

LICENSING LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITIES: A FORMIDABLE CHALLENGE

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ABSTRACT

Almost all of the new facilities for commercial disposal of low-level radioactive waste will use disposal strategies other than shallow land burial. No regulatory agency, including the Nuclear Regulatory Commission, has licensed any kind of commercial disposal other than shallow land burial, and none of the existing commercial disposal facilities was licensed pursuant to 10 CFR Part 61, the Commission's regulations for licensing land burial of radioactive waste. The regulatory challenge which must be met if a low-level radioactive waste disposal crisis is to be averted is successful licensing under new regulations, be they 10 CFR Part 61 or compatible Agreement State regulations, of new commercial facilities, that use new disposal strategies. If the past is predictive, the likelihood of meeting the challenge on time is low. This paper lays out the basis for these prognostications and offers some suggestions for mitigating, but not necessarily averting, the crisis.

INTRODUCTION

The Low-Level Radioactive Waste Policy Act, (1) as amended by the Low-Level Radioactive Waste Policy Amendments Act of 1985 (2) (collectively referred to as the "amended Policy Act"), provides a framework for low-level radioactive waste ("LLRW") disposal. The program established by Congress in the amended Policy Act assigns basic responsibility for LLRW disposal to the States. It also encourages States to join in regional Compacts to provide for the establishment and operation of regional LLRW disposal facilities. As a result of the statutory provisions of the amended Policy Act, the use of such facilities can be restricted to LLRW generators within the States comprising Compact regions, without running afoul of the commerce clause of the U.S. Constitution.

Discharge of State responsibilities imposed under, and the exercise of prerogatives granted by, the amended Policy Act will result in the establishment of new LLRW disposal facilities. The development and operation of such facilities, in turn, will require licensing by either the Nuclear Regulatory Commission ("NRC" or "Commission"), or a State which has entered into an appropriate Agreement with the NRC pursuant to Section 274 of the Atomic Energy Act of 1954 (3). This effort will pose numerous challenges from both procedural and technical perspectives.

For example, while these facilities may not be the first of their kind, they will, in the case of regulation by the NRC, be the first licensed by the Commission since authority devolved from the Atomic Energy Commission ("AEC"); and the first to be subject to the requirements and procedures prescribed by the agency in its new regulations governing land disposal of LLRW, embodied in 10 CFR Part 61. The licensing of LLRW disposal facilities will also be a first-time endeavor for many Agreement States. Further, Agreement States will be administering regulatory programs, aspects of which have never been implemented before.

In addition, overlaying both NRC and State licensing regimes is a general complex of State-based prescriptions stemming from the regional Compacts, themselves, and State statutes and regulations. These are certain to lead to

complications. For example, in some cases Compacts, as well as individual States, have prohibited or restricted the use of shallow land burial ("SLB"), thus ushering in a new era in commercial LLRW disposal technology. In other instances, State prescriptions governing facility site selection are not in complete harmony with facility licensing requirements. There are also cases where State requirements may be incomplete, or have not yet met the legal test of compatibility with the applicable NRC regulatory framework, thus contributing to licensing uncertainties. Further, the evolving regulatory framework governing the disposal of radioactive waste that is below regulatory concern ("BRC") creates the potential for additional complexity.

The purpose of this paper is to provide an overview of the regulatory landscape pertinent to LLRW disposal facilities as it now reveals itself. In so doing, the paper will identify specific examples of some of the problems that can be expected.

Overall, the picture is clear. The establishment of a network of LLRW disposal facilities presents a significant challenge. This challenge is heightened by the milestones prescribed in the amended Policy Act; particularly the January 1, 1993, deadline for the operation of new facilities.

BACKGROUND LLRW DISPOSAL HISTORY LEADING TO PASSAGE OF THE AMENDED POLICY ACT

In 1971, six commercial LLRW disposal facilities were in operation. They were located at Beatty, Nevada; Maxey Flats, Kentucky; West Valley, New York; Hanford, Washington; Sheffield, Illinois; and Barnwell, South Carolina. All sites utilized shallow land burial. By 1980, only three of the six sites remained in operation those at Beatty, Hanford and Barnwell. The Governors of the States of Nevada, Washington, and South Carolina became concerned that their States would remain the recipients of the nation's commercial LLRW indefinitely, unless affirmative steps were taken to encourage the development of new disposal facilities. Out of this concern came Congressional enactment of the 1980 Low-Level Radioactive Waste Policy Act, which established State responsibility for disposal of

LLRW. However, the basic goal of the Policy Act to have new regional LLRW disposal facilities in operation by January 1, 1986 was not achieved. By 1985, a disposal crisis was imminent.

