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NON-PROPRIETARY VERSION

***Holtec International & Eddy Lea Energy
Alliance (ELEA) CIS Facility -
Decommissioning Cost Estimate and
Funding Plan***

Holtec Report No: HI-2177565

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Sponsoring Holtec Division: NPD

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COMPANY PRIVATE

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**REVISION LOG**

Revision	Revision Changes
0	Initial revision.

HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**1.0 INTRODUCTION**

Holtec International (Holtec) is currently seeking a Nuclear Materials License from the Nuclear Regulatory Commission (NRC) requesting authorization to construct and operate a Central Interim Storage (CIS) Facility (HI-STORE) to store 500 sealed canisters containing spent fuel and discharged reactor internal parts from commercial US nuclear power plants. This CIS Facility would remain in operation until such time that the Department of Energy is prepared to accept Spent Nuclear Fuel (SNF) and Greater Than Class C (GTCC) wastes from commercial nuclear plant licensees. When the requested CIS Facility license is issued by the NRC, Holtec subsequently anticipates requesting an amendment to the license to request authorization to possess and store an additional 500 canisters for each of 19 subsequent expansion phases to be completed over the course of years. Ultimately, Holtec anticipates that approximately 10,000 SNF canisters would be stored at the CIS Facility upon completion of all 20 phases.

The Decommissioning Funding Plan (DFP) was developed to provide the decommissioning cost estimate and financial assurance for the CIS Facility.

2.0 REGULATORY COMPLIANCE

This DFP was developed following the guidance of NUREG-1757 “Consolidated Decommissioning Guidance” [Refs. 4.1 and 4.2].

3.0 DEFINITIONS

None

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**4.0 REFERENCES**

- 4.1 NUREG-1757 Volume 1, “Consolidated Decommissioning Guidance, Decommissioning Process for Material Licensees.”
- 4.2 NUREG-1757 Volume 3, “Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping and Timeliness.”
- 4.3 10 CFR 72.30, Financial Assurance and Recordkeeping for Decommissioning.
- 4.4 R.S. Means, Construction Cost Data, 2017.
- 4.5 US Department of Labor, Bureau of Labor Statistics, Occupational Employment and Wages in Albuquerque May 2015 (website https://www.bls.gov/regions/southwest/news-release/occupationalemploymentandwages_albuquerque.htm)
- 4.6 Holtec International, HI-2177593 HI-STORE Financial Assurance & Project Life Cycle Cost Estimates, Rev. 0.

5.0 RESPONSIBILITIES

None

6.0 DECOMMISSIONING COST ESTIMATE

The cost estimating method used for developing the overall decommissioning cost estimate for this DFP is based on resource costing. The resource costing is based on the resources and duration to estimate the costs associated with radiological surveys and decontamination activities.

The CIS Facility will fall into the decommissioning Group 3 category per Section 1.3 “Decommissioning Roadmap” of NUREG-1757 Volume 1 [Ref. 4.1], which requires a Decommissioning Plan due to the 10 CFR 72.30 [Ref. 4.3] requirements.

7.0 DECOMMISSIONING FUNDING ASSURANCE

The method of financial assurance as specified in 10 CFR 72.30(e) will be provided in the Financial Assurance & Project Life Cycle Cost Estimates [Ref. 4.6].

8.0 SITE SPECIFIC DECOMMISSIONING COST ESTIMATE

The decommissioning cost estimate was prepared for Phase 1 of the CIS Facility in accordance with the guidelines provided in Section A.3 of Appendix A of NUREG-1757 Volume 3 [Ref. 4.2]. The radiological surveys, decontamination, and demolition cost estimate is based on the

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removal of the facility components to the extent that the NRC license may be terminated and the remaining facility and site may be released for unrestricted use in accordance with 10 CFR 72.30(b)(2)(iii).

8.1 Facility Description

Phase 1 of the CIS Facility will include two HI-STORM UMAX pads that will allow storage of 500 canisters of SNF and GTCC waste from commercial nuclear reactors as well as a small quantity of spent mixed-oxide fuel. Canisters will be stored in the in-ground HI-STORM UMAX Vertical Ventilated Modules (VVM). The VVM consists of a Cavity Enclosure Container (CEC) and divider shell. The CECs rests on a concrete foundation pad. The CECs are surrounded by controlled low-strength material (CLSM), which is a self-compacting cementitious material. A concrete pad (ISFSI pad) surrounds the upper portion of the CEC, which is just above ground level.

