



APPENDIX A6-1

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 1 - C-PAD, PILOT, LOW SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility
 Pilot Storage Facility (5,000 MTU)

Project: C-PAD Pilot (5,000 MTU)
 PILOT Project - C-PAD 60/40 Vertical/Horizontal - Low Seismic
 Separate CHB
 Annual Escalation Factor 1.90%

<i>Life Cycle Costs (40 Year Life)</i>	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$779,581,409					\$779,581,409
<i>Operations & Maintenance (40 Year Life)</i>		\$566,213,291				\$566,213,291
<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&D</i>				\$91,292,445		\$91,292,445
<i>Escalation</i>					\$701,752,643	\$701,752,643
<i>Total Costs (40 year Life)</i>						\$2,177,348,477
<i>Present Value</i>						\$1,226,480,689

<i>Life Cycle Costs (80 Year Life)</i>	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$779,581,409					\$779,581,409
<i>Operations & Maintenance (80 Year Life)</i>		\$1,031,946,410				\$1,031,946,410
<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&D</i>				\$91,292,445		\$91,292,445
<i>Escalation</i>					\$2,310,737,337	\$2,310,737,337
<i>Total Costs (80 Year Life)</i>						\$4,252,066,291
<i>Present Value</i>						\$1,428,561,887



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CAPITAL COST SUMMARIES



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-PAD 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-PAD EX 01			Interim Storage Facility and transportation Project	
	C-PAD EX 01.01		Pilot ISF Facility	\$471,759,814
		C-PAD EX 01.01.01	Storage Pads	\$0
		C-PAD EX 01.01.02	Cask Handling (Transfer) Facility	\$135,175,719
		C-PAD EX 01.01.03	Horizontal Dry Storage Modules	\$95,969,797
		C-PAD EX 01.01.04	Vertical Dry Storage Module	\$81,475,136
		C-PAD EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-PAD EX 01.01.06	Cask Maintenance Facility	\$0
		C-PAD EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-PAD EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-PAD EX 01.01.09	Administration Building	\$3,140,000
		C-PAD EX 01.01.10	Security	\$24,148,975
		C-PAD EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-PAD EX 01.01.12	Utilities	\$18,682,150
		C-PAD EX 01.01.13	Roads	\$18,212,737
		C-PAD EX 01.01.14	Parking	\$735,000
		C-PAD EX 01.01.15	Site Work	\$23,417,500
		C-PAD EX 01.01.16	Warehouse	\$10,200,000
		C-PAD EX 01.01.17	Maintenance Facility	\$0
		C-PAD EX 01.01.18	Waste management Facility	\$0
		C-PAD EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-PAD EX 01.02		Expanded Interim Storage Facility	\$0
		C-PAD EX 01.02.01	Expanded Storage Pads and Dry Cask Storage Systems	\$0
		C-PAD EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-PAD EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-PAD EX 01.02.04	Vertical Dry Storage Casks	\$0
		C-PAD EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-PAD EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-PAD EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$0
		C-PAD EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$0
		C-PAD EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-PAD EX 01.02.10	Security (Expanded)	\$0
		C-PAD EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-PAD EX 01.02.12	Utilities Expanded as needed)	\$0
		C-PAD EX 01.02.13	Roads (Expanded)	\$0
		C-PAD EX 01.02.14	Parking (Expanded as needed)	\$0
		C-PAD EX 01.02.15	Site Work (Expanded)	\$0
		C-PAD EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-PAD EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-PAD EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-PAD EX 01.02.19	Hot Cell / Laboratories	\$0
		C-PAD EX 01.02.20	Pool Packaging Facility	\$0
		C-PAD EX 01.02.21	Standardized Storage System	\$0
		C-PAD EX 01.02.22	Standardized Disposal Canister	\$0
		C-PAD EX 01.02.23	Canister Repackaging Facility (For Repository)	\$0
	C-PAD EX 01.03		Transportation Equipment	\$0
		C-PAD EX 01.03.01	Transportation Casks	\$0
		C-PAD EX 01.03.02	Rail Equipment	\$0
		C-PAD EX 01.03.03	Rail Maintenance Facility	\$0
		C-PAD EX 01.03.04	Transportation Systems Services	\$0
	C-PAD EX 01.04		Pre-Construction Capitalized Costs	\$60,265,000
		C-PAD EX 01.04.01	Land or Land Leases	\$1,920,000
		C-PAD EX 01.04.02	Site permits	\$200,000
		C-PAD EX 01.04.03	Site Licensing	\$6,240,000
		C-PAD EX 01.04.05	Plant Permits	\$0
		C-PAD EX 01.04.06	Planning and Alternative Studies	\$750,000