To avert the crisis, the Policy Act was amended. A substantially revamped statutory framework was put in place to encourage States to have new disposal facilities on-line no later than December 31, 1992. In particular, progress toward this deadline was to be measured by a series of milestones July 1, 1986 (State joins a Compact or Governor certifies intent to develop a site within the State for a LLRW disposal facility); January 1, 1988 (siting plans developed for each facility, including implementation schedule); January 1, 1990 (license application completed or certification by Governor of State's capability to store, dispose of or manage LLRW generated in State after December 31, 1992) designed, among other things, to permit easy assessment of progress toward development of required disposal capacity. (4)

This approach has, in fact, resulted in progress. For example, only New Hampshire, North Dakota, Vermont and Puerto Rico failed to meet the January 1, 1988, milestone. Further, it already appears that California (Southwestern Compact), Illinois (Central Midwest Compact), and Texas (which is proceeding by itself) will meet the January 1, 1990, milestone of submitting license applications for new disposal facilities. Governors of States who otherwise would not have access to these or existing facilities each will have to comply with the 1990 milestone by providing written certification to the NRC that each individual State will be capable of assuming its responsibilities for storage, disposal or management of commercial LLRW generated within the State. (5)

In spite of progress, however, the road ahead is long, and by no means smooth and clear. In particular, meeting the final milestone, calling for the operation of new disposal facilities by January 1, 1993, will present a significant

challenge; especially when considered in terms of the need to complete the licensing review process for each new facility.

CURRENT REGULATORY FRAMEWORK UNDER THE AMENDED POLICY ACT AND REGIONAL COMPACTS

Congress has consented to nine regional compacts for LLRW disposal (of which 41 States presently are members, with 2 more States expected to join). Currently, 13 States have been identified as likely to host new facilities. Of these States, seven now have Agreement State Authority to regulate commercial LLRW disposal (California, Colorado, Illinois, Nebraska, New York, North Carolina and Texas), and will license the sites they host. Michigan and Massachusetts are seeking Agreement State status which would include authority to regulate, and hence license, LLRW disposal. However, timing is not clear, and the NRC may continue as licensor. Pennsylvania is seeking a limited-status Agreement to regulate only LLRW disposal. If successful, Pennsylvania can be expected to license the regional facility for the Appalachian Compact. (6)

LICENSING LLRW DISPOSAL UNDER NRC AND AGREEMENT STATE REGIMES - AN OVERVIEW

NRC Licensing Regime

An applicant must be able to demonstrate compliance with the requirements of 10 CFR Part 61, the Commission's "Licensing Requirements for Land Disposal of Radioactive Waste," in order to receive a license for commercial disposal of LLRW from the NRC. These regulations, promulgated in 1982, have never been applied to the licensing of a new LLRW disposal facility. This, in itself, will result in uncertainties in the licensing process.

In addition, the regulations, although applicable to near-surface LLRW disposal in general, are complete only with respect to SLB. The NRC Staff has developed guidance

- * Because California does not intend to permit the disposal of "mixed" LLRW at the facility presently under development, it is possible that Governors of member States of the Southwestern Compact will also have to provide this certification in order to be found in compliance with the 1990 milestone.
- ** Appalachian States Low-Level Radioactive Waste Compact (Delaware, Maryland, Pennsylvania, West Virginia); Central Interstate Low-Level Radioactive Waste Compact (Arkansas, Kansas, Louisiana, Nebraska, Oklahoma); Central Midwest Interstate Low-Level Radioactive Waste Compact (Illinois, Kentucky); Midwest Interstate Low-Level Radioactive Waste Management Compact (Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin); Northeast Interstate Low-Level Radioactive Waste Compact (Connecticut, New Jersey); Northwest Interstate Compact on Low-Level Radioactive Waste Management (Alaska, Hawaii, Idaho, Montana, Oregon, Utah, Washington); Rocky Mountain Low-Level Radioactive Waste Compact (Colorado, Nevada, New Mexico, Wyoming); Southeast Interstate Low-Level Radioactive Waste Management Compact (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, Virginia); Southwestern Low-Level Radioactive Waste Disposal Compact (Arizona, California, North Dakota (expected, South Dakota (as expected)).
- *** California, Colorado, Connecticut, Illinois, Maine, Massachusetts, Michigan, Nebraska, New Jersey, New York, North Carolina, Pennsylvania, Texas. Colorado will be the second host State for the Rocky Mountain Compact. However, there is not as yet a schedule for replacing the Beatty, Nevada site with a Colorado site. Washington will continue to serve the Northwest Compact States.

on alternatives to SLB, which has been published in the form of "NUREG" documents. As with the basic regulations in Part 61, however, this guidance has never been applied before, and there are certain to be complications. The significance of the matter is enhanced by the fact that SLB has been precluded in five of the six facilities the NRC may license.

