DOE/ET/44207-2

Cost Estimates Supporting West Valley DEIS

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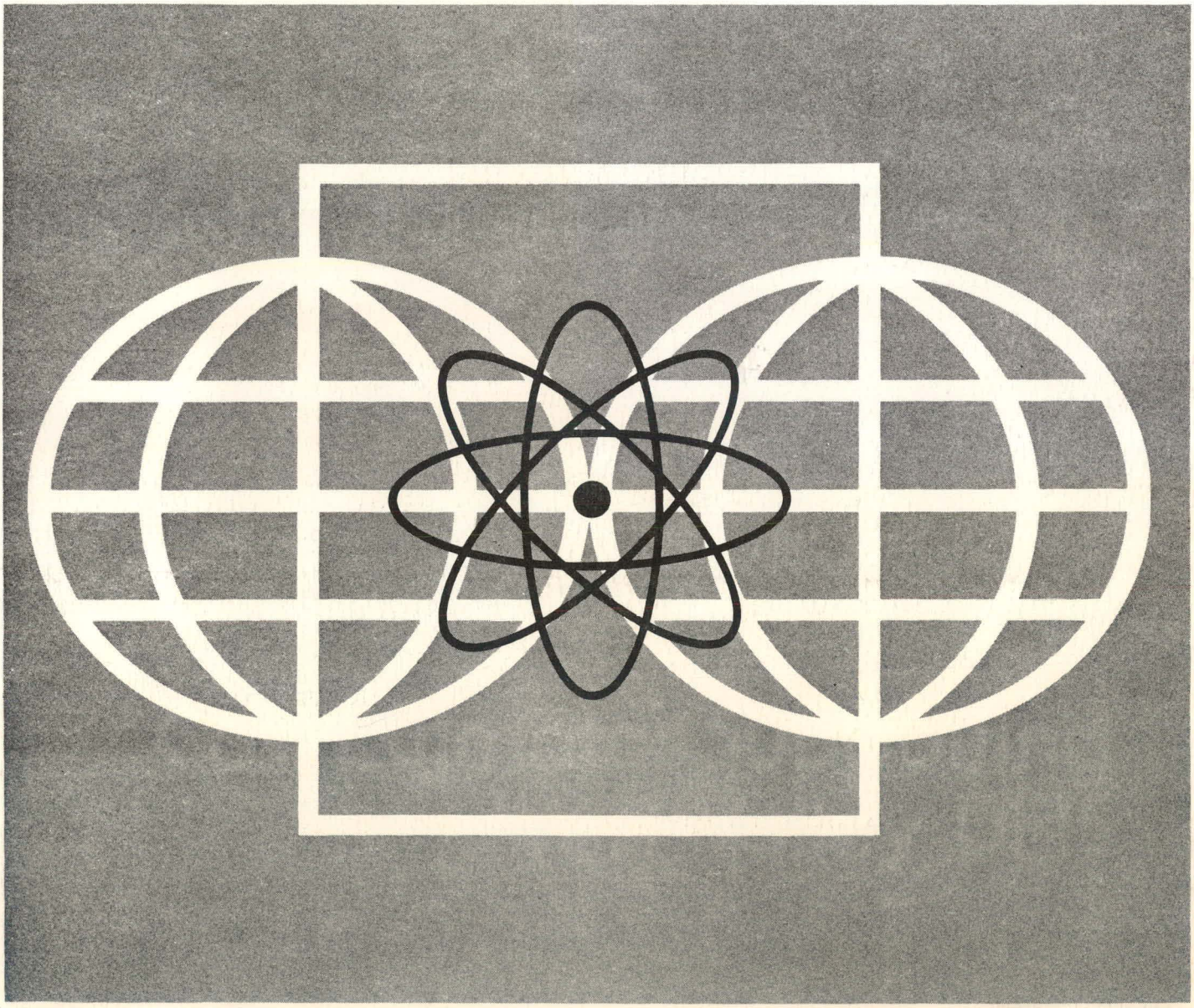

Burns and Roe Industrial Services Corporation

DISCLAIMER

DOE/ET/44207-2

COST ESTIMATES SUPPORTING WEST VALLEY DEIS

BURNS AND ROE INDUSTRIAL SERVICES CORPORATION
PARAMUS, NEW JERSEY

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PREPARED FOR
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Integrated Cost Estimate for EIS

Introduction

An Environmental Impact Statement (EIS) is being prepared which considers alternate means for solidifying the high level liquid wastes (HLLW) at the Western New York Nuclear Service Center (WNYNSC). To support the EIS, the costs to accomplish each of the alternatives is provided. The purpose of this cost estimate is to provide a common basis to evaluate the expenditures required to immobilize the HLLW presently stored at the WNYNSC.

Alternatives

For this purpose three basic scenarios were considered together with alternates to the basic scenarios as follows:

A. The HLLW is converted into terminal waste form (borosilicate glass selected as reference waste form for analyses)

1. Before vitrification, the non-radioactive chemical salts are separated from the radioactive and transuranic (TRU) constituents in the HLLW.

a. Alternative 1a

After vitrification, the solidified HLLW and TRU wastes are eventually removed to a Federal repository for permanent disposal, whereas the low level waste (LLW) is buried on-site and the contaminated equipment and structures are decontaminated, placed into protective storage for 100 years and eventually entombed.

b. Alternative 1b

After vitrification, the solidified HLLW and TRU wastes are eventually removed to a Federal repository for permanent disposal, all LLW generated during the solidification operation is removed and transported for off-site burial at a commercial burial site and the structures used during solidification, including the HLLW storage tanks, are decontaminated, dismantled and removed.

2. The HLLW solution is not treated to separate non-radioactive chemical salts as in A.1 but is calcined and vitrified together with them.

a. Alternative 1c

As in A.1.a, solidified HLLW and TRU wastes are eventually removed to a Federal repository for permanent disposal, LLW is buried on-site and contaminated equipment and structures are decontaminated, placed into protective storage for 100 years and eventually entombed.

b. Alternative 1d

As in A.1.b, the facility is decontaminated and dismantled. Solidified HLLW and TRU wastes are removed for permanent disposal at a Federal repository and LLW is buried at a commercial facility off-site. All structures are removed after decontamination.

B. The HLLW is converted into Intermediate Form (Fused salt is used as reference waste form)

The stored HLLW is dewatered and melted and the solids are transported to a Department of Energy (DOE) site. The fused salt will be processed at the DOE site at a later date where it will be converted to a vitrified form in a facility that will be constructed to treat HLLW stored at that site. The vitrified salt will be eventually removed for permanent disposal at a Federal repository identical with the one considered under A.1 and A.2.

1. Alternative 2a

The solidified HLLW and TRU wastes are removed, for treatment at a DOE site and burial at a Federal Repository respectively, but the LLW is buried on-site and the on-site facilities and equipment are decontaminated, placed in protective storage for 100 years and eventually entombed as in A.1.a and A.2.a.

2. Alternative 2b

For this option, the solidified HLLW and TRU wastes are removed for treatment at a DOE site and burial at a Federal Repository respectively, the facility is decontaminated and dismantled, LLW is buried at a commercial off-site facility and all structures are removed similar to the operation under A.1.b and A.2.b.

C. The HLLW is solidified in the Existing HLLW Storage Tanks

Alternative 3

For this option, the HLLW is treated with cement to immobilize it as a concrete and returned for on-site disposal in the existing tanks and additional tanks as necessary to accommodate the needed volume. The existing on-site facilities are decontaminated, placed into protective storage for 100 years and eventually entombed in a manner similar to A.1.a, A.2.a and B.1.

Outline

The cost estimate, which is presented, considered the costs of all the activities that will be required to accomplish the goal of solidifying the HLLW stored at the WNYNSC site for the seven different options which are evaluated. These activities are listed in Table 1 and range from the initial planning for the activities to the burial of all

TABLE 1

WESTERN NEW YORK NUCLEAR SERVICE CENTER
ENVIRONMENTAL IMPACT STATEMENT COST INTEGRATION MATRIX

DESCRIPTION OF ACTIVITY	INCLUDED IN ALTERNATIVE						
	1a	1b	1c	1d	2a	2b	3a
1. Planning and Preparing Decommissioning Activities							
A. Prepare decommissioning plan	X	X	X	X	X	X	X
B. Submit documents to regulatory agencies, licensing	X	X	X	X	X	X	X
C. Train decommissioning staff	X	X	X	X	X	X	X
2. Construct LLWTF, Building and Equipment							
A. New Structure	X	X	X	X	X	X	X
B. LLWT Process equipment, capital cost, and installation	X	X	X	X	X	X	X
3. Decontamination Activities							
A. Obtain and prepare decontamination equipment and chemicals, capital cost	X	X	X	X	X	X	X
B. Chemical decontamination of process equipment							
1. Decontaminate for complete dismantlement - entire facility		X		X		X	
2. Decontaminate for protective storage - entire facility							X
3. Decontaminate required processing areas for complete dismantlement, process rest of building for protective storage	X		X		X		
C. Decontaminate Process Cell Surfaces							
1. Decontaminate for complete demolition of building		X		X		X	
2. Decontaminate for protective storage							X
3. Decontaminate required processing areas for dismantlement, rest for protective Storage	X		X		X		
D. Miscellaneous							
1. Dismantlement and removal of contaminated equipment piping and contaminated plant structures for entire reprocessing building		X		X		X	
2. Dismantlement of processing area piping, surface concrete, and packaging	X		X		X		
4. Process LLW Resulting from Decontamination Effort							
Operational Cost: includes chemicals, labor and utilities							
1. Decontamination solutions and spent resins - volume reduction, solidification by by binder addition, and packaging in drums	X	X	X	X	X	X	X
2. Radioactive trash - compacting and packaging in drums	X	X	X	X	X	X	X
3. Contaminated equipment and hardware - packaging in metal and wood boxes							
a. Equipment in processing areas	X		X		X		
b. All process equipment		X		X		X	
5. Modify Existing Facilities to Process HLW							
Vitrification: Modify existing facilities - provide path for canister transfer in/out of CPC, modify existing off-gas system, modify various systems, aux. systems, ventilation, glass frit, viewing, remote handling equipment, modify existing acid recovery system, install equipment required for post immobilization of decon as necessary.	X	X	X	X	X	X	

