LOW-LEVEL WASTE MANAGEMENT - ALTERNATIVES TO LICENSED DISPOSAL

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ABSTRACT

The issue of low-level waste disposal is one of great current interest in the nuclear power industry. Locensed burial of low-level waste is costly and is becoming scarce. Many utilities are seeking alternatives to licensed burial for very-low-level wastes. The regulations of 10 CFR 20.302 provide licensees with the opportunity to request NRC approval of proposed alternative methods for low-level waste disposal. By obtaining NRC approval for alternative disposal methods, licensees can save money and valuable licensed burial space. This paper summarizes a study performed for the National Environmental Studies Project of the Atomic Industrial Forum which examined utility experience with 10 CFR 20.302 applications. It will highlight similarities and differences to develop a better understanding of the 10 CFR 20.302 application process.

INTRODUCTION

As licensed burial space for low-level radioactive waste becomes more and more scare, utilities are faced with the prospect of implementing stringent waste management practices. 10 CFR Part 20 requires that all licensed material be disposed of in a manner specified in the regulations. The usual method of disposal for low-level waste is transfer to a disposal facility licensed under Part 61. However, alternative methods of disposal are available for very-low-level wastes under the provisions of 10 CFR 20.302 (a). These very-low-level wastes may be disposed of in an alternative manner if such disposal does not present an undue risk to the public health and safety.

The Low-Level Waste Policy Act of 1980 established January 1, 1986 as the cutoff date past which land disposal of low-level waste may be restricted by regional/state compacts. The 1985 Amendments to the Act now require low-level waste generators to provide for waste disposal within their own interstate compact regions by January 1, 1991.

To minimize their problems, many utilities are taking an active approach to waste management. A major objective of a waste management program is to reduce the volume of radioactive waste which may be shipped to licensed disposal sites. This objective can be addressed by methods such as limiting the volume of prospective waste material which enters the plant and reducing the volume of waste by compaction. Another approach to the problem is to limit the amount of waste that must be sent to licensed sites by segregating plant wastes into "contaminated waste" (to be disposed of under Part 61) and "clean waste" which could be disposed of by alternate means.

10 CFR 20.302(a) APPLICATIONS

NRC IE Information Notice No. 83-05, "Obtaining Approval for Disposing of Very-Low-Level Radioactive Waste- 10 CFR Section 20.302", encouraged the use of 10 CFR 20.302(a) as an economically viable alternative to Part 61 licensed shallow land burial. The Notice was issued early in 1983 and prompted several utility licensees to take advantage of this disposal alternative offered to them. Many utilities have applied under 20.302 and have been successful in obtaining approval for the alternative disposal method they proposed.

The regulations state generally what must be included in an application for approval of a proposed disposal method. 10 CFR 20.302(a) states:

> Each application should include a description of the licensed material and any other radioactive material involved, including the quantities and kinds of radioactivity involved, and the proposed manner and conditions of disposal. The application should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, metheorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

This method of approval for disposal method is applicable to both routine specific waste streams and special one-time-only cases. Waste streams such as waste oil or compacted trash are generated routinely on-site, and the disposal of these wastes (requires routine disposal). Under 20.302, licensees may apply to alternatively disposal of such wastes on a routine basis on the grounds that such

disposal would not adversely affect the public health and safety. Non-routine wastes such as contaminated soil or sand also create problems due to the large volume or unusual nature of waste involved. 10 CFR 20.302 provides the opportunity to dispose of these wastes in a manner which would be cost-efficient as well as space-saving.

SUMMARY OF UTILITY EXPERIENCE

Licensee experience with 10 CFR 20.302 approval requests is limited. The NRC staff has provided much information regarding these requests. Table I summarized the major characteristics of the requests for approval to dispose of very-low-level waste under 10 CFR 20.302 ("approval requests") reviewed by NRR over the past several years. Information outlined on the table includes the request approval date, the plant that generated the waste, a description of the waste stream, the disposal site and method, and the estimated dose to the maximally exposed individual (in mrem/yr). This table is useful for summarizing utility experience and identifies areas of generic interest. The various table headings will be examined further in this paper.

Request Approval Date

The request approval dates, displayed in the second column of Table I, point to trends in the waste disposal area. In 1981, '82, and '83 only two requests per year were reviewed and approved by NRR. The next year, 1984, saw a significant increase in the number of requests reviewed and approved. This escalation in 20.302 applications continues in 1985. Five requests were approved during the first quarter of the year.