The support facilities considered in the CIS Facility decommissioning cost estimate includes the Canister Transfer Building.

The canisters will not be opened at CIS Facility. The VVMs in which the canisters are placed are to be expected free of any radioactive contamination. However, for the purpose of estimating the Decommissioning Fund, the CEC and divider liner will disposed at a licensed Low Level Rad Waste (LLRW) facility. The facility will not contain glove boxes, fume hoods, lab benches, ductwork, soil plots, storage tanks, or any component that will require decontamination. No radiological material will be stored in any building.

As part of operations of the CIS Facility, the routine radiological surveillance will be performed during normal operations. The routine radiological surveillance ensures that any contamination is discovered, identified, and removed before decommissioning commences.

All canisters will be removed from the site before physical decommissioning commences.

8.2 Estimate Decommissioning Costs

The estimated costs for decommissioning costs for the radiological surveys, decontamination, and select demolition activities of the HI-STORM UMAX storage pads, VVMs and support facilities include the cost for planning, staff labor, equipment, supplies, and management. Select demolition involves the removal and offsite disposal of the CEC and divider shells as well a

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portion of the concrete rubble. Site Stabilization cost estimates are to fill any voids after the removal of the CECs with concrete backfill material.

The estimated labor costs are based on an RS Means 2017 [Ref. 4.4] that will allow an independent third party to assume the responsibility and carry out the decommissioning project.

The decommissioning cost estimate is presented in a series of tables (Table 9.1 through 9.14) following the guidance of NUREG-1757 to allow the NRC to fully evaluate the adequacy of the estimate. Table 9.1 present the labor rates used for the cost estimate. Tables 9.2 and 9.3 present the facility components with anticipated level of contamination. Table 9.4 estimates the number of workdays needed for the planning and preparation level of effort for the decommissioning tasks. Tables 9.5 and 9.6 estimate the labor workdays needed to complete the decontamination tasks. Table 9.7 estimates the labor workdays to restore contaminated areas on the facility grounds. Table 9.8 estimates the labor workdays to complete the final radiation survey of the facility. Table 9.9 estimates the labor workday to perform site stabilization and long-term surveillance. Table 9.10 summarizes the total workdays for labor category for each decommissioning task. Table 9.11 summarizes the cost per workday for each labor category. Table 9.12 summarizes the total labor cost for each decommissioning task. Table 9.13 summarizes the total non-labor costs. Table 9.14 presents the total decommissioning cost estimate.

8.2.1 Labor Costs

Table 9.1 provides the labor rates for the crew associated the radiological surveys and decontamination activities. The labor rates include basic wages and benefits as well as overhead and profit. The labor rates are consistent with the wages listed for Albuquerque, NM labor wages listed by the US Department of Labor [Ref. 4.5].

The general overhead and profit is based on percent of the wages and benefits, which follows the cost estimating methodology established in RS Means [Ref. 4.4]. A 30% rate was used to determine the loaded labor rates. This percentage is based on overhead and profit for a large project (15%), Insurance (11%), and Main Office expenses (4%).

The labor estimates and totals for the decommissioning tasks are presents Tables 9.4 through 9.12.

8.2.2 Non-Labor Costs

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Non-labor costs associated with decommissioning activities may include the following items for decontamination:

- Equipment for Personal protective equipment and supplies
- NRC Inspection Fees
- ORAU/ORISE License Termination Final Site Survey Charges
- Equipment Rental
- Disposal costs
- Laboratory costs
- Materials
- Miscellaneous expenses
- Security

8.2.3 Contingency Factor

A 25 percent contingency factor was applied to the estimated costs. The contingency factor provides reasonable assurance for unforeseen circumstances and was applied to all estimated costs associated with decommissioning.

8.2.4 Key Assumptions

The decommissioning cost estimate is based on the configuration of the ISFSI expected after all canisters have been removed from the site. The physical decommissioning activities will commence with the radiological survey and decontamination activities (if any) followed by select demolition of the CECs and divider shells and site stabilization. Four crews will be used to perform the radiological survey within a two year time frame. Work schedule is based on a 5 day work week with no planned overtime.