	C-PAD EX 01.04.07	Research and Development		\$0
	C-PAD EX 01.04.08	Design		\$23,955,000
	C-PAD EX 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-PAD EX 01.04.10	Pre-construction contingencies		\$10,000,000
	C-PAD EX 01.04.xx	(Add Further Breakdown as needed)		\$0
C-PAD EX 01.05		Indirect Capitalized Costs	\$63,180,000	
	C-PAD EX 01.05.01	Project Management		\$2,700,000
	C-PAD EX 01.05.02	Construction Management		\$3,600,000
	C-PAD EX 01.05.03	Field indirect services		\$11,880,000
	C-PAD EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-PAD EX 01.05.05	QA/QC		\$12,600,000
	C-PAD EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-PAD EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-PAD EX 01.05.08	Document Control		\$2,700,000
	C-PAD EX 01.05.09	Project Controls		\$3,600,000
	C-PAD EX 01.05.10	Construction Testing		\$2,700,000
	C-PAD EX 01.05.11	Inspections		\$3,600,000
	C-PAD EX 01.05.12	Startup and Testing		\$3,000,000
	C-PAD EX 01.05.13	Commissioning		\$3,000,000
C-PAD EX 01.06		Site Selection	\$0	
	C-PAD EX 01.06.01	Site Selection		\$0
	C-PAD EX 01.06.02	Public Information Process		\$0
C-PAD EX 01.07		Decontamination and Deconstruction	\$0	
	C-PAD EX 01.07.01	Decommissioning		\$0
	C-PAD EX 01.07.02	Decontamination		\$0
	C-PAD EX 01.07.03	Deconstruction		\$0
	C-PAD EX 01.07.04			\$0
	C-PAD EX 01.07.05			\$0
C-PAD EX 01.08		Project Financial Costs	\$79,757,445	
	C-PAD EX 01.08.01	Contractor Fees		\$47,616,385
	C-PAD EX 01.08.02	Escalation Costs		\$32,141,060
	C-PAD EX 01.08.03	Interest Payments		\$0
	C-PAD EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-PAD EX 01.08.05			\$0
	C-PAD EX 01.08.xx	(Add Further Breakdown as needed)		\$0
C-PAD EX 01.09		Project Contingencies	\$104,619,150	
	C-PAD EX 01.09.01	Management Reserve - Contractor Held		\$33,748,113
	C-PAD EX 01.09.02	Contingency - DOE held		\$70,871,037
C-PAD EX 01.10		Other Direct Costs	\$0	
	C-PAD EX 01.10.01	DOE Project Operations		\$0
	C-PAD EX 01.10.02	DOE TM&E		\$0
	C-PAD EX 01.10.03	Host site Operational Costs	Miscellaneous	\$0
	C-PAD EX 01.10.04	Miscellaneous ODC		\$0
C-PAD EX 01.11		Operational Costs	0	
	C-PAD EX 01.11.01	Operations Costs		\$0
	C-PAD EX 01.11.02	Transportation Costs		\$0
	C-PAD EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$708,710,372
		TPC (TEC plus Contingency, ODCs)		\$779,581,409
		LCC All Capitol, Operation, Transportation, Escalation		\$779,581,409



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LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-PAD 60/40 Vertical/Horizontal - Low Seismic

Separate CHB

40 Year Operating life YEAR	Design/Const	O&M	Cask Handling	D&D	Annual Escalation	Annual Expense	Discount Rate
					1.90%		3.00%
					Escalation		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	\$ 28,054,945	\$ -	\$ -	\$ 42,096,410	\$ 270,151,354	\$ 642,131,376
10	\$ 273,071,660	\$ 26,453,185	\$ -	\$ -	\$ 62,030,422	\$ 361,555,266	\$ 1,003,686,642
11		\$ 26,967,342	\$ 12,836,230	\$ -	\$ 9,156,052	\$ 48,959,623	\$ 1,052,646,265
12	\$ -	\$ 26,967,342	\$ 12,836,230	\$ -	\$ 10,086,284	\$ 49,889,856	\$ 1,102,536,121
13	\$ -	\$ 26,967,342	\$ 12,836,230	\$ -	\$ 11,034,192	\$ 50,837,763	\$ 1,153,373,884
14	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 3,510,268	\$ 15,153,596	\$ 1,168,527,480
15	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 3,798,186	\$ 15,441,514	\$ 1,183,968,994
16	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,091,575	\$ 15,734,903	\$ 1,199,703,898
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$ 16,033,866	\$ 1,215,737,764
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$ 16,338,510	\$ 1,232,076,274
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$ 16,648,942	\$ 1,248,725,215
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$ 16,965,271	\$ 1,265,690,487
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$ 17,287,612	\$ 1,282,978,098
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$ 17,616,076	\$ 1,300,594,174
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$ 17,950,782	\$ 1,318,544,956
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$ 18,291,846	\$ 1,336,836,803
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$ 18,639,392	\$ 1,355,476,194
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$ 18,993,540	\$ 1,374,469,734
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$ 19,354,417	\$ 1,393,824,151
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$ 19,722,151	\$ 1,413,546,303
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$ 20,096,872	\$ 1,433,643,175
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$ 20,478,713	\$ 1,454,121,887
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$ 20,867,808	\$ 1,474,989,696
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$ 21,264,297	\$ 1,496,253,992
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$ 21,668,318	\$ 1,517,922,310
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$ 22,080,016	\$ 1,540,002,326
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$ 22,499,537	\$ 1,562,501,863
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$ 22,927,028	\$ 1,585,428,891
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$ 23,362,641	\$ 1,608,791,532
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$ 23,806,531	\$ 1,632,598,063
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$ 24,258,856	\$ 1,656,856,919
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$ 24,719,774	\$ 1,681,576,693
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$ 25,189,449	\$ 1,706,766,142
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$ 25,668,049	\$ 1,732,434,191
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$ 26,155,742	\$ 1,758,589,933
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$ 26,652,701	\$ 1,785,242,634
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$ 27,159,102	\$ 1,812,401,737
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$ 27,675,125	\$ 1,840,076,862
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$ 28,200,953	\$ 1,868,277,815
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$ 28,736,771	\$ 1,897,014,585
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$ 29,282,769	\$ 1,926,297,355
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$ 29,839,142	\$ 1,956,136,497
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 2,011,434,163
52	\$ -	\$ -	\$ -	\$ 20,000,000	\$ 33,221,556	\$ 53,221,556	\$ 2,064,655,719
53	\$ -	\$ -	\$ -	\$ 16,705,815	\$ 28,594,312	\$ 45,300,127	\$ 2,109,955,846
54	\$ -	\$ -	\$ -	\$ 16,705,815	\$ 29,455,015	\$ 46,160,830	\$ 2,156,116,675
55	\$ -	\$ -	\$ -	\$ 16,705,815	\$ 30,332,070	\$ 47,037,885	\$ 2,203,154,561
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,203,154,561
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,203,154,561
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,203,154,561
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,203,154,561
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,203,154,561
	Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation		Total Life Cycle
	\$ 800,960,059	\$ 566,213,291	\$ 38,508,689	\$ 91,292,445	\$ 706,180,078		\$ 2,203,154,561