TABLE 1 (Cont'd)

WESTERN NEW YORK NUCLEAR SERVICE CENTER
ENVIRONMENTAL IMPACT STATEMENT COST INTEGRATION MATRIX

DESCRIPTION OF ACTIVITY	INCLUDED IN ALTERNATIVE						
	1a	1b	1c	1d	2a	2b	3a
6. Interim Storage of Solidified HLW							
A. Construct storage facility, transfer path and ancillary equipment for storage and transfer							
1. 300 canister facility	X	X					
2. 1200 canister facility			X	X			
B. Provide interim storage capability and construct a transfer facility to load interim waste for offsite transportion					X	X	
7. Capital Cost of Solidification Process Equipment							
A. Vitrification - Installation in process area - Hands on installation							
1. Facility for salt separated	X	X					
2. Facility for salt not separated			X	X			
B. Interim Waste - capital costs					X	X	
C. In Tank Solidification - capital cost of installation required for mixing the HLW with cement and feeding mixture to tank 8D1. Includes recirculating pumps, slurry transfer pump, and shielded enclosure							X
8. Removal of HLW from Underground Tanks and transfer to HLW Solidification Equipment							
A. Capital Cost of equipment	X	X	X	X	X	X	X
B. Operational Cost (Alternative 1 - 3 years, 2 - 2 years, 3 - 1 year)	X	X	X	X	X	X	X
C. Utilities(Alternative 1 - 3 years, 2 - 2 years, 3 - 1 year)	X	X	X	X	X	X	X
9. HLW Processing - Operational Costs							
A. Vitrification (3 year operation) - Operational and Maintenance costs, chemicals, utilities, glass frit, resins							
1. Salts separated (300 canisters)	X	X					
2. Salts not separated (1200 canisters)			X	X			
B. Interim Waste - Operational and maintenance costs, chemicals, resins, utilities, etc. (800 canisters)					X	X	
C. In Tank Solidification - Operational and maintenance costs, cement, utilities, and fly ash							X
10. Transfer of Solidified HLW to Interim Storage							
A. Vitrification - Remote operation, operating cost (3 years), Decontamination of canisters							
1. Salts separated (300 canisters)	X	X					
2. Salts not separated (1200 canisters)			X	X			
B. Interim Waste - Transfer of HLW canisters to load out area, operational cost, (800 canisters)					X	X	
11. Maintain Interim Storage Facility (for about 15 years)							
Vitrification (15 years)							
A. Monitoring drainage, surveillance	X	X	X	X			
B. Repairs, maintenance	X	X	X	X			

TABLE 1 (Cont'd)

WESTERN NEW YORK NUCLEAR SERVICE CENTER
ENVIRONMENTAL IMPACT STATEMENT COST INTEGRATION MATRIX

DESCRIPTION OF ACTIVITY	INCLUDED IN ALTERNATIVE						
	1a	1b	1c	1d	2a	2b	3a
12. Post Operational Decontamination							
A Place Reprocessing Building in Protective Storage Mode							
1. Decontamination to protecting storage level							
a. Chemical decontamination of solidification equipment and areas	X		X				
b. Chemical decontamination of areas/facilities used for converting HLW to interim waste form					X		
c. Chemical decontamination of in-tank solidification equipment and buildings							X
2. Low level activity can be fixed in place by covering with protective paints	X		X		X		X
3. Deactivate all equipment not to be used, closing valves, blanking flanges, disconnect utilities. Only safety equipment remains operational (e.g. fire fire protection)	X		X		X		X
4. Seal all access paths with inoperable steel plate barriers, bolted or welded	X		X		X		X
5. Inspect, repair, upgrade all safety equipment							
a. Fire protection	X		X		X		X
b. Radiation monitoring	X		X		X		X
c. Install Intrusion Alarms	X		X		X		X
B. Decontamination Processing Building to Dismantlement Level							
1. Chemical decontamination to dismantlement level							
a. Chemical decontamination of solidification equipment and areas		X		X			
b. Chemical decontamination of areas/facilities used for converting HLW to interim waste form						X	
2. Dismantlement and removal Solidification equipment, concrete, cell liners, structural steel, etc.		X		X		X	
13. Process LLW Generated During HLW Processing							
Operating Cost Includes Utilities, Labor, and Chemicals							
A. Salt cake	X	X					
B. Spent Resins - volume reduction, solidification by binder addition and packaging in drums	X	X	X	X	X	X	X
C. Radioactive trash - compacting and packaging in drums	X	X	X	X	X	X	X
14. Decontamination of Storage Tanks							
A. Decontaminate HLW Storage tanks (8D2 & 8D4), and dismantle		X		X		X	
B. Decontaminate HLW storage tanks (8D2 & 8D4), and prepare for protective storage	X		X		X		
15. Process LLW Generated During Final Decontamination							
Operating cost includes chemicals, labor, and utilities provides for LLW from decontamination of solidification equipment and areas, decontamination of HLW tanks, and heel cleanup of LLWT facility							
A. Decontamination solutions and spent resins - volume reduction, solidification by binder addition, and packaging in drums	X	X	X	X	X	X	X
B. Radioactive trash - compacting and packaging in drums	X	X	X	X	X	X	X
C. Contaminated equipment and hardware - packaging in metal and wood boxes		X		X		X	
D. HLW storage tank sections - packaging in steel boxes		X		X		X	

TABLE 1 (Cont'd)

WESTERN NEW YORK NUCLEAR SERVICE CENTER
ENVIRONMENTAL IMPACT STATEMENT COST INTEGRATION MATRIX

DESCRIPTION OF ACTIVITY	INCLUDED IN ALTERNATIVE						
	1a	1b	1c	1d	2a	2b	3a
16. Disposal of LLW							
Material cost of packaging, transportation and disposal of LLW generated during operation of facility (Items IV, XIII, XIV and XV)							
A. Non-TRU LLW							
1. Commercial site disposal		X		X		X	
2. On site disposal	X		X		X		X
B. TRU Waste							
Disposal at federal repository	X	X	X	X	X	X	
17. HLW Disposal							
A. Packaging and load out of HLW Canisters	X	X	X	X	X	X	
B. Transportation							
1. To Federal Repository from West Valley							
a. Salts separated (300 canisters)	X	X					
b. Salts not separated (1200 canisters)			X	X			
2. To Waste Processing Plant at DOE Site from West Valley (800 canisters)					X	X	
3. From Waste Processing Plant at DOE Site to Federal Repository (300 canisters)					X	X	
C. Burial							
1. Salts separated (300 canisters)	X	X			X	X	
2. Salts not separated (1200 canisters)			X	X			
18. Decontamination LLWT Facility							
A. Decontaminate LLWT Facility and prepare for protective storage	X		X		X		X
B. Decontaminate LLWT Facility, dismantlement of equipment		X		X		X	
19. Interim Care for Facility, 100 years, while in protective storage. Follows decontamination of LLWT Facility							
A. Immediate Plant area inaccessible to public, includes:	X		X		X		X
1. Main Process Building							
2. LLWT Facility and HLLW storage tanks							
3. Interim storage facility while HLW is in storage							
B. Bulk of site released for public access	X		X		X		X
C. Surveillance, maintenance, security activities	X		X		X		X
D. Inspection of barriers	X		X		X		X
20. Entombment: Filling areas that contain activity with concrete. Follows protective storage.							
A. Selected Cells in Process Building	X		X		X		X
B. HLW Tanks							
1. HLW tanks, 802 and 804	X		X		X		
2. Vaults around HLW storage tanks							X
C. LLWT Facility, certain equipment and cells	X		X		X		X
21. Demolition and Restoration Activity. Includes demolition of (1) main process building; (2) LLWT facility; (3) the area around the HLW underground storage tanks by use of conventional methods such as explosives. The site is then restored to its original form.		X		X		X	
22. Solidification of the Interim Waste at DOE Site - Processing Cost and Cost of Terminal Waste Canisters					X	X	

wastes, HLW and LLW, as well as the decommissioning of selected facility structures that are contaminated from previous operations or which become contaminated during the program operations. Also shown in Table 1 are alternatives in some of the activities and to which of the scenarios considered for this study they apply. Not included are research and development activities that have been carried out to bring the selected processes to the operational phase. The dollar values presented in this estimate are in mid-1980 dollars and no escalation has been applied for activities, although it is clear that these activities will be carried out in different time periods. Consequently, appropriate escalation must be applied to each activity when the specific date for the activity is identified at a later date.

