



## **APPENDIX A6-13**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 13 - C-AGV, PILOT, LOW SEISMIC**

#### **LIFE CYCLE COST SUMMARIES**



## Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic

Separate CHB

Annual Escalation Factor 1.90%

Discount Rate 3.40%

### Life Cycle Costs (40 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$838,448,486					\$838,448,486
<i>Operations &amp; Maintenance (40 Year Life)</i>		\$532,376,272				\$532,376,272
<i>Cask Handling</i>		\$38,508,689				\$38,508,689
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$181,389,912		\$181,389,912
<i>Escalation</i>					\$846,613,419	\$846,613,419
<b>Total Costs (40 year Life)</b>						\$2,437,336,778
<b>Present Value</b>						\$1,221,937,959

### Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$838,448,486					\$838,448,486
<i>Operations &amp; Maintenance (80 Year Life)</i>		\$973,159,561				\$973,159,561
<i>Cask Handling</i>		\$38,508,689				\$38,508,689
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$181,389,912		\$181,389,912
<i>Escalation</i>					\$2,659,562,915	\$2,659,562,915
<b>Total Costs (80 Year Life)</b>						\$4,691,069,562
<b>Present Value</b>						\$1,344,503,618



## **APPENDIX A6-13**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 13 - C-AGV, PILOT, LOW SEISMIC**

#### **CAPITAL COST SUMMARY**



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)  
 Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic  
 Separate CHB

Level 3 Cost Summary - First of A kind module

Level 1	Level 2	Level 3	Description	Level 3 Total
C-AGV EX 01			Interim Storage Facility and transportation Project	
	C-AGV EX 01.01		Pilot ISF Facility	\$510,944,405
		C-AGV EX 01.01.01	Storage AGVs	\$0
		C-AGV EX 01.01.02	Cask Handling (Transfer) Facility	\$135,175,719
		C-AGV EX 01.01.03	Horizontal Dry Storage Modules	\$0
		C-AGV EX 01.01.04	Vertical Dry Storage Module	\$216,629,524
		C-AGV EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-AGV EX 01.01.06	Cask Maintenance Facility	\$0
		C-AGV EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-AGV EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-AGV EX 01.01.09	Administration Building	\$3,140,000
		C-AGV EX 01.01.10	Security	\$24,148,975
		C-AGV EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-AGV EX 01.01.12	Utilities	\$18,682,150
		C-AGV EX 01.01.13	Roads	\$18,212,737
		C-AGV EX 01.01.14	Parking	\$735,000
		C-AGV EX 01.01.15	Site Work	\$23,417,500
		C-AGV EX 01.01.16	Warehouse	\$10,200,000
		C-AGV EX 01.01.17	Maintenance Facility	\$0
		C-AGV EX 01.01.18	Waste management Facility	\$0
		C-AGV EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-AGV EX 01.02		Expanded Interim Storage Facility	\$0
		C-AGV EX 01.02.01	Expanded Storage AGVs and Dry Cask Storage Systems	\$0
		C-AGV EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-AGV EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-AGV EX 01.02.04	Vertical Dry Storage Casks	\$0
		C-AGV EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-AGV EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-AGV EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$0
		C-AGV EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$0
		C-AGV EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-AGV EX 01.02.10	Security (Expanded)	\$0
		C-AGV EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-AGV EX 01.02.12	Utilities Expanded as needed)	\$0
		C-AGV EX 01.02.13	Roads (Expanded)	\$0
		C-AGV EX 01.02.14	Parking (Expanded as needed)	\$0
		C-AGV EX 01.02.15	Site Work (Expanded)	\$0
		C-AGV EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-AGV EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-AGV EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-AGV EX 01.02.19	Hot Cell / Laboratories	\$0
		C-AGV EX 01.02.20	Pool Packaging Facility	\$0
		C-AGV EX 01.02.21	Standardized Storage System	\$0
		C-AGV EX 01.02.22	Standardized Disposal Canister	\$0
		C-AGV EX 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-AGV EX 01.03		Transportation Equipment	\$0
		C-AGV EX 01.03.01	Transportation Casks	\$0
		C-AGV EX 01.03.02	Rail Equipment	\$0
		C-AGV EX 01.03.03	Rail Maintenance Facility	\$0
		C-AGV EX 01.03.04	Transportation Systems Services	\$0
	C-AGV EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-AGV EX 01.04.01	Land or Land Leases	\$7,680,000
		C-AGV EX 01.04.02	Site permits	\$200,000
		C-AGV EX 01.04.03	Site Licensing	\$6,240,000
		C-AGV EX 01.04.05	Plant Permits	\$0



	C-AGV EX 01.04.06	Planning and Alternative Studies		\$750,000
	C-AGV EX 01.04.07	Research and Development		\$0
	C-AGV EX 01.04.08	Design		\$23,955,000
	C-AGV EX 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-AGV EX 01.04.10	Pre-construction contingencies		\$10,000,000
	C-AGV EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-AGV EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-AGV EX 01.05.01	Project Management		\$2,700,000
	C-AGV EX 01.05.02	Construction Management		\$3,600,000
	C-AGV EX 01.05.03	Field indirect services		\$11,880,000
	C-AGV EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-AGV EX 01.05.05	QA/QC		\$12,600,000
	C-AGV EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-AGV EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-AGV EX 01.05.08	Document Control		\$2,700,000
	C-AGV EX 01.05.09	Project Controls		\$3,600,000
	C-AGV EX 01.05.10	Construction Testing		\$2,700,000
	C-AGV EX 01.05.11	Inspections		\$3,600,000
	C-AGV EX 01.05.12	Startup and Testing		\$3,000,000
	C-AGV EX 01.05.13	Commissioning		\$3,000,000
	C-AGV EX 01.06	Site Selection	\$0	
	C-AGV EX 01.06.01	Site Selection		\$0
	C-AGV EX 01.06.02	Public Information Process		\$0
	C-AGV EX 01.07	Decontamination and Deconstruction	\$0	
	C-AGV EX 01.07.01	Decommissioning		\$0
	C-AGV EX 01.07.02	Decontamination		\$0
	C-AGV EX 01.07.03	Deconstruction		\$0
	C-AGV EX 01.07.04			\$0
	C-AGV EX 01.07.05			\$0
	C-AGV EX 01.08	Project Financial Costs	\$85,780,020	
	C-AGV EX 01.08.01	Contractor Fees		\$51,211,952
	C-AGV EX 01.08.02	Escalation Costs		\$34,568,068
	C-AGV EX 01.08.03	Interest Payments		\$0
	C-AGV EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-AGV EX 01.08.05			\$0
	C-AGV EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-AGV EX 01.09	Project Contingencies	\$112,519,061	
	C-AGV EX 01.09.01	Management Reserve - Contractor Held		\$36,296,471
	C-AGV EX 01.09.02	Contingency - DOE held		\$76,222,590
	C-AGV EX 01.10	Other Direct Costs	\$0	
	C-AGV EX 01.10.01	DOE Project Operations		\$0
	C-AGV EX 01.10.02	DOE TM&E		\$0
	C-AGV EX 01.10.03	Host site Operational		\$0
	C-AGV EX 01.10.04	Costs	Miscellaneous	\$0
	C-AGV EX 01.10.05	Miscellaneous ODC		\$0
	C-AGV EX 01.11	Operational Costs	0	
	C-AGV EX 01.11.01	Operations Costs		\$0
	C-AGV EX 01.11.02	Transportation Costs		\$0
	C-AGV EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
	TEC	(All Direct & indirect Costs, MR, Escalation)		\$762,225,896
	TPC	(TEC plus Contingency, ODCs)		\$838,448,486
	LCC	All Capitol, Operation, Transportation, Escalation		\$838,448,486



## APPENDIX A6-13

### STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

#### COST DETAILS

#### ALTERNATIVE 13 - C-AGV, PILOT, LOW SEISMIC

#### LIFE CYCLE COST – 40 YEAR OPERATING LIFE



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic

Separate CHB

40 Year Operating life		Annual Escalation		Discount Rate			
		1.90%		3.40%			
YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative
1	\$ 10,000,000	\$ -	Cask Handling	\$ -	\$ 190,000	\$ 10,190,000	\$ 10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$ 10,383,610	\$ 20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$ 21,161,797	\$ 41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$ 21,563,871	\$ 63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$ 21,973,585	\$ 85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$ 22,391,083	\$ 107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$ 31,815,802	\$ 139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$ 232,500,273	\$ 371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$ 266,619,471	\$ 638,599,492
10	\$ 310,560,087	\$ 24,539,498	\$ -	\$ -	\$ 69,397,811	\$ 404,497,395	\$ 1,043,096,888
11		\$ 25,012,938	\$ -	\$ -	\$ 5,753,749	\$ 30,766,687	\$ 1,073,863,575
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$ 47,440,204	\$ 1,121,303,779
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$ 48,341,568	\$ 1,169,645,346
14	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,192,127	\$ 31,047,939	\$ 1,200,693,285
15	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,594,713	\$ 14,614,296	\$ 1,215,307,581
16	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,872,385	\$ 14,891,967	\$ 1,230,199,548
17	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,155,332	\$ 15,174,915	\$ 1,245,374,463
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$ 15,463,238	\$ 1,260,837,701
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$ 15,757,040	\$ 1,276,594,740
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$ 16,056,423	\$ 1,292,651,164
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$ 16,361,495	\$ 1,309,012,659
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$ 16,672,364	\$ 1,325,685,023
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$ 16,989,139	\$ 1,342,674,161
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$ 17,311,932	\$ 1,359,986,094
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$ 17,640,859	\$ 1,377,626,953
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$ 17,976,035	\$ 1,395,602,988
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$ 18,317,580	\$ 1,413,920,568
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$ 18,665,614	\$ 1,432,586,182
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$ 19,020,261	\$ 1,451,606,443
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$ 19,381,646	\$ 1,470,988,088
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$ 19,749,897	\$ 1,490,737,985
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$ 20,125,145	\$ 1,510,863,130
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$ 20,507,523	\$ 1,531,370,653
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$ 20,897,166	\$ 1,552,267,819
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$ 21,294,212	\$ 1,573,562,030
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$ 21,698,802	\$ 1,595,260,832
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$ 22,111,079	\$ 1,617,371,911
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$ 22,531,190	\$ 1,639,903,101
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$ 22,959,282	\$ 1,662,862,383
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$ 23,395,509	\$ 1,686,257,891
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$ 23,840,023	\$ 1,710,097,915
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$ 24,292,984	\$ 1,734,390,898
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$ 24,754,550	\$ 1,759,145,448
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$ 25,224,887	\$ 1,784,370,335
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$ 25,704,160	\$ 1,810,074,495
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$ 26,192,539	\$ 1,836,267,033
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$ 26,690,197	\$ 1,862,957,230
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$ 27,197,311	\$ 1,890,154,541
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$ 27,714,060	\$ 1,917,868,600
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$ 28,240,627	\$ 1,946,109,227
51	\$ -	\$ -	\$ -	\$ 42,500,000	\$ 68,487,052	\$ 110,987,052	\$ 2,057,096,279
52	\$ -	\$ -	\$ -	\$ 26,000,000	\$ 43,188,022	\$ 69,188,022	\$ 2,126,284,301
53	\$ -	\$ -	\$ -	\$ 37,629,971	\$ 64,408,897	\$ 102,038,868	\$ 2,228,323,169
54	\$ -	\$ -	\$ -	\$ 37,629,971	\$ 66,347,636	\$ 103,977,606	\$ 2,332,300,775
55	\$ -	\$ -	\$ -	\$ 37,629,971	\$ 68,323,210	\$ 105,953,181	\$ 2,438,253,956
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,438,253,956
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,438,253,956
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,438,253,956
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,438,253,956
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,438,253,956
Total Design/Const		Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Annual Expense	Total Cumulative
\$ 838,448,486		\$ 532,376,272	\$ 38,508,689	\$ 181,389,912	\$ 847,530,598	\$ -	\$ 2,438,253,956

