## **The Board's Continuing Role**

For the last 20 years, DOE has focused on developing a permanent geologic repository at Yucca Mountain in Nevada. During that time, the Board has reported on the technical validity of DOE's efforts to Congress and the Secretary of Energy in twice yearly reports, in testimony, and in correspondence. The Administration recently indicated its intention to terminate funding for the Yucca Mountain repository program and to appoint a Blue Ribbon Commission to consider alternatives for nuclear waste management. As Secretary Steven Chu has observed, even as new options for managing nuclear waste are evaluated, DOE continues to have responsibility under existing law for the long-term management and disposition of DOE-owned spent nuclear fuel and HLW and for the disposition of spent nuclear fuel from commercial reactors. Similarly, the Board's statutory responsibility for conducting ongoing technical peer review of DOE's waste management efforts and for advising Congress and the Secretary on related issues is unchanged.

## **Refocusing the Board's Priority Goals**

In accordance with its continuing peer review responsibilities, the Board has refocused its priority goals to provide technical findings and information that can be used by Congress, the Secretary of Energy, and a Blue Ribbon Commission in evaluating alternatives for managing nuclear waste. The Board also will continue reviewing DOE's ongoing nuclear waste management activities. Issues on which the Board will focus include the technical implications of very long-term dry storage of commercial spent nuclear fuel, the characteristics and inventories of DOE-owned spent nuclear fuel and HLW, and the characteristics and quantities of waste associated with adopting alternatives for spent nuclear fuel management that include reprocessing and recycling. The Board also is developing a capability to analyze the effects of various waste management approaches on the waste management system.

Based on the activities described above and on others planned for the future, the Board will create information products that can inform, from a technical perspective, the discussion of waste management alternatives. In addition, the Board will soon issue a report to Congress and the Secretary that is a survey of the nuclear waste management approaches used by 13 countries, including the United States. The survey, which is a compilation of basic information, will be followed by a report on "lessons learned" from experiences in the United States and other countries. A list of the Board's priority goals and their associated tasks is enclosed with this letter.

The Board looks forward to providing objective technical information that will support the decision-making process as alternatives for managing nuclear waste are considered.

Sincerely,

{Signed By}

B. John Garrick  
Chairman

Enclosures

# NUCLEAR WASTE TECHNICAL REVIEW BOARD

## PRIORITY GOALS

At its June 2009 public meeting in Las Vegas, Nevada, the U.S. Nuclear Waste Technical Review Board's Chairman, Dr. B. John Garrick, articulated three priority goals that are intended to focus and direct the Board's future work. Since that meeting, the Board has made significant progress in implementing the goals. The following is a discussion of what the Board has accomplished with respect to each of the priority goals and what it plans to do in the future.

**Goal 1.** The Board will develop and compile objective technical information to inform the evaluation of waste management alternatives by Congress, the Secretary of Energy, and a Blue Ribbon Commission. In developing such information, the Board will look broadly at an integrated waste management system and potential waste management alternatives. Specific tasks related to this goal are described below.

**A. Systems Analysis.** The Board recently began development of a computerized model of various U.S. alternatives for nuclear waste management and disposal. The model has been designed with sufficient flexibility so that it can represent a wide range of nuclear technologies, separation processes, and implementation time frames. The resulting analyses will enable the Board to provide Congress, DOE, a Blue Ribbon Commission, and other interested parties with an assessment of the technical implications of various alternatives under consideration. Such assessments will include issues associated with on-site and centralized interim storage as well as transportation and final disposition.

**B. "Stranded" DOE Spent Nuclear Fuel and High-Level Radioactive Waste (HLW).** The termination of the Yucca Mountain repository program leaves thousands of tons of government-owned spent nuclear fuel and HLW with no place to go—at least temporarily. The wastes, which are mostly from defense-related activities, are stored primarily at Hanford in Washington, at Idaho National Laboratory in Idaho, and at the Savannah River Site in South Carolina. Much of the waste is subject to legal agreements between the federal government and the respective states. The agreements include timely transportation off the site to a final disposal location. The Board visited Hanford recently to ascertain the amounts and characteristics of such wastes at that site and the plans for disposition of the wastes under current legal agreements. Board meetings with the same objectives are scheduled for January 2010 and June 2010 at the Savannah River Site and Idaho National Laboratory, respectively. The Board intends to hold more meetings of this kind, including a trip to the West Valley Demonstration Project in the state of New York that is planned but not yet scheduled. A report that summarizes the amounts and characteristics of the waste, discusses the alternatives under consideration for their management and disposition, and identifies technical issues that need to be resolved will be prepared after the Board completes its planned site visits.