Many of the activities, considered in this cost estimate, are identical for different options. In these cases, the same costs are assigned in the estimate for these activities. In some of the activities slight variations in cost are incurred. For those cases, appropriate adjustments are made in the estimate for these activities.

In a number of the activities, such as the structure for interim storage of vitrified HLW, the cost estimated is based on those developed by Burns and Roe in studies performed for DOE. For other activities, the cost estimate is based on values developed by others, such as Rockwell Hanford for the removal of HLLW from the storage tanks.

In those instances where previous estimates were not available, costs were developed using engineering judgement. Rough quantities of material were developed and major items of equipment identified. From this information conceptual estimates were developed reflecting as near as possible the envisioned requirements for that particular activity.

Construction craft labor rates included in the direct cost portion of the estimates were developed specifically for the West Valley, New York project and reflect mid 1980 rates. These rates include fringe benefits.

Material costs were taken from various estimating publications such as: R. S. Means, Richardson Engineering Services, National Price Service and our in-house Cost Data Bank. The cost for special items of material and equipment were solicited from vendor sources who have familiarity and experience with the products involved.

Labor manhours were developed for each task using the above publications and established industry-wide standards as a basis adjusted to suit the nature of work involved.

Indirect costs cover such items as:

1. Field supervision

2. Quality assurance

3. Unemployment Insurance, Workman's Compensation, Social Security and Liability Insurance

4. Field office trailers, telephone, water and electrical hook-ups.

5. Minor construction equipment such as scaffolding, welding machines, small cranes, A-frames and trucks. Major construction equipment is included in the Direct Cost portion of the estimate.

6. Small tools and consumables

7. Contractor home office costs, including Purchasing, Estimating, Administrative, Bonds, Permits and other costs

8. General contractor mark-up on subcontracted work

9. Profit

Included in the estimates is a contingency allowance of 25 percent, based on the conceptual nature of the design and the complexity and uncertainties of the component parts of the estimates.

In the development of costs for structures to be constructed for this program, it was assumed that these structures will be designed to meet seismic forces of 0.1g. This design is compatible with that applied to waste systems in nuclear power plants. It was also assumed that sufficient shielding is provided for operation of activities that personnel exposure for continuous operations will not exceed 0.1 mr/hr. The estimate of manpower requirements to accomplish activities in the operation of the facility takes into consideration that many of these activities will require remote operation and will consequently be more drawn out.

Details of the costs considered for each activity are described in Appendices A to G for the different options considered in this group of cost estimates. The description of the activities in each appendix considers the sequence in which the activities are carried out. In all options where entombment or demolition of facilities was considered, these activities related only to the facilities associated with the solidification project and the process building. Demolition of the fuel receiving and storage facility (FRS) was not considered in any option.

The cost estimates for each option are shown in Tables 2 to 8. The numbering system of activities in each of the tables is arranged to correspond to that followed in Table 1. A particular activity, which does not apply to one of the options, is listed and a notation not applicable (NA) is made in the cost column.

TABLE 2

EIS COST INTEGRATION
ALTERNATIVE # 1a

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				1,670,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				21,247,000
4	Process LLW Resulting from Decontamination Effort				2,000,000
5	Modify Existing Facilities to Process HLW				2,814,000
6	Interim Storage of Solidified HLW				5,400,000
7	Capital Cost of Solidification Process Equipment				15,500,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				16,000,000
9	HLW Processing - Operational Costs				16,861,000
10	Transfer of Solidified HLW to Interim Storage				447,000
11	Maintain Interim Storage Facility (for about 15 years)				4,140,000
12	Post Operational Decontamination				5,057,000
13	Process LLW Generated During HLW Processing				4,005,000
14	Decontamination of Storage Tanks				8,343,000
15	Process LLW Generated During Final Decontamination				2,000,000
16	Disposal of LLW				
		Packaging	Transportation	Disposal	
	a) Non-TRU LLW	2,455,000	347,000	1,553,000	4,355,000
	b) TRU LLW	397,000	1,098,000	2,376,000	3,871,000
17	HLW Disposal				
		Packaging	Transportation	Disposal	
		5,475,000	2,092,000	32,076,000	39,643,000
18	Decontamination LLWT Facility				706,000
19	Interim Care for Facility				28,640,000
20	Entombment: Filling areas that contain activity with concrete				2,528,000
			Sub-Total		211,630,000
21	Demolition and Restoration Activity				N/A
22	Solidification of the Interim Waste at DOE Site				N/A
	Engineering, Design & Construction Management @ 15%				31,744,000
			Sub-Total		243,374,000
	Contingency @ 25%				60,843,000
			Total Alternate 1a		304,217,000

TABLE 3

EIS COST INTEGRATION
ALTERNATIVE # 1b

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				2,530,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				22,480,000
4	Process LLW Resulting from Decontamination Effort				2,009,000
5	Modify Existing Facilities to Process HLW				2,814,000
6	Interim Storage of Solidified HLW				5,400,000
7	Capital Cost of Solidification Process Equipment				15,500,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				16,000,000
9	HLW Processing - Operational Costs				16,861,000
10	Transfer of Solidified HLW to Interim Storage				447,000
11	Maintain Interim Storage Facility (for about 15 years)				4,140,000
12	Post Operational Decontamination				9,223,000
13	Process LLW Generated During HLW Processing				4,005,000
14	Decontamination of Storage Tanks				12,354,000
15	Process LLW Generated During Final Decontamination				2,009,000
16	Disposal of LLW				
		Packaging	Transportation	Disposal	
	a) Non-TRU LLW	2,980,000	19,392,000	2,545,000	24,917,000
	b) TRU LLW	766,000	2,830,000	7,579,000	11,175,000
17	HLW Disposal				
		Packaging	Transportation	Disposal	
		5,475,000	2,092,000	32,076,000	39,643,000
18	Decontamination LLWT Facility				1,742,000
19	Interim Care for Facility				N/A
20	Entombment: Filling areas that contain activity with concrete				N/A
21	Demolition and Restoration Activity				7,182,000
22	Solidification of the Interim Waste at DOE Site				N/A
			Sub-Total		226,843,000
	Engineering, Design & Construction Management @15%				34,026,000
			Sub-Total		260,869,000
	Contingency @ 25%				65,217,000
			Total Alternate 1b		326,086,000

TABLE 4

EIS COST INTEGRATION
ALTERNATIVE # 1c

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				1,670,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				21,247,000
4	Process LLW Resulting from Decontamination Effort				2,000,000
5	Modify Existing Facilities to Process HLW				2,814,000
6	Interim Storage of Solidified HLW				12,880,000
7	Capital Cost of Solidification Process Equipment				7,300,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				16,000,000
9	HLW Processing - Operational Costs				20,277,000
10	Transfer of Solidified HLW to Interim Storage				1,789,000
11	Maintain Interim Storage Facility (for about 15 years)				4,140,000
12	Post Operational Decontamination				5,057,000
13	Process LLW Generated During HLW Processing				3,987,000
14	Decontamination of Storage Tanks				8,343,000
15	Process LLW Generated During Final Decontamination				2,000,000
16	Disposal of LLW				
		Packaging	Transportation	Disposal	
	a) Non-TRU LLW	1,210,000	163,000	770,000	2,150,000
	b) TRU LLW	397,000	1,098,000	2,376,000	3,871,000
17	HLW Disposal				
		Packaging	Transportation	Disposal	
		21,900,000	8,366,000	128,304,000	158,570,000
18	Decontamination LLWT Facility				706,000
19	Interim Care for Facility				28,640,000
20	Entombment: Filling areas that contain activity with concrete				2,528,000
21	Demolition and Restoration Activity				N/A
22	Solidification of the Interim Waste at DOE Site				N/A
			Sub-Total		332,372,000
	Engineering, Design & Construction Management @15%				49,855,000
			Sub-Total		382,227,000
	Contingency @ 25%				57,334,000
			Total Alternate 1c		439,561,000