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Separate CHB

80 Year Operating Life

YEAR	Design/Const	O&M	Cask Handling	D&D	Annual Escalation		Discount Rate	
					Escalation	Annual Expense	Cumulative	
1	\$ 10,000,000	\	\$ -	\$ -	1.90%	\$ 190,000	\$10,190,000	\$10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	1.90%	\$ 383,610	\$10,383,610	\$20,573,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	1.90%	\$ 1,161,797	\$21,161,797	\$41,735,407
4	\$ 20,000,000	\$ -	\$ -	\$ -	1.90%	\$ 1,563,871	\$21,563,871	\$63,299,279
5	\$ 20,000,000	\$ -	\$ -	\$ -	1.90%	\$ 1,973,585	\$21,973,585	\$85,272,863
6	\$ 20,000,000	\$ -	\$ -	\$ -	1.90%	\$ 2,391,083	\$22,391,083	\$107,663,946
7	\$ 27,888,399	\$ -	\$ -	\$ -	1.90%	\$ 3,927,403	\$31,815,802	\$139,479,748
8	\$ 200,000,000	\$ -	\$ -	\$ -	1.90%	\$ 32,500,273	\$232,500,273	\$371,980,021
9	\$ 200,000,000	\$ 28,054,945	\$ -	\$ -	1.90%	\$ 42,096,410	\$270,151,354	\$642,131,376
10	\$ 273,071,660	\$ 26,453,185	\$ -	\$ -	1.90%	\$ 62,030,422	\$361,555,266	\$1,003,686,642
11		\$ 26,967,342	\$ 12,836,230	\$ -	1.90%	\$ 9,156,052	\$48,959,623	\$1,052,646,265
12	\$ -	\$ 26,967,342	\$ 12,836,230	\$ -	1.90%	\$ 10,086,284	\$49,889,856	\$1,102,536,121
13	\$ -	\$ 26,967,342	\$ 12,836,230	\$ -	1.90%	\$ 11,034,192	\$50,837,763	\$1,153,373,884
14	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 3,510,268	\$15,153,596	\$1,168,527,480
15	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 3,798,186	\$15,441,514	\$1,183,968,994
16	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 4,091,575	\$15,734,903	\$1,199,703,898
17	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 4,390,538	\$16,033,866	\$1,215,737,764
18	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 4,695,182	\$16,338,510	\$1,232,076,274
19	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 5,005,614	\$16,648,942	\$1,248,725,215
20	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 5,321,943	\$16,965,271	\$1,265,690,487
21	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 5,644,284	\$17,287,612	\$1,282,978,098
22	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 5,972,748	\$17,616,076	\$1,300,594,174
23	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 6,307,454	\$17,950,782	\$1,318,544,956
24	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 6,648,518	\$18,291,846	\$1,336,836,803
25	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 6,996,064	\$18,639,392	\$1,355,476,194
26	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 7,350,212	\$18,993,540	\$1,374,469,734
27	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 7,711,089	\$19,354,417	\$1,393,824,151
28	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 8,078,823	\$19,722,151	\$1,413,546,303
29	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 8,453,544	\$20,096,872	\$1,433,643,175
30	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 8,835,385	\$20,478,713	\$1,454,121,887
31	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 9,224,480	\$20,867,808	\$1,474,989,696
32	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 9,620,969	\$21,264,297	\$1,496,253,992
33	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 10,024,990	\$21,668,318	\$1,517,922,310
34	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 10,436,688	\$22,080,016	\$1,540,002,326
35	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 10,856,209	\$22,499,537	\$1,562,501,863
36	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 11,283,700	\$22,927,028	\$1,585,428,891
37	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 11,719,313	\$23,362,641	\$1,608,791,532
38	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 12,163,203	\$23,806,531	\$1,632,598,063
39	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 12,615,528	\$24,258,856	\$1,656,856,919
40	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 13,076,446	\$24,719,774	\$1,681,576,693
41	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 13,546,121	\$25,189,449	\$1,706,766,142
42	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 14,024,721	\$25,668,049	\$1,732,434,191
43	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 14,512,414	\$26,155,742	\$1,758,589,933
44	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 15,009,373	\$26,652,701	\$1,785,242,634
45	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 15,515,774	\$27,159,102	\$1,812,401,737
46	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 16,031,797	\$27,675,125	\$1,840,076,862
47	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 16,557,625	\$28,200,953	\$1,868,277,815
48	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 17,093,443	\$28,736,771	\$1,897,014,585
49	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 17,639,441	\$29,282,769	\$1,926,297,355
50	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 18,195,814	\$29,839,142	\$1,956,136,497
51	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 18,762,758	\$30,406,086	\$1,986,542,583
52	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 19,340,473	\$30,983,801	\$2,017,526,384
53	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 19,929,166	\$31,572,494	\$2,049,098,878
54	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 20,529,043	\$32,172,371	\$2,081,271,249
55	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 21,140,318	\$32,783,646	\$2,114,054,895
56	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 21,763,207	\$33,406,535	\$2,147,461,430
57	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 22,397,931	\$34,041,259	\$2,181,502,689
58	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 23,044,715	\$34,688,043	\$2,216,190,733
59	\$ -	\$ 11,643,328	\$ -	\$ -	1.90%	\$ 23,703,788	\$35,347,116	\$2,251,537,849



