The Department of Energy's Program to Manage Civilian Spent Fuel and Defense High-Level Radioactive Waste: Critical Decisions Lie Ahead

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U. S Nuclear Regulatory Commission

March 14, 1994
Rockville, Maryland

[VIEWGRAPH 1]

Good afternoon, ladies and gentlemen.

It is a pleasure to be here today. My name is John Cantlon, and I am Chairman of the U. S. Nuclear Waste Technical Review Board. Accompanying me is Board member Warner North. Approximately one year ago, we talked to you about the Board and its perspectives on the Department of Energy's (DOE's) program to manage civilian spent fuel and defense high-level waste. Today, we would like to update you on progress during the past year and on the Board's views regarding some of the key decisions we expect the DOE to be facing during the coming year. Then, we will provide some observations on the NRC's role in this effort, and will close our remarks with a brief synopsis of the Board's latest report to Congress and the Secretary of Energy.

[VIEWGRAPH 2]

The Nuclear Waste Technical Review Board was created by Congress in the 1987 Nuclear Waste Policy Amendments Act and is charged with evaluating the technical and scientific aspects of the DOE's waste management program. This includes site-characterization activities and activities relating to the packaging and transport of high-level radioactive waste and spent nuclear fuel. As you are aware, the Board is an independent agency within the federal government, *not* part of the Department of Energy or any regulatory agency.

[VIEWGRAPH 3]

Members of our Board are nominated by the National Academy of Sciences and are appointed by the President I have served from the Board's creation and became its second chairman two years ago. Currently, ten of the Board's eleven memberships are filled. I have listed the members for you on this viewgraph. We all serve part time.

The Board is organized into seven panels. They are shown on the next viewgraph.

[VIEWGRAPH 4]

Since the Board's inception, and especially during the past year, the Board has witnessed considerable progress in the civilian high-level waste management program. For example, after several delays, construction of the underground excavation of the exploratory studies facility at Yucca Mountain has been started. Also, the management and operating contractor is beginning to integrate the DOE's efforts in all the components of the waste management system — storage, transportation, and disposal. The Board strongly believes the momentum of these activities should be maintained.

The coming year promises to be one of additional progress, and also one during which many important decisions will be made. Some of these decisions are the direct

responsibility of the DOE. An example is the decision whether to pursue development of a multipurpose canister design. Other decisions will involve interactions with other bodies, especially the Nuclear Regulatory Commission. Here, an example would be a decision whether to amend the siting guidelines of 10 CFR Part 960. Still other decisions, for example regarding the administration's proposal to Congress for disbursing Nuclear Waste Fund receipts, will not be made by the DOE, but the civilian high-level waste management program will be strongly affected by them.

The Board has been encouraged by Secretary O'Leary's recent efforts to improve the program. For example, she has created the position of chief scientist; she is proceeding with a financial and management review of the Yucca Mountain project; and she has taken steps toward broadening stakeholder participation in the program. On October 7, 1993, Dr. Daniel Dreyfus was confirmed as director of the Office of Civilian Radioactive Waste Management (OCRWM).

At our Board's January 1994 meeting, Dr. Dreyfus listed several short-term goals the OCRWM program had set for itself. These include "returning the emphasis" of the repository program to science and site characterization, "institutionalizing stakeholder interaction," and proposing a new funding mechanism to increase monies going to the OCRWM program. To achieve this latter goal, the DOE recently requested the creation of a special fund to give the OCRWM increased access to revenues coming into the Nuclear Waste Fund.

In the Board's view, relatively too little funding has been going to the direct costs of the scientific research and engineering activities essential to characterizing the Yucca Mountain site and to laying a sound basis for the waste management system. Based on its four-year review of the program, the Board believes that *simply increasing the program's funding will not ensure that adequate funds will be allocated to the most important site-characterization activities or to other critical research.* In a February 1994 letter to Congress and to Secretary O'Leary, the Board repeated its earlier recommendation for an independent review of the OCRWM's management and organizational structure to be initiated as soon as possible. The Board believes that this review can and should be undertaken without slowing the momentum of important site-characterization activities currently under way at Yucca Mountain. Whether the program budget remains level or is increased, program management should ensure sufficient and reliable funding for site characterization, performance assessment, and systems studies, which are critical for integrating the program.

[VIEWGRAPH 5]

The Board believes that the management of spent fuel and high-level waste, that is, the transport, storage, and disposal of waste, should be viewed as a system whose separate elements and subelements are highly interdependent. The Board has been concerned that DOE decisions about some components of the overall waste management system are being made without adequate regard for the effects those decisions could have on other system components or on the entire system. In our presentation to you last

year, we discussed the Board's views on several of the major issues facing the program at that time. Today, I would like to update you on the Board's views on two of those subjects: development of a multipurpose canister and research on engineered barriers. Then, I would like to summarize the conclusions and recommendations of a recent Board report on underground exploration and testing at Yucca Mountain. Finally, I will close my remarks with some observations about the NRC's regulations for a high-level waste repository.

