

PURSUIT OF AGREEMENT STATE APPROVAL OF IN-PLACE DISPOSAL AND LANDSPREADING OF SLIGHTLY CONTAMINATED SOIL

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ABSTRACT

The question of how to economically dispose of very low-level radioactive waste is one which has confronted utility waste management professionals for many years. Much of the waste which contains extremely low levels of radioactive waste is very great in volume and essentially benign both physically and chemically. This combination of features makes disposing of this waste difficult. Packaging the waste and shipping it to a licensed facility is wasteful of both disposal site space and utility resources. Many utilities are presently seeking approval to dispose of these relatively harmless waste streams on-site at their nuclear power facility.

Commonwealth Edison Company is setting an industry example with their ambitious program for dealing with these difficult waste streams. They are currently seeking approval for disposal of several very low-level waste streams in alternative manners. This paper explores the technical and regulatory hurdles of preparing and submitting requests for approval of alternative disposal. The two examples cited in this paper are landspreading of slightly contaminated soil at the Dresden Nuclear Power Station and in-situ disposal of slightly contaminated soil at the LaSalle County Station.

INTRODUCTION

This paper begins by discussing the regulations which govern the disposal of low-level radioactive waste outside of federally licensed facilities. It then provides a short description of each waste stream and the disposal method proposed for each stream. These descriptions are followed by a summary of the potential doses resulting from implementation of the disposal options. The paper concludes with an update of the status of each submittal.

In general, disposal of slightly contaminated soil as ordinary soil presents little risk to man or the environment. The dose assessments performed in support of these submittals demonstrates this. Leaving contaminated soil in-place or landspreading it on a remote location are attractive disposal options for high-volume, slightly contaminated waste streams.

SUMMARY OF RELEVANT REGULATIONS

Part 20, section 302(a) of Title 10 of the Code of Federal Regulations provides a method by which NRC licensees can apply for approval to dispose of radioactive waste outside of facilities licensed under Part 61. A licensee must provide adequate descriptions of the waste stream, the disposal site, and the disposal method. He must also show that the proposed action will not adversely impact man or the environment.

This regulation has been used by numerous utilities to obtain approval of proposed "non-licensed" disposal methods for very low-level waste streams. In non-Agree-

ment States, the NRC is responsible for reviewing and approving licensee submittals under 10CFR 20.302(a). The responsibility for the review and approval process falls on the State authorities in Agreement States. The NRC must also review and approve the submittal if transportation or storage of the waste stream is included under the proposed option. The State retains the authority to regulate the "disposal" of the waste stream, regardless of whether or not the "disposal" is to occur on the licensee's property. [The NRC is currently working to regain absolute authority over 20.302(a) submittals for on-site disposal]

Because Illinois is an Agreement State, Commonwealth Edison must submit their applications for approval of alternative disposal methods to the State regulatory authority under the provisions of a State law. The law in the State of Illinois which parallels 10 CFR 20.302(a) is 32 Illinois Administrative Code, Chapter II, Section 340.3020(a). The two regulations are very similar in nature, with the Illinois regulation being slightly more restrictive. Section 340.3020(a) requires the licensee to provide all of the information necessary for the Illinois Department of Nuclear Safety to perform an independent assessment of the impacts of the proposed disposal option.

Other state regulations may impact a licensee's choice of alternative disposal methods. For instance, in the state of Illinois, "shallow land burial" is prohibited. Because no specific definition of "shallow land burial" is provided in the regulations, the interpretation of this rule is difficult. Based on the accepted industry definition of "shallow land burial" of radioactive waste, Commonwealth Edison has excluded

the option of disposal in soil-covered, lined trenches from consideration.

Another regulation impacting the preparation and submittal of these exemption requests is the State/Compact legislation. The state of Illinois is a member of the Central Midwest Compact. The Compact legislation places restrictions on the disposal of any waste at facilities other than the regional licensed facility. Provisions exist to petition the Compact Commission for approval to dispose of waste outside the regional facility, and Commonwealth Edison is taking advantage of this provision to seek approval of their proposed disposal options. In summary, a licensee could expect to face three levels of regulatory authority when submitting an application for approval of alternative disposal options - the NRC, the Agreement State (if applicable), and the Compact Commission.

DESCRIPTION OF WASTE STREAMS AND DESIRED DISPOSAL METHODS

Dresden Landspreading

A large mound of slightly contaminated soil has collected over the past years at the Dresden Nuclear Power Station site mainly from excavation and cleanup activities. The large mound of soil was originally collected in several smaller piles dispersed over the site. These smaller mounds were sampled and analyzed to determine the radionuclides present and their concentrations.

The small dirt mounds (labeled a-j) were analyzed in May of 1986 and the results of the analysis appear in Table I. This data gives a reasonable indication of the levels of activity in the soil. For the purpose of the dose assessments, the mass of contaminated soil is assumed to be homogeneous. The total volume of soil to be disposed of is 59,800 (approximately 60,000) cubic feet.