It is expected that at the time of decommissioning, no residual radioactivity requiring remediation or decontamination will be present, however to assure that necessary funds are available if remediation is required, the labor and nonlabor estimates in Tables 9.5, 9.12, 9.13, and 9.14 are based upon the assumption that removal of the VVMs will be necessary. The removal of the CECs will be accomplished in the reverse process of construction of the HI-STORM UMAX. Heavy demolition equipment is assumed to be used to remove the top concrete pad followed by the removal of the low density concrete surrounding the CECs. As the CECs are exposed, the CEC are cut and torn away in sections and later further reduced in size to fit compactly into a standard gondola rail car. The waste stream will be monitored by Radiation Protection to locate and dispose of any material with detectable radiation above ambient levels.

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Clean concrete and soil will be use in refill the HI-STORM UMAX storage pad cavity. Four crews will be used to remove and dispose of the CECs and divider shells within a one year time frame. Work schedule is based on a 5 day work week with no planned overtime.

Site stabilization activities are expected to take less than one year to complete.

No subsurface material is assumed to require remediation regarding radionuclides because of the following reasons:

- No canisters will be opened at the CIS Facility
- No canisters will be stored in any buildings
- SNF and GTCC waste from commercial nuclear reactors as well as small quantity of spent mixed-oxide fuel are stored in sealed canisters
- Nuclear activation of the sealed canisters, VVMs, and ISFSI are anticipated but the activation products will remain fixed during the storage period.

The HI-STORM UMAX system will be constructed on clean soil where no previous business structures occupied the land. Thus, it is assumed that there is no subsurface soil containing residual radioactivity that will require remediation.

The demolition of the support buildings and other demolition debris can be disposed as clean waste at a local landfill. However, the cost estimate does not include the cost to remove clean material and equipment nor does it restore the land to a “green field” or site restoration.

The decommissioning tasks are assumed to be completed in a four year time frame.

All costs used in the estimates were current on January 2017.

8.2.5 Adjusting the Cost Estimate

The decommissioning cost estimate will be updated a minimum every three years, adjusting the estimated cost for current prices of services, inflation (as necessary), and approach. The key assumptions will be also be revisited and adjusted as warranted.

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**9.0 TABLES**

Table 9.1			
CIS FACILITY LABOR RATES			
Labor Category	Wages & Benefit	Overhead & Profit	Loaded Rate
Project Manager	\$53.85	\$16.15	\$70.00
Radiation Protection (RP) Supervisor	\$46.15	\$13.85	\$60.00
RP	\$46.15	\$13.85	\$60.00
Laborer	\$46.15	\$13.85	\$60.00
QA Auditor / Inspector	\$46.15	\$13.85	\$60.00
Administrative Assistant	\$23.07	\$6.93	\$30.00
Site Engineer	\$46.15	\$13.85	\$60.00

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**Table 9.2****NUMBER AND DIMENSIONS OF FACILITY COMPONENTS – HI-STORM UMAX SYSTEM**

Area: HI-STORM UMAX System

Level of Contamination: None

Component	Number of Components	Dimension of Components	Total Dimensions
Glove Boxes	0		
Fume Hoods	0		
Lab Benches	0		
Sinks	0		
Drains	0		
Floors	0		
Walls	0		
Ceilings	0		
Ventilation/Ductwork	0		
Hot Cells	0		
Equipment/Materials	0		
Soil Plots	0		
Storage Tanks	0		
Storage Areas	0		
Radwaste Areas	0		
Maintenance Shop	0		
Equipment Decontamination Areas	0		
Utilities/Piping	0		
Other: HI-STORM UMAX ISFSI	2		10,000 sq ft
Other: VVM (inside surface area of cylinder)	500	Diameter = 10 ft, height = 20 ft	343,250 sq ft

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**Table 9.3****NUMBER AND DIMENSIONS OF FACILITY COMPONENTS – CANISTER
TRANSFER BUILDING**

Area: Canister Transfer Building

Level of Contamination: None

Component	Number of Components	Dimension of Components	Total Dimensions
Glove Boxes	0		
Fume Hoods	0		
Lab Benches	0		
Sinks	0		
Drains	0		
Floors	1	400 ft x 150 ft	60,000 sq ft
Walls	2	150 ft x 60 ft	18,000 sq ft
Ceilings	1		
Ventilation/Ductwork	0		
Hot Cells	0		
Equipment/Materials	0		
Soil Plots	0		
Storage Tanks	0		
Storage Areas	0		
Radwaste Areas	0		
Maintenance Shop	0		
Equipment Decontamination Areas	0		
Utilities/Piping	0		
Other: Overhead Crane	1		600 sq ft
Other: Rail	2	400 ft x 0.6 ft	480 sq ft