The increase in the number of requests processed could be due to several factors. First, the rescinding of the provision of Part 20 allowing on-site disposal of small quantities of radioactive wastes means that the disposal of materials that were formerly buried now require prior NRC approval. Second, the cost of Part 61 licensed burial is rising rapidly, and the availability of such burial space is declining rapidly. The Low Level Waste Policy Act is also placing restrictions on the availability of low-level waste disposal space.

TABLE I

Summary of 20.302(a) Application Characteristics

Case No.	Date	Plant	Description of Waste	Disposal		Estimated Maximum Dose (mrem/yr)*
				Site	Method	
1.	03/21/81	Oconee 1, 2, 3	Waste Oil	On-site	Incireration	0.07
2.	08/24/81	San Onofre	Contaminated Sand	On-site	Burial	1
3.	10/05/82	Oconee 1, 2, 3	Waste Oil	On-site	Incineration	0.5
4.	11/09/82	Oyster Creek	Soil	On-site	Burial & Paved Over	3
5.	02/10/83	H.B. Robinson 2	Sediment	Fossil Plant Ash Pond	Transfer from Settling Pond	5
6.	04/28/83	H.B. Robinson 2	Soil	On-site	Burial in a Drainage Ditch	5
7.	04/24/84	Humboldt Bay	Sludge	On-site	Burial in Chemical Waste Disposal Landfill	1.5
8.	07/19/84	Oconee 1, 2, 3	Sewage Sludge	Off-site	Sanitary Landfill	0.2 - 0.6
9.	10/17/84	H.B. Robinson 2	Settling Pond Sediment	On-site	Transfer to Ash Pond	5 5
10.	10/17/84	R.E. Ginna 1	Roofing Materials	Off-site	Municipal Landfill	4
11.	10/18/84	McGuire 1 & 2	Wastewater-Residue Sludge	On-Site	Landspread, Vegetation & Top-soil Cover	1 1
12.	12/15/84	Oconee 1, 2, & 3	Feedwater heaters	Off-site company controlled area	Trench burial	0.01
13.	01/31/85	Oconee 1, 2, & 3	Sand	Off-site-company Controlled Area	Trench burial	1
14.	02/04/85	Brunswick 1 & 2	Waste Oil	On-site	Incineration	0.1
15.	02/07/85	Oconee 1, 2 ,& 3 McGuire 1 & 2 Catawba 1 & 2	Wood	Off-site	Sanitary Landfill (Burial)	1
16.	03/11/85	Davis Besse	Secondary Side Resins	Off-site Company Owned	Landspread, Vegetation & Topsoil Cover	4
17.	03/14/85	H.B. Robinson 2	Soil	On-site	Transfer to Ash Pond	0.1

*Estimated Dose Equivalent to the Maximally Exposed Person.

Typical Waste Streams - Descriptions and Characteristics.

The provisions of 10 CFR 20.302 were established to give licensees an alternative to Part 61 requirements for large volumes of very-low-level waste. IE Information Note 83-05 recommends (regarding 20.302) that "...this section of the regulations may be used to obtain approval of proposed procedures for disposal of, among other things, large volumes of material contaminated at very low levels, such as contamined soil, oil, or tools and equipment." A review of the applications submitted to date reveals trends in waste type, volume, and activity. The following sections will investigate these trends and summarize major characteristics in each category.

Waste Type and Frequency

A summary of all the approval requests submitted and reviewed as of August 1985 is presented in Table I. A quick look at the table indicates that licensees tend to seek disposal approval for similar sorts of waste. Table II identifies several general waste categories and the number of applications reviewed for each waste category

TABLE II

Waste Categories and Frequency of Application*

Waste Category	Number of Applications Reviewed
Contaminated Sand/Soil	5
Sludge	5**
Waste Oil	3
Sediment	2
Secondary Side Resins	1
Scrap Wood	1
Feedwater Heater Tube Bundles	1
Roofing Materials	1

*Data Supplied by NRR
**Includes two cases not summarized on Table I, but recently reviewed and approved by NRR.