TABLE 5

EIS COST INTEGRATION
ALTERNATIVE # 1d

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				2,530,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				22,480,000
4	Process LLW Resulting from Decontamination Effort				2,009,000
5	Modify Existing Facilities to Process HLW				2,814,000
6	Interim Storage of Solidified HLW				12,880,000
7	Capital Cost of Solidification Process Equipment				7,300,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				16,000,000
9	HLW Processing - Operational Costs				20,277,000
10	Transfer of Solidified HLW to Interim Storage				1,789,000
11	Maintain Interim Storage Facility (for about 15 years)				4,140,000
12	Post Operational Decontamination				9,223,000
13	Process LLW Generated During HLW Processing				3,987,000
14	Decontamination of Storage Tanks				12,354,000
15	Process LLW Generated During Final Decontamination				2,009,000
16	Disposal of LLW	Packaging	Transportation	Disposal	
	a) Non-TRU LLW	1,736,000	13,502,000	1,754,000	16,992,000
	b) TRU LLW	766,000	2,830,000	7,579,000	11,175,000
17	HLW Disposal	Packaging	Transportation	Disposal	
		21,900,000	8,366,000	128,304,000	158,570,000
18	Decontamination LLWT Facility				1,742,000
19	Interim Care for Facility				N/A
20	Entombment: Filling areas that contain activity with concrete				N/A
21	Demolition and Restoration Activity				7,182,000
22	Solidification of the Interim Waste at DOE Site				N/A
			Sub-Total		341,856,000
	Engineering, Design & Construction Management @15%				51,278,000
			Sub-Total		393,134,000
	Contingency @ 25%				98,284,000
			Total Alternate 1d		491,418,000

TABLE 6

EIS COST INTEGRATION
ALTERNATIVE # 2a

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				1,670,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				21,247,000
4	Process LLW Resulting from Decontamination Effort				2,000,000
5	Modify Existing Facilities to Process HLW				2,814,000
6	Interim Storage of Solidified HLW				2,283,000
7	Capital Cost of Solidification Process Equipment				1,700,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				15,000,000
9	HLW Processing - Operational Costs				16,225,000
10	Transfer of Solidified HLW to Interim Storage				1,087,000
11	Maintain Interim Storage Facility (for about 15 years)				N/A
12	Post Operational Decontamination				5,057,000
13	Process LLW Generated During HLW Processing				2,660,000
14	Decontamination of Storage Tanks				8,343,000
15	Process LLW Generated During Final Decontamination				2,000,000
16	Disposal of LLW				
		Packaging	Transportation	Disposal	
	a) Non-TRU LLW	1,164,000	150,000	688,000	2,002,000
	b) TRU LLW	369,000	981,000	2,020,000	3,370,000
17	HLW Disposal				
		Packaging	Transportation	Disposal	
	To DOE Site	14,600,000	3,890,000	-	18,490,000
	To Federal Depository	-	592,000	32,076,000	32,668,000
18	Decontamination LLWT Facility				706,000
19	Interim Care for Facility				28,640,000
20	Entombment: Filling areas that contain activity with concrete				2,528,000
21	Demolition and Restoration Activity				N/A
22	Solidification of the Interim Waste at DOE Site				24,000,000
			Sub-Total		220,893,000
	Engineering, Design & Construction Management @15%				33,134,000
			Sub-Total		254,027,000
	Contingency @ 25%				63,507,000
			Total Alternate 2a		317,534,000

TABLE 7

EIS COST INTEGRATION
ALTERNATIVE # 2b

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				2,530,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				22,480,000
4	Process LLW Resulting from Decontamination Effort				2,000,000
5	Modify Existing Facilities to Process HLW				2,814,000
6	Interim Storage of Solidified HLW				2,283,000
7	Capital Cost of Solidification Process Equipment				1,700,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				15,000,000
9	HLW Processing - Operational Costs				16,225,000
10	Transfer of Solidified HLW to Interim Storage				1,087,000
11	Maintain Interim Storage Facility (for about 15 years)				N/A
12	Post Operational Decontamination				9,223,000
13	Process LLW Generated During HLW Processing				2,660,000
14	Decontamination of Storage Tanks				12,354,000
15	Process LLW Generated During Final Decontamination				2,000,000
16	Disposal of LLW				
		Packaging	Transportation	Disposal	
	a) Non-TRU LLW	1,569,000	10,806,000	1,450,000	13,825,000
	b) TRU LLW	679,000	2,333,000	6,291,000	9,303,000
17	HLW Disposal				
		Packaging	Transportation	Disposal	
	To DOE Site	14,600,000	3,890,000	-	18,490,000
	To Federal Depository	-	592,000	32,076,000	32,668,000
18	Decontamination LLWT Facility				1,742,000
19	Interim Care for Facility				N/A
20	Entombment: Filling areas that contain activity with concrete				N/A
21	Demolition and Restoration Activity				7,182,000
22	Solidification of the Interim Waste at DOE Site				24,000,000
			Sub-Total		225,969,000
	Engineering, Design & Construction Management @ 15%				33,895,000
			Sub-Total		259,864,000
	Contingency @ 25%				64,966,000
			Total Alternate 2b		324,830,000

TABLE 8

EIS COST INTEGRATION
ALTERNATIVE # 3

ITEM	DESCRIPTION OF ACTIVITY				TOTAL MID-1980 DOLLARS
1	Planning and Preparing Decommissioning Activities				1,670,000
2	Construct LLWTF, Building and Equipment				26,403,000
3	Decontamination Activities				21,247,000
4	Process LLW Resulting from Decontamination Effort				2,000,000
5	Modify Existing Facilities to Process HLW				N/A
6	Interim Storage of Solidified HLW				N/A
7	Capital Cost of Solidification Process Equipment				5,913,000
8	Removal of HLW from Underground Tanks and Transfer to HLW Solidification Equipment				18,451,000
9	HLW Processing - Operational Costs				4,306,000
10	Transfer of Solidified HLW to Interim Storage				N/A
11	Maintain Interim Storage Facility (for about 15 years)				N/A
12	Post Operational Decontamination				5,057,000
13	Process LLW Generated During HLW Processing				1,329,000
14	Decontamination of Storage Tanks				N/A
15	Process LLW Generated During Final Decontamination				1,333,000
16	Disposal of LLW				
		Packaging	Transportation	Disposal	
	a) Non-TRU LLW	803,000	122,000	539,000	1,464,000
	b) TRU LLW	307,000	818,000	1,880,000	3,005,000
17	HLW Disposal				
		Packaging	Transportation	Disposal	
					N/A
18	Decontamination LLWT Facility				706,000
19	Interim Care for Facility				28,640,000
20	Entombment: Filling areas that contain activity with concrete				1,532,000
21	Demolition and Restoration Activity				N/A
22	Solidification of the Interim Waste at DOE Site				N/A
			Sub-Total		123,056,000
	Engineering, Design & Construction Management @15%				18,458,000
			Sub-Total		141,514,000
	Contingency @ 25%				35,379,000
			Total Alternate 3		176,893,000

Reference Case Interim LLW Storage (Modified alternative 1b)

It was decided to investigate the alternative of deferred burial of LLW, TRU and non-TRU wastes. Suitable burial locations for LLW will become available in a time frame when processing of the HLW has been completed. For this alternative, the contaminated structures will be decommissioned by dismantling except for the storage tanks, which will be entombed in situ. Therefore, for this option, interim storage facilities are required to store LLW. For this cost assessment, alternate 1b is chosen as the basis. Costs are added to the 1b assessments for 1) construction and operation of the facility, 2) additional handling of LLW, and 3) entombment of the HLW storage tanks. Costs are subtracted from the 1b assessment for, 1) the demolition or the HLW tanks and 2) the packaging, transport and burial of the dismantled HLW tanks. This cost estimate is shown in Table 9.

Conclusions

The total cost of treating the HLLW at WNYNSC employing the activities described for each of the alternatives assessed in this study is summarized in Table 10.

Alternative 3 results in the lowest cost. However, with this alternative, the high level waste (HLW) is not removed from the site. In assessing this alternative no cost was assigned for the longterm storage provision that will be required to maintain the HLW storage facility for many centuries.

Review of alternative 1 shows that separation of non-radioactive chemical salts from the HLW is cost effective. The reason for this is the relatively high cost assigned to the burial of HLW. Therefore, when the salt can be buried as LLW waste a significant cost reduction is realized.

The cost differential between full cleanup of the facility and entombment of the contaminated structures is not significant. One of the reasons for the low differential is that the cost of interim care for the facility which was assumed to extend for 100 years is large--approximately 30 million dollars.

The reference case for which it is assumed that all facilities, except the HLW storage tanks, are removed has a cost which is comparable to either entombment or full cleanup that is shown for alternatives 1a and 1b respectively.

Alternative 2 results in costs that are comparable to alternative 1. The difference in costs can be attributed to multiple handling and processing of the HLW at WNYNSC and at another DOE site respectively.