**C. Very-Long-Term Dry Storage.** A likely consequence of a decision not to proceed with the Yucca Mountain repository program is that commercial spent nuclear fuel will remain in storage for periods that may be much longer than previously anticipated. In late FY 2009, the Board convened a panel of experts to discuss research and data needs for very-long-term dry storage of commercial spent nuclear fuel. On the basis of those discussions and its own research, the Board is preparing a “white paper” on technical needs for very-long-term dry storage. The Board expects the results of this effort to serve as a framework for evaluating DOE technical activities related to long-term dry storage and for advising Congress, the Secretary, and a Blue Ribbon Commission.

**Goal 2.** The Board will compile information gained from its extensive experience with the U.S. nuclear waste program and from observing waste management efforts in other countries. Specific tasks related to this goal are described below.

**A. Survey of National Programs.** Over the years, the Board has visited several countries whose long-term waste management programs are relatively mature. The Board visited Finland’s underground research laboratory (URL) in the construction phase and has gone into URLs in Belgium, Canada, France, Germany, Sweden, and Switzerland. The Board also has exchanged information and discussed with international scientists and engineers the technical challenges of developing a repository in a variety of host rocks, including granite, salt, clay, and argillite. In addition, the Board has visited facilities and held detailed technical exchanges with operators of reprocessing plants in France and Japan and has investigated technical issues associated with developing centralized interim-storage facilities for spent nuclear fuel in Germany, Switzerland, and Sweden. In November 2009, the Board will travel to the United Kingdom, where it will meet with officials from the Nuclear Decommissioning Authority, talk with local community participants in the United Kingdom’s “Managing Radioactive Waste Safely” initiative, and visit the reprocessing facilities at the Sellafield site.

In the next few weeks, the Board will issue a report entitled, *Survey of National Programs for Managing High-Level Radioactive Waste and Spent Nuclear Fuel*. In the document, the Board provides up-to-date factual information to Congress and the Secretary of Energy about the wide range of institutional arrangements and technical approaches that have been adopted in 13 countries.

**B. Study of “Lessons Learned.”** On the basis of its experience and understanding of waste management programs in other countries, its in-depth technical reviews of the Yucca Mountain Project, and the *Survey of National Programs for Managing High-Level Radioactive Waste and Spent Nuclear Fuel*, the Board will perform a study that focuses on lessons learned. This effort will explore the technical and scientific aspects of nuclear waste management and disposal, including the generic and specific issues associated with the various media that have been considered worldwide for developing a deep geologic repository. The Board’s technical expertise and its 20-year history of performing objective technical analysis will enable it to make a unique contribution to the national discussion of alternative strategies for waste management and to provide advice on implementing whatever strategy is subsequently adopted.

**C. Source Term.** As part of its examination of lessons that can be taken from the U.S. repository program and applied to any potential future repository, the Board is preparing a paper that describes the application of risk assessment to repository performance by identifying the source term and the movement of radionuclides significant to dose through geologic barriers.

**Goal 3.** To the extent that DOE engages in new technical work related to managing and disposing of high-level radioactive waste and spent nuclear fuel, the Board will continue to monitor and evaluate that work and report on the technical validity of the work to Congress and the Secretary. Specific tasks related to this goal are described below.

**A. Office of Nuclear Energy.** DOE's Office of Nuclear Energy (NE) fuel-cycle research and development program has an ongoing advanced fuel-cycle initiative program underway to explore alternatives to fuel cycles and associated waste management strategies. The Board will evaluate the technical validity of activities that are being conducted under the auspices of the fuel-cycle research and development program in the waste management area. In particular, the Board will carefully scrutinize whether data developed in laboratories and pilot plants are consistent with predicted effects on waste management and disposal.