60	\$	-	\$ 11,643,328	\$	-	\$	-	\$	24,375,383	\$36,018,711	\$2,287,556,561
61	\$	-	\$ 11,643,328	\$	-	\$	-	\$	25,059,739	\$36,703,067	\$2,324,259,627
62	\$	-	\$ 11,643,328	\$	-	\$	-	\$	25,757,097	\$37,400,425	\$2,361,660,053
63	\$	-	\$ 11,643,328	\$	-	\$	-	\$	26,467,705	\$38,111,033	\$2,399,771,086
64	\$	-	\$ 11,643,328	\$	-	\$	-	\$	27,191,815	\$38,835,143	\$2,438,606,229
65		\$0	\$ 11,643,328	\$	-	\$	-	\$	27,929,683	\$39,573,011	\$2,478,179,240
66		\$0	\$ 11,643,328	\$	-	\$	-	\$	28,681,570	\$40,324,898	\$2,518,504,138
67		\$0	\$ 11,643,328	\$	-	\$	-	\$	29,447,743	\$41,091,071	\$2,559,595,208
68		\$0	\$ 11,643,328	\$	-	\$	-	\$	30,228,473	\$41,871,801	\$2,601,467,010
69		\$0	\$ 11,643,328	\$	-	\$	-	\$	31,024,038	\$42,667,366	\$2,644,134,375
70		\$0	\$ 11,643,328	\$	-	\$	-	\$	31,834,717	\$43,478,045	\$2,687,612,421
71		\$0	\$ 11,643,328	\$	-	\$	-	\$	32,660,800	\$44,304,128	\$2,731,916,549
72		\$0	\$ 11,643,328	\$	-	\$	-	\$	33,502,579	\$45,145,907	\$2,777,062,456
73		\$0	\$ 11,643,328	\$	-	\$	-	\$	34,360,351	\$46,003,679	\$2,823,066,135
74		\$0	\$ 11,643,328	\$	-	\$	-	\$	35,234,421	\$46,877,749	\$2,869,943,884
75		\$0	\$ 11,643,328	\$	-	\$	-	\$	36,125,098	\$47,768,426	\$2,917,712,310
76		\$0	\$ 11,643,328	\$	-	\$	-	\$	37,032,698	\$48,676,026	\$2,966,388,336
77		\$0	\$ 11,643,328	\$	-	\$	-	\$	37,957,543	\$49,600,871	\$3,015,989,207
78		\$0	\$ 11,643,328	\$	-	\$	-	\$	38,899,959	\$50,543,287	\$3,066,532,494
79		\$0	\$ 11,643,328	\$	-	\$	-	\$	39,860,282	\$51,503,610	\$3,118,036,104
80		\$0	\$ 11,643,328	\$	-	\$	-	\$	40,838,850	\$52,482,178	\$3,170,518,282
81		\$0	\$ 11,643,328	\$	-	\$	-	\$	41,836,012	\$53,479,340	\$3,223,997,622
82		\$0	\$ 11,643,328	\$	-	\$	-	\$	42,852,119	\$54,495,447	\$3,278,493,069
83		\$0	\$ 11,643,328	\$	-	\$	-	\$	43,887,533	\$55,530,861	\$3,334,023,929
84		\$0	\$ 11,643,328	\$	-	\$	-	\$	44,942,619	\$56,585,947	\$3,390,609,876
85		\$0	\$ 11,643,328	\$	-	\$	-	\$	46,017,752	\$57,661,080	\$3,448,270,956
86		\$0	\$ 11,643,328	\$	-	\$	-	\$	47,113,312	\$58,756,640	\$3,507,027,597
87		\$0	\$ 11,643,328	\$	-	\$	-	\$	48,229,689	\$59,873,017	\$3,566,900,613
88		\$0	\$ 11,643,328	\$	-	\$	-	\$	49,367,276	\$61,010,604	\$3,627,911,217
89		\$0	\$ 11,643,328	\$	-	\$	-	\$	50,526,477	\$62,169,805	\$3,690,081,023
90		\$0	\$ 11,643,328	\$	-	\$	-	\$	51,707,704	\$63,351,032	\$3,753,432,055
91				\$	-	\$ 21,175,000	\$		96,226,640	\$117,401,640	\$3,870,833,695
92				\$	-	\$ 20,000,000	\$		92,993,881	\$112,993,881	\$3,983,827,575
93				\$	-	\$ 16,705,815	\$		79,470,201	\$96,176,016	\$4,080,003,591
94				\$	-	\$ 16,705,815	\$		81,297,545	\$98,003,360	\$4,178,006,951
95				\$	-	\$ 16,705,815	\$		83,159,609	\$99,865,424	\$4,277,872,375
96						\$	-	\$	-	\$0	\$4,277,872,375
97						\$	-	\$	-	\$0	\$4,277,872,375
98								\$	-	\$0	\$4,277,872,375
99								\$	-	\$0	\$4,277,872,375
100								\$	-	\$0	\$4,277,872,375

Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Life Cycle
\$800,960,059	\$1,031,946,410	\$38,508,689	\$91,292,445	\$2,315,164,772	\$4,277,872,375

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



APPENDIX A6-2

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 2 - C-PAD, PILOT, HIGH SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-PAD 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 & Construction</i>	\$862,827,226					\$862,827,226
<i>Operations & Maintenance (40 Year Life)</i>		\$564,151,464				\$564,151,464
<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&D</i>				\$103,606,960		\$103,606,960
<i>Escalation</i>					\$740,233,214	\$740,233,214
<i>Total Costs (40 year Life)</i>						\$2,309,327,553
<i>Present Value</i>						\$1,229,220,278

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$862,827,226					\$862,827,226
<i>Operations & Maintenance (80 Year Life)</i>		\$1,029,884,584				\$1,029,884,584
<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&D</i>				\$103,606,960		\$103,606,960
<i>Escalation</i>					\$2,387,437,595	\$2,387,437,595
<i>Total Costs (80 Year Life)</i>						\$4,422,265,054
<i>Present Value</i>						\$1,376,686,520