TABLE 9

EIS COST INTEGRATION
REFERENCE CASE

	Total Mid-1980 Dollars
Base Case-Alternate 1b	$ 326,086,000
A. Added Activities	
1) Construction & Operation (10 yrs) of Interim Storage Facility -	11,250,000
2) Additional Handling of LLW -	498,000
3) Entombment of HLW Storage Tanks	996,000
4) Decon HLW Storage Tanks	8,343,000
Total Addition -	$21,087,000
B. Deducted Activities	
1) Demolition of HLW Storage Tanks -	12,354,000
2) Packaging, Transportation & Burial of HLW Storage Tanks -	3,331,000
Total Deduct -	15,685,000
Net Add -	5,402,000
Engineering, Design & Construction Management @ 15% -	810,000
Sub-Total -	6,212,000
Contingency @ 25% -	1,553,000
Total Net Add -	7,765,000
Total Alternate 1b w/additional Interim LLW Storage Facility -	333,851,000

TABLE 10

COST OF HLLW PROGRAM OPERATION
FOR DIFFERENT ALTERNATIVES

Alternative	Cost $\$10^6$
1a	304
1b	326
1c	440
1d	491
2a	318
2b	325
3	177
* Reference Case	334

* - Considers interim storage of LLW before disposal and entombment of HLLW storage tanks

APPENDIX A

ACTIVITIES FOR ALTERNATIVE 1a

Wastes Separated; On-Site Disposal of By-Products; 100 Years Protective Storage Followed by Entombment

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities (Inside CPC - 12 mr/hr - outside other shield walls - 0.1 mr/hr)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost.
   b. Chemical Decontamination of the Process Equipment in the Entire Facility.
      1. CPC - Decontaminate for Complete Dismantlement
      2. Process Building - Decontaminate to Protective Storage Mode
   c. Decontaminate Process Cells Surfaces
      1. CPC - Dismantlement
      2. Rest of Process Building - Protective Storage
   d. Dismantlement of CPC equipment piping, surface concrete, and packaging

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility. This includes processing of all decontamination solutions, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost.
   c. Operational cost of packaging contaminated equipment and hardware in metallic/wooden boxes.

5. Modify Existing Facilities
   a. Prepare CPC for Solidification Equipment, ex. canisters in/out path, additional windows, manipulators, periscopes.
   b. Off-Gas System Existing - Modify
   c. Modify various systems, Auxiliary Systems, Ventilation, Glass Frit, Viewing, Remote Handling Equipment
   d. Acid Recovery Existing - Modify
   e. Install Equipment that will be required for Post-Immobilization Decon; lances, lining, sprays

6. Construct High Level Waste Interim Storage Facility, should be operational at start of Solidification Phase
   a. 300 Canisters Facility
   b. Transfer Path for Canisters, interface with CPC.

7. Capital Cost of the HLW Solidification Equipment and Installation Cost in the CPC.
   a. Capital cost of vitrification equipment and pretreatment equipment.
   b. Installation cost of Equipment. Hands on.

8. Removal of HLW from Underground Tanks and Feeding the Same to the HLW Solidification Equipment, Effort will be on-going for 3 years
   a. Capital Cost of Equipment
   b. Operational Cost (3 years)
   c. Utilities

9. Processing of HLW by Solidification Equipment, 3 years
   a. Operational and Maintenance Costs
   b. Chemical, Utilities, Glass Frit.

10. Transfer of HLW Canisters to Interim Storage On-site, Operational Cost
   a. Capital cost of transfer truck
   b. Operating Cost: Remote operation, on-going effort that will last three (3) years, 300 canisters.

11. Maintain Interim Storage Facility for about 15 years
   a. Monitoring, Drainage, Surveillance
   b. Repairs, Maintenance

12. Post Operational Decontamination - 0.1 mr/hr outside shield walls. (Place Reprocessing Building in Protective Storage Mode)
   a. Chemical Decontamination of CPC Solidification Equipment and Isolate Equipment
   b. All the contaminated equipment is isolated by rigid barriers. Can be placed in process cells or where it may be isolated.
   c. Low Level Activity can be fixed in place by covering with protective paints.
   d. Deactivate all equipment that is not to be used, closing valves, blanking flanges, disconnect utilities. Only safety equipment remains operational; e.g., fire protection.
   e. Seal all access paths with non-operable steel plate barriers, bolted or welded.
   f. Inspect, repair, upgrade all safety equipment.
      1. Fire protection
      2. Radiation Monitoring
      3. Install intrusion alarms

13. Cost of processing LLW associated with the solidification effort.
    a. Operational cost of operating LLWT facility for approximately three (3) years. Includes processing of the salt cake and the filling of drums. Also, solidification of spent resins. Includes labor, chemicals, and utilities.
    b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

14. Decontaminate HLW storage tanks (8D2 and 8D4), and prepare for protective storage. See Item 12 steps. Follows removal of HLW from tanks.

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the solidification equipment, and cells employed during the solidification campaign (CPC, OGT and ARC); (2) Decontamination of the HLLW storage tanks; (3) Heel cleanup of the LLWT Facility. The above costs include:
    a. The cost of operating the LLWT Facility for approximately two (2) years. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.
    b. Operational cost of packaging contaminated equipment and hardware in steel/wooden boxes.

16. Disposal of LLW generated in items 4, 13, 14 and 15.
    a. Packaging cost. This includes cost of binder material (DOW), drums and steel/wooden boxes.
    b. Transportation cost.
        1. Cost of transferring non-TRU LLW to existing WV burial grounds.
        2. Cost of transporting TRU LLW to Federal Repository
    c. Disposal Cost
        1. Burial of non-TRU LLW at WV.
        2. Burial of TRU LLW at Federal Repository

17. Packaging, Transportation and Disposal Cost of the HLW Canisters. This includes:
    a. Packaging cost; namely, cost of stainless steel canisters proposed for containing the vitrified HLW.
    b. Loadout cost of HLW canisters from interim storage to off-site shipping cask and subsequently onto railroad car. Operational cost.

c. Off-site transportation cost of HLW canisters (300 canisters) from WV site to a Federal repository.
d. Disposal cost of HLW canisters at a Federal Repository (deep geological burial).

18. Decontaminate LLWT Facility, and prepare for protective storage, see Item 12, estimate Decon. waste produced.

19. Interim care for Facility, 100 years, while in protective storage. Follows decontamination of LLWT facility
    a. Immediate plant area is inaccessible to the public, includes:
        1. Main Process Building
        2. LLWT Facility and HLLW storage tanks
        3. Interim Storage Facility while HLW is in storage.
    b. Bulk of site released for public access
    c. Surveillance, Maintenance, security activities
    d. Inspection of barriers

20. Entombment. Filling with concrete areas that contain activity.
    a. Selected cells in Process Building
    b. HLW storage tanks, 8D2 and 8D4
    c. LLWT Facility, certain equipment and cells

APPENDIX B

ACTIVITIES FOR ALTERNATIVE 1b

Wastes Separated; Off-Site Disposal of By-Products; Equipment is Dismantled and Structures Demolished

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities (Inside CPC-12 mr/hr - Other areas - unrestricted area access as defined in 10CFR20)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost
   b. Chemical Decontamination of the Process Equipment in the Entire Facility, Decontaminate for Complete Dismantlement
   c. Decontaminate Process Cells Surfaces, Decontaminate for Complete Demolition of Building
   d. Dismantlement and removal of contaminated equipment, piping and contaminated portions of plant structures for the entire reprocessing building

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility. This includes processing of all decontamination solutions, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost
   c. Operational cost of packaging contaminated equipment and hardware in steel/wooden boxes. This relates to the equipment and hardware dismantled and removed from the process cells in the main process building.

5. Modify Existing Facilities to accommodate solidification equipment.
   a. Prepare CPC for Solidification Equipment, ex. canisters in/out path, additional windows, manipulators, and periscopes.
   b. Off-Gas System Existing - Modify
   c. Modify various systems, Auxiliary Systems, Ventilation, Glass Frit, Viewing, Remote Handling Equipment
   d. Acid Recovery Existing - Modify
   e. Install Equipment that will be required for Post-Immobilization Decon; lances, lining, sprays

6. Construct High Level Waste Interim Storage Facility, should be operational at start of Solidification Phase
   a. 300 Canisters Facility
   b. Transfer Path for Canisters, interfaces with CPC

7. Capital Cost of the HLW Solidification Equipment and Installation Cost in the CPC, Solidification equipment is based on separation of sludge from supernate.
   a. Pretreatment and vitrification Equipment.
   b. Installation Cost, Hands-On.

8. Removal of HLW from Underground Tanks and feeding the same to the HLW Solidification Equipment, Effort will be on-going for 3 years.
   a. Capital Cost of Equipment
   b. Operational Cost (3 years)
   c. Utilities

9. Processing of HLW by Solidification Equipment, 3 years.
   a. Operational and Maintenance Costs, labor
   b. Chemicals, Utilities, Glass Frit, Resins

10. Transfer of HLW Canisters to Interim Sterage On-site, Operational Cost
   a. Capital Cost of transfer truck
   b. Operating Cost: Remote operation, on-going effort that will last three (3) years, 300 canisters
   c. Decontamination of Canisters.

11. Maintain Interim Storage Facility for about 15 years
   a. Monitoring, Drainage, Surveillance
   b. Repairs, Maintenance

12. Post Operational Decontamination - unrestricted area access as defined in 10CFR20 (Final Decontamination of CPC and Solidification Equipment)
   a. Chemical Decontamination of Solidification Equipment and CPC
   b. Dismantlement and removal of the Solidification Equipment

13. Cost of processing LLW associated with the solidification effort
   a. Operational cost of operating LLWT facility for approximately three (3) years. Includes processing of the salt cake and the filling of drums. Also, solidification of spent resins. Includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

14. Cost to decontaminate HLW storage tanks (8D2 & 8D4) and to dismantle the same.

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the solidification equipment, and cells employed during the solidification campaign (CPC, OGT and ARC); (2) Decontamination of the HLLW storage tanks; (3) Heel cleanup of the LLWT Facility. The above costs include:
    a. The cost of operating the LLWT Facility for approximately 18 months. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.
    b. Operational cost of packaging contaminated equipment and hardware in steel/wooden boxes. This relates to the dismantled solidification equipment removed from the CPC, SRR and OGT/ARR, the dismantled equipment and hardware of the LLWT Facility, and dismantled HLLW Storage Tanks section.