[VIEWGRAPH 6]

First, the DOE is now examining the feasibility of a concept it calls the *multipurpose canister* (MPC). This concept involves *permanently* sealing spent fuel in a canister at the reactor where the spent fuel is generated. During all subsequent storage, transportation, and disposal operations, spent fuel would remain sealed within the MPC. If necessary, overpacks or casks could be used for shielding and protection during storage or transportation, or to provide corrosion resistance after disposal. But this is not simply a storage-related decision.

Development of an MPC has potential ramifications for a decision about the thermal loading of a repository, and the thermal loading decision, in turn, will affect how much waste can be put into one repository; how the waste will be loaded into canisters; how long waste must be aged prior to disposal; how the waste is packaged, handled, transported, and emplaced in the repository; and how and when the drifts are back-filled. It also will affect how much the overall waste management program will cost. Therefore, MPC development decisions, as well as the decision about the thermal loading, should be approached carefully, especially since future underground thermal tests will be required to support a thermal-loading decision.

The DOE has evaluated alternative MPC designs and has studied the effects of those designs on the rest of the waste management system. In general, large MPC designs offer economic advantages, but often affect other parts of the waste management system, such as the repository design. The Board believes that a systems analysis is an important prerequisite to the final design of an MPC. Such an analysis, which does not require a large-scale effort, should assess the trade-offs of alternative concepts for the major parts of the system — storage, transportation, *and* disposal — and provide a technical basis for decision making. Given the uncertainties associated with disposal (e.g., the thermal load of the repository), the question of how a *true* multipurpose canister can be made a reality is a difficult one. Nonetheless, an attempt at least should be made to address this issue in a substantive way, given present technology and what is known about the repository and the site.

A second issue that concerns the Board is the low priority the DOE has placed on studies of engineered barriers.

[VIEWGRAPH 7]

A well-designed system of engineered barriers working together with well-characterized geologic barriers will increase our confidence in the long-term performance of a repository. For this reason, the Board has recommended that the DOE place greater emphasis on the engineered barrier system as a way to build redundant radionuclide containment into the repository design. This redundancy, in our view, should help add confidence about repository safety, especially in the face of the inevitable uncertainties associated with predicting natural geologic, hydrologic, and climatologic processes far into the future.

[VIEWGRAPH 8]

With respect to designing the waste package itself, the Board believes that extensive materials testing is required. Of greatest importance is determining how various materials will hold up over long periods of time under possible underground conditions. Despite this strong and repeated Board position, the DOE has, until recently, chosen to reduce the funds going to the waste package development program. We believe it is unwise to defer studies in this area. As the DOE reviews its budget priorities during the coming year, the Board recommends that increased funding be directed to engineered barrier development

In October of last year, the Board published a report titled *Underground Exploration and Testing at Yucca Mountain.* In that report, the Board expressed its strong support for the DOE's plan to rapidly construct an underground tunnel to identify and provide access to potentially significant geologic features of the Yucca Mountain site. It has long been the Board's view that the significance of some geologic features, especially those that are nearly vertical, cannot adequately be evaluated using surface-based drilling. This is because there is only a small likelihood that vertical boreholes drilled from the surface will intersect such structures at repository depth. A bored tunnel, however, would cross such features perpendicularly, allowing physical access to them for visual examination and scientific testing at the repository level.

The Board also recommended that the DOE should reinitiate its underground thermal-testing program as soon as possible to allow the development of instrumentation and procedures and to gain as much testing experience as possible *prior* to initiating testing in the core test area. The Fran Ridge large block heater test is a start, but the program currently lacks sufficient field testing experience, proven instrumentation for underground testing, and a well-developed testing strategy. As I noted earlier, a significant issue currently facing the Yucca Mountain project is a research base for determining the most appropriate thermal loading for a repository. A well-developed program of thermal testing is needed to support a thermal-loading decision.

The Board found that the lack of a testing strategy was also evident in other areas of proposed underground testing. The Board recommended that existing plans should be

expanded to produce a *comprehensive strategy* for exploration and testing. Priorities and goals should be based on specific intermediate goals, should be consistent with the scientific needs of site characterization and repository design, and should be consistent with realistic funding expectations.

Finally, the Board found that the DOE's plans for construction of the exploratory studies facility are not consistent with practices in the underground construction industry. The Board recommended development of a more efficient system for managing design and construction of the facility that contains greater accountability and incentives for cost-effective and timely performance of the contractors.