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY



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### STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

#### COST DETAILS

#### ALTERNATIVE 13 - C-AGV, PILOT, LOW SEISMIC

#### LIFE CYCLE COST – 80 YEAR OPERATING LIFE





# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic  
Separate CHB

80 Year Operating Life

Annual Escalation

1.90%

Discount Rate

3.40%

YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative
1	\$ 10,000,000	\$ -	Cask Handling	\$ -	\$ 190,000	\$10,190,000	\$10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$10,383,610	\$20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$21,161,797	\$41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$21,563,871	\$63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$21,973,585	\$85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$22,391,083	\$107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$31,815,802	\$139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$232,500,273	\$371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$266,619,471	\$638,599,492
10	\$ 310,560,087	\$ 24,539,498	\$ -	\$ -	\$ 69,397,811	\$404,497,395	\$1,043,096,888
11	\$ -	\$ 25,012,938	\$ -	\$ -	\$ 5,753,749	\$30,766,687	\$1,073,863,575
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$47,440,204	\$1,121,303,779
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$48,341,568	\$1,169,645,346
14	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,192,127	\$31,047,939	\$1,200,693,285
15	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,594,713	\$14,614,296	\$1,215,307,581
16	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,872,385	\$14,891,967	\$1,230,199,548
17	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,155,332	\$15,174,915	\$1,245,374,463
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$15,463,238	\$1,260,837,701
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$15,757,040	\$1,276,594,740
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$16,056,423	\$1,292,651,164
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$16,361,495	\$1,309,012,659
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$16,672,364	\$1,325,685,023
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$16,989,139	\$1,342,674,161
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$17,311,932	\$1,359,986,094
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$17,640,859	\$1,377,626,953
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$17,976,035	\$1,395,602,988
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$18,317,580	\$1,413,920,568
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$18,665,614	\$1,432,586,182
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$19,020,261	\$1,451,606,443
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$19,381,646	\$1,470,988,088
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$19,749,897	\$1,490,737,985
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$20,125,145	\$1,510,863,130
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$20,507,523	\$1,531,370,653
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$20,897,166	\$1,552,267,819
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$21,294,212	\$1,573,562,030
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$21,698,802	\$1,595,260,832
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$22,111,079	\$1,617,371,911
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$22,531,190	\$1,639,903,101
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$22,959,282	\$1,662,862,383
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$23,395,509	\$1,686,257,891
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$23,840,023	\$1,710,097,915
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$24,292,984	\$1,734,390,898
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$24,754,550	\$1,759,145,448
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$25,224,887	\$1,784,370,335
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$25,704,160	\$1,810,074,495
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$26,192,539	\$1,836,267,033
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$26,690,197	\$1,862,957,230
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$27,197,311	\$1,890,154,541
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$27,714,060	\$1,917,868,600
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$28,240,627	\$1,946,109,227
51	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,757,616	\$28,777,199	\$1,974,886,426
52	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,304,383	\$29,323,965	\$2,004,210,391
53	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,861,538	\$29,881,121	\$2,034,091,512
54	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 19,429,280	\$30,448,862	\$2,064,540,374
55	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,007,808	\$31,027,390	\$2,095,567,764
56	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,597,329	\$31,616,911	\$2,127,184,675
57	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,198,050	\$32,217,632	\$2,159,402,307
58	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,810,185	\$32,829,767	\$2,192,232,074



59	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 22,433,950	\$33,453,533	\$2,225,685,606
60	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 23,069,568	\$34,089,150	\$2,259,774,756
61	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 23,717,261	\$34,736,844	\$2,294,511,600
62	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 24,377,261	\$35,396,844	\$2,329,908,443
63	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 25,049,801	\$36,069,384	\$2,365,977,827
64	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 25,735,120	\$36,754,702	\$2,402,732,529
65		\$0	\$ 11,019,582	\$	-	\$	-	\$ 26,433,459	\$37,453,041	\$2,440,185,570
66		\$0	\$ 11,019,582	\$	-	\$	-	\$ 27,145,067	\$38,164,649	\$2,478,350,219
67		\$0	\$ 11,019,582	\$	-	\$	-	\$ 27,870,195	\$38,889,777	\$2,517,239,997
68		\$0	\$ 11,019,582	\$	-	\$	-	\$ 28,609,101	\$39,628,683	\$2,556,868,680
69		\$0	\$ 11,019,582	\$	-	\$	-	\$ 29,362,046	\$40,381,628	\$2,597,250,308
70		\$0	\$ 11,019,582	\$	-	\$	-	\$ 30,129,297	\$41,148,879	\$2,638,399,187
71		\$0	\$ 11,019,582	\$	-	\$	-	\$ 30,911,126	\$41,930,708	\$2,680,329,895
72		\$0	\$ 11,019,582	\$	-	\$	-	\$ 31,707,809	\$42,727,391	\$2,723,057,286
73		\$0	\$ 11,019,582	\$	-	\$	-	\$ 32,519,629	\$43,539,212	\$2,766,596,498
74		\$0	\$ 11,019,582	\$	-	\$	-	\$ 33,346,874	\$44,366,457	\$2,810,962,955
75		\$0	\$ 11,019,582	\$	-	\$	-	\$ 34,189,837	\$45,209,419	\$2,856,172,374
76		\$0	\$ 11,019,582	\$	-	\$	-	\$ 35,048,816	\$46,068,398	\$2,902,240,772
77		\$0	\$ 11,019,582	\$	-	\$	-	\$ 35,924,116	\$46,943,698	\$2,949,184,470
78		\$0	\$ 11,019,582	\$	-	\$	-	\$ 36,816,046	\$47,835,628	\$2,997,020,098
79		\$0	\$ 11,019,582	\$	-	\$	-	\$ 37,724,923	\$48,744,505	\$3,045,764,604
80		\$0	\$ 11,019,582	\$	-	\$	-	\$ 38,651,068	\$49,670,651	\$3,095,435,254
81		\$0	\$ 11,019,582	\$	-	\$	-	\$ 39,594,811	\$50,614,393	\$3,146,049,647
82		\$0	\$ 11,019,582	\$	-	\$	-	\$ 40,556,484	\$51,576,067	\$3,197,625,714
83		\$0	\$ 11,019,582	\$	-	\$	-	\$ 41,536,430	\$52,556,012	\$3,250,181,726
84		\$0	\$ 11,019,582	\$	-	\$	-	\$ 42,534,994	\$53,554,576	\$3,303,736,302
85		\$0	\$ 11,019,582	\$	-	\$	-	\$ 43,552,531	\$54,572,113	\$3,358,308,415
86		\$0	\$ 11,019,582	\$	-	\$	-	\$ 44,589,401	\$55,608,983	\$3,413,917,398
87		\$0	\$ 11,019,582	\$	-	\$	-	\$ 45,645,972	\$56,665,554	\$3,470,582,951
88		\$0	\$ 11,019,582	\$	-	\$	-	\$ 46,722,617	\$57,742,199	\$3,528,325,151
89		\$0	\$ 11,019,582	\$	-	\$	-	\$ 47,819,719	\$58,839,301	\$3,587,164,452
90		\$0	\$ 11,019,582	\$	-	\$	-	\$ 48,937,666	\$59,957,248	\$3,647,121,700
91				\$	-	\$ 42,500,000	\$	193,134,933	\$235,634,933	\$3,882,756,632
92				\$	-	\$ 26,000,000	\$	120,892,045	\$146,892,045	\$4,029,648,677
93				\$	-	\$ 37,629,971	\$	179,007,209	\$216,637,179	\$4,246,285,856
94				\$	-	\$ 37,629,971	\$	183,123,315	\$220,753,286	\$4,467,039,142
95				\$	-	\$ 37,629,971	\$	187,317,627	\$224,947,598	\$4,691,986,740
96					\$	-	\$	-	\$0	\$4,691,986,740
97					\$	-	\$	-	\$0	\$4,691,986,740
98						\$	-	-	\$0	\$4,691,986,740
99						\$	-	-	\$0	\$4,691,986,740
100						\$	-	-	\$0	\$4,691,986,740
		Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation				Life Cycle
		\$838,448,486	\$973,159,561	\$38,508,689	\$181,389,912	\$2,660,480,093				\$4,691,986,740

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY



## **APPENDIX A6-14**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 14 - C-AGV, PILOT, HIGH SEISMIC**

#### **LIFE CYCLE COST SUMMARIES**



## Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

Project: C-AGV Pilot (5,000 MTU)