16. Disposal of LLW generated in Items 4, 13, 14 and 15
    a. Packaging cost. This includes cost of binder material (DOW) drums and steel/wooden boxes
    b. Transportation cost
        1. Cost of transferring non TRU LLW to commercial burial ground
        2. Cost of transporting TRU LLW to Federal Repository
    c. Disposal Cost
        1. Burial of non TRU LLW at commercial burial ground
        2. Burial of TRU LLW at Federal Repository

17. Packaging, Transportation and Disposal Cost of the HLW Canisters, (300 Canisters). This includes:
    a. Packaging cost; namely, cost of stainless steel canisters proposed for containing the vitrified HLW.
    b. Loadout cost of HLW canisters from interim storage to off-site shipping cask and subsequently onto railroad car. Operational cost.
    c. Off-site transportation cost of HLW canisters from WV site to a Federal repository.
    d. Disposal cost of HLW canisters at a Federal Repository (deep geological burial).

18. Cost of decontaminating LLWT Facility and dismantlement of equipment.

21. Demolition and Restoration Activity. This includes the demolition of: (1) the main process building; (2) the LLWT facility; and

(3) the area around the HLW underground storage tank by use of conventional methods such as explosives. The site is then restored to its original form.

APPENDIX C

ACTIVITIES FOR ALTERNATIVE 1c

No Separation of Waste; On-Site Disposal of By-Products;
100 Years Protective Storage Followed by Entombment

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment.
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities - (Inside CPC - 12 mr/hr - outside other shield walls - 0.1 mr/hr)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost.
   b. Chemical Decontamination of the Process Equipment in the Entire Facility
      1. CPC - Decontaminate for Complete Dismantlement
      2. Process Building - Decontaminate to Protective Storage Mode
   c. Decontaminate Process Cells Surfaces
      1. CPC - Dismantlement,
      2. Rest of Process Building - Protective Storage
   d. Dismantlement of CPC equipment and piping.

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility for a duration of 18 months. This includes processing of all decontamination solutions of item 3, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost
   c. Operational cost of packaging contaminated equipment and hardware in metallic/wooden boxes, (applies to CPC equipment)

5. Modify Existing Facilities

These activities include preparing the CPC for accommodating the solidification equipment, and the periphery modifications/additions necessary before the CPC can be operated as a waste vitrification cell. It should be noted that for separation of salt from the HLW supernate the scope of the HLW processing equipment is significantly reduced as compared with the salt separation option.

a. Provide a path for transfer of canister in/out of the CPC.
b. Off-Gas System Existing - Modify
c. Modify various systems, Auxiliary Systems, Ventilation, Glass Frit, Viewing, Remote Handling equipment, also additional manipulators, periscopes.
d. Acid Recovery Existing - Modify
e. Install Equipment that will be required for Post-Immobilization Decon; lances, lining, sprays

6. Construct High Level Waste Interim Storage Facility, should be operational at start of Solidification Phase
   a. 1200 Canisters Facility
   b. Transfer Path for Canisters

7. Capital Cost of the HLW Solidification Equipment and Installation Cost in the CPC. Note reduced scope of HLW processing equipment as identified under item 5 above.
   a. Capital cost of vitrification equipment
   b. Installation Cost, Hands-On.

8. Removal of HLW from Underground Tanks and feeding the same to the HLW Solidification Equipment, Effort will be on-going for 3 years.
   a. Capital Cost of Equipment
   b. Operational Cost (3 years)
   c. Utilities

9. Processing of HLW by Solidification Equipment, 3 years.
   a. Operational and Maintenance Costs
   b. Chemical, Utilities, Glass Frit

10. Transfer of HLW Canisters to Interim Storage On-site, Operational Cost
    a. Capital Cost of Transfer Truck
    b Operating Cost: Remote Operation, On-going effort that will last three (3) years, 1200 canisters
    c. Decontamination of Canisters.

11. Maintain Interim Storage Facility for about 15 years.
    a. Monitoring, Drainage, Surveillance
    b. Repairs, Maintenance

12. Post Operational Decontamination - 0.1 mr/hr outside shield walls. (Place Reprocessing Building in Protective Storage Mode).
    a. Chemical Decontamination of CPC Solidification Equipment and Isolate Equipment
    b. All the contaminated equipment is isolated by rigid barriers. Can be placed in process cells or where it may be isolated.

c. Low Level Activity can be fixed in place by covering with protective paints.
d. Deactivate all equipment that is not to be used, closing valves, blanking flanges, disconnect utilities. Only safety equipment remains operational; e.g., fire protection.
e. Seal all access paths with non-operable steel plate barriers, bolted or welded.
f. Inspect, repair, upgrade all safety equipment
   1. Fire protection
   2. Radiation Monitoring
   3. Install Intrusion Alarms

13. Process LLW that will be generated during the solidification phase. Waste related to Solidification Equipment - Spent Resins, Radioactive Rubbish and Trash, and Radioactive Sludge. It will be necessary to operate the LLWT Facility throughout the Solidification Phase. Cost includes:
    a. Operational cost of operating LLWT facility for approximately three (3) years. Includes processing of radioactive sludge, solidification by addition of binder, and the filling of drums. Also, solidification of spent resins. Includes labor, chemicals, and utilities.
    b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

14. Decontaminate HLW storage tanks (8D2 and 8D4) and prepare for protective storage. See Item 12 steps. Follow removal of HLW from tanks.

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the solidification equipment, and cells employed during the solidification campaign (CPC, OGT and ARC); (2) Decontamination of the HLLW storage tanks; (3) Heel cleanup of the LLWT Facility. The above costs include:
    The cost of operating the LLWT Facility for approximately 18 months. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.

16. Disposal of LLW generated in Items 4, 13, 14 and 15
    a. Packaging cost. This includes cost of binder material (DOW), drums and steel/wooden boxes

b. Transportation cost
   1. Cost of transferring non-TRU LLW to existing WV burial grounds
   2. Cost of transporting TRU LLW to Federal Repository
c. Disposal Cost
   1. Burial of non TRU LLW at WV 2. Burial of TRU LLW at Federal Repository

17. Packaging, Transportation and Disposal Cost of the HLW Canisters. This includes:-
   a. Packaging cost; namely, cost of stainless steel canisters proposed for containing the vitrified HLW, 1200 canisters.
   b. Loadout cost of HLW canisters from interim storage to off-site shipping cask and subsequently onto railroad car. Operational cost, 1200 canisters.
   c. Off-site transportation cost of HLW canisters (1200 canisters) from WV site to a Federal repository.
   d. Disposal cost of HLW canisters at a Federal Repository (deep geological burial).

18. Decontaminate LLWT Facility, and prepare for protective storage, see Item 12.

19. Interim care for Facility, 100 years, while in protective storage. Follows decontamination of LLWT facility.
   a. Immediate plant area is inaccessible to the public, includes:
      1. Main Process Building
      2. LLWT Facility and HLLW storage tanks
      3. Interim Storage Facility while HLW is in storage.
   b. Bulk of site released for public access
   c. Surveillance, maintenance, security activities
   d. Inspection of barriers

20. Entombment. Filling with concrete areas that contain activity. Follows protective storage
   a. Selected cells in Process Building
   b. HLW storage tanks, 8D2 and 8D4
   c. LLWT Facility, certain equipment and cells

APPENDIX D

ACTIVITIES FOR ALTERNATIVE 1d

No Separation of Waste; Off-Site Disposal of By-Products; Equipment is Dismantled and Structures Demolished

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities (Inside CPC - 12 mr/hr - Other areas - unrestricted area access as defined in 10CFR20)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost.
   b. Chemical Decontamination of the Process Equipment in the Entire Facility, Decontaminate for Complete Dismantlement.
   c. Decontaminate Process Cells Surfaces, Decontaminate for Complete Demolition of Building.
   d. Dismantlement and removal of contaminated equipment, piping and contaminated portions of plant structures for the entire reprocessing building

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility. This includes processing of all decontamination solutions, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost
   c. Operational cost of packaging contaminated equipment and hardware in steel/wooden boxes. This relates to the equipment and hardware dismantled and removed from the process cells in the main process building.