An additional complication is added by the fact that the NRC, itself, has never licensed a new LLRW disposal facility, of any type. There is, of course, some institutional memory in the agency remaining from the licensing activities of the AEC. Further, there is a vast body of NRC licensing decisions concerning reactor siting and construction, and some decisions concerning LLRW disposal at existing sites. Certain of these decisions can and should provide guidance regarding the sufficiency and presentation of information on technical matters; such as geology, seismology, and meteorology. The agency's lack of experience in the licensing of LLRW disposal sites, however, is certain to be a complicating factor in the licensing process.

The NRC will issue a license for LLRW disposal only after a thorough review of the license application by the NRC Staff. This review will be highly interactive, requiring the submittal and clarification of information by the applicant as it proceeds. In addition, the Commission's regulations in 10 CFR Part 2 provide opportunity for an adjudicatory hearing with respect to applications for licenses issued under Part 61. If a request for a hearing or a petition for leave to intervene is timely filed, an Atomic Safety and Licensing Board will be established to rule on whether or not the request or petition should be granted. If granted, a proceeding would be conducted in accordance with Subpart G of 10 CFR Part 2, which sets forth rules pertaining to formal, adjudicatory, trial-type hearings. Under these rules, there would be opportunity to conduct discovery and to present evidence concerning contested issues (or "contentions") admitted by the Licensing Board. There would also be the opportunity to cross-examine

witnesses presenting testimony. If a hearing is held, appeals may follow, thus lengthening the process.

Agreement State Licensing Framework

For an Agreement State to license LLRW disposal, it must first have in place regulations which are "compatible" with the NRC's program for regulating LLRW disposal. The Commission has defined what is necessary for compatibility in a series of policy statements. This guidance includes the identification of certain sections of 10 CFR Part 61 which Agreement States must include in their regulations either in virtually identical language, or in language consistent with the principles underlying the NRC requirements. (7) In part because of the compatibility requirement and the relatively recent adoption of 10 CFR Part 61, Agreement State regulations governing LLRW disposal are new in many respects. Accordingly, they will face first-time application in the licensing of new LLRW disposal facilities in Agreement States.

The choice of other than SLB for LLRW disposal is also a factor operating to add novelty to the Agreement State licensing process. Thus far, only California has committed to SLB. Nebraska, New York, Texas, North Carolina and Illinois are precluded by law from using SLB. Colorado, while not precluding SLB, has not yet announced the disposal method it will use. Even though it is likely that Agreement States will rely on NRC Staff guidance pertaining to alternative disposal methods, its application will be new to Agreement State reviewers and applicants⁺.

None of the Agreement States that will be licensing new LLRW disposal facilities has done so before, except New York, which licensed the West Valley commercial LLRW disposal site. Illinois has had some experience with regulation of the Sheffield site. Colorado and Texas have had experience in the regulation of uranium mill tailings under amended Agreements with the NRC. This relative paucity of experience is of potential concern because the licensing of a LLRW disposal facility involves interpretation and application of criteria from a number of scientific disciplines --including geology, seismology, hydrology, geochemistry, meteorology, and climatology not of

* NUREG-1241 (December 1986), "Licensing of Alternative Methods of Disposal of Low-Level Radioactive Waste"; NUREG-1199, Rev. 1 (January 1988), "Standard Format and Content of a License Application for a Low-Level Radioactive Waste Facility; Safety Analysis Report"; NUREG-1200, Rev. 1 (January 1988), "Standard Review Plan for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility; Safety Analysis Report."

** The NRC will license LLRW disposal in non-Agreement States. Presently, the non-Agreement States expected to host LLRW disposal facilities include Connecticut, Maine and New Jersey, in addition to Massachusetts, Michigan and Pennsylvania.

*** The NRC Staff licensing review process is described in NUREG-1274 (August 1987), "Review Process for Low-Level Radioactive Waste Disposal License Application Under Low-Level Radioactive Waste Policy Amendments Act."