PILOT Project - C-AGV 60/40 Vertical/Horizontal - High Seismic

Separate CHB

Annual Escalation Factor 1.90%

Discount Rate 3.40%

### Life Cycle Costs (40 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$875,276,914					\$875,276,914
<i>Operations &amp; Maintenance (40 Year Life)</i>		\$532,376,272				\$532,376,272
<i>Cask Handling</i>		\$38,508,689				\$38,508,689
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$186,798,657		\$186,798,657
<i>Escalation</i>					\$863,778,686	\$863,778,686
<i>Total Costs (40 year Life)</i>						\$2,496,739,218
<i>Present Value</i>						\$1,256,216,493

### Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$875,276,914					\$875,276,914
<i>Operations &amp; Maintenance (80 Year Life)</i>		\$973,159,561				\$973,159,561
<i>Cask Handling</i>		\$38,508,689				\$38,508,689
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$186,798,657		\$186,798,657
<i>Escalation</i>					\$2,693,514,919	\$2,693,514,919
<i>Total Costs (80 Year Life)</i>						\$4,767,258,739
<i>Present Value</i>						\$1,377,694,570



## **APPENDIX A6-14**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 14 - C-AGV, PILOT, HIGH SEISMIC**

#### **CAPITAL COST SUMMARY**



# Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

Project: C-AGV Pilot (5,000 MTU)

PILOT Project - C-AGV 60/40 Vertical/Horizontal - High Seismic

Separate CHB

Level 3 Cost Summary - First of A kind module

TASK ORDER NO. 16 – GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY – OFFICE OF NUCLEAR ENERGY

Level 1	Level 2	Level 3	Description	Level 3 Total
C-AGV LE EX 01			Interim Storage Facility and transportation Project	
	C-AGV LE EX 01.01		Pilot ISF Facility	\$539,062,646
		C-AGV LE EX 01.01.01	Storage AGV LE s	\$0
		C-AGV LE EX 01.01.02	Cask Handling (Transfer) Facility	\$163,293,960
		C-AGV LE EX 01.01.03	Horizontal Dry Storage Modules	\$0
		C-AGV LE EX 01.01.04	Vertical Dry Storage Module	\$216,629,524
		C-AGV LE EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-AGV LE EX 01.01.06	Cask Maintenance Facility	\$0
		C-AGV LE EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-AGV LE EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-AGV LE EX 01.01.09	Administration Building	\$3,140,000
		C-AGV LE EX 01.01.10	Security	\$24,148,975
		C-AGV LE EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-AGV LE EX 01.01.12	Utilities	\$18,682,150
		C-AGV LE EX 01.01.13	Roads	\$18,212,737
		C-AGV LE EX 01.01.14	Parking	\$735,000
		C-AGV LE EX 01.01.15	Site Work	\$23,417,500
		C-AGV LE EX 01.01.16	Warehouse	\$10,200,000
		C-AGV LE EX 01.01.17	Maintenance Facility	\$0
		C-AGV LE EX 01.01.18	Waste management Facility	\$0
		C-AGV LE EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-AGV LE EX 01.02		Expanded Interim Storage Facility	\$0
		C-AGV LE EX 01.02.01	Expanded Storage AGV LE s and Dry Cask Storage Systems	\$0
		C-AGV LE EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-AGV LE EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-AGV LE EX 01.02.04	Vertical Dry Storage Casks	\$0
		C-AGV LE EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-AGV LE EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-AGV LE EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$0
		C-AGV LE EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$0
		C-AGV LE EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-AGV LE EX 01.02.10	Security (Expanded)	\$0
		C-AGV LE EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-AGV LE EX 01.02.12	Utilities Expanded as needed)	\$0
		C-AGV LE EX 01.02.13	Roads (Expanded)	\$0
		C-AGV LE EX 01.02.14	Parking (Expanded as needed)	\$0
		C-AGV LE EX 01.02.15	Site Work (Expanded)	\$0
		C-AGV LE EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-AGV LE EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-AGV LE EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-AGV LE EX 01.02.19	Hot Cell / Laboratories	\$0
		C-AGV LE EX 01.02.20	Pool Packaging Facility	\$0
		C-AGV LE EX 01.02.21	Standardized Storage System	\$0
		C-AGV LE EX 01.02.22	Standardized Disposal Canister	\$0
		C-AGV LE EX 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-AGV LE EX 01.03		Transportation Equipment	\$0
		C-AGV LE EX 01.03.01	Transportation Casks	\$0
		C-AGV LE EX 01.03.02	Rail Equipment	\$0
		C-AGV LE EX 01.03.03	Rail Maintenance Facility	\$0
		C-AGV LE EX 01.03.04	Transportation Systems Services	\$0
	C-AGV LE EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-AGV LE EX 01.04.01	Land or Land Leases	\$7,680,000
		C-AGV LE EX 01.04.02	Site permits	\$200,000
		C-AGV LE EX 01.04.03	Site Licensing	\$6,240,000
		C-AGV LE EX 01.04.05	Plant Permits	\$0
		C-AGV LE EX 01.04.06	Planning and Alternative Studies	\$750,000
		C-AGV LE EX 01.04.07	Research and Development	\$0



	C-AGV LE EX 01.04.08	Design		\$23,955,000
	C-AGV LE EX 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-AGV LE EX 01.04.10	Pre-construction contingencies		\$10,000,000
	C-AGV LE EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-AGV LE EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-AGV LE EX 01.05.01	Project Management		\$2,700,000
	C-AGV LE EX 01.05.02	Construction Management		\$3,600,000
	C-AGV LE EX 01.05.03	Field indirect services		\$11,880,000
	C-AGV LE EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-AGV LE EX 01.05.05	QA/QC		\$12,600,000
	C-AGV LE EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-AGV LE EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-AGV LE EX 01.05.08	Document Control		\$2,700,000
	C-AGV LE EX 01.05.09	Project Controls		\$3,600,000
	C-AGV LE EX 01.05.10	Construction Testing		\$2,700,000
	C-AGV LE EX 01.05.11	Inspections		\$3,600,000
	C-AGV LE EX 01.05.12	Startup and Testing		\$3,000,000
	C-AGV LE EX 01.05.13	Commissioning		\$3,000,000
	C-AGV LE EX 01.06	Site Selection	\$0	
	C-AGV LE EX 01.06.01	Site Selection		\$0
	C-AGV LE EX 01.06.02	Public Information Process		\$0
	C-AGV LE EX 01.07	Decontamination and Deconstruction	\$0	
	C-AGV LE EX 01.07.01	Decommissioning		\$0
	C-AGV LE EX 01.07.02	Decontamination		\$0
	C-AGV LE EX 01.07.03	Deconstruction		\$0
	C-AGV LE EX 01.07.04			\$0
	C-AGV LE EX 01.07.05			\$0
	C-AGV LE EX 01.08	Project Financial Costs	\$89,547,865	
	C-AGV LE EX 01.08.01	Contractor Fees		\$53,461,412
	C-AGV LE EX 01.08.02	Escalation Costs		\$36,086,453
	C-AGV LE EX 01.08.03	Interest Payments		\$0
	C-AGV LE EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-AGV LE EX 01.08.05			\$0
	C-AGV LE EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-AGV LE EX 01.09	Project Contingencies	\$117,461,404	
	C-AGV LE EX 01.09.01	Management Reserve - Contractor Held		\$37,890,776
	C-AGV LE EX 01.09.02	Contingency - DOE held		\$79,570,629
	C-AGV LE EX 01.10			
	C-AGV LE EX 01.10.01	Other Direct Costs	\$0	
	C-AGV LE EX 01.10.02	DOE Project Operations		\$0
	C-AGV LE EX 01.10.03	DOE TM&E		\$0
	C-AGV LE EX 01.10.04	Host site Operational Costs      Miscellaneous		\$0
	C-AGV LE EX 01.10.05	Miscellaneous ODC		\$0
	C-AGV LE EX 01.11	Operational Costs	0	
	C-AGV LE EX 01.11.01	Operations Costs		\$0
	C-AGV LE EX 01.11.02	Transportation Costs		\$0
	C-AGV LE EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		(All Direct & indirect Costs, MR, Escalation)	TEC	\$795,706,286
		(TEC plus Contingency, ODCs)	TPC	\$875,276,914
		All Capitol, Operation, Transportation, Escalation	LCC	\$875,276,914



## APPENDIX A6-14

### STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

#### COST DETAILS

#### ALTERNATIVE 14 - C-AGV, PILOT, HIGH SEISMIC

#### LIFE CYCLE COST – 40 YEAR OPERATING LIFE





# Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

Project: C-AGV Pilot (5,000 MTU)