5. Modify Existing Facilities.

   These activities include preparing the CPC for accommodating the solidification equipment, and the periphery modifications/additions necessary before the CPC can be operated as a waste vitrification cell. It should be noted that for separation of salt from the HLW supernate the scope of the HLW processing equipment is significantly reduced, as compared with the salt separation option.

a. Provide a path for transfer of canister in/out of the CPC.
b. Off-Gas System Existing - Modify
c. Modify various systems, Auxiliary Systems, Ventilation, Glass Frit, additional manipulators, viewing windows, and periscopes.
d. Acid Recovery Existing - Modify
e. Install Equipment that will be required for Post-Immobilization Decon; lances, lining, sprays

6. Construct High Level Waste Interim Storage Facility, should be operational at start of Solidification Phase.
   a. 1200 Canisters Facility
   b. Transfer Path for Canisters. Interfaces with CPC

7. Capital Cost of the HLW Solidification Equipment and Installation Cost in the CPC, note reduced scope of HLW processing equipment as identified under item 5 above.
   a. Capital cost of equipment
   b. Installation Cost, Hands-On

8. Removal of HLW from Underground Tanks and feeding the same to the HLW Solidification Equipment, Effort will be on-going for 3 years.
   a. Capital Cost of Equipment
   b. Operational Cost (3 years)
   c. Utilities

9. Processing of HLW by Solidification Equipment, 3 years
   a. Operational and Maintenance Costs
   b. Chemical, Utilities, Glass Frit, Resins

10. Transfer of HLW Canisters to Interim Storage On-site, Operational Cost
    a. Capital cost of transfer truck
    b. Operating Cost: Remote Operation. On-going effort that will last three (3) years, 1200 canisters.
    c. Decontamination of Canisters

11. Maintain Interim Storage Facility for about 15 years.
    a. Monitoring, Drainage, Surveillance
    b. Repairs, Maintenance

12. Post Operational Decontamination - unrestricted area access as defined in 10CFR20 (Final Decontamination of CPC and Solidification Equipment)
    a. Chemical Decontamination of Solidification Equipment and CPC
    b. Dismantle and Remove Solidification Equipment.

13. Cost of processing LLW associated with the solidification effort
    a. Operational cost of operating LLWT facility for approximately three (3) years. Includes processing of the radioactive sludge, solidification by addition of binder, and the filling of drums. Also, solidification of spent resins. Includes labor, chemicals, and utilities.

b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

14. Cost to decontaminate HLW storage tanks (8D2 & 8D4) and to dismantle the same

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the solidification equipment, and cells employed during the solidification campaign (CPC, OGT and ARC); (2) Decontamination of the HLLW storage tanks; (3) Heel cleanup of the LLWT Facility. The above costs include:
    a. The cost of operating the LLWT Facility for approximately 18 months. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.
    b. Operational cost of packaging contaminated equipment and hardware in steel/wooden boxes. This relates to the dismantled solidification equipment removed from the CPC, SRR and OGT/ARR, the dismantled equipment and hardware of the LLWT Facility, and dismantled HLLW Storage Tanks section.

16. Disposal of LLW generated in items 4, 13, 14 and 15
    a. Packaging cost. This includes cost of binder material (DOW) drums and steel/wooden boxes
    b. Transportation cost
        1. Cost of transferring non TRU LLW to commercial burial ground.
        2. Cost of transporting TRU LLW to Federal Repository
    c. Disposal Cost
        1. Burial of non TRU LLW at commercial burial ground
        2. Burial of TRU LLW at Federal Repository

17. Packaging, Transportation and Disposal Cost of the HLW Canisters, (1200 Canisters). This includes:
    a. Packaging cost; namely, cost of stainless steel canisters proposed for containing the vitrified HLW.
    b. Loadout cost of HLW canisters from interim storage to off-site shipping cask and subsequently onto railroad car. Operational cost.

c. Off-site transportation cost of HLW canisters from WV site to a Federal repository
d. Disposal cost of HLW canisters at a Federal Repository (deep geological burial).

18. Decontamination of LLWT Facility, and dismantlement of equipment

21. Demolition and Restoration Activities. This includes the demolition of: (1) the main process building; (2) the LLWT facility; and (3) the area around the HLW underground storage tanks by use of conventional methods such as explosives. The site is then restored to its original form.

APPENDIX E

ACTIVITIES FOR ALTERNATIVE 2a

HLW Converted to an Interim Waste Form; On-Site Disposal of By-Products; 100 Years Protective Storage Followed by Entombment

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities (Inside CPC - 12 mr/hr - outside other shield walls - 0.1 mr/hr)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost
   b. Chemical Decontamination of the Process Equipment in the Entire Facility, Decontaminate to Protective Storage Mode.
   c. Decontaminate Process Cells Surfaces, Decon. to Protective Storage
   d. Dismantlement of CPC equipment and removal

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility. This includes processing of all decontamination solutions, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost.
   c. Operational cost of packaging contaminated equipment and hardware in metallic/wooden boxes.

5. Modify CPC and prepare for installation of Interim Waste Form equipment.
   a. Prepare a path for transfer of fused salt canisters in/out.
   b. Off-Gas System existing - modify.
   c. Modify various auxiliary systems; ventilation, utilities, remote handling equipment
   d. Lag storage racks for fused salt canisters
   e. Install equipment that will be required for post-immobilization decontamination; lances, lining, sprays

6. Interim Storage of Fused Salt
   a. Capital cost of loadout station, railroad car by area, 215,000 lb crane, cask handling area
   b. On-Site transfer cask and truck, capital cost

7. Capital Cost of the process equipment required to convert the HLLW to an interim waste form (fused salt).
   a. Capital cost of equipment (evaporators, melters, etc.)
   b. Installation cost, hands-on.

8. Removal of HLW from Underground Tanks and Feeding the Same to the HLW Conversion Equipment
   a. Capital Cost of Equipment: risers, pumps, sluicers, etc.
   b. Operational Cost, 2 years
   c. Utilities

9. Processing of HLW to an Interim Waste Form, 2 years
   a. Operational and Maintenance Costs, 2 years
   b. Utilities, electric power, steam, etc.

10. Transfer of Fused Salt Canisters to Load out
    Operational cost of transferring fused salt canisters from CPC to loadout station and loadout on railroad car, 800 canisters, 2 years effort

12. Post Operational Decontamination - 0.1 mr/hr outside shield walls. (Place Reprocessing Building in Protective Storage Mode)
   a. Chemical Decontamination of Areas/Facilities used for converting HLW to Interim Waste Form (CPC, EDR)
   b. All the contaminated equipment is isolated by rigid barriers. Can be placed in process cells or where it may be isolated.
   c. Low Level Activity can be fixed in place by covering with protective paints.
   d. Deactivate all equipment that is not to be used, closing valves, blanking flanges, disconnect utilities. Only safety equipment remains operational; e.g., fire protection.
   e. Seal all access paths with non-operable steel plate barriers, bolted or welded.
   f. Inspect, repair, upgrade all safety equipment

      1. Fire protection
      2. Radiation Monitoring
      3. Install intrusion alarms

13. Cost of processing LLW associated with the interim waste forming
   a. Operational cost of operating LLWT facility for approximately two (2) years. Includes processing of the evaporative residue, solidification by addition of binder, and the filling of drums. Also, solidification of spent resins. Includes labor, chemicals and utilities.

b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

14. Decontaminate HLW storage tanks (8D2 and 8D4), and prepare for protective storage. See Item 12 steps.

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the interim waste forming equipment, and cells employed during the interim waste forming campaign (CPC); (2) Decontamination of the HLLW storage tanks; (3) Heel cleanup of the LLWT Facility. The above costs include:
    The cost of operating the LLWT Facility for approximately 18 months. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.

16. Disposal of LLW generated in items 4, 13, 14 and 15
    a. Packaging cost. This includes cost of binder material (DOW), drums and steel/wooden boxes
    b. Transportation cost
        1. Cost of transferring non-TRU LLW to existing WV burial grounds
        2. Cost of transporting TRU LLW to Federal Repository
    c. Disposal Cost
        1. Burial of non TRU LLW at WV
        2. Burial of TRU LLW at Federal Repository

17. a. Packaging and transportation of High Level Interim Waste Form Canisters (fused salt) to DOE site for processing and vitrification, 800 canisters.
    b. Transportation of vitrified waste canisters from DOE site to a Federal Repository and Burial, 300 HLW canisters

18. Decontaminate LLWT Facility, and prepare for protective storage, see Item 12.

19. Interim care for Facility, 100 years, while in protective storage. Follows decontamination of LLWT facility.
    a. Immediate plant area is inaccessible to the public, includes:
        1. Main Process Building
        2. LLWT Facility and HLLW storage tanks
    b. Bulk of site released for public access
    c. Surveillance, maintenance, security activities.
    d. Inspection of barriers

20. Entombment. Filling with concrete areas that contain activity.
    a. Selected cells in Process Building
    b. HLW storage tanks, 8D2 and 8D4
    c. LLWT Facility, certain equipment and cells

22. Solidification of Interim Waste at a DOE Site, Processing Cost, cost of overpack (canisters)

APPENDIX F

ACTIVITIES FOR ALTERNATIVE 2b

Convert HLLW to an Interim Waste Form: Off-Site Disposal of By-Products; Equipment is Dismantled and Structures Demolished.

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities (Inside CPC - 12 mr/hr - Other areas - unrestricted area access as defined in 10CFR20)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost
   b. Chemical Decontamination of the Process Equipment in the Entire Facility, Decontaminate for Complete Dismantlement.
   c. Decontaminate Process Cells Surfaces, Decontaminate for Complete Demolition of Building.
   d. Dismantlement and removal of contaminated equipment, piping and contaminated portions of plant structures for the entire reprocessing building.

