



UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
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External Affairs

Evaluation of DOE Research and Development Program on Deep Borehole Disposal of Some Radioactive Waste Is Subject of U.S. NWTRB Report

The U.S. Nuclear Waste Technical Review Board has released a report to the U.S. Congress and the Secretary of Energy titled, *Technical Evaluation of the U.S. Department of Energy Deep Borehole Disposal Research and Development Program*. The report presents the Board's findings, conclusions, and recommendations related to activities being undertaken by the U.S. Department of Energy (DOE) to assess the feasibility of deep borehole disposal of some high-level radioactive waste (HLW), including a planned Deep Borehole Field Test to obtain technical information and understanding of critical processes related to deep borehole disposal.

The Board held the International Technical Workshop on Deep Borehole Disposal of Radioactive Waste on October 20 and 21, 2015, in Washington, D.C., at which DOE presented its concept of deep borehole disposal of some radioactive wastes and discussed specific details of its Deep Borehole Field Test. The Board also invited experts from the United States and other countries to participate in the workshop and to provide their technical and scientific perspectives on issues related to the DOE plans.

Following the workshop, the Board prepared a report that addresses two topics: (1) technical and scientific issues that may affect the feasibility of the deep borehole disposal option for select radioactive waste forms and (2) whether results that will be obtained from the DOE Deep Borehole Field Test will provide the necessary technical data and scientific understanding for determining the feasibility of disposing of select waste forms in deep boreholes. The report includes the Board's findings and recommendations on these topics.

Following are abbreviated versions of the Board's findings and recommendations. Full versions of the findings and recommendations are presented in the report.

Board Findings:

- *Even if disposal of some radioactive waste in deep boreholes is determined to be feasible, the need for a mined, geologic repository is not eliminated.*
- *Establishing a regulatory framework, identifying an acceptable site, and characterizing a deep borehole at depths down to 5 km (3.1 mi) are challenging and time consuming activities, suggesting that the time required for completing a deep borehole disposal facility might be comparable to that of a mined, geologic repository.*
- *The Deep Borehole Field Test will provide only limited information on which to base an evaluation of the feasibility of the deep borehole disposal concept and the selection of a deep borehole disposal site.*
- *The operational implications and limitations of handling and emplacing highly radioactive waste at depth are very different from those for operations involving non-radioactive material; however, evaluating and understanding those implications and limitations are of utmost importance for the design of a deep borehole disposal facility and for the feasibility assessment of the deep borehole disposal concept.*

Board Recommendations:

- **Independent expert review**—The Board recommends that DOE ensure the drilling program design and implementation are reviewed by independent experts with extensive experience in drilling and down-hole operations (*e.g.*, logging, testing, well completion) and in designing and operating equipment for handling highly radioactive material.
- **Comprehensive risk analysis**—The Board recommends that a more comprehensive risk analysis be completed for all aspects of the drilling and emplacement program as part of assessing the feasibility of deep borehole disposal of radioactive waste.
- **Heterogeneity of subsurface geology and transferability of data and analysis results**—The Board recommends that DOE strengthen its assessment of the feasibility of the deep borehole disposal option by addressing the technical and scientific issues related to the potential heterogeneity of the subsurface geology and the complex *in situ* conditions at depth.
- **Pre-drilling geophysical subsurface characterization**—The Board recommends that the Deep Borehole Field Test include surface-based geophysical surveys to delineate subsurface structure and physical conditions prior to drilling (*e.g.*, detailed gravity, magnetic, seismic, or electrical data).

- **Robust waste forms, waste packages, and seals**—The Board recommends that DOE explicitly analyze the potential safety benefits of using more robust waste forms and waste packages as part of assessing the feasibility of the deep borehole disposal concept and in developing the associated safety case.
- **Developing an operational safety strategy**—The Board recommends that DOE develop an operational safety strategy for the Deep Borehole Field Test that integrates conventional borehole operations and remote handling of highly radioactive materials.
- **Engaging regulators to define retrievability requirements**—The Board recommends that, as part of its assessment of the feasibility of deep borehole disposal of radioactive waste, DOE place a high priority on engaging regulators to define retrievability requirements in the context of deep borehole disposal of radioactive waste.
- **A transparent pathway from the Deep Borehole Field Test to siting**—The Board recommends that DOE use the Deep Borehole Field Test to gain experience related to its siting approach.
- **Chief scientist in charge of the Deep Borehole Field Test program**—The Board recommends that the DOE Deep Borehole Field Test program have a chief scientist responsible for integrating the engineering activities (*i.e.*, drilling the characterization and field test boreholes, emplacing and retrieving the simulated waste) and the site characterization activities.

The Board was established in the Nuclear Waste Policy Amendments Act of 1987 to perform ongoing evaluation of the technical and scientific validity of U.S. DOE activities related to the management and disposal of spent nuclear fuel and HLW. The Board is required to report its findings, conclusions, and recommendations to Congress and the Secretary of Energy. Board members serve part time and are appointed by the President from a list of nominees submitted by the National Academy of Sciences. The Board is an independent federal agency in the Executive Branch.

This report, an archived video of the Board’s International Technical Workshop on Deep Borehole Disposal of Radioactive Waste, and presentations and other materials from the workshop, are available on the Board’s website at www.nwtrb.gov.