PILOT Project - C-AGV 60/40 Vertical/Horizontal - High Seismic

Separate CHB

40 Year Operating life		Annual Escalation		Discount Rate			
		1.90%		3.40%			
YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative
1	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 190,000	\$ 10,190,000	\$ 10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$ 10,383,610	\$ 20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$ 21,161,797	\$ 41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$ 21,563,871	\$ 63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$ 21,973,585	\$ 85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$ 22,391,083	\$ 107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$ 31,815,802	\$ 139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$ 232,500,273	\$ 371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$ 266,619,471	\$ 638,599,492
10	\$ 347,388,515	\$ 24,539,498	\$ -	\$ -	\$ 77,024,834	\$ 448,952,848	\$ 1,087,552,340
11		\$ 25,012,938	\$ 12,836,230	\$ -	\$ 8,706,478	\$ 46,555,646	\$ 1,134,107,986
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$ 47,440,204	\$ 1,181,548,190
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$ 48,341,568	\$ 1,229,889,757
14	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,322,219	\$ 14,341,801	\$ 1,244,231,559
15	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,594,713	\$ 14,614,296	\$ 1,258,845,855
16	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,872,385	\$ 14,891,967	\$ 1,273,737,822
17	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,155,332	\$ 15,174,915	\$ 1,288,912,736
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$ 15,463,238	\$ 1,304,375,974
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$ 15,757,040	\$ 1,320,133,014
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$ 16,056,423	\$ 1,336,189,437
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$ 16,361,495	\$ 1,352,550,933
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$ 16,672,364	\$ 1,369,223,296
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$ 16,989,139	\$ 1,386,212,435
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$ 17,311,932	\$ 1,403,524,367
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$ 17,640,859	\$ 1,421,165,226
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$ 17,976,035	\$ 1,439,141,262
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$ 18,317,580	\$ 1,457,458,842
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$ 18,665,614	\$ 1,476,124,456
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$ 19,020,261	\$ 1,495,144,716
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$ 19,381,646	\$ 1,514,526,362
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$ 19,749,897	\$ 1,534,276,259
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$ 20,125,145	\$ 1,554,401,404
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$ 20,507,523	\$ 1,574,908,927
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$ 20,897,166	\$ 1,595,806,092
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$ 21,294,212	\$ 1,617,100,304
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$ 21,698,802	\$ 1,638,799,106
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$ 22,111,079	\$ 1,660,910,185
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$ 22,531,190	\$ 1,683,441,375
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$ 22,959,282	\$ 1,706,400,657
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$ 23,395,509	\$ 1,729,796,165
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$ 23,840,023	\$ 1,753,636,188
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$ 24,292,984	\$ 1,777,929,172
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$ 24,754,550	\$ 1,802,683,722
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$ 25,224,887	\$ 1,827,908,609
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$ 25,704,160	\$ 1,853,612,769
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$ 26,192,539	\$ 1,879,805,307
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$ 26,690,197	\$ 1,906,495,504
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$ 27,197,311	\$ 1,933,692,815
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$ 27,714,060	\$ 1,961,406,874
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$ 28,240,627	\$ 1,989,647,501
51	\$ -	\$ -	\$ -	\$ 42,500,000	\$ 68,487,052	\$ 110,987,052	\$ 2,100,634,552
52	\$ -	\$ -	\$ -	\$ 26,000,000	\$ 43,188,022	\$ 69,188,022	\$ 2,169,822,575
53	\$ -	\$ -	\$ -	\$ 39,432,886	\$ 67,494,835	\$ 106,927,721	\$ 2,276,750,296
54	\$ -	\$ -	\$ -	\$ 39,432,886	\$ 69,526,462	\$ 108,959,348	\$ 2,385,709,643
55	\$ -	\$ -	\$ -	\$ 39,432,886	\$ 71,596,690	\$ 111,029,575	\$ 2,496,739,218
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,496,739,218
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,496,739,218
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,496,739,218
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,496,739,218
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,496,739,218
	<b>Total Design/Const</b>	<b>Total O&amp;M</b>	<b>Total Cask Handling</b>	<b>Total D&amp;D</b>	<b>Total Escalation</b>	<b>Total Annual Expense</b>	<b>Total Cumulative Life Cycle</b>
	\$ 875,276,914	\$ 532,376,272	\$ 38,508,689	\$ 186,798,657	\$ 863,778,686	\$ -	\$ 2,496,739,218

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY



## **APPENDIX A6-14**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 14 - C-AGV, PILOT, HIGH SEISMIC**

#### **LIFE CYCLE COST – 80 YEAR OPERATING LIFE**



# Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

Project: C-AGV Pilot (5,000 MTU)

PILOT Project - C-AGV 60/40 Vertical/Horizontal - High Seismic

Separate CHB

80 Year Operating Life

Annual Escalation  
1.90%

Discount Rate  
3.40%

YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative
1	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 190,000	\$10,190,000	\$10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$10,383,610	\$20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$21,161,797	\$41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$21,563,871	\$63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$21,973,585	\$85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$22,391,083	\$107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$31,815,802	\$139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$232,500,273	\$371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$266,619,471	\$638,599,492
10	\$ 347,388,515	\$ 24,539,498	\$ -	\$ -	\$ 77,024,834	\$448,952,848	\$1,087,552,340
11		\$ 25,012,938	\$ 12,836,230	\$ -	\$ 8,706,478	\$46,555,646	\$1,134,107,986
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$47,440,204	\$1,181,548,190
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$48,341,568	\$1,229,889,757
14	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,322,219	\$14,341,801	\$1,244,231,559
15	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,594,713	\$14,614,296	\$1,258,845,855
16	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 3,872,385	\$14,891,967	\$1,273,737,822
17	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,155,332	\$15,174,915	\$1,288,912,736
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$15,463,238	\$1,304,375,974
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$15,757,040	\$1,320,133,014
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$16,056,423	\$1,336,189,437
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$16,361,495	\$1,352,550,933
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$16,672,364	\$1,369,223,296
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$16,989,139	\$1,386,212,435
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$17,311,932	\$1,403,524,367
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$17,640,859	\$1,421,165,226
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$17,976,035	\$1,439,141,262
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$18,317,580	\$1,457,458,842
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$18,665,614	\$1,476,124,456
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$19,020,261	\$1,495,144,716
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$19,381,646	\$1,514,526,362
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$19,749,897	\$1,534,276,259
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$20,125,145	\$1,554,401,404
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$20,507,523	\$1,574,908,927
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$20,897,166	\$1,595,806,092
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$21,294,212	\$1,617,100,304
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$21,698,802	\$1,638,799,106
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$22,111,079	\$1,660,910,185
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$22,531,190	\$1,683,441,375
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$22,959,282	\$1,706,400,657
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$23,395,509	\$1,729,796,165
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$23,840,023	\$1,753,636,188
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$24,292,984	\$1,777,929,172
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$24,754,550	\$1,802,683,722
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$25,224,887	\$1,827,908,609
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$25,704,160	\$1,853,612,769
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$26,192,539	\$1,879,805,307
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$26,690,197	\$1,906,495,504
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$27,197,311	\$1,933,692,815
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$27,714,060	\$1,961,406,874
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$28,240,627	\$1,989,647,501
51	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,757,616	\$28,777,199	\$2,018,424,699
52	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,304,383	\$29,323,965	\$2,047,748,665
53	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,861,538	\$29,881,121	\$2,077,629,785
54	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 19,429,280	\$30,448,862	\$2,108,078,647
55	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,007,808	\$31,027,390	\$2,139,106,038
56	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,597,329	\$31,616,911	\$2,170,722,948
57	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,198,050	\$32,217,632	\$2,202,940,581



58	\$	-	\$ 11,019,582	\$	-	\$	-	\$	21,810,185	\$32,829,767	\$2,235,770,348
59	\$	-	\$ 11,019,582	\$	-	\$	-	\$	22,433,950	\$33,453,533	\$2,269,223,880
60	\$	-	\$ 11,019,582	\$	-	\$	-	\$	23,069,568	\$34,089,150	\$2,303,313,030
61	\$	-	\$ 11,019,582	\$	-	\$	-	\$	23,717,261	\$34,736,844	\$2,338,049,874
62	\$	-	\$ 11,019,582	\$	-	\$	-	\$	24,377,261	\$35,396,844	\$2,373,446,717
63	\$	-	\$ 11,019,582	\$	-	\$	-	\$	25,049,801	\$36,069,384	\$2,409,516,101
64	\$	-	\$ 11,019,582	\$	-	\$	-	\$	25,735,120	\$36,754,702	\$2,446,270,803
65	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	26,433,459	\$37,453,041	\$2,483,723,844
66	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	27,145,067	\$38,164,649	\$2,521,888,493
67	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	27,870,195	\$38,889,777	\$2,560,778,271
68	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	28,609,101	\$39,628,683	\$2,600,406,954
69	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	29,362,046	\$40,381,628	\$2,640,788,582
70	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	30,129,297	\$41,148,879	\$2,681,937,461
71	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	30,911,126	\$41,930,708	\$2,723,868,169
72	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	31,707,809	\$42,727,391	\$2,766,595,560
73	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	32,519,629	\$43,539,212	\$2,810,134,772
74	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	33,346,874	\$44,366,457	\$2,854,501,228
75	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	34,189,837	\$45,209,419	\$2,899,710,648
76	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	35,048,816	\$46,068,398	\$2,945,779,046
77	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	35,924,116	\$46,943,698	\$2,992,722,744
78	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	36,816,046	\$47,835,628	\$3,040,558,372
79	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	37,724,923	\$48,744,505	\$3,089,302,877
80	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	38,651,068	\$49,670,651	\$3,138,973,528
81	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	39,594,811	\$50,614,393	\$3,189,587,921
82	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	40,556,484	\$51,576,067	\$3,241,163,988
83	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	41,536,430	\$52,556,012	\$3,293,719,999
84	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	42,534,994	\$53,554,576	\$3,347,274,575
85	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	43,552,531	\$54,572,113	\$3,401,846,688
86	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	44,589,401	\$55,608,983	\$3,457,455,671
87	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	45,645,972	\$56,665,554	\$3,514,121,225
88	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	46,722,617	\$57,742,199	\$3,571,863,425
89	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	47,819,719	\$58,839,301	\$3,630,702,726
90	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$	48,937,666	\$59,957,248	\$3,690,659,973
91				\$	-	\$	42,500,000	\$	193,134,933	\$235,634,933	\$3,926,294,906
92				\$	-	\$	26,000,000	\$	120,892,045	\$146,892,045	\$4,073,186,951
93				\$	-	\$	39,432,886	\$	187,583,743	\$227,016,629	\$4,300,203,580
94				\$	-	\$	39,432,886	\$	191,897,059	\$231,329,945	\$4,531,533,525
95				\$	-	\$	39,432,886	\$	196,292,328	\$235,725,214	\$4,767,258,739
96					\$	-		\$		\$0	\$4,767,258,739
97					\$	-		\$		\$0	\$4,767,258,739
98						\$		\$		\$0	\$4,767,258,739
99						\$		\$		\$0	\$4,767,258,739
100						\$		\$		\$0	\$4,767,258,739

Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Life Cycle
\$875,276,914	\$973,159,561	\$38,508,689	\$186,798,657	\$2,693,514,919	\$4,767,258,739

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY



## **APPENDIX A6-15**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 15 - C-AGV, EXPANDED, LOW SEISMIC**

#### **LIFE CYCLE COST SUMMARIES**



## Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic

Separate CHB

Annual Escalation Factor 1.90%

Discount Rate 3.40%

### Life Cycle Costs (40 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$1,157,896,612					\$1,157,896,612
<i>Operations &amp; Maintenance (40 Year Life)</i>		\$532,376,272				\$532,376,272
<i>Cask Handling</i>		\$77,017,378				\$77,017,378
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$232,088,625		\$232,088,625
<i>Escalation</i>					\$1,013,310,624	\$1,013,310,624
<b>Total Costs (40 year Life)</b>						<b>\$3,012,689,511</b>
<b>Present Value</b>						<b>\$1,552,106,384</b>

### Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$1,157,896,612					\$1,157,896,612
<i>Operations &amp; Maintenance (80 Year Life)</i>		\$973,159,561				\$973,159,561
<i>Cask Handling</i>		\$77,017,378				\$77,017,378
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$232,088,625		\$232,088,625
<i>Escalation</i>					\$2,981,999,939	\$2,981,999,939
<b>Total Costs (80 Year Life)</b>						<b>\$5,422,162,114</b>
<b>Present Value</b>						<b>\$1,664,394,336</b>