Let me now briefly discuss an issue of more direct concern to the NRC — the NRC's regulatory requirements for the Yucca Mountain repository.

[VIEWGRAPH 9]

The Board is aware that the Energy Policy Act of 1992 calls for a general review of repository regulatory requirements, including those of the NRC. However, any needed amendments to the NRC's regulation are to follow completion of the reviews by the National Academy of Sciences and the Environmental Protection Agency. Several years could be required to complete those reviews. Meanwhile, the repository program is having difficulty implementing certain aspects of the NRC's regulations, and some NRC criteria may actually be unnecessary for repository safety.

The most obvious example is the ground-water travel time criterion of § 60.113. The DOE is now conducting studies to estimate ground-water travel time even though many hydrologists do not believe it is a very meaningful indicator of the suitability of the site. At Yucca Mountain, other parameters, such as percolation flux through the unsaturated zone, might be better measures of the waste isolation capabilities of the site.

Another example of less immediate urgency, but possibly of greater significance as the repository design matures, is the provision of §60.113 that allows alternative numerical goals for the performance of the major subsystems of a repository. It is not clear at what stage in the licensing process the NRC would approve or specify alternative goals, nor is it clear how the NRC would decide what those goals should be.

It has been more than ten years since the NRC's regulation was promulgated. In those areas where there are *known* problems with the regulations, the Board encourages the NRC to develop needed guidance or amendments now, rather than waiting until completion of the reviews of the National Academy of Sciences and the Environmental Protection Agency.

In summary, the Board expects a number of important decisions to be made, at least in a preliminary way, in the year ahead. These decisions have the potential to significantly move the program forward. In some cases, the Board has reservations about

the adequacy of existing information to support decisions, and review of this information base will be a significant area of investigation by the Board during the coming year.

Dr. North and I will be happy to respond to questions.

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Critical Decisions Lie Ahead

John E. Cantlon, Chairman, NWTRB

March 14, 1994

Nuclear Waste Technical Review Board

Created by Congress in 1987 to:

Evaluate technical and scientific aspects of DOE's civilian spent fuel and high-level waste management program including site characterization, packaging, and transportation.