APPENDIX A6-2

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 2 - C-PAD, PILOT, HIGH SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

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

Separate CHB

Level 3 Cost Summary - First of A kind module

Level 1	Level 2	Level 3	Description	Level 3 Total
C-PAD LE 01			Interim Storage Facility and transportation Project	
	C-PAD LE 01.01		Pilot ISF Facility	\$529,557,398
		C-PAD LE 01.01.01	Storage Pads	\$0
		C-PAD LE 01.01.02	Cask Handling (Transfer) Facility	\$163,293,960
		C-PAD LE 01.01.03	Horizontal Dry Storage Modules	\$113,041,942
		C-PAD LE 01.01.04	Vertical Dry Storage Module	\$94,082,334
		C-PAD LE 01.01.05	Storage Cask Fabrication Facility	\$0
		C-PAD LE 01.01.06	Cask Maintenance Facility	\$0
		C-PAD LE 01.01.07	Concrete Batch Plant	\$1,850,000
		C-PAD LE 01.01.08	Visitor Center/ Auditorium	\$0
		C-PAD LE 01.01.09	Administration Building	\$3,140,000
		C-PAD LE 01.01.10	Security	\$24,148,975
		C-PAD LE 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-PAD LE 01.01.12	Utilities	\$18,682,150
		C-PAD LE 01.01.13	Roads	\$18,212,737
		C-PAD LE 01.01.14	Parking	\$735,000
		C-PAD LE 01.01.15	Site Work	\$23,417,500
		C-PAD LE 01.01.16	Warehouse	\$10,200,000
		C-PAD LE 01.01.17	Maintenance Facility	\$0
		C-PAD LE 01.01.18	Waste management Facility	\$0
		C-PAD LE 01.01.xx	(Add Further Breakdown as needed)	\$0
	C-PAD LE 01.02		Expanded Interim Storage Facility	\$0
		C-PAD LE 01.02.01	Expanded Storage Pads and Dry Cask Storage Systems	\$0
		C-PAD LE 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-PAD LE 01.02.03	Horizontal Dry Storage Modules	\$0
		C-PAD LE 01.02.04	Vertical Dry Storage Casks	\$0
		C-PAD LE 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-PAD LE 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-PAD LE 01.02.07	Concrete Batch Plant (Expanded if needed)	\$0
		C-PAD LE 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$0
		C-PAD LE 01.02.09	Administration Building (Expanded if needed)	\$0
		C-PAD LE 01.02.10	Security (Expanded)	\$0
		C-PAD LE 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-PAD LE 01.02.12	Utilities Expanded as needed)	\$0
		C-PAD LE 01.02.13	Roads (Expanded)	\$0
		C-PAD LE 01.02.14	Parking (Expanded as needed)	\$0
		C-PAD LE 01.02.15	Site Work (Expanded)	\$0
		C-PAD LE 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-PAD LE 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-PAD LE 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-PAD LE 01.02.19	Hot Cell / Laboratories	\$0
		C-PAD LE 01.02.20	Pool Packaging Facility	\$0
		C-PAD LE 01.02.21	Standardized Storage System	\$0
		C-PAD LE 01.02.22	Standardized Disposal Canister	\$0
		C-PAD LE 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-PAD LE 01.03		Transportation Equipment	\$0
		C-PAD LE 01.03.01	Transportation Casks	\$0
		C-PAD LE 01.03.02	Rail Equipment	\$0
		C-PAD LE 01.03.03	Rail Maintenance Facility	\$0
		C-PAD LE 01.03.04	Transportation Systems Services	\$0
	C-PAD LE 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-PAD LE 01.04.01	Land or Land Leases	\$7,680,000
		C-PAD LE 01.04.02	Site permits	\$200,000
		C-PAD LE 01.04.03	Site Licensing	\$6,240,000
		C-PAD LE 01.04.05	Plant Permits	\$0
		C-PAD LE 01.04.06	Planning and Alternative Studies	\$750,000

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



	C-PAD LE 01.04.07	Research and Development		\$0
	C-PAD LE 01.04.08	Design		\$23,955,000
	C-PAD LE 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-PAD LE 01.04.10	Pre-construction contingencies		\$10,000,000
	C-PAD LE 01.04.xx	(Add Further Breakdown as needed)		\$0
C-PAD LE 01.05		Indirect Capitalized Costs	\$63,180,000	
	C-PAD LE 01.05.01	Project Management		\$2,700,000
	C-PAD LE 01.05.02	Construction Management		\$3,600,000
	C-PAD LE 01.05.03	Field indirect services		\$11,880,000
	C-PAD LE 01.05.04	Design Services in support of Construction		\$5,400,000
	C-PAD LE 01.05.05	QA/QC		\$12,600,000
	C-PAD LE 01.05.06	Commissioning and Startup		\$1,200,000
	C-PAD LE 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-PAD LE 01.05.08	Document Control		\$2,700,000
	C-PAD LE 01.05.09	Project Controls		\$3,600,000
	C-PAD LE 01.05.10	Construction Testing		\$2,700,000
	C-PAD LE 01.05.11	Inspections		\$3,600,000
	C-PAD LE 01.05.12	Startup and Testing		\$3,000,000
	C-PAD LE 01.05.13	Commissioning		\$3,000,000
C-PAD LE 01.06		Site Selection	\$0	
	C-PAD LE 01.06.01	Site Selection		\$0
	C-PAD LE 01.06.02	Public Information Process		\$0
C-PAD LE 01.07		Decontamination and Deconstruction	\$0	
	C-PAD LE 01.07.01	Decommissioning		\$0
	C-PAD LE 01.07.02	Decontamination		\$0
	C-PAD LE 01.07.03	Deconstruction		\$0
	C-PAD LE 01.07.04			\$0
	C-PAD LE 01.07.05			\$0
C-PAD LE 01.08		Project Financial Costs	\$88,274,161	
	C-PAD LE 01.08.01	Contractor Fees		\$52,700,992
	C-PAD LE 01.08.02	Escalation Costs		\$35,573,169
	C-PAD LE 01.08.03	Interest Payments		\$0
	C-PAD LE 01.08.04	Indirect costs to support shipments to repository		\$0
	C-PAD LE 01.08.05			\$0
	C-PAD LE 01.08.xx	(Add Further Breakdown as needed)		\$0
C-PAD LE 01.09		Project Contingencies	\$115,790,667	
	C-PAD LE 01.09.01	Management Reserve - Contractor Held		\$37,351,828
	C-PAD LE 01.09.02	Contingency - DOE held		\$78,438,839
C-PAD LE 01.10		Other Direct Costs	\$0	
	C-PAD LE 01.10.01	Other Direct Costs	\$0	
	C-PAD LE 01.10.02	DOE Project Operations		\$0
	C-PAD LE 01.10.03	DOE TM&E		\$0
	C-PAD LE 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-PAD LE 01.10.05	Miscellaneous ODC		\$0
C-PAD LE 01.11		Operational Costs	0	
	C-PAD LE 01.11.01	Operations Costs		\$0
	C-PAD LE 01.11.02	Transportation Costs		\$0
	C-PAD LE 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$784,388,387
		TPC (TEC plus Contingency, ODCs)		\$862,827,226
		LCC All Capitol, Operation, Transportation, Escalation		\$862,827,226