Most of the Board's September 2009 public meeting focused on proposals from vendors on closing the nuclear fuel cycle. The proposals were sponsored by NE under the former Global Nuclear Energy Partnership program. The discussions at the September 2009 meeting will help the Board formulate a specific set of technical issues for exploring in depth in the future. (See Goal 1A)

**B. Corrosion.** Deliquescence-induced localized corrosion and general corrosion rates long have been technical issues of interest to the Board and may be important to other options for permanent underground disposal or for long-term dry storage of spent nuclear fuel and high-level radioactive waste. Several Board members and staff are scheduled to visit Sandia National Laboratory in December 2009 to observe and discuss work that has been undertaken on those issues. The Board will report on its findings and recommendations related to the current program in its next summary report to Congress and the Secretary. These issues will be part of the Board's examination of lessons that can be learned about the engineered system from the experience of the U.S. program.

**C. Office of Environmental Management.** In contrast to the HLW at Hanford and Savannah River, which is mostly in liquid or sludge form in tanks, most of the high-level waste at Idaho National Laboratory is in a solid, granular form in bins. There is a question about how much additional treatment this waste needs, if any, to be a suitable waste form for disposal in a geologic repository. Options include: (1) no additional treatment, (2) mixing the waste with cement, (3) hot isostatic pressing, and (4) vitrification. In the coming year, the Board intends to examine the technical bases and process for selecting the preferred option. This will guide future work that will be undertaken by the Board, as discussed below.

Most DOE-owned spent nuclear fuel is in dry storage or soon will be moved to dry storage. All vitrified high-level radioactive waste is in dry storage. The Board plans to evaluate the design bases for dry-storage facilities, beginning with the facilities at Savannah River. The objective of the evaluation will be to determine whether the design bases are suitable for supporting longer facility lifetimes and what additional data or analyses are needed.

**D. Office of Civilian Radioactive Waste Management.** Virtually no new technical work is being undertaken by the Office of Civilian Radioactive Waste Management (OCRWM). OCRWM has several approved but unfunded programs that are applicable to any repository. Chief among them are burnup credit and waste form programs. If new work is funded and undertaken, the Board will evaluate the technical validity of that work.

## **U.S. NUCLEAR WASTE TECHNICAL REVIEW BOARD**

### **Members**

The Board is nonpartisan and apolitical. Its 11 members are appointed by the President from a list of nominees submitted by the National Academy of Sciences (NAS). The NAS makes its nominations solely on the basis of the eminence and expertise of the candidates in relevant scientific and engineering disciplines.

**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 nuclear science and engineering, specializing in probabilistic risk assessment and the application of the risk sciences to natural and engineered systems.

**Mark D. Abkowitz, Ph.D.**, is professor of civil and environmental engineering at Vanderbilt University and director of the Vanderbilt Center for Environmental Management Studies. His areas of expertise include the strategic and operational deployment of intelligent transportation systems, enterprise risk management methods and practices, and assessing the impacts of energy choices and climate change.

**William Howard Arnold, Ph.D., P.E.**, is a private consultant with long experience as a top executive in the nuclear industry. He retired from a 40-year career, first with Westinghouse and then with Louisiana Energy Services, in 1996. He holds a doctorate in 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 Distinguished Professor of Biology at the University of Utah. His areas of expertise include field geology, isotope geology, and geochemical processes occurring near the Earth's surface.

**David J. Duquette, Ph.D.**, is John Tod Horton '52 Professor of Engineering in the Department of Materials Science and 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 a Distinguished University Professor at Vanderbilt University where he is Director of the Vanderbilt Institute for Energy and Environment. He also is the Craig E. Philip Professor of Engineering and a Professor of Earth and Environmental Sciences there. His areas of expertise include catchment hydrology and hydrochemistry and transport of solutes and 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 fundamental nuclear engineering, reactor operations, and the development of advanced reactors.

**Ronald M. Latanision, Ph.D.**, is emeritus professor of materials science and engineering and of nuclear engineering at the Massachusetts Institute of Technology and a Corporate Vice President of the engineering consulting firm, Exponent. 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 professor of Geological and Environmental Sciences at California State University, Chico. His research focuses on geochemistry, including the interactions of nuclear wastes and geologic media. He also is a technical administrative judge on the Atomic Safety and Licensing Board Panel of the U.S. Nuclear Regulatory Commission.

**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 design, the nature of invention, and the history of technology.