## **APPENDIX A6-15**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 15 - C-AGV, EXPANDED, LOW SEISMIC**

#### **CAPITAL COST SUMMARY**





# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)  
 Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic  
 Separate CHB

Level 3 Cost Summary - First of A kind module

Level 1	Level 2	Level 3	Description	Level 3 Total
C-AGV EX 01			Interim Storage Facility and transportation Project	
	C-AGV EX 01.01		Pilot ISF Facility	\$510,944,405
		C-AGV EX 01.01.01	Storage AGVs	\$0
		C-AGV EX 01.01.02	Cask Handling (Transfer) Facility	\$135,175,719
		C-AGV EX 01.01.03	Horizontal Dry Storage Modules	\$0
		C-AGV EX 01.01.04	Vertical Dry Storage Module	\$216,629,524
		C-AGV EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-AGV EX 01.01.06	Cask Maintenance Facility	\$0
		C-AGV EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-AGV EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-AGV EX 01.01.09	Administration Building	\$3,140,000
		C-AGV EX 01.01.10	Security	\$24,148,975
		C-AGV EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-AGV EX 01.01.12	Utilities	\$18,682,150
		C-AGV EX 01.01.13	Roads	\$18,212,737
		C-AGV EX 01.01.14	Parking	\$735,000
		C-AGV EX 01.01.15	Site Work	\$23,417,500
		C-AGV EX 01.01.16	Warehouse	\$10,200,000
		C-AGV EX 01.01.17	Maintenance Facility	\$0
		C-AGV EX 01.01.18	Waste management Facility	\$0
		C-AGV EX 01.01.xx	(Add Further Breakdown as needed)	\$0
	C-AGV EX 01.02		Expanded Interim Storage Facility	\$243,896,353
		C-AGV EX 01.02.01	Expanded Storage AGVs and Dry Cask Storage Systems	\$0
		C-AGV EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-AGV EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-AGV EX 01.02.04	Vertical Dry Storage Casks	\$216,629,524
		C-AGV EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-AGV EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-AGV EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$1,850,000
		C-AGV EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$745,000
		C-AGV EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-AGV EX 01.02.10	Security (Expanded)	\$10,074,488
		C-AGV EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-AGV EX 01.02.12	Utilities Expanded as needed)	\$3,624,200
		C-AGV EX 01.02.13	Roads (Expanded)	\$83,142
		C-AGV EX 01.02.14	Parking (Expanded as needed)	\$0
		C-AGV EX 01.02.15	Site Work (Expanded)	\$10,890,000
		C-AGV EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-AGV EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-AGV EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-AGV EX 01.02.19	Hot Cell / Laboratories	\$0
		C-AGV EX 01.02.20	Pool Packaging Facility	\$0
		C-AGV EX 01.02.21	Standardized Storage System	\$0
		C-AGV EX 01.02.22	Standardized Disposal Canister	\$0
		C-AGV EX 01.02.23	Canister Repackaging Facility (For Repository)	\$0
	C-AGV EX 01.03		Transportation Equipment	\$0
		C-AGV EX 01.03.01	Transportation Casks	\$0
		C-AGV EX 01.03.02	Rail Equipment	\$0
		C-AGV EX 01.03.03	Rail Maintenance Facility	\$0
		C-AGV EX 01.03.04	Transportation Systems Services	\$0
	C-AGV EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-AGV EX 01.04.01	Land or Land Leases	\$7,680,000
		C-AGV EX 01.04.02	Site permits	\$200,000
		C-AGV EX 01.04.03	Site Licensing	\$6,240,000
		C-AGV EX 01.04.05	Plant Permits	\$0
		C-AGV EX 01.04.06	Planning and Alternative Studies	\$750,000





	C-AGV EX 01.04.07	Research and Development		\$0
	C-AGV EX 01.04.08	Design		\$23,955,000
	C-AGV EX 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-AGV EX 01.04.10	Pre-construction contingencies		\$10,000,000
	C-AGV EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-AGV EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-AGV EX 01.05.01	Project Management		\$2,700,000
	C-AGV EX 01.05.02	Construction Management		\$3,600,000
	C-AGV EX 01.05.03	Field indirect services		\$11,880,000
	C-AGV EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-AGV EX 01.05.05	QA/QC		\$12,600,000
	C-AGV EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-AGV EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-AGV EX 01.05.08	Document Control		\$2,700,000
	C-AGV EX 01.05.09	Project Controls		\$3,600,000
	C-AGV EX 01.05.10	Construction Testing		\$2,700,000
	C-AGV EX 01.05.11	Inspections		\$3,600,000
	C-AGV EX 01.05.12	Startup and Testing		\$3,000,000
	C-AGV EX 01.05.13	Commissioning		\$3,000,000
	C-AGV EX 01.06	Site Selection	\$0	
	C-AGV EX 01.06.01	Site Selection		\$0
	C-AGV EX 01.06.02	Public Information Process		\$0
	C-AGV EX 01.07	Decontamination and Deconstruction	\$0	
	C-AGV EX 01.07.01	Decommissioning		\$0
	C-AGV EX 01.07.02	Decontamination		\$0
	C-AGV EX 01.07.03	Deconstruction		\$0
	C-AGV EX 01.07.04			\$0
	C-AGV EX 01.07.05			\$0
	C-AGV EX 01.08	Project Financial Costs	\$118,462,132	
	C-AGV EX 01.08.01	Contractor Fees		\$70,723,661
	C-AGV EX 01.08.02	Escalation Costs		\$47,738,471
	C-AGV EX 01.08.03	Interest Payments		\$0
	C-AGV EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-AGV EX 01.08.05			\$0
	C-AGV EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-AGV EX 01.09	Project Contingencies	\$155,388,723	
	C-AGV EX 01.09.01	Management Reserve - Contractor Held		\$50,125,394
	C-AGV EX 01.09.02	Contingency - DOE held		\$105,263,328
	C-AGV EX 01.10	Other Direct Costs	\$0	
	C-AGV EX 01.10.01	DOE Project Operations		\$0
	C-AGV EX 01.10.02	DOE TM&E		\$0
	C-AGV EX 01.10.03	DOE TM&E		\$0
	C-AGV EX 01.10.04	Host site Operational Costs      Miscellaneous		\$0
	C-AGV EX 01.10.05	Miscellaneous ODC		\$0
	C-AGV EX 01.11	Operational Costs	0	
	C-AGV EX 01.11.01	Operations Costs		\$0
	C-AGV EX 01.11.02	Transportation Costs		\$0
	C-AGV EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$1,052,633,284
		TPC (TEC plus Contingency, ODCs)		\$1,157,896,612
		LCC All Capital, Operation, Transportation, Escalation		\$1,157,896,612



## APPENDIX A6-15

### STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

#### COST DETAILS

#### ALTERNATIVE 15 - C-AGV, EXPANDED, LOW SEISMIC

#### LIFE CYCLE COST – 40 YEAR OPERATING LIFE



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic  
Separate CHB

						Annual Escalation	Discount Rate	
40 Year Operating life						1.90%	3.40%	
YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative	
1	\$ 10,000,000	\$ -	Cask Handling	\$ -	\$ 190,000	\$ 10,190,000	\$ 10,190,000	
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$ 10,383,610	\$ 20,573,610	
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$ 21,161,797	\$ 41,735,407	
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$ 21,563,871	\$ 63,299,279	
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$ 21,973,585	\$ 85,272,863	
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$ 22,391,083	\$ 107,663,946	
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$ 31,815,802	\$ 139,479,748	
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$ 232,500,273	\$ 371,980,021	
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$ 266,619,471	\$ 638,599,492	
10	\$ 630,008,213	\$ 24,539,498	\$ -	\$ -	\$ 135,554,266	\$ 790,101,978	\$ 1,428,701,470	
11		\$ 25,012,938	\$ -	\$ -	\$ 5,753,749	\$ 30,766,687	\$ 1,459,468,157	
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$ 47,440,204	\$ 1,506,908,361	
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$ 48,341,568	\$ 1,555,249,928	
14	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,192,127	\$ 31,047,939	\$ 1,586,297,867	
15	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,782,038	\$ 31,637,850	\$ 1,617,935,717	
16	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,383,157	\$ 32,238,969	\$ 1,650,174,686	
17	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,995,698	\$ 32,851,509	\$ 1,683,026,196	
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$ 15,463,238	\$ 1,698,489,434	
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$ 15,757,040	\$ 1,714,246,473	
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$ 16,056,423	\$ 1,730,302,896	
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$ 16,361,495	\$ 1,746,664,392	
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$ 16,672,364	\$ 1,763,336,755	
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$ 16,989,139	\$ 1,780,325,894	
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$ 17,311,932	\$ 1,797,637,826	
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$ 17,640,859	\$ 1,815,278,685	
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$ 17,976,035	\$ 1,833,254,721	
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$ 18,317,580	\$ 1,851,572,301	
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$ 18,665,614	\$ 1,870,237,915	
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$ 19,020,261	\$ 1,889,258,176	
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$ 19,381,646	\$ 1,908,639,821	
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$ 19,749,897	\$ 1,928,389,718	
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$ 20,125,145	\$ 1,948,514,863	
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$ 20,507,523	\$ 1,969,022,386	
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$ 20,897,166	\$ 1,989,919,551	
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$ 21,294,212	\$ 2,011,213,763	
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$ 21,698,802	\$ 2,032,912,565	
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$ 22,111,079	\$ 2,055,023,644	
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$ 22,531,190	\$ 2,077,554,834	
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$ 22,959,282	\$ 2,100,514,116	
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$ 23,395,509	\$ 2,123,909,624	
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$ 23,840,023	\$ 2,147,749,647	
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$ 24,292,984	\$ 2,172,042,631	
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$ 24,754,550	\$ 2,196,797,181	
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$ 25,224,887	\$ 2,222,022,068	
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$ 25,704,160	\$ 2,247,726,228	
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$ 26,192,539	\$ 2,273,918,766	
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$ 26,690,197	\$ 2,300,608,963	
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$ 27,197,311	\$ 2,327,806,274	
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$ 27,714,060	\$ 2,355,520,333	
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$ 28,240,627	\$ 2,383,760,960	
51	\$ -	\$ -	\$ -	\$ 42,500,000	\$ 68,487,052	\$ 110,987,052	\$ 2,494,748,012	
52	\$ -	\$ -	\$ -	\$ 40,000,000	\$ 66,443,111	\$ 106,443,111	\$ 2,601,191,123	
53	\$ -	\$ -	\$ -	\$ 49,862,875	\$ 85,347,205	\$ 135,210,080	\$ 2,736,401,202	
54	\$ -	\$ -	\$ -	\$ 49,862,875	\$ 87,916,196	\$ 137,779,071	\$ 2,874,180,273	
55	\$ -	\$ -	\$ -	\$ 49,862,875	\$ 90,533,998	\$ 140,396,874	\$ 3,014,577,147	
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,014,577,147	
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,014,577,147	
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,014,577,147	
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,014,577,147	
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,014,577,147	
Total Design/Const		Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Life Cycle		
\$ 1,157,896,612		\$ 532,376,272	\$ 77,017,378	\$ 232,088,625	\$ 1,015,198,259	\$ 3,014,577,147		