Several conclusions may be drawn from reviewing Table II. Licensees most often seek approval to dispose of non-repetitive, high-volume wastes such as contaminated sand and/or soil. These wastes most often occur as the result of an accidental spill or leak or from BWR sandblasting cleanup efforts. The physical nature of these wastes makes them good candidates for alternative disposal. Their large volume and low activity also contribute to their suitability for disposal under 20.302.

Routine wastes such as sludge and waste oil are often disposed of under 20.302 as well. These wastes are generated on a continuous basis and contain very little radioactivity. Because they originate at a licensed facility, disposal of these wastes is governed by 10 CFR 61. The alternative to disposal at a Part 61 licensed facility is approval of a disposal method under 20.302. Waste oil can be burned to recover energy, and sludge can be sent to sanitary landfills or be landspread.

The remaining wastes which were disposed of under 20.302 are all non-routine, large-volume, low-activity wastes. Disposal of these wastes in a Part 61 licensed facility would be costly to the licensee and would scarce disposal space. The disposal of these wastes by the methods described on Table I has been determined by the NRC to present no undue risk to the health and safety of the public.

Waste Volume

A major factor in choosing to seek approval under 20.302 for disposal of low-level wastes is the large volume of the waste involved. Disposal of low-level waste in a Part 61 licensed facility is a very expensive prospect; and since space is sold by volume, the larger the volume of waste to be disposed of, the greater the cost. Table III summarizes the typical waste categories and presents an average volume for each category. These averages are based on relatively few data points, and should be viewed with caution. They will, however, give the reader some idea of the amount of waste involved.

TABLE III

Average Waste Volumes

Waste Category	Average Volume
Contaminated Sand/Soil	350 m^3
Sludge	173 m^3
Waste Oil	25.2 m^3
Sediment	33,000 m^3
Secondary Side Resins	142 m^3
Scrap Wood	19.8 m^3
Feedwater Heater Tube Bundles	145 tons (metric)
Roofing Materials	90.8 tons (metric)

Waste Disposal Methods

Table I shows the disposal sites and the disposal methods approved for various wastes under 10 CFR 20.302. A comparison of the disposal site/disposal method combinations led to six general combinations. Table IV lists the combinations and the frequency with which each method has been approved.

The on-site burial of low-level reactor waste is the most frequent combination, with the other five falling close behind. On-site incineration is the only method approved so far for waste oil. Soil and sand are usually buried on-site or at an off-site owner controlled area. Methods used reflect the typical disposal methods for non-radioactive waste of the same type. Other combinations of disposal site/disposal method could be developed using new combinations of previous sites and methods, or introducing new sites and/or disposal methods. NRC's acceptance of these "unproven" combinations will depend on how such disposal will affect the environment and the public health and safety.

TABLE IV

Disposal Site/Disposal Method Combinations

Disposal Site	Disposal Method	Frequency of Occurrence
On-Site	Incineration	3
On-Site	Burial	4
On-Site	Relocation *	3
On-Site/Off-Site OCA **	Landspreading	2
Off-Site OCA	Burial	2
Off-Site	Sanitary Landfill	3

* Relocation refers to relocation of waste from settling pond to on-site fossil ash pond.

** OCA is an abbreviation for Owner Controlled Area.

Dose Contributions From Disposed Waste

One of the most important considerations when evaluating a waste stream for potential alternative disposal is the contribution the waste will make to annual dose received by the (hypothetical) maximally exposed individual. The licensee must evaluate the impact of disposal of the waste through various exposure pathways. The annual dose to the maximally exposed individual is then calculated. The NRC reviews and re-evaluates these estimates. In general the methods of analysis and the assumptions used are conservative, that is, the dose measured in an actual situation is more likely to be below than above the calculated estimate. For the cases reviewed and approved to date the estimated annual dose to the maximally exposed individual ranges from 0.01 mrem/yr to 5 mrem/yr (see Table I). This is 0.002% to 1% of the allowable annual dose to an actual member of the public of 500 mrem/yr (10 CFR 20).

CONCLUSION

10CFR 20.302(a) provides an opportunity for licensees to apply for permission to dispose of very-low-level wastes by alternative means. Alternative disposal of these waste allows licensees to devote their waste disposal resources to development of new and better waste management practices. The savings to be gained from utilizing 20.302(a) as an alternative to Part 61 licensed disposal extends beyond capital savings. The savings in licensed burial space may be an even more significant benefit. Scarce licensed burial space will be better utilized through disposal of wastes which truly require licensed burial.