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan

Table 9.4							
PLANNING AND PREPARATION (WORKDAYS)							
Activity	Labor Category						
	Project Supervisor	RP Supervisor	RP	Laborer	QA Auditor / Inspector	Administrative Assistant	Site Engineer
Preparation of Documentation for Regulatory Agencies	120	120			10	30	80
Submittal of Decommissioning Plan to NRC When Required by 10 CFR 72.54(g)	25	20				10	40
Development of Work Plans	20	20			5	10	10
Procurement of Special Equipment	5	5				5	5
Staff Training	10	10				5	
Characterization of Radiological Condition of the Facility (including soil or concrete sampling)	20	40	80		10	15	5
Administrative Fees (procurement fees for third-party contractor, legal fees, local permits, utilities, financial assurance fees, and NRC staff review of these items)	30	20		15	5	30	40
Other							
TOTALS	230	235	80	0	40	105	180

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**Table 9.5****DECONTAMINATION OR DISMANTLING OF RADIOACTIVE FACILITY COMPONENTS**

Area: HI-STORE UMAX Pads

Level of Contamination: None

Component	Decon Method	Laborer	Specialist	Project Supervisor
Glove Boxes	-	0	0	0
Fume Hoods	-	0	0	0
Lab Benches	-	0	0	0
Sinks	-	0	0	0
Drains	-	0	0	0
Floors	-	0	0	0
Walls	-	0	0	0
Ceilings	-	0	0	0
Ventilation/Ductwork	-	0	0	0
Hot Cells	-	0	0	0
Equipment/Materials	-	0	0	0
Soil Plots	-	0	0	0
Storage Tanks	-	0	0	0
Storage Areas	-	0	0	0
Radwaste Areas	-	0	0	0
Maintenance Shop	-	0	0	0
Equipment Decontamination Areas	-	0	0	0
Utilities/Piping	-	0	0	0
Other: HI-STORM UMAX Pad	Scrabbling	0	0	0
Other: VVM	Steel Brushing	450	0	80
TOTALS		450	0	80

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**Table 9.6****DECONTAMINATION OR DISMANTLING OF RADIOACTIVE FACILITY COMPONENTS**

Area: Canister Transfer Building

Level of Contamination: None

Component	Decon Method	Laborer	Specialist	Project Supervisor
Glove Boxes	-	0	0	0
Fume Hoods	-	0	0	0
Lab Benches	-	0	0	0
Sinks	-	0	0	0
Drains	-	0	0	0
Floors	-	0	0	0
Walls	-	0	0	0
Ceilings	-	0	0	0
Ventilation/Ductwork	-	0	0	0
Hot Cells	-	0	0	0
Equipment/Materials	-	0	0	0
Soil Plots	-	0	0	0
Storage Tanks	-	0	0	0
Storage Areas	-	0	0	0
Radwaste Areas	-	0	0	0
Maintenance Shop	-	0	0	0
Equipment Decontamination Areas	-	0	0	0
Utilities/Piping	-	0	0	0
Other: Overhead Crane	-	0	0	0
Other: Rail	-	0	0	0
TOTALS		0	0	0

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Table 9.7				
RESTORATION OF CONTAMINATED AREAS ON FACILITY GROUNDS (WORKDAYS)				
Activity	Project Supervisor	RP Supervisor	Laborer	Site Engineer
None	0	0	0	0
TOTALS	0	0	0	0

Table 9.8							
FINAL RADIATION SURVEY (WORKDAYS)							
Activity	Labor Category						
	Project Supervisor	RP Supervisor	HP	Laborer	QA Auditor / Inspector	Administrative Assistant	Site Engineer
Final Radiation Survey	277	277	1,891		277	277	277
Report	80	80			10	80	10
TOTALS	357	357	1,891		287	357	287

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Table 9.9							
SITE STABILIZATION AND LONG-TERM SURVEILLANCE (WORKDAYS)							
Activity	Labor Category						
	Project Supervisor	RP Supervisor	HP	Laborer	QA Auditor / Inspector	Administrative Assistant	Site Engineer
Backfill	80			240		80	90
TOTALS	124			248		124	124