**** Until 1959, only the AEC had authority to regulate by-product, source or special nuclear materials under the Atomic Energy Act of 1954, as amended. In 1959, Congress added section 274 to the Act, which authorized the AEC "to enter into agreements with the Governor of any State providing for discontinuance of the regulatory authority of the Commission....During the duration of such an agreement the (Agreement) State... (has) authority to regulate the materials covered by the agreement for the protection of the public health and safety from radiation hazards." 42 U.S.C. 2021(b). In 1962, the AEC allowed Agreement States to regulate commercial land burial of LLRW. To obtain such authority, a State must have a program that is "compatible with the Commission's program for the regulation of such materials... (and which) is adequate to protect the public health and safety with respect to the materials covered by the proposed agreement." 42 U.S.C. 2021(d)(2). The AEC's Agreement State authority is now exercised by the NRC.

+ Agreement State compatibility does not extend to the administrative review process. (8) Thus, Agreement States may vary as to whether or not they require a judiciary hearings.

importance to much of the other licensing conducted under State Agreements with the NRC. These criteria will add complexity to licensing reviews conducted under Agreement State authority, particularly if the licensing agency must rely for review on technical experts in the various disciplines who lack prior licensing or regulatory experience.

Applicant's Role in Successful Licensing Under NRC or Agreement State Regime

How well the licensing review process will proceed is a function not only of the experience of the regulatory agency's licensing staff, but also of the capability and experience of the applicant's team. Deficiencies in the latter will exacerbate deficiencies in the former. As indicated earlier, there are numerous NRC precedents that can and should be used, at least analogously, in determining the nature and level of proof necessary in licensing a LLRW disposal facility. This base of experience should not go untapped as the prospective applicant prepares for licensing.

SURVEY OF STATE-BASED PRESCRIPTIONS REGARDING LLRW DISPOSAL

States have responded vigorously to passage of the amended Policy Act by enacting new legislation to delegate authority to existing or newly created State agencies to carry out the tasks of developing, licensing and regulating new LLRW disposal facilities, and by the adoption of implementing regulations. The new legislation and implementing regulations have tended to establish detailed legal requirements for discharging responsibilities. They have also operated to create complexity and attendant uncertainty.

State-Based Prescriptions Related to the Banning of SLB

In enacting legislation responsive to the amended Policy Act, States have tended to preclude the use of SLB as a method of disposal. New requirements will affect the complexity of licensing, especially where compliance with requirements is determined in the course of adjudicatory hearings. Such determinations can be expected to present problems of proof related, for example, to the adequacy of the information needed or the use of state-of-the-art (but not necessarily field-proven) technology.

For example, Michigan law (9) requires "above and below ground canisters or above and below ground vaults, or both"; recoverability of the wastes; and provisions for monitoring at the disposal site and within the disposal unit. Use of state-of-the-art technology is required for design, construction, operation, and waste disposal technology, to be applied in the form of specifications to be included in the "construction and operating license." The licensing

requirements for design, construction and operation of the disposal site are to be at least as stringent as all applicable Federal design, construction and operating requirements. The Michigan siting criteria, however, create the potential for selection of unlicensable site; or a site for which a finding of compliance with applicable requirements might be difficult.

New York also precludes SLB. New York's regulations regarding LLRW disposal facilities set forth detailed criteria directed at maintaining the integrity of the disposal unit. (10) Criteria cover above ground disposal methods; below ground disposal methods; and underground mined repositories. The performance of disposal units must be "defensibly characterized, modeled, analyzed and evaluated." This language suggests a high yet undefined standard of proof. Additionally, there may be proof problems associated with criteria related to the stability of the foundations of above ground or below ground disposal units, or the resistance of these disposal units to inadvertent intrusion, or their structural stability and containment capability under environmental conditions that include the freeze-thaw cycle and acid rain. The choice of above ground disposal units could exacerbate proof problems.

Similarly, Pennsylvania's proposed regulations for LLRW management and disposal could present proof problems. (11) For example, certain technical analyses required to demonstrate that performance objectives are met must "clearly demonstrate" assurance or "demonstrate" assurance or simply "provide" assurance. This language suggests differing levels of proof. There is a design and construction goal for the disposal technology of zero release of radioactive material. Engineered structures, in addition to waste containers, must be used and must provide leak resistance for 100 years following the postclosure observation and maintenance period. The engineered structures must permit the disposal facility to comply independently with the performance objectives which relate to protection of the general population and environment from releases of radioactivity and to long term stability of the disposal site, without regard for the natural site features, for a minimum of 100 years. Design goals for the material integrity and stability of the engineered structures are for 100 years for Class A waste, 300 years for Class B waste, and 500 years for both Class C and mixed waste. How each of these goals has been accommodated must be described in the application. The adequacy of the accommodation will have to be considered in the licensing review.

