

## Free Executive Summary



### Radioactive Waste Repository Licensing: Synopsis of a Symposium

Board on Radioactive Waste Management,  
Commission on Geosciences Environment and  
Resources, National Research Council

ISBN: 978-0-309-04691-6, 112 pages, 6 x 9, paperback (1992)

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*This book recounts the issues raised and the viewpoints aired at a recent symposium on repository licensing. It summarizes the problems surrounding the setting of an Environmental Protection Agency standard for the release of radionuclides and the regulatory problems inherent in meeting such a standard. Symposium participants came from a variety of federal agencies and advisory groups, state governments, public interest groups, engineering firms, national laboratories, and foreign and international organizations. The book illustrates the strong feeling in the radioactive waste disposal community that changes must be made if the United States is to fulfill its promise of safe management of current and future nuclear waste.*

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## Introduction

There is a worldwide scientific consensus that deep geological disposal — the approach being followed in the United States — is the best option for the disposal of high-level radioactive waste (HLRW). Despite this consensus, many in the radioactive waste community are concerned that current federal regulations, by virtue of the prescriptive nature of the Standard's assurance requirements and the expected contentious licensing process, may ultimately prevent identification and licensing of a site technically suitable for a repository in the United States. Others in this community believe that current regulations are workable if the proper site is chosen.

Since 1955 the National Research Council, the research arm of the National Academy of Sciences (NAS/NRC), has been advising the U.S. government on technical matters related to the management of radioactive waste, especially through its Board on Radioactive Waste Management (BRWM or the Board), a permanent committee of the NAS/NRC. After careful study, the Board concluded in a recent position statement ("Rethinking High-Level Radioactive Waste Disposal," National Academy Press, Washington, D.C., 1990; Appendix A in this volume) that the U.S. program for deep geological disposal of HLRW is unlikely to succeed if it continues on its current course because the present U.S. Department of Energy (DOE) approach, in which every step is mandated in detail in advance, is poorly matched to the technical task at hand.

The BRWM believes that, based on public concern over safety and the implementing and regulatory agencies' perceived need for public credibility, a high degree of inflexibility with respect to both technical and schedule specifications has been built into the U.S. Environmental Protection Agency (EPA) Standard and the U.S. Nuclear Regulatory Commission (USNRC) regulation. In "Rethinking High-Level Radioactive Waste Disposal" the

Board warned that the HLRW program might well fail to site and license a repository because the various federal agencies involved had, according to the Board, set unnecessarily high and technically insupportable hurdles to regulatory compliance. The Board viewed the policies of the federal agencies as promising to anticipate every potential problem and/or as assuming that science will soon provide the appropriate answers. The Board encouraged the involved federal agencies to see that the choice is not between an "ideal" underground facility and a less than perfect one, but rather between disposal underground with reasonable assurance of safety versus on-site storage at each nuclear power plant where there is greater chance of disturbance. The inherent variability of the geologic environment, the Board suggested, necessitates allowing flexibility and iteration in the design, construction, and scheduling of a repository. The Board also urged the federal agencies to facilitate greater participation in policymaking by interested parties and to involve them substantively in the planning and construction of a repository.

Because of the widespread scientific concern about these issues and interest in regulatory revisions planned by the EPA as a result of the court remand of 40 CFR Part 191 ("Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Wastes" — Appendix B), the BRWM held a symposium on September 17–18, 1990, in Washington, D.C. to examine the status of repository licensing requirements and related issues in the United States and elsewhere, and to consider approaches to the reconciliation of divergent viewpoints. Approximately 300 people, including representatives of federal and state regulatory agencies, Congress, national and international organizations, national laboratories, industry, public interest groups, and members of the public, attended the symposium.

At the symposium, the EPA, the State of Nevada, and the Natural Resources Defense Council (NRDC) asserted that the scientific basis for the Standard and the release criteria was strong. Other participants expressed concerns that aspects of the current draft of the Standard were not technically supported. They maintained that better quality scientific data would support a less prescriptive standard and allow for flexibility through a performance standard, rather than through the current subsystem performance criteria. They favored an iterative approach that could take into account new information acquired through the characterization and construction processes. These participants favored also the dose-to-man or population dose criteria, rather than current release criteria, as more valid regulatory criteria because they relate to health effects. EPA and the USNRC staff preferred to retain a multiple barrier approach to repository design and construction in order to resolve uncertainty about expected performance. Inasmuch as plausible human intrusion scenarios based upon worst-case assumptions may pose difficult challenges for assuring repository safety over 10,000 years — a

period longer than all of recorded history — some participants wanted the issue of human intrusion to be considered separately from the performance standard.

Many participants expressed concern about the feasibility of implementing probabilistic standards as compared to deterministic standards; they believed that there was insufficient information on the distribution functions of many of the parameters. There was concern that, by itself, the uncertainty in some of the parameters could cause the results of a number of the modeled scenarios to exceed the Standard. The EPA, however, held that probabilistic standards are more appropriate for dealing with the long time frame of 10,000 years over which the prospective repository must demonstrate safety.

The EPA maintained that the current release limits are supported by recent radiation research demonstrating increased estimates of health effects from low doses of radiation. The state of Nevada and the NRDC asserted that this new research called for lower release limits. The New Mexico Environmental Evaluation Group pointed out that the stringency of the Standard was the catalyst for the U.S. Department of Energy's (DOE's) consideration of engineering enhancements to the Waste Isolation Pilot Plant design. Other symposium participants advocated modifying the probabilistic assumptions in order to make the human exposure risk from HLRW more nearly commensurate with that of other hazardous wastes; they wanted the Standard to require only the stringency necessary to the protection of human health. They also pointed out that the more stringent the Standard, the more costly it is to demonstrate compliance. An additional risk identified was that if compliance could not be demonstrated at any facility, the existing and any future radioactive waste must remain forever in "temporary" storage.

There was a good deal of discussion about the fact that licensee compliance with either the Standard, 40 CFR Part 191, or the USNRC implementing regulation, 10 CFR Part 60, did not guarantee licensee compliance with both rulemakings. This standard-to-regulation connection was termed the "nexus" and prompted an examination of ameliorative options.

The symposium generated detailed discussion of the science involved in modeling and assessing a repository and of the difficulties associated with the licensing process. Subsequent to the symposium, the EPA has issued revised Working Drafts of 40 CFR Part 191. While the drafts incorporate some recommendations from the BRWM's 1990 position paper and from the symposium participants, other recommendations — including quantitative probabilistic criteria vs. qualitative or deterministic criteria, and level of stringency — were not addressed in Drafts #3 and #4 of 40 CFR Part 191. The drafts do not incorporate suggestions made at the symposium to consider the relationship between cost/benefit and stringency and to consider separately the human intrusion issue (although there is an allowance made for adoption of diverse human intrusion assumptions by the implementing agency).

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Synopsis of a Symposium  
sponsored by the  
Board on Radioactive Waste Management

Commission on Geosciences, Environment, and Resources

National Research Council

NATIONAL ACADEMY PRESS  
Washington, D.C. 1992