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Table 9.10							
TOTAL WORKDAYS BY LABOR CATEGORY							
Activity	Labor Category						
	Project Supervisor	RP Supervisor	HP	Laborer	QA Auditor / Inspector	Administrative Assistant	Site Engineer
Planning and Preparation (Totals from Table 9.4)	230	235	80		40	105	180
Decontamination or Dismantling of Radioactive Facility Components (Sum of Totals from Tables 9.5 and 9.6)	80	0	150	450	0	0	0
Packaging, Shipping, and Disposal of Radioactive Waste	80	80	150	450	80	80	90
Restoration of Contaminated Areas on Facility Grounds (Totals from Table 9.7)	0	0	0	0	0	0	0
Final Radiation Survey (Totals from Table 9.8)	357	357	1,891	0	287	357	287
Site Stabilization and Long-Term Surveillance (Totals from Table 9.9)	80	0	80	240	0	80	80

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**Table 9.11****WORKER UNIT COST SCHEDULE**

Labor Cost Component	Labor Category						
	Project Supervisor	RP Supervisor	RP	Laborer	QA Auditor / Inspector	Administrative Assistant	Site Engineer
Wages & Benefits (\$/year) *	\$140,010	\$119,990	\$119,990	\$119,990	\$119,990	\$59,982	\$119,990
Overhead Rate (%)**	30	30	30	30	30	30	30
Total Cost Per Year	\$182,000	\$156,000	\$156,000	\$156,000	\$156,000	\$78,000	\$156,000
Total Cost Per Workday ***	\$560	\$480	\$480	\$480	\$480	\$240	\$480
Note: * Labor rates consistent with US Department of wages for Albuquerque, NM ** Source: RS Means 2017 *** Based on 260 workday per year and an 8 hour workday							

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HI-STORE CIS Facility Decommissioning Cost Estimate and Funding Plan**Table 9.12****TOTAL LABOR COSTS BY MAJOR DECOMMISSIONING TASK**

Activity	Labor Category							
	Project Supervisor	RP Supervisor	RP	Laborer	QA Auditor / Inspector	Administrative Assistant	Site Engineer	Total Labor Cost Per Task
Planning and Preparation	\$128,800	\$112,800	\$38,400	0	\$19,200	\$25,200	\$86,400	\$410,800
Decontamination or Dismantling of Radioactive Facility Components	\$44,800	0	\$72,000	\$216,000	0			\$332,800
Packaging, Shipping, and Disposal of Radioactive Waste	\$44,800	\$38,400	\$72,000	\$216,000	\$38,400	\$19,200	\$43,200	\$472,000
Restoration of Contaminated Areas on Facility Grounds	0	0		0			0	
Final Radiation Survey	\$200,076	\$171,493	\$907,788	0	\$137,893	\$85,747	\$137,893	\$1,640,890
Site Stabilization and Long-Term Surveillance	\$44,800	0	\$38,400	\$115,200	0	\$19,200	\$38,400	\$256,000

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Table 9.13 TOTAL NON-LABOR COSTS BY MAJOR DECOMMISSIONING TASK	
Task	Non-Labor Cost
Planning and Preparation	0
Decontamination or Dismantling of Radioactive Facility Components	\$340,000
Packaging, Shipping, and Disposal of Radioactive Waste	\$13,610,594
Restoration of Contaminated Areas on Facility Grounds	\$100,000
Final Radiation Survey (Equipment & Supplies)	\$600,000
Final Radiation Survey (NRC Inspection Fee)	\$250,000
Final Radiation Survey (Validate Survey)	\$210,000
Site Stabilization and Long-Term Surveillance	\$100,000
Other: Security	\$750,000

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Table 9.14	
TOTAL DECOMMISSIONING COSTS	
Task	Cost
Planning and Preparation	\$410,800
Decontamination or Dismantling of Radioactive Facility Components	\$672,800
Packaging, Shipping, and Disposal of Radioactive Waste	\$14,082,594
Restoration of Contaminated Areas on Facility Grounds	0
Final Radiation Survey	\$2,700,890
Site Stabilization and Long-Term Surveillance	\$356,000
Other: Security	\$750,000
Subtotal	\$18,973,084
25% Contingency	\$4,743,271
Total Decommissioning Costs	\$23,716,355