State-Based Prescriptions Potentially Affecting BRC Waste Disposal Strategies

Radioactive wastes below regulatory concern ("BRC wastes") are wastes that "would not need to be subject to

* Michigan law sets up a dual system of regulation, requiring licensing approvals from the NRC or a Michigan State agency, should Michigan not become an Agreement State.

regulatory control to assure adequate protection of the public health and safety because of their radioactive content BRC waste is also LLRW. It is reasonable to expect that the Commission would find that some BRC waste streams could be disposed of in sanitary landfills. However, because of State-based prescriptions precluding SLB or precluding, in the absence of Compact or host State approval, disposal of LLRW in other than the regional or State LLRW disposal facility, BRC waste has a potential for creating licensing uncertainties. The designation of a BRC waste stream would not necessarily preclude burial of the waste within the confines of a LLRW disposal facility and, if a decision was made to require disposal of BRC waste in a LLRW disposal facility, it is not unreasonable to expect that such disposal would still require licensing review to make certain that the place and means chosen for disposal of the BRC waste would not interfere with disposal of the Class A, B or C LLRW waste at the facility. Because requirements for non-interference have not been established, there is a potential for complication if questions concerning BRC waste disposal in a LLRW disposal facility should arise.

MEETING THE DECEMBER 31, 1992 DEADLINE PROGNOSIS

Although progress is being made toward meeting the December 31, 1992, deadline for having new LLRW disposal facilities in operation, much of that progress has, of necessity, been focused on aspects of LLRW facility development other than licensing, *per se*. Compacts have been established; new facility host States have been identified; host States have created statutory and regulatory frameworks for delegating LLRW disposal responsibilities within the States; and license-designees have been selected.

Attention cannot be focused too soon on the task of licensing. Now is the time for applicants to complete the assembling of their licensing teams, and to move ahead. Based upon past experience, the challenge of licensing may be the most formidable of all. The efforts of everyone will be required if the challenge of meeting the January 1, 1993

deadline for new facilities is to be met.

REFERENCES

1. Pub. L. 96-573, Dec. 22, 1980, 94 Stat. 3347, repealed by, Pub. L. 99-240, Title I, Jan. 15, 1986, 99 Stat. 1842.
2. 42 U.S.C.A. 2021b *et seq.* (West Supp. 1988), Pub. L. 99-240, Jan. 15, 1986, 99 Stat. 1842.
3. 42 U.S.C.A. 2011 *et seq.* (West 1987).
4. 42 U.S.C.A. 2021e (West Supp. 1988).
5. U.S. Nuclear Regulatory Commission, NRC Staff Memorandum, "Current Status of Each State in Providing Disposal of Low-Level Radioactive Waste August 8, 1988" (August 16, 1988).
6. *Id.*
7. "Criteria for Guidance of States and NRC in Discontinuance of NRC Regulatory Authority and Assumptions Thereof by States Through Agreement" (46 Fed. Reg. 7,540 (Jan. 23, 1981)); "Discontinuance of NRC Authority and Assumption Thereof by States Through Agreement; Criteria for Guidance of States and NRC" (48 Fed. Reg. 33,376 (July 21, 1983)); "Evaluation of Agreement State Radiation Control Programs: Final General Statement of Policy" (52 Fed. Reg. 21,132 (June 4, 1987)). See also, "Licensing Requirements for Land Disposal of Radioactive Waste" (47 Fed. Reg. 57,446 (Dec. 27, 1982)).
8. U.S. Nuclear Regulatory Commission, "Review Process for Low-Level Radioactive Waste Disposal License Application Under Low-Level Radioactive Waste Policy Amendments Act," NUREG-1274, (August 1987), p.1.
9. Michigan Compiled Laws Annotated (Supp. 1988), 333.13701 *et seq.*; 333.26201 *et seq.*
10. Title 6, Part 382 of the Official Compilation of Codes, Rules and Regulations of the State of New York (1988).
11. Proposed Rulemaking of Environmental Quality Board concerning Low-Level Radioactive Waste Management and Disposal, 18 Pennsylvania Bulletin 3,167 (July 16, 1988).

* See Appendix B of 10 CFR Part 2, which sets forth the Commission's General Statement of Policy and Procedures Concerning Petitions Pursuant to 2802 for Disposal of Radioactive Waste Streams Below Regulatory Concern. It was promulgated in response to provisions of the amended Policy Act directed at conserving capacity at LLRW facilities.