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility. This includes processing of all decontamination solutions, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost.

   c. Operational cost of packaging contaminated equipment and hardware in steel/wooden boxes. This relates to the equipment and hardware dismantled and removed from the process cells in the main process building.

5. Modify CPC and prepare for installation of Interim Waste Forming equipment
   a. Prepare a path for transfer of fused salt canisters in/out.
   b. Off-Gas System existing modify.
   c. Modify various auxiliary systems; ventilation, utilities, remote handling equipment

d. Lag storage racks for fused salt canisters
e. Install equipment that will be required for post-immobilization decontamination; lances, lining, sprays

6. Interim Storage of Fused Salt
   a. Capital cost of loadout station, railroad car bay area, 215,000 lb crane, cask handling area
   b. On-site transfer cask and truck, capital cost

7. Capital Cost of the process equipment required to convert the HLLW to an interim waste form (fused salt).
   a. Capital cost of equipment (evaporators, melters, etc.)
   b. Installation cost, hands-on

8. Removal of HLLW from Underground Tanks and Feeding the Same to the HLW Conversion Equipment
   a. Capital Cost of Equipment: risers, pumps, sluicers, etc.
   b. Operational Cost, 2 years
   c. Utilities

9. Processing of HLW to an Interim Waste Form, 2 years
   a. Operational and Maintenance Costs, 2 years
   b. Utilities, electric power, steam, etc.

10. Transfer of Fused Salt Canisters to Loadout
    Operational cost of transferring fused salt canisters from CPC to loadout station and loadout on railroad car, 800 canisters, 2 years effort

12. Post Operational Decontamination - unrestricted area access as defined in 10CFR 20 (Final Decontamination of the HLLW interim waste forming equipment)
    a. Chemical Decontamination of the interim waste forming equipment and CPC
    b. Dismantle and remove the interim waste forming equipment

13. Cost of processing LLW associated with the interim waste forming
    a. Operational cost of operating LLWT facility for approximately two (2) years. Includes processing of the evaporative residue, solidification by addition of binder, and the filling of drums. Also, solidification of spent resins. Includes labor, chemicals and utilities.
    b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

14. Decontaminate HLLW storage tanks (8D2 & 8D4) and dismantle the same.

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the interim waste forming equipment, and cells employed during the interim waste forming campaign (CPC); (2) Decontamination of the HLLW storage tanks; (3) Heel cleanup of the LLWT Facility. The above costs include:

a. The cost of operating the LLWT Facility for approximately 18 months. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.
b. Operational cost of packaging contaminated equipment and hardward in steel/wooden boxes. This relates to the dismantled interim waste forming equipment removed from the CPC, the dismantled equipment and hardward of the LLWT Facility, and dismantled HLLW Storage Tanks section.

16. Disposal of LLW generated in items 4, 13, 14 and 15
    a. Packaging cost. This includes cost of binder material (DOW) drums and steel/wooden boxes
    b. Transportation cost
        1. Cost of transferring non TRU LLW to commercial burial ground.
        2. Cost of transporting TRU LLW to Federal Repository
    c. Disposal Cost
        1. Burial of non TRU LLW at commercial burial ground
        2. Burial of TRU LLW at Federal Repository

17. a. Packaging and transportation of High Level Interim Waste Form Canisters (fused salt) to a DOE site for processing and vitrification, 800 canisters.
    b. Transportation of vitrified waste canisters from DOE site to a Federal Repository and Burial, 300 canisters

18. Decontaminate LLWT Facility and dismantlement of equipment

21. Demolition and Restoration Activity. This includes the demolition of: (1) the main process building; (2) the LLWT facility; and (3) the area around the HLLW underground storage tanks by use of conventional methods such as explosives. The site is then restored to its original form.

22. Solidification of Interim Waste at a DOE Site, Processing Cost, Cost of Overpack (Canisters)

APPENDIX G

ACTIVITIES FOR ALTERNATIVE 3a

In-Tank Solidification of HLW; On-Site Disposal of By-Products; 100 Years Protective Storage Followed by Entombment

1. Planning and Preparing Decommissioning Activities
   a. Prepare decommissioning plan
   b. Submit documents to regulatory agencies, licensing
   c. Train decommissioning staff

2. Construct Low Level Waste Treatment Facility (LLWTF). Building and Equipment
   a. New Structure
   b. LLWT Process Equipment, Capital Cost and Installation

3. Decontamination Activities (Outside shield walls - 0.1 mr/hr)
   a. Obtain and Prepare Decontamination Equipment and Chemicals. Capital Cost
   b. Chemical Decontamination of the Process Equipment in the Entire Process Building, Decontaminate to Protective Storage
   c. Decontaminate Process Cells Surfaces, Decon. to Protective Storage

4. Processing LLW associated with the Decontamination Effort
   a. Operational cost of operating LLWT facility for a duration of 18 months. This includes processing of all decontamination solutions of item 3, volume reduction of waste, solidification by addition of binder and filling of drums. Above applies to decontamination solutions and spent resins. Cost includes labor, chemicals, and utilities.
   b. Compaction of radioactive trash and packaging in drums, operational cost.
   c. Operational cost of packaging contaminated equipment and hardware in metallic/wooden boxes, (applies to CPC equipment).

7. Capital Cost for Solidification Process Equipment
   a. Cost of Installing a Separate Facility for Housing the HLLW Cement, Solidification Equipment
      1. Cost of adding a shielded building at the waste tanks farm; the building will house the equipment used for in-tank solidification, such as mixer, grout pump, dust separator, etc.
      2. An additional 30,000 gallon hold-up tank. The tank is to be enclosed and shielded.

b. Capital cost of the installation that will be required for mixing the HLLW with cement and feeding the grout to the existing HLLW storage tanks. This includes cement mixer, grout and slurry pumps, dust separator, a washwater system, piping and an off-gas treatment system

c. The cost of a cement supply system:
   1. Cement, Fly Ash, Attapugite and Shale Storage tanks and feed systems
   2. Shale hopper, dryer, crusher and pulverizer
   3. Weigh tank and blender
   4. Dry solids storage tank

8. Removal of HLLW from Underground Storage Tanks and Feeding the Same to the Cement Mixing Equipment (8D4 tank contents neutralized and fed to tank 8D2)
   a. Capital Cost of Equipment, pumps, sluicers, etc.
   b. Operational Cost, labor, 9 months operation
   c. Utilities, electric power, NaOH

9. Operational Cost of In-Tank Solidification. Effort will last nine (9) months
   a. Operational and Maintenance Costs, labor
   b. Utilities, Fly Ash, Cement, Ground Shale, etc.

12. Post Operational Decontamination - 0.1 mr/hr outside shield walls (Place Reprocessing Building in Protective Storage Mode).
   a. Chemical Decontamination of In-Tank Solidification Equipment and isolation of Equipment
   b. All the contaminated equipment is isolated by rigid barriers, and placed in process cells or where it may be isolated.
   c. Low Level Activity is fixed in place by covering with protective paints.
   d. Deactivate all equipment that is not to be used, closing valves blanking flanges, disconnect utilities. Only safety equipment remains operational; e.g., fire protection.
   e. Seal all access paths with non-operable steel plate barriers, bolted or welded.
   f. Inspect, repair, upgrade all safety equipment
      1. Fire protection
      2. Radiation Monitoring
      3. Install intrusion alarms.

13. Process any LLW that will be generated during the in-tank solidification phase.
   a. Operational cost of operating LLWT facility for approximately nine (9) months. Includes: labor, chemicals, and utilities.
   b. Compaction of radioactive trash generated during the solidification phase and packaging in drums, operational cost.

15. Cost of processing LLW generated in association with the final decontamination of the facility. This includes LLW associated with the following decontamination efforts: (1) Decontamination of the waste cement mixing equipment; (2) Heel cleanup of the LLWT Facility. The above costs include:

    The cost of operating the LLWT Facility for approximately 12 months. It covers the following: processing of all the decontamination solutions, volume reduction of the waste, solidification of waste by addition of binder, filling of drums, and solidification of spent resins and compaction of radioactive trash, followed by packaging in drums, operational cost. Cost includes: labor, chemicals, and utilities.

16. Disposal of LLW generated in items 4, 13, 14 and 15
    a. Packaging cost. This includes cost of binder material (DOW), drums and steel/wooden boxes
    b. Transportation cost
        1. Cost of transferring non-TRU LLW to existing WV burial grounds
        2. Cost of transporting TRU LLW to Federal Repository
    c. Disposal Cost
        1. Burial of non TRU LLW at WV
        2. Burial of TRU LLW at Federal Repository

18. Decontaminate LLWT Facility, and prepare for protective storage, see Item 12.

19. Interim care for Facility, 100 years, while in protective storage, follows decontamination of LLWT facility.
    a. Immediate plant area is inaccessible to the public. Includes:
        1. Main Process Building
        2. LLWT Facility
        3. HLLW storage tank vaults.
    b. Bulk of site released for public access
    c. Surveillance, maintenance, security activities
    d. Inspection of barriers

20. Entombment. Filling with concrete areas that contain activity
    a. Selected cells in Process Building
    b. Vaults around HLW storage tanks
    c. LLWT Facility, certain equipment and cells