

LOW-LEVEL RADIOACTIVE WASTE PROTOTYPE LICENSE APPLICATION PROJECT

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ABSTRACT

This paper reports the status of the Department of Energy's Prototype License Application Project. The Prototype License Application Project evaluates the licenseability of earth-mounded concrete bunkers and below ground vaults for low-level radioactive waste disposal. Work is progressing with a November 1988 completion anticipated.

BACKGROUND

With the passage of the Low-Level Radioactive Waste Policy Amendments Act of 1985, the Department of Energy (DOE) was given responsibility for providing assistance on alternative technologies for low-level radioactive waste (LLW) disposal. In early 1986, DOE's Low-Level Waste Management Program (LLWMP) initiated a project to develop conceptual designs and analyze six widely considered disposal concepts. These include: a) shallow land disposal, b) intermediate depth disposal c) below ground vault disposal, d) above ground vault disposal, e) earth-mounded concrete bunker disposal, and f) modular concrete canister disposal. The project was completed in early 1987 and culminated with the issuance of the DOE's Conceptual Design Report, "Alternative Concepts in Low-Level Radioactive Waste Disposal" and a national seminar on alternative technologies in July 1987.

It soon became evident that additional needs existed that could not be addressed by further developing the designs presented in the Conceptual Design Report. These needs, identified by representatives of several states and compact regions, focused on the licensing of LLW disposal facilities incorporating disposal technologies other than shallow land disposal. Because eleven of the fourteen states developing new disposal facilities prohibit the use of conventional shallow land disposal it was apparent that this was an issue of general concern.

Licensing requirements for near-surface disposal, that is disposal within the upper 30 meters of the earth's surface, have been in existence since the Nuclear Regulatory Commission (NRC) issued Title 10, Code of Federal Regulations, Part 61 (10 CFR 61), "Licensing Requirements for Land Disposal of Radioactive Waste" in 1982. Although the regulation was developed around the use of shallow land disposal, the NRC has publicly stated that 10 CFR 61 re-

quirements would apply to most earthen-covered alternatives and that those alternatives can indeed be licensed under 10 CFR 61. However, it still remained unclear if additional requirements would be imposed when an alternative concept was employed. Both the DOE and the NRC agreed that a project should be developed to address these concerns and the Prototype License Application Project was conceived.

PROTOTYPE LICENSE APPLICATION PROJECT

In planning this second major project on alternative technologies, the LLWMP decided that two different alternative disposal concepts would be developed. This approach would provide a broader perspective on licensing, while furthering the development of two disposal concepts.

State and regional compact representatives were asked to provide recommendations for the two disposal concepts to be used as the basis for the project. Without a clear consensus, the LLWMP chose two technologies representing a broad spectrum of interests: below ground vault disposal and earth-mounded concrete bunker disposal. The below ground vault had been the preferred disposal concept of those technical representatives who attended the national seminar on alternative technologies in July 1987. The earth-mounded concrete bunker, on the other hand, offered the most technical and regulatory challenges of the concepts considered.

Four major project objectives were identified: (a) further the state-of-the-art in LLW disposal technology design and analysis, (b) address potential licensing issues associated with alternative disposal technologies, (c) develop a prototype license application using existing NRC guidance and (d) provide for NRC review and comment of the prototype license application. These objectives most

clearly represented the concerns which had been related to DOE by state and regional representatives.

A request for proposals was issued in early 1987. Rogers and Associates Engineering Corporation and Ebasco Services Incorporated were selected to perform the below ground vault and earth-mounded concrete bunker projects respectively. Work on both projects began during the third quarter of 1987; a November 1988 completion is anticipated. The following deliverables are being developed to meet the project objectives.