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY



## APPENDIX A6-15

### STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

#### COST DETAILS

#### ALTERNATIVE 15 - C-AGV, EXPANDED, LOW SEISMIC

#### LIFE CYCLE COST – 80 YEAR OPERATING LIFE



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - Low Seismic  
Separate CHB

80 Year Operating Life

Annual Escalation  
1.90%

Discount Rate  
3.40%

YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative
1	\$ 10,000,000	\$ -	Cask Handling	\$ -	\$ 190,000	\$10,190,000	\$10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$10,383,610	\$20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$21,161,797	\$41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$21,563,871	\$63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$21,973,585	\$85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$22,391,083	\$107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$31,815,802	\$139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$232,500,273	\$371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$266,619,471	\$638,599,492
10	\$ 630,008,213	\$ 24,539,498	\$ -	\$ -	\$ 135,554,266	\$790,101,978	\$1,428,701,470
11		\$ 25,012,938	\$ -	\$ -	\$ 5,753,749	\$30,766,687	\$1,459,468,157
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$47,440,204	\$1,506,908,361
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$48,341,568	\$1,555,249,928
14	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,192,127	\$31,047,939	\$1,586,297,867
15	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,782,038	\$31,637,850	\$1,617,935,717
16	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,383,157	\$32,238,969	\$1,650,174,686
17	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,995,698	\$32,851,509	\$1,683,026,196
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$15,463,238	\$1,698,489,434
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$15,757,040	\$1,714,246,473
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$16,056,423	\$1,730,302,896
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$16,361,495	\$1,746,664,392
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$16,672,364	\$1,763,336,755
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$16,989,139	\$1,780,325,894
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$17,311,932	\$1,797,637,826
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$17,640,859	\$1,815,278,685
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$17,976,035	\$1,833,254,721
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$18,317,580	\$1,851,572,301
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$18,665,614	\$1,870,237,915
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$19,020,261	\$1,889,258,176
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$19,381,646	\$1,908,639,821
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$19,749,897	\$1,928,389,718
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$20,125,145	\$1,948,514,863
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$20,507,523	\$1,969,022,386
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$20,897,166	\$1,989,919,551
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$21,294,212	\$2,011,213,763
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$21,698,802	\$2,032,912,565
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$22,111,079	\$2,055,023,644
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$22,531,190	\$2,077,554,834
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$22,959,282	\$2,100,514,116
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$23,395,509	\$2,123,909,624
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$23,840,023	\$2,147,749,647
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$24,292,984	\$2,172,042,631
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$24,754,550	\$2,196,797,181
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$25,224,887	\$2,222,022,068
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$25,704,160	\$2,247,726,228
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$26,192,539	\$2,273,918,766
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$26,690,197	\$2,300,608,963
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$27,197,311	\$2,327,806,274
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$27,714,060	\$2,355,520,333
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$28,240,627	\$2,383,760,960
51	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,757,616	\$28,777,199	\$2,412,538,159
52	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,304,383	\$29,323,965	\$2,441,862,124
53	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,861,538	\$29,881,121	\$2,471,743,244
54	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 19,429,280	\$30,448,862	\$2,502,192,106
55	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,007,808	\$31,027,390	\$2,533,219,497
56	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,597,329	\$31,616,911	\$2,564,836,408
57	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,198,050	\$32,217,632	\$2,597,054,040
58	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,810,185	\$32,829,767	\$2,629,883,807
59	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 22,433,950	\$33,453,533	\$2,663,337,339
60	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 23,069,568	\$34,089,150	\$2,697,426,489
61	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 23,717,261	\$34,736,844	\$2,732,163,333



62	\$	-	\$ 11,019,582	\$	-	\$	-	\$	24,377,261	\$35,396,844	\$2,767,560,176
63	\$	-	\$ 11,019,582	\$	-	\$	-	\$	25,049,801	\$36,069,384	\$2,803,629,560
64	\$	-	\$ 11,019,582	\$	-	\$	-	\$	25,735,120	\$36,754,702	\$2,840,384,262
65		\$0	\$ 11,019,582	\$	-	\$	-	\$	26,433,459	\$37,453,041	\$2,877,837,303
66		\$0	\$ 11,019,582	\$	-	\$	-	\$	27,145,067	\$38,164,649	\$2,916,001,952
67		\$0	\$ 11,019,582	\$	-	\$	-	\$	27,870,195	\$38,889,777	\$2,954,891,730
68		\$0	\$ 11,019,582	\$	-	\$	-	\$	28,609,101	\$39,628,683	\$2,994,520,413
69		\$0	\$ 11,019,582	\$	-	\$	-	\$	29,362,046	\$40,381,628	\$3,034,902,041
70		\$0	\$ 11,019,582	\$	-	\$	-	\$	30,129,297	\$41,148,879	\$3,076,050,920
71		\$0	\$ 11,019,582	\$	-	\$	-	\$	30,911,126	\$41,930,708	\$3,117,981,628
72		\$0	\$ 11,019,582	\$	-	\$	-	\$	31,707,809	\$42,727,391	\$3,160,709,019
73		\$0	\$ 11,019,582	\$	-	\$	-	\$	32,519,629	\$43,539,212	\$3,204,248,231
74		\$0	\$ 11,019,582	\$	-	\$	-	\$	33,346,874	\$44,366,457	\$3,248,614,687
75		\$0	\$ 11,019,582	\$	-	\$	-	\$	34,189,837	\$45,209,419	\$3,293,824,107
76		\$0	\$ 11,019,582	\$	-	\$	-	\$	35,048,816	\$46,068,398	\$3,339,892,505
77		\$0	\$ 11,019,582	\$	-	\$	-	\$	35,924,116	\$46,943,698	\$3,386,836,203
78		\$0	\$ 11,019,582	\$	-	\$	-	\$	36,816,046	\$47,835,628	\$3,434,671,831
79		\$0	\$ 11,019,582	\$	-	\$	-	\$	37,724,923	\$48,744,505	\$3,483,416,336
80		\$0	\$ 11,019,582	\$	-	\$	-	\$	38,651,068	\$49,670,651	\$3,533,086,987
81		\$0	\$ 11,019,582	\$	-	\$	-	\$	39,594,811	\$50,614,393	\$3,583,701,380
82		\$0	\$ 11,019,582	\$	-	\$	-	\$	40,556,484	\$51,576,067	\$3,635,277,447
83		\$0	\$ 11,019,582	\$	-	\$	-	\$	41,536,430	\$52,556,012	\$3,687,833,458
84		\$0	\$ 11,019,582	\$	-	\$	-	\$	42,534,994	\$53,554,576	\$3,741,388,034
85		\$0	\$ 11,019,582	\$	-	\$	-	\$	43,552,531	\$54,572,113	\$3,795,960,147
86		\$0	\$ 11,019,582	\$	-	\$	-	\$	44,589,401	\$55,608,983	\$3,851,569,131
87		\$0	\$ 11,019,582	\$	-	\$	-	\$	45,645,972	\$56,665,554	\$3,908,234,684
88		\$0	\$ 11,019,582	\$	-	\$	-	\$	46,722,617	\$57,742,199	\$3,965,976,884
89		\$0	\$ 11,019,582	\$	-	\$	-	\$	47,819,719	\$58,839,301	\$4,024,816,185
90		\$0	\$ 11,019,582	\$	-	\$	-	\$	48,937,666	\$59,957,248	\$4,084,773,433
91				\$	-	\$	42,500,000	\$	193,134,933	\$235,634,933	\$4,320,408,365
92				\$	-	\$	40,000,000	\$	185,987,761	\$225,987,761	\$4,546,396,127
93				\$	-	\$	49,862,875	\$	237,199,603	\$287,062,478	\$4,833,458,604
94				\$	-	\$	49,862,875	\$	242,653,790	\$292,516,665	\$5,125,975,269
95				\$	-	\$	49,862,875	\$	248,211,606	\$298,074,481	\$5,424,049,750
96						\$	-	\$	-	\$0	\$5,424,049,750
97						\$	-	\$	-	\$0	\$5,424,049,750
98								\$	-	\$0	\$5,424,049,750
99								\$	-	\$0	\$5,424,049,750
100								\$	-	\$0	\$5,424,049,750

Total Design/Const	\$1,157,896,612	Total O&M	\$973,159,561	Total Cask Handling	\$77,017,378	Total D&D	\$232,088,625	Total Escalation	\$2,983,887,574	Total Life Cycle	\$5,424,049,750
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## **APPENDIX A6-16**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 16 - C-AGV, EXPANDED, HIGH SEISMIC**

#### **LIFE CYCLE COST SUMMARIES**



## Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - High Seismic

Separate CHB

Annual Escalation Factor 1.90%

Discount Rate 3.40%

### Life Cycle Costs (40 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$1,194,725,041					\$1,194,725,041
<i>Operations &amp; Maintenance (40 Year Life)</i>		\$532,376,272				\$532,376,272
<i>Cask Handling</i>		\$77,017,378				\$77,017,378
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$259,186,098		\$259,186,098
<i>Escalation</i>					\$1,068,723,652	\$1,068,723,652
<b>Total Costs (40 year Life)</b>						<b>\$3,132,028,442</b>
<b>Present Value</b>						<b>\$1,596,237,768</b>

### Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design &amp; Construction</i>	\$1,194,725,041					\$1,194,725,041
<i>Operations &amp; Maintenance (80 Year Life)</i>		\$973,159,561				\$973,159,561
<i>Cask Handling</i>		\$77,017,378				\$77,017,378
<i>Transportation Equipment</i>	\$0					\$0
<i>Transport Operations</i>		\$0	\$0			\$0
<i>Repackaging</i>	\$0	\$0				\$0
<i>Transport to Repository</i>	\$0		\$0			\$0
<i>D&amp;D</i>				\$259,186,098		\$259,186,098
<i>Escalation</i>					\$3,121,513,471	\$3,121,513,471
<b>Total Costs (80 Year Life)</b>						<b>\$5,625,601,548</b>
<b>Present Value</b>						<b>\$1,703,076,998</b>





## **APPENDIX A6-16**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 16 - C-AGV, EXPANDED, HIGH SEISMIC**

#### **CAPITAL COST SUMMARY**



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)  
 Expanded Project - C-AGV 60/40 Vertical/Horizontal - High Seismic  
 Separate CHB

Level 3 Cost Summary - First of A kind module

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY

Level 1	Level 2	Level 3	Description	Level 3 Total
C-AGV LE EX 01			Interim Storage Facility and transportation Project	
	C-AGV LE EX 01.01		Pilot ISF Facility	\$539,062,646
		C-AGV LE EX 01.01.01	Storage AGVs	\$0
		C-AGV LE EX 01.01.02	Cask Handling (Transfer) Facility	\$163,293,960
		C-AGV LE EX 01.01.03	Horizontal Dry Storage Modules	\$0
		C-AGV LE EX 01.01.04	Vertical Dry Storage Module	\$216,629,524
		C-AGV LE EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-AGV LE EX 01.01.06	Cask Maintenance Facility	\$0
		C-AGV LE EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-AGV LE EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-AGV LE EX 01.01.09	Administration Building	\$3,140,000
		C-AGV LE EX 01.01.10	Security	\$24,148,975
		C-AGV LE EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-AGV LE EX 01.01.12	Utilities	\$18,682,150
		C-AGV LE EX 01.01.13	Roads	\$18,212,737
		C-AGV LE EX 01.01.14	Parking	\$735,000
		C-AGV LE EX 01.01.15	Site Work	\$23,417,500
		C-AGV LE EX 01.01.16	Warehouse	\$10,200,000
		C-AGV LE EX 01.01.17	Maintenance Facility	\$0
		C-AGV LE EX 01.01.18	Waste management Facility	\$0
		C-AGV LE EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-AGV LE EX 01.02		Expanded Interim Storage Facility	\$243,896,353
		C-AGV LE EX 01.02.01	Expanded Storage AGVs and Dry Cask Storage Systems	\$0
		C-AGV LE EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-AGV LE EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-AGV LE EX 01.02.04	Vertical Dry Storage Casks	\$216,629,524
		C-AGV LE EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-AGV LE EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-AGV LE EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$1,850,000
		C-AGV LE EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$745,000
		C-AGV LE EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-AGV LE EX 01.02.10	Security (Expanded)	\$10,074,488
		C-AGV LE EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-AGV LE EX 01.02.12	Utilities Expanded as needed)	\$3,624,200
		C-AGV LE EX 01.02.13	Roads (Expanded)	\$83,142
		C-AGV LE EX 01.02.14	Parking (Expanded as needed)	\$0
		C-AGV LE EX 01.02.15	Site Work (Expanded)	\$10,890,000
		C-AGV LE EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-AGV LE EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-AGV LE EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-AGV LE EX 01.02.19	Hot Cell / Laboratories	\$0
		C-AGV LE EX 01.02.20	Pool Packaging Facility	\$0
		C-AGV LE EX 01.02.21	Standardized Storage System	\$0
		C-AGV LE EX 01.02.22	Standardized Disposal Canister	\$0
		C-AGV LE EX 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-AGV LE EX 01.03		Transportation Equipment	\$0
		C-AGV LE EX 01.03.01	Transportation Casks	\$0
		C-AGV LE EX 01.03.02	Rail Equipment	\$0
		C-AGV LE EX 01.03.03	Rail Maintenance Facility	\$0
		C-AGV LE EX 01.03.04	Transportation Systems Services	\$0
	C-AGV LE EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-AGV LE EX 01.04.01	Land or Land Leases	\$7,680,000
		C-AGV LE EX 01.04.02	Site permits	\$200,000
		C-AGV LE EX 01.04.03	Site Licensing	\$6,240,000
		C-AGV LE EX 01.04.05	Plant Permits	\$0
		C-AGV LE EX 01.04.06	Planning and Alternative Studies	\$750,000
		C-AGV LE EX 01.04.07	Research and Development	\$0
		C-AGV LE EX 01.04.08	Design	\$23,955,000
		C-AGV LE EX 01.04.09	Other Pre-construction Costs	\$17,200,000
		C-AGV LE EX 01.04.10	Pre-construction contingencies	\$10,000,000



	C-AGV LE EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-AGV LE EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-AGV LE EX 01.05.01	Project Management		\$2,700,000
	C-AGV LE EX 01.05.02	Construction Management		\$3,600,000
	C-AGV LE EX 01.05.03	Field indirect services		\$11,880,000
	C-AGV LE EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-AGV LE EX 01.05.05	QA/QC		\$12,600,000
	C-AGV LE EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-AGV LE EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-AGV LE EX 01.05.08	Document Control		\$2,700,000
	C-AGV LE EX 01.05.09	Project Controls		\$3,600,000
	C-AGV LE EX 01.05.10	Construction Testing		\$2,700,000
	C-AGV LE EX 01.05.11	Inspections		\$3,600,000
	C-AGV LE EX 01.05.12	Startup and Testing		\$3,000,000
	C-AGV LE EX 01.05.13	Commissioning		\$3,000,000
	C-AGV LE EX 01.06	Site Selection	\$0	
	C-AGV LE EX 01.06.01	Site Selection		\$0
	C-AGV LE EX 01.06.02	Public Information Process		\$0
	C-AGV LE EX 01.07	Decontamination and Deconstruction	\$0	
	C-AGV LE EX 01.07.01	Decommissioning		\$0
	C-AGV LE EX 01.07.02	Decontamination		\$0
	C-AGV LE EX 01.07.03	Deconstruction		\$0
	C-AGV LE EX 01.07.04			\$0
	C-AGV LE EX 01.07.05			\$0
	C-AGV LE EX 01.08	Project Financial Costs	\$122,229,976	
	C-AGV LE EX 01.08.01	Contractor Fees		\$72,973,120
	C-AGV LE EX 01.08.02	Escalation Costs		\$49,256,856
	C-AGV LE EX 01.08.03	Interest Payments		\$0
	C-AGV LE EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-AGV LE EX 01.08.05			\$0
	C-AGV LE EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-AGV LE EX 01.09	Project Contingencies	\$160,331,066	
	C-AGV LE EX 01.09.01	Management Reserve - Contractor Held		\$51,719,699
	C-AGV LE EX 01.09.02	Contingency - DOE held		\$108,611,367
	C-AGV LE EX 01.10			
	C-AGV LE EX 01.10.01	Other Direct Costs	\$0	
	C-AGV LE EX 01.10.02	DOE Project Operations		\$0
	C-AGV LE EX 01.10.03	DOE TM&E		\$0
	C-AGV LE EX 01.10.04	Host site Operational Costs      Miscellaneous		\$0
	C-AGV LE EX 01.10.05	Miscellaneous ODC		\$0
	C-AGV LE EX 01.11	Operational Costs	0	
	C-AGV LE EX 01.11.01	Operations Costs		\$0
	C-AGV LE EX 01.11.02	Transportation Costs		\$0
	C-AGV LE EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		(All Direct & indirect Costs, MR, Escalation)	TEC	\$1,086,113,674
		(TEC plus Contingency, ODCs)	TPC	\$1,194,725,041
		All Capitol, Operation, Transportation, Escalation	LCC	\$1,194,725,041



## APPENDIX A6-16

### STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

#### COST DETAILS

#### ALTERNATIVE 16 - C-AGV, EXPANDED, HIGH SEISMIC

#### LIFE CYCLE COST – 40 YEAR OPERATING LIFE



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - High Seismic

Separate CHB

		Annual Escalation		Discount Rate			
40 Year Operating life		1.90%		3.40%			
YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Expense	Cumulative
1	\$ 10,000,000	\$ -	Cask Handling	\$ -	\$ 190,000	\$ 10,190,000	\$ 10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$ 10,383,610	\$ 20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$ 21,161,797	\$ 41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$ 21,563,871	\$ 63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$ 21,973,585	\$ 85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$ 22,391,083	\$ 107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$ 31,815,802	\$ 139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$ 232,500,273	\$ 371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$ 266,619,471	\$ 638,599,492
10	\$ 666,836,642	\$ 24,539,498	\$ -	\$ -	\$ 143,181,289	\$ 834,557,430	\$ 1,473,156,922
11		\$ 25,012,938	\$ -	\$ -	\$ 5,753,749	\$ 30,766,687	\$ 1,503,923,609
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$ 47,440,204	\$ 1,551,363,813
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$ 48,341,568	\$ 1,599,705,381
14	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,192,127	\$ 31,047,939	\$ 1,630,753,319
15	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,782,038	\$ 31,637,850	\$ 1,662,391,169
16	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,383,157	\$ 32,238,969	\$ 1,694,630,138
17	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,995,698	\$ 32,851,509	\$ 1,727,481,648
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$ 15,463,238	\$ 1,742,944,886
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$ 15,757,040	\$ 1,758,701,925
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$ 16,056,423	\$ 1,774,758,349
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$ 16,361,495	\$ 1,791,119,844
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$ 16,672,364	\$ 1,807,792,208
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$ 16,989,139	\$ 1,824,781,346
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$ 17,311,932	\$ 1,842,093,279
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$ 17,640,859	\$ 1,859,734,138
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$ 17,976,035	\$ 1,877,710,173
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$ 18,317,580	\$ 1,896,027,753
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$ 18,665,614	\$ 1,914,693,367
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$ 19,020,261	\$ 1,933,713,628
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$ 19,381,646	\$ 1,953,095,273
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$ 19,749,897	\$ 1,972,845,170
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$ 20,125,145	\$ 1,992,970,315
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$ 20,507,523	\$ 2,013,477,838
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$ 20,897,166	\$ 2,034,375,004
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$ 21,294,212	\$ 2,055,669,215
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$ 21,698,802	\$ 2,077,368,017
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$ 22,111,079	\$ 2,099,479,096
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$ 22,531,190	\$ 2,122,010,286
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$ 22,959,282	\$ 2,144,969,568
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$ 23,395,509	\$ 2,168,365,076
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$ 23,840,023	\$ 2,192,205,100
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$ 24,292,984	\$ 2,216,498,083
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$ 24,754,550	\$ 2,241,252,634
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$ 25,224,887	\$ 2,266,477,520
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$ 25,704,160	\$ 2,292,181,680
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$ 26,192,539	\$ 2,318,374,219
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$ 26,690,197	\$ 2,345,064,415
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$ 27,197,311	\$ 2,372,261,726
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$ 27,714,060	\$ 2,399,975,785
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$ 28,240,627	\$ 2,428,216,412
51	\$ -	\$ -	\$ -	\$ 42,500,000	\$ 68,487,052	\$ 110,987,052	\$ 2,539,203,464
52	\$ -	\$ -	\$ -	\$ 40,000,000	\$ 66,443,111	\$ 106,443,111	\$ 2,645,646,575
53	\$ -	\$ -	\$ -	\$ 58,895,366	\$ 100,807,562	\$ 159,702,928	\$ 2,805,349,503
54	\$ -	\$ -	\$ -	\$ 58,895,366	\$ 103,841,917	\$ 162,737,283	\$ 2,968,086,786
55	\$ -	\$ -	\$ -	\$ 58,895,366	\$ 106,933,926	\$ 165,829,292	\$ 3,133,916,078
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,133,916,078
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,133,916,078
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,133,916,078
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,133,916,078
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,133,916,078
	<b>Total Design/Const</b>	<b>Total O&amp;M</b>	<b>Total Cask Handling</b>	<b>Total D&amp;D</b>	<b>Total Escalation</b>	<b>Total Annual Expense</b>	<b>Total Cumulative</b>
	\$ 1,194,725,041	\$ 532,376,272	\$ 77,017,378	\$ 259,186,098	\$ 1,070,611,288	\$ -	\$ 3,133,916,078