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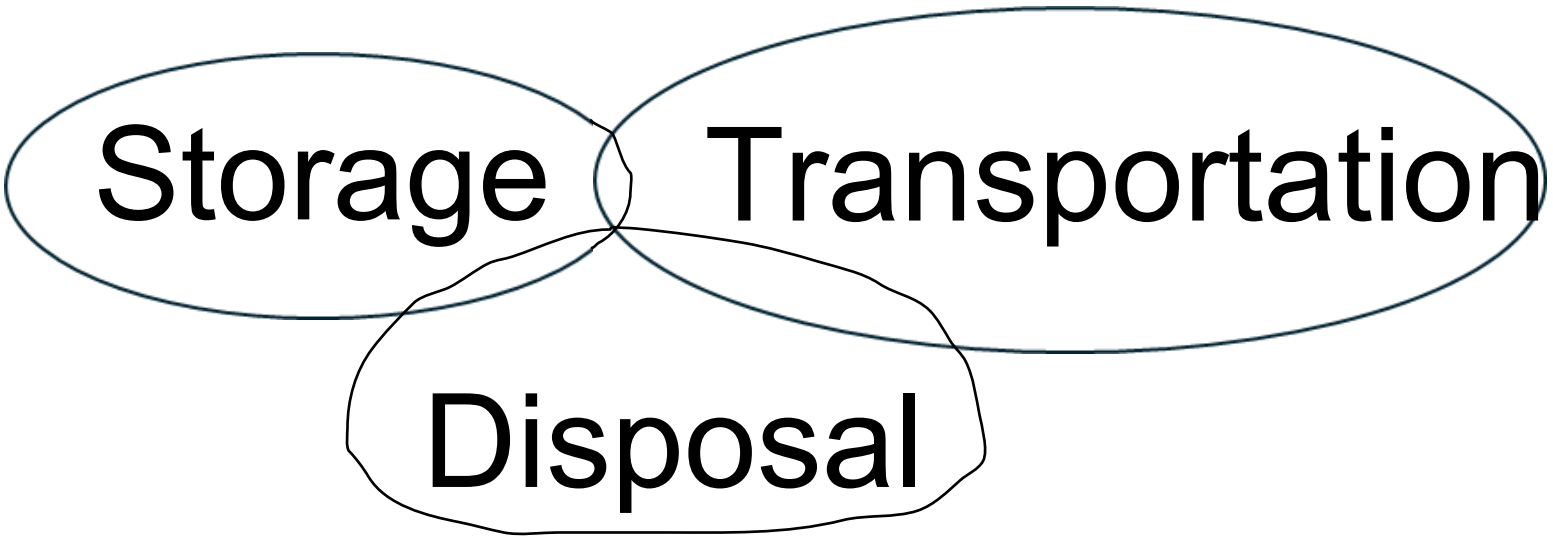
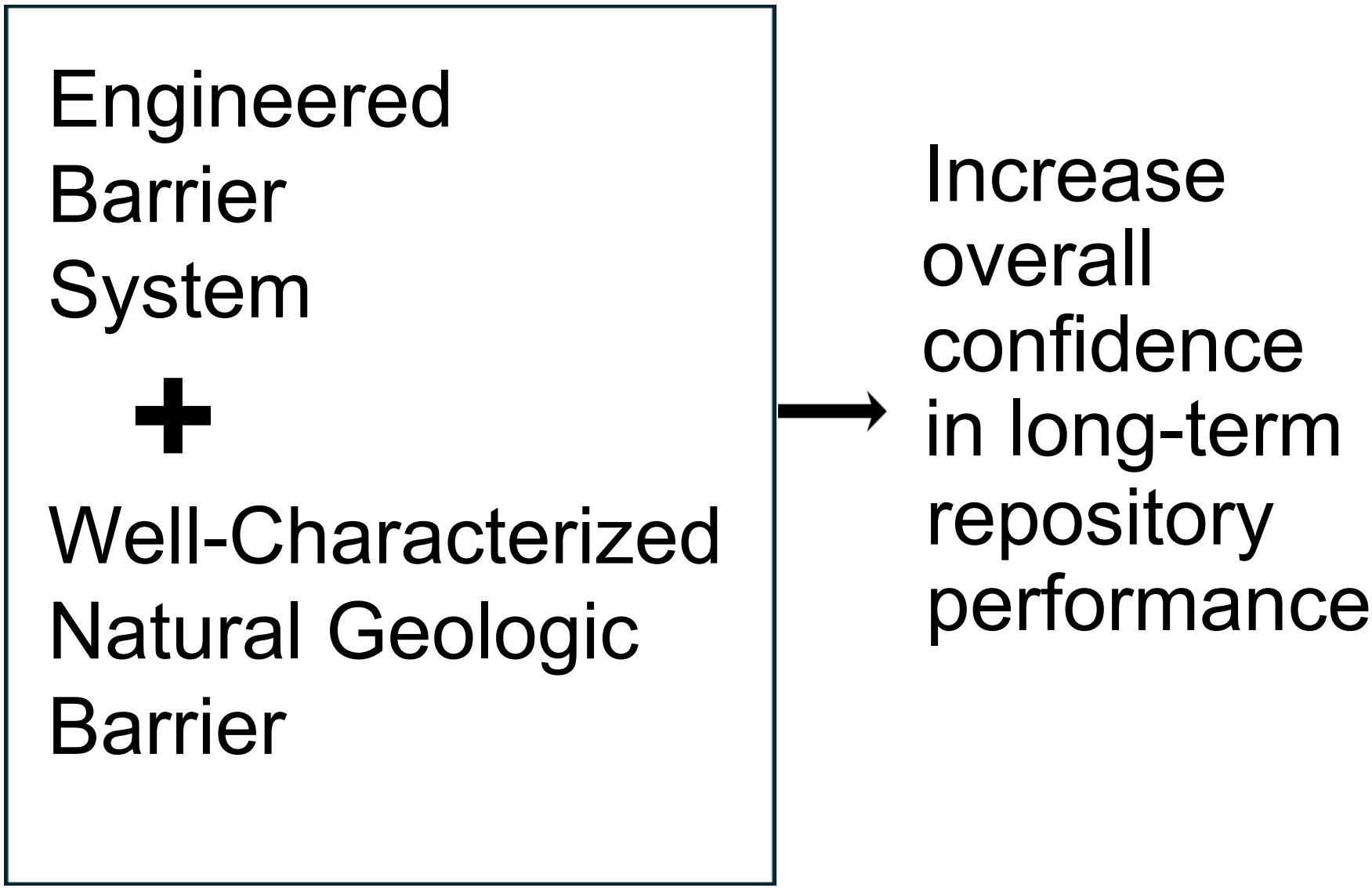
Radioactive Waste Management is a Highly Interdependent System



Multipurpose Containers

- Could have advantages
- System impacts need to be evaluated


Engineered
Barrier
System
+
Well-Characterized
Natural Geologic
Barrier
Increase
overall
confidence
in long-term
repository
performance

Recommendation

Don't defer studies on engineered barriers

Update of 10 CFR Part 60 is Needed

- **Ground-water travel time criterion needs revision**
- **Trade-offs between subsystems need clarification**