Commonwealth Edison wishes to dispose of this slightly contaminated soil by landspreading it on a remote location on-site. The landspreading procedure consists of loading the soil into trucks and transporting it to the proposed disposal site. The soil is then removed from the trucks and distributed in a thin (6-8 inch) layer over the disposal area. The bare soil will then be seed with a suitable vegetation cover to prevent erosion by air or water.

The site which has been selected as the landspreading site is located just north of the Dresden Nuclear Power Station Unit 2/3 intake canal outside the security fence, but within the owner controlled area (property fence). The proposed disposal site is essentially flat and currently is covered with grass and small trees and bushes. The slightly contaminated soil would be spread in a thin layer over an area approximately 200 feet wide by 600 feet long.

LaSalle In-place

On May 27, 1985, a security guard noticed water bubbling from the ground near the Off Gas Filter Building of the LaSalle County Station. Operations personnel determined that the Unit 2 High Pressure Core Spray (HPCS) pump was running, and had been running for about 2 hours. The pump was immediately secured and the flow of water slowed, and the excess water flowed into the cooling pond via a drainage ditch. The HPCS line to the Cycled Condensate tank was immediately isolated and taken out of service to prevent further leakage.

Following establishment of surveying and monitoring procedures a test program was developed to test all underground HPCS-CY piping for leaks. The tests confirmed the leak on the Unit 2 HPCS return line and produced evidence of a similar but smaller leak on the Unit 1 HPCS return line. Since the Unit 1 HPCS return line was located 15 feet closer to the surface, this line was excavated and a section removed (the exposed ends of the line were capped) to determine the reason for the failure. Analysis of the removed section of piping showed the failure to be due to preferential attack of the weld metal.

Table II below summarizes the concentrations of the radionuclides of concern in both water and two soil zones. The inner zone refers to soil directly surrounding the two HPCS lines out to a radius of 2 feet. The outer zone refers to all other soil possibly contaminated by the HPCS line break and leak. The data used and assumptions made to develop Table II can be found in the General Physics Report GP-R-213096, "Dose Assessment Report - LaSalle County Station In-place Disposal of Soil."

Commonwealth Edison is proposing to "dispose" of the soil surrounding the two HPCS in-situ. Leaving the slightly contaminated soil in-place will prevent needless outages to excavate and remove the soil, and will save Commonwealth Edison the expense of packaging the material and transporting it to a licensed facility. The impacts of this action on man and the environment are minimal, as demonstrated by the dose assessment results provided in the following section.

SUMMARY OF RADIOLOGICAL/ENVIRONMENTAL IMPACTS

Dresden Landspreading

The landspreading of slightly contaminated soil on-site at the Dresden Nuclear Power Station could theoretically impact various individuals and groups. In order to determine the dose to the maximally exposed individual, the doses via various exposure pathways/scenarios were calculated. Using a generalized model consisting of four basic exposure pathways (direct exposure, inhalation, ingestion of contaminated food and ingestion of contaminated water), detailed exposure scenarios were developed based the

TABLE I

Soil Analysis Results (May, 1986)

SAMPLE (PILE) (*)	VOLUME [ft ³ (m ³)]	CONCEN**		TOTAL	
		Co-60 [uCi/g]	Co-60 [mCi]	Cs-137 [uCi/g]	Cs-137 [mCi]
86-01(a)	23000 (651)	5.3E-07	0.597	6.8E-07	0.766
86-02(b)	10000 (283)	4.4E-06	2.156	8.9E-07	0.436
86-03(c)	1500 (43)	1.1E-06	0.081	6.0E-07	0.045
86-04(c)	1500 (43)	5.4E-07	0.040	2.3E-07	0.017
86-05(d)	1000 (28)	1.7E-05	0.833	8.0E-06	0.388
86-06(d)	1000 (28)	3.5E-06	0.171	6.8E-06	0.329
86-07(e)	4000 (113)	8.5E-07	0.166	5.9E-07	0.116
86-08(f)	1200 (34)	6.5E-07	0.038	2.5E-07	0.015
86-09(g)	3300 (94)	1.1E-06	0.178	1.7E-06	0.275
86-10(g)	3300 (94)	8.3E-07	0.134	9.1E-07	0.147
86-11(h)	4000 (113)	4.1E-07	0.080	8.8E-08	0.017
86-12(h)	4000 (113)	4.5E-07	0.088	-----	---
86-13(i)	1000 (28)	5.1E-07	0.025	9.5E-08	0.005
86-14(j)	1000 (28)	2.7E-07	0.013	-----	---
TOTAL	59800 (1693)		4.600		2.556
AVERAGE***		1.6E-06		8.5E-07	

Notes: * The letter in parentheses designates the original mound. The total volume of each small mound is the sum of the volumes of the sample points with the same letter.