TASK ORDER NO. 16 - GENERIC DESIGN ALTERNATIVES FOR DRY STORAGE OF USED NUCLEAR FUEL THE DEPARTMENT OF ENERGY - OFFICE OF NUCLEAR ENERGY



## **APPENDIX A6-16**

### **STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS**

#### **COST DETAILS**

#### **ALTERNATIVE 16 - C-AGV, EXPANDED, HIGH SEISMIC**

#### **LIFE CYCLE COST – 80 YEAR OPERATING LIFE**



# Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-AGV Expanded (10,000 MTU)

Expanded Project - C-AGV 60/40 Vertical/Horizontal - High Seismic  
Separate CHB

80 Year Operating Life

Annual Escalation

1.90%

Discount Rate

3.40%

YEAR	Design/Const	O&M	Cask Handling	D&D	Escalation	Annual Funding	Cumulative
1	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 190,000	\$10,190,000	\$10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$10,383,610	\$20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$21,161,797	\$41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$21,563,871	\$63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$21,973,585	\$85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$22,391,083	\$107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$31,815,802	\$139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$232,500,273	\$371,980,021
9	\$ 200,000,000	\$ 25,073,418	\$ -	\$ -	\$ 41,546,053	\$266,619,471	\$638,599,492
10	\$ 666,836,642	\$ 24,539,498	\$ -	\$ -	\$ 143,181,289	\$834,557,430	\$1,473,156,922
11	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 8,706,478	\$46,555,646	\$1,519,712,568
12	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 9,591,036	\$47,440,204	\$1,567,152,772
13	\$ -	\$ 25,012,938	\$ 12,836,230	\$ -	\$ 10,492,400	\$48,341,568	\$1,615,494,340
14	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,192,127	\$31,047,939	\$1,646,542,279
15	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 7,782,038	\$31,637,850	\$1,678,180,128
16	\$ -	\$ 11,019,582	\$ 12,836,230	\$ -	\$ 8,383,157	\$32,238,969	\$1,710,419,097
17	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,155,332	\$15,174,915	\$1,725,594,012
18	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,443,656	\$15,463,238	\$1,741,057,250
19	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 4,737,457	\$15,757,040	\$1,756,814,290
20	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,036,841	\$16,056,423	\$1,772,870,713
21	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,341,913	\$16,361,495	\$1,789,232,208
22	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,652,782	\$16,672,364	\$1,805,904,572
23	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 5,969,556	\$16,989,139	\$1,822,893,711
24	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,292,350	\$17,311,932	\$1,840,205,643
25	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,621,277	\$17,640,859	\$1,857,846,502
26	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 6,956,453	\$17,976,035	\$1,875,822,537
27	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,297,998	\$18,317,580	\$1,894,140,117
28	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 7,646,032	\$18,665,614	\$1,912,805,731
29	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,000,678	\$19,020,261	\$1,931,825,992
30	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,362,063	\$19,381,646	\$1,951,207,638
31	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 8,730,315	\$19,749,897	\$1,970,957,535
32	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,105,563	\$20,125,145	\$1,991,082,680
33	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,487,941	\$20,507,523	\$2,011,590,202
34	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 9,877,583	\$20,897,166	\$2,032,487,368
35	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,274,630	\$21,294,212	\$2,053,781,580
36	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 10,679,220	\$21,698,802	\$2,075,480,382
37	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,091,497	\$22,111,079	\$2,097,591,461
38	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,511,607	\$22,531,190	\$2,120,122,650
39	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 11,939,700	\$22,959,282	\$2,143,081,932
40	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,375,926	\$23,395,509	\$2,166,477,441
41	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 12,820,441	\$23,840,023	\$2,190,317,464
42	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,273,401	\$24,292,984	\$2,214,610,448
43	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 13,734,968	\$24,754,550	\$2,239,364,998
44	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,205,305	\$25,224,887	\$2,264,589,885
45	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 14,684,577	\$25,704,160	\$2,290,294,044
46	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,172,956	\$26,192,539	\$2,316,486,583
47	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 15,670,615	\$26,690,197	\$2,343,176,780
48	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,177,728	\$27,197,311	\$2,370,374,090
49	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 16,694,477	\$27,714,060	\$2,398,088,150
50	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,221,044	\$28,240,627	\$2,426,328,777
51	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 17,757,616	\$28,777,199	\$2,455,105,975
52	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,304,383	\$29,323,965	\$2,484,429,940
53	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 18,861,538	\$29,881,121	\$2,514,311,061
54	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 19,429,280	\$30,448,862	\$2,544,759,923
55	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,007,808	\$31,027,390	\$2,575,787,313
56	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 20,597,329	\$31,616,911	\$2,607,404,224
57	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,198,050	\$32,217,632	\$2,639,621,856
58	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 21,810,185	\$32,829,767	\$2,672,451,623
59	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 22,433,950	\$33,453,533	\$2,705,905,156
60	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 23,069,568	\$34,089,150	\$2,739,994,306
61	\$ -	\$ 11,019,582	\$ -	\$ -	\$ 23,717,261	\$34,736,844	\$2,774,731,149





62	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 24,377,261	\$35,396,844	\$2,810,127,993
63	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 25,049,801	\$36,069,384	\$2,846,197,377
64	\$	-	\$ 11,019,582	\$	-	\$	-	\$ 25,735,120	\$36,754,702	\$2,882,952,078
65	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 26,433,459	\$37,453,041	\$2,920,405,120
66	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 27,145,067	\$38,164,649	\$2,958,569,769
67	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 27,870,195	\$38,889,777	\$2,997,459,546
68	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 28,609,101	\$39,628,683	\$3,037,088,229
69	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 29,362,046	\$40,381,628	\$3,077,469,858
70	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 30,129,297	\$41,148,879	\$3,118,618,737
71	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 30,911,126	\$41,930,708	\$3,160,549,444
72	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 31,707,809	\$42,727,391	\$3,203,276,836
73	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 32,519,629	\$43,539,212	\$3,246,816,047
74	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 33,346,874	\$44,366,457	\$3,291,182,504
75	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 34,189,837	\$45,209,419	\$3,336,391,923
76	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 35,048,816	\$46,068,398	\$3,382,460,322
77	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 35,924,116	\$46,943,698	\$3,429,404,020
78	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 36,816,046	\$47,835,628	\$3,477,239,648
79	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 37,724,923	\$48,744,505	\$3,525,984,153
80	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 38,651,068	\$49,670,651	\$3,575,654,804
81	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 39,594,811	\$50,614,393	\$3,626,269,197
82	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 40,556,484	\$51,576,067	\$3,677,845,263
83	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 41,536,430	\$52,556,012	\$3,730,401,275
84	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 42,534,994	\$53,554,576	\$3,783,955,851
85	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 43,552,531	\$54,572,113	\$3,838,527,964
86	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 44,589,401	\$55,608,983	\$3,894,136,947
87	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 45,645,972	\$56,665,554	\$3,950,802,501
88	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 46,722,617	\$57,742,199	\$4,008,544,700
89	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 47,819,719	\$58,839,301	\$4,067,384,001
90	\$0	\$	\$ 11,019,582	\$	-	\$	-	\$ 48,937,666	\$59,957,248	\$4,127,341,249
91				\$	-	\$ 42,500,000	\$	\$ 193,134,933	\$235,634,933	\$4,362,976,182
92				\$	-	\$ 40,000,000	\$	\$ 185,987,761	\$225,987,761	\$4,588,963,943
93				\$	-	\$ 58,895,366	\$	\$ 280,167,507	\$339,062,873	\$4,928,026,816
94				\$	-	\$ 58,895,366	\$	\$ 286,609,702	\$345,505,068	\$5,273,531,884
95				\$	-	\$ 58,895,366	\$	\$ 293,174,298	\$352,069,664	\$5,625,601,548
96					\$	-	\$	-	\$0	\$5,625,601,548
97					\$	-	\$	-	\$0	\$5,625,601,548
98						\$		-	\$0	\$5,625,601,548
99						\$		-	\$0	\$5,625,601,548
100						\$		-	\$0	\$5,625,601,548
		Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation			Life Cycle	
		\$1,194,725,041	\$973,159,561	\$77,017,378	\$259,186,098	\$3,121,513,471			\$5,625,601,548	

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