Deliverables

Safety Analysis Report EMCB	10/88
Safety Analysis Report BGV	11/88
Concrete Properties Test Repo	11/88
Results of NRC License Application Review	TBD
Regional Sensitivities Analysis Report for BGV Performance Assessment	11/88

DOE and NRC are working together to provide a regulatory review of both safety analysis reports (SAR). The regulatory review will be performed upon the completion of the prototype reports. The final SAR will not be released until the regulatory review has been completed and the results documented. A schedule for NRC review and comment as not been determined.

APPROACH

In an actual design and licensing project, the performer would have data such as waste stream characteristics, site characteristics, and design requirements available as a point of departure. This is not the case with the Prototype License Application Project, in which a hypothetical site and an imaginary waste stream must be assumed. Although the waste, site, and other important aspects of the project are hypothetical, it is important that data be developed, evaluated and selected to reasonably represent real states and compact regions. Initial conditions were additionally established to maintain a basis of comparison between the below-ground vault and the earth-mounded concrete bunker reports. These include:

Annual disposal volume	235,000 cu ft
Operating life	30 years
Geographical locatio	Northeastern United States

The annual disposal volume and operating life are consistent with the design basis assumptions used in the Conceptual Design Report. The northeastern United States was chosen as the geographical location for the site because it provided the most technical challenges. Important characteristics of both hypothetical sites are presented on Table I.

The NRC's "Standard Format and Content of a License Application for a Low-Level Radioactive Waste Diposal Facility" (NUREG 1199) and "Standard Review Plan for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility" (NUREG 1200) were used as the basis for both safety analysis reports. In accordance with these documents, the major elements of the SAR for both projects will include:

1. General Information
2. Site Characteristics
3. Design and Construction
4. Facility Operations
5. Site Closure Plan and Institutional Controls
6. Safety Assessment
7. Occupational Radiation Protection
8. Conduct of Operations
9. Quality Assurance
10. Financial Assurance

Emphasis has been placed on elements three, six, and seven, with particular attention given to the analytical approach. As with any nonspecific study, it is difficult to know how much information is "too much" and how much is "not enough". The NRC documents were written for real sites, real waste, and real license applications. Consequently, much information is required that would be applicable to an actual site, but that has limited application to a hypothetical site. Programmatic decisions have been made throughout the project to ensure that the correct level of detail is achieved.

The important information to be gained from the Prototype License Application Project is not the results of the analysis, the comparison between disposal concepts, nor the "representativeness" or completeness of the assumed data, but rather, the approach taken to meet the licensing requirements and the NRC's evaluation of that approach.

RESULTS

EG&G staff are currently reviewing the drafts of both safety analysis reports and the preliminary results of the performance assessment calculations. A panel of industry experts will be assembled to perform a peer review of both

TABLE I

Hypothetical Site Characteristics

	BGV	ERMC
Area Requirements (acres)	300	160
Regional Geology	Coastal Plain	Overlain glacial till w/shale bedrock
Permeability (cm/s)	10 ⁻⁴	10 ⁻⁵ to 10 ⁻⁸
Groundwater		
* Depth (m)	16.7	27.4
* Recharge location from site (km)	17.6 (upstream)	
* Recharge Rate (cm)	46	
* Groundwater/surface water discharge	small stream	small stream
* Distance to discharge point (km)	<1.6	8
Mean annual precipitation (cm)	119	89
Annual percolation rates (cm/y)		
* General site area	45	
* Class A vault caps	10	
* Class B/C vault caps	4	
Nearest population center (km)	3.5	
Nearest resident (km)		1.6
Projected population within 10km	19,000	16,300
Maximum frost penetration (m)	1	
Extreme Temperatures (°f)		
- Low	-14	-28
- High	102	100
Maximum wind speed (kph)	83	113.6
Mean annual snowfall (cm)	46	170
Seismicity		
- UBC zone	II	II
- Peak horizontal acceleration (g)	.2	.15

documents. The peer review is scheduled for June with a projected completion date of November 1988. Distribution of all the project deliverables will be made to independent

states and compact regions developing new LLW disposal capacity upon completion of the NRC review.