** The concentration of the nuclides was reported in units of microcuries per gram. The total activity is obtained by multiplying the volume times the concentration times the density of the soil. (Assume a density of 108 lb/ft³)

*** The average total activity is the volume weighted average of the values reported for each sample.

TABLE II

Concentrations of Radionuclides to be Left In-Situ

Table II
Concentrations of Radionuclides to be Left In-situ

RADIO- NUCLIDE	HALF-LIFE	(WATER) [uCi/ml]	CONCENTRATION		EST. TOTAL ACTIVITY*
			(OUTER ZONE) [uCi/g]	(INNER ZONE) [uCi/g]	
H-3	12.3 y	5.8 E-04	-----	-----	1.2 E+07
Cr-51	27.7 d	-----	2.1 E-15	-----	5.1 E-13
Mn-54	312.5 d	-----	3.0 E-06	1.9 E-07	7.2 E-04
Fe-59	44.6 d	-----	9.3 E-12	-----	2.2 E-09
Co-58	70.8 d	-----	2.0 E-09	-----	2.4 E-07
Co-60	5.27 y	-----	1.2 E-05	1.7 E-07	2.9 E-03
Zn-65	243.8 d	-----	2.5 E-07	4.2 E-07	6.0 E-05
Sb-124	60.2 d	4.3 E-12	-----	-----	9.1 E-02

* The estimated total activity (uCi) is calculated from the inner zone soil concentrations for all radionuclides except H-3 and Sb-124. The total activity for these radionuclides is estimated based on their concentration in water.

disposal method to be used, the environmental conditions of the area, and the distribution of population in the region. A total of seventeen exposure pathway/scenarios were assessed for this proposed disposal option. The results of the dose assessment calculations appear below in Tables III and IV. The detailed calculations along with the data used and the assumption made can be found in the General Physics Report, "Dose Assessment Report - Landspreading of Contaminated Soil at the Dresden Generating Station."

LaSalle In-place

As with the Dresden waste stream, the slightly contaminated soil to be left in place at the LaSalle County Station will have little, if any, measurable impact on man or the environment. The exposure pathway/scenarios developed for this waste stream were based on the specific disposal method and environmental and population factors relevant

to this option. Table V below summarizes the dose calculated for the pathway/scenarios assessed for in-situ disposal of soil at the LaSalle County Station.

SUBMITTAL STATUS

As of this writing, the Dresden submittal has been forwarded to the Illinois Department of Nuclear Safety by Commonwealth Edison. The application may be submitted to other regulatory authorities, as necessary, by early spring. Permission to dispose of low-level waste outside the regional licensed facility has been requested, but no answer has been received from the Compact Commissioners.

The LaSalle submittal has been drafted and reviewed and the final submittal is currently in the production phase. Once the final application has been compiled and approved,

TABLE III

Individual Dose Summary for Landspreading of Soil at the Dresden Generating Station

Pathway/Scenario	Dose* (mrem/yr)	Organ
1. Direct Exposure - Occupational	6.5 7.6	T Body Skin
2. Direct Exposure - Casual	0.64 0.75	T Body Skin
3. Direct Exposure at Property Fence	0.013	T Body
4. Inhalation	1.7 E-06 1.2 E-06 2.3 E-05 1.1 E-06	Liver T Body Lung GI-LLI
5. Flood of Illinois River	3.0 E-03 2.0 E-03 6.0 E-04	Liver T Body GI-LLI
6. Ingestion of River Water	N/R	
7. Ingestion of Fish	N/R	
8. Swim in River Water	N/R	
9. Ingestion of Offsite Well Water	N/R	
10. Intruder	1.2 1.4	T Body Skin
11. Construction	N/R	
12. Residential	1.2 1.4	T Body Skin
13. Ingestion of Food	N/R	
14. Ingestion of Onsite Well Water	N/R	

*Note: The doses reported are either the actual doses calculated or an extreme upper bound. (N/R - Not Reported)

the submittal will be forwarded to the Illinois Department of Nuclear Safety and other regulatory bodies, as necessary.

TABLE IV

**Summary of Collective Doses for Landspreading of Slightly Contaminated
Soil at the Dresden Generating Station**

Critical Group	Collective Dose
Disposal/Transport Worker	0.004 person-rem/yr
Total Workers Onsite	0.058 person-rem/yr
Total Population	0.016 person-rem/yr

TABLE V

**Summary of Dose Assessment Results -
In-Situ Disposal of Soil at the LaSalle County Station**

Pathway/Scenario	Dose(mrem/yr)
1. Direct Exposure - Occupational	0.7
2. Direct Exposure - Casual	0.07
3. Direct Exposure at Property Fence	0.6
4. Ingestion of On-site Well Water	3 E-06
5. Inhalation	2 E-05 (T Body) 7 E-05 (Lung)
6. Direct Exposure - Recreational	<1 E-06
7. Ingestion of Fish from Cooling Lake	3 E-05
8. Ingestion of River Water	5 E-04
9. Ingestion of Fish from River	<1 E-06
10. Swimming in Illinois River	<1 E-06
11. Direct Exposure - Residence on River	<1 E-06
12. Ingestion of Food - River Irrigated	1 E-04
13. Ingestion of Offsite Well Water	<1E-06
14. Ingestion of Food - Well Irrigated	7 E-04
15. Ingestion of Offsite Well Water	<1 E-06
16. Intruder	<1 E-06
17. Ingestion of Onsite Well Water	3 E-02
18. Ingestion of Food Grown Onsite	7 E-03
19. Inhalation - Intruder	<1 E-06