APPENDIX A6-2

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 2 - C-PAD, PILOT, HIGH SEISMIC

LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-PAD 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	\$ 27,647,777	\$ -	\$ -	\$ 42,021,251	\$ 269,669,028	\$ 641,649,050
10	\$ 334,938,827	\$ 26,046,017	\$ -	\$ -	\$ 74,758,547	\$ 435,743,390	\$ 1,077,392,440
11	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,060,398	\$ 48,448,139	\$ 1,125,840,579
12	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,980,912	\$ 49,368,653	\$ 1,175,209,232
13	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 10,918,917	\$ 50,306,658	\$ 1,225,515,890
14	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 3,510,268	\$ 15,153,596	\$ 1,240,669,486
15	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 3,798,186	\$ 15,441,514	\$ 1,256,111,001
16	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,091,575	\$ 15,734,903	\$ 1,271,845,904
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$ 16,033,866	\$ 1,287,879,770
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$ 16,338,510	\$ 1,304,218,280
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$ 16,648,942	\$ 1,320,867,221
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$ 16,965,271	\$ 1,337,832,493
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$ 17,287,612	\$ 1,355,120,104
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$ 17,616,076	\$ 1,372,736,181
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$ 17,950,782	\$ 1,390,686,962
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$ 18,291,846	\$ 1,408,978,809
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$ 18,639,392	\$ 1,427,618,200
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$ 18,993,540	\$ 1,446,611,740
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$ 19,354,417	\$ 1,465,966,158
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$ 19,722,151	\$ 1,485,688,309
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$ 20,096,872	\$ 1,505,785,181
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$ 20,478,713	\$ 1,526,263,894
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$ 20,867,808	\$ 1,547,131,702
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$ 21,264,297	\$ 1,568,395,998
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$ 21,668,318	\$ 1,590,064,316
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$ 22,080,016	\$ 1,612,144,333
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$ 22,499,537	\$ 1,634,643,869
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$ 22,927,028	\$ 1,657,570,897
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$ 23,362,641	\$ 1,680,933,538
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$ 23,806,531	\$ 1,704,740,070
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$ 24,258,856	\$ 1,728,998,925
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$ 24,719,774	\$ 1,753,718,699
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$ 25,189,449	\$ 1,778,908,148
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$ 25,668,049	\$ 1,804,576,197
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$ 26,155,742	\$ 1,830,731,939
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$ 26,652,701	\$ 1,857,384,640
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$ 27,159,102	\$ 1,884,543,743
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$ 27,675,125	\$ 1,912,218,868
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$ 28,200,953	\$ 1,940,419,821
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$ 28,736,771	\$ 1,969,156,591
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$ 29,282,769	\$ 1,998,439,361
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$ 29,839,142	\$ 2,028,278,503
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 2,083,576,169
52	\$ -	\$ -	\$ -	\$ 20,000,000	\$ 33,221,556	\$ 53,221,556	\$ 2,136,797,725
53	\$ -	\$ -	\$ -	\$ 20,810,653	\$ 35,620,311	\$ 56,430,964	\$ 2,193,228,689
54	\$ -	\$ -	\$ -	\$ 20,810,653	\$ 36,692,499	\$ 57,503,152	\$ 2,250,731,841
55	\$ -	\$ -	\$ -	\$ 20,810,653	\$ 37,785,059	\$ 58,595,712	\$ 2,309,327,553
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,309,327,553
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,309,327,553
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,309,327,553
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,309,327,553
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,309,327,553
	Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Annual Expense	Total Cumulative Life Cycle
	\$ 862,827,226	\$ 564,151,464	\$ 38,508,689	\$ 103,606,960	\$ 740,233,214	\$ -	\$ 2,309,327,553



APPENDIX A6-2

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 2 - C-PAD, PILOT, HIGH SEISMIC

LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-PAD 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	\$ 27,647,777	\$ -	\$ -	\$ 42,021,251	\$269,669,028	\$641,649,050
10	\$ 334,938,827	\$ 26,046,017	\$ -	\$ -	\$ 74,758,547	\$435,743,390	\$1,077,392,440
11		\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,060,398	\$48,448,139	\$1,125,840,579
12	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,980,912	\$49,368,653	\$1,175,209,232
13	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 10,918,917	\$50,306,658	\$1,225,515,890
14	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 3,510,268	\$15,153,596	\$1,240,669,486
15	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 3,798,186	\$15,441,514	\$1,256,111,001
16	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,091,575	\$15,734,903	\$1,271,845,904
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$16,033,866	\$1,287,879,770
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$16,338,510	\$1,304,218,280
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$16,648,942	\$1,320,867,221
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$16,965,271	\$1,337,832,493
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$17,287,612	\$1,355,120,104
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$17,616,076	\$1,372,736,181
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$17,950,782	\$1,390,686,962
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$18,291,846	\$1,408,978,809
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$18,639,392	\$1,427,618,200
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$18,993,540	\$1,446,611,740
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$19,354,417	\$1,465,966,158
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$19,722,151	\$1,485,688,309
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$20,096,872	\$1,505,785,181
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$20,478,713	\$1,526,263,894
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$20,867,808	\$1,547,131,702
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$21,264,297	\$1,568,395,998
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$21,668,318	\$1,590,064,316
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$22,080,016	\$1,612,144,333
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$22,499,537	\$1,634,643,869
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$22,927,028	\$1,657,570,897
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$23,362,641	\$1,680,933,538
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$23,806,531	\$1,704,740,070
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$24,258,856	\$1,728,998,925
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$24,719,774	\$1,753,718,699
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$25,189,449	\$1,778,908,148
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$25,668,049	\$1,804,576,197
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$26,155,742	\$1,830,731,939
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$26,652,701	\$1,857,384,640
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$27,159,102	\$1,884,543,743
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$27,675,125	\$1,912,218,868
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$28,200,953	\$1,940,419,821
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$28,736,771	\$1,969,156,591
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$29,282,769	\$1,998,439,361
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$29,839,142	\$2,028,278,503
51	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,762,758	\$30,406,086	\$2,058,684,589
52	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 19,340,473	\$30,983,801	\$2,089,668,390
53	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 19,929,166	\$31,572,494	\$2,121,240,884
54	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 20,529,043	\$32,172,371	\$2,153,413,255
55	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 21,140,318	\$32,783,646	\$2,186,196,901
56	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 21,763,207	\$33,406,535	\$2,219,603,436
57	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 22,397,931	\$34,041,259	\$2,253,644,696
58	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 23,044,715	\$34,688,043	\$2,288,332,739
59	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 23,703,788	\$35,347,116	\$2,323,679,855



60	\$	-	\$ 11,643,328	\$	-	\$	-	\$ 24,375,383	\$36,018,711	\$2,359,698,567
61	\$	-	\$ 11,643,328	\$	-	\$	-	\$ 25,059,739	\$36,703,067	\$2,396,401,634
62	\$	-	\$ 11,643,328	\$	-	\$	-	\$ 25,757,097	\$37,400,425	\$2,433,802,059
63	\$	-	\$ 11,643,328	\$	-	\$	-	\$ 26,467,705	\$38,111,033	\$2,471,913,092
64	\$	-	\$ 11,643,328	\$	-	\$	-	\$ 27,191,815	\$38,835,143	\$2,510,748,235
65		\$0	\$ 11,643,328	\$	-	\$	-	\$ 27,929,683	\$39,573,011	\$2,550,321,246
66		\$0	\$ 11,643,328	\$	-	\$	-	\$ 28,681,570	\$40,324,898	\$2,590,646,144
67		\$0	\$ 11,643,328	\$	-	\$	-	\$ 29,447,743	\$41,091,071	\$2,631,737,215
68		\$0	\$ 11,643,328	\$	-	\$	-	\$ 30,228,473	\$41,871,801	\$2,673,609,016
69		\$0	\$ 11,643,328	\$	-	\$	-	\$ 31,024,038	\$42,667,366	\$2,716,276,381
70		\$0	\$ 11,643,328	\$	-	\$	-	\$ 31,834,717	\$43,478,045	\$2,759,754,427
71		\$0	\$ 11,643,328	\$	-	\$	-	\$ 32,660,800	\$44,304,128	\$2,804,058,555
72		\$0	\$ 11,643,328	\$	-	\$	-	\$ 33,502,579	\$45,145,907	\$2,849,204,462
73		\$0	\$ 11,643,328	\$	-	\$	-	\$ 34,360,351	\$46,003,679	\$2,895,208,141
74		\$0	\$ 11,643,328	\$	-	\$	-	\$ 35,234,421	\$46,877,749	\$2,942,085,890
75		\$0	\$ 11,643,328	\$	-	\$	-	\$ 36,125,098	\$47,768,426	\$2,989,854,316
76		\$0	\$ 11,643,328	\$	-	\$	-	\$ 37,032,698	\$48,676,026	\$3,038,530,342
77		\$0	\$ 11,643,328	\$	-	\$	-	\$ 37,957,543	\$49,600,871	\$3,088,131,213
78		\$0	\$ 11,643,328	\$	-	\$	-	\$ 38,899,959	\$50,543,287	\$3,138,674,500
79		\$0	\$ 11,643,328	\$	-	\$	-	\$ 39,860,282	\$51,503,610	\$3,190,178,110
80		\$0	\$ 11,643,328	\$	-	\$	-	\$ 40,838,850	\$52,482,178	\$3,242,660,288
81		\$0	\$ 11,643,328	\$	-	\$	-	\$ 41,836,012	\$53,479,340	\$3,296,139,628
82		\$0	\$ 11,643,328	\$	-	\$	-	\$ 42,852,119	\$54,495,447	\$3,350,635,075
83		\$0	\$ 11,643,328	\$	-	\$	-	\$ 43,887,533	\$55,530,861	\$3,406,165,936
84		\$0	\$ 11,643,328	\$	-	\$	-	\$ 44,942,619	\$56,585,947	\$3,462,751,882
85		\$0	\$ 11,643,328	\$	-	\$	-	\$ 46,017,752	\$57,661,080	\$3,520,412,962
86		\$0	\$ 11,643,328	\$	-	\$	-	\$ 47,113,312	\$58,756,640	\$3,579,169,603
87		\$0	\$ 11,643,328	\$	-	\$	-	\$ 48,229,689	\$59,873,017	\$3,639,042,620
88		\$0	\$ 11,643,328	\$	-	\$	-	\$ 49,367,276	\$61,010,604	\$3,700,053,224
89		\$0	\$ 11,643,328	\$	-	\$	-	\$ 50,526,477	\$62,169,805	\$3,762,223,029
90		\$0	\$ 11,643,328	\$	-	\$	-	\$ 51,707,704	\$63,351,032	\$3,825,574,061
91				\$	-	\$ 21,175,000	\$	\$ 96,226,640	\$117,401,640	\$3,942,975,701
92				\$	-	\$ 20,000,000	\$	\$ 92,993,881	\$112,993,881	\$4,055,969,581
93				\$	-	\$ 20,810,653	\$	\$ 98,997,074	\$119,807,727	\$4,175,777,309
94				\$	-	\$ 20,810,653	\$	\$ 101,273,421	\$122,084,074	\$4,297,861,383
95				\$	-	\$ 20,810,653	\$	\$ 103,593,018	\$124,403,671	\$4,422,265,054
96					\$	-	\$	-	\$0	\$4,422,265,054
97					\$	-	\$	-	\$0	\$4,422,265,054
98							\$	-	\$0	\$4,422,265,054
99							\$	-	\$0	\$4,422,265,054
100							\$	-	\$0	\$4,422,265,054

Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Life Cycle
\$862,827,226	\$1,029,884,584	\$38,508,689	\$103,606,960	\$2,387,437,595	\$4,422,265,054

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



APPENDIX A6-3

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 3 - C-PAD, EXPANDED, LOW SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Expanded Storage Facility (5,000 MTU)

Project: C-PAD Expanded (5,000 MTU)

Expanded Project - C-PAD 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 & Construction</i>	\$1,094,242,205					\$1,094,242,205
<i>Operations & Maintenance (40 Year Life)</i>		\$564,151,464				\$564,151,464
<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&D</i>				\$160,550,290		\$160,550,290
<i>Escalation</i>					\$900,505,052	\$900,505,052
<i>Total Costs (40 year Life)</i>						\$2,796,466,389
<i>Present Value</i>						\$1,486,056,761

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$1,094,242,205					\$1,094,242,205
<i>Operations & Maintenance (80 Year Life)</i>		\$1,029,884,584				\$1,029,884,584
<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&D</i>				\$160,550,290		\$160,550,290
<i>Escalation</i>					\$2,723,721,574	\$2,723,721,574
<i>Total Costs (80 Year Life)</i>						\$5,085,416,030
<i>Present Value</i>						\$1,622,035,739



APPENDIX A6-3

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 3 - C-PAD, EXPANDED, LOW SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Expanded Storage Facility (5,000 MTU)

Project: C-PAD Expanded (5,000 MTU)
 Expanded Project - C-PAD 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-PAD EX 01			Interim Storage Facility and transportation Project	
	C-PAD EX 01.01		Pilot ISF Facility	\$486,894,563
		C-PAD EX 01.01.01	Storage Pads	\$0
		C-PAD EX 01.01.02	Cask Handling (Transfer) Facility	\$135,175,719
		C-PAD EX 01.01.03	Horizontal Dry Storage Modules	\$107,986,923
		C-PAD EX 01.01.04	Vertical Dry Storage Module	\$84,592,759
		C-PAD EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-PAD EX 01.01.06	Cask Maintenance Facility	\$0
		C-PAD EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-PAD EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-PAD EX 01.01.09	Administration Building	\$3,140,000
		C-PAD EX 01.01.10	Security	\$24,148,975
		C-PAD EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-PAD EX 01.01.12	Utilities	\$18,682,150
		C-PAD EX 01.01.13	Roads	\$18,212,737
		C-PAD EX 01.01.14	Parking	\$735,000
		C-PAD EX 01.01.15	Site Work	\$23,417,500
		C-PAD EX 01.01.16	Warehouse	\$10,200,000
		C-PAD EX 01.01.17	Maintenance Facility	\$0
		C-PAD EX 01.01.18	Waste management Facility	\$0
		C-PAD EX 01.01.xx	(Add Further Breakdown as needed)	\$0
	C-PAD EX 01.02		Expanded Interim Storage Facility	\$219,346,512
		C-PAD EX 01.02.01	Expanded Storage Pads and Dry Cask Storage Systems	\$0
		C-PAD EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-PAD EX 01.02.03	Horizontal Dry Storage Modules	\$107,986,923
		C-PAD EX 01.02.04	Vertical Dry Storage Casks	\$84,092,759
		C-PAD EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-PAD EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-PAD EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$1,850,000
		C-PAD EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$745,000
		C-PAD EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-PAD EX 01.02.10	Security (Expanded)	\$10,074,488
		C-PAD EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-PAD EX 01.02.12	Utilities Expanded as needed)	\$3,624,200
		C-PAD EX 01.02.13	Roads (Expanded)	\$83,142
		C-PAD EX 01.02.14	Parking (Expanded as needed)	\$0
		C-PAD EX 01.02.15	Site Work (Expanded)	\$10,890,000
		C-PAD EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-PAD EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-PAD EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-PAD EX 01.02.19	Hot Cell / Laboratories	\$0
		C-PAD EX 01.02.20	Pool Packaging Facility	\$0
		C-PAD EX 01.02.21	Standardized Storage System	\$0
		C-PAD EX 01.02.22	Standardized Disposal Canister	\$0
		C-PAD EX 01.02.23	Canister Repackaging Facility (For Repository)	\$0
	C-PAD EX 01.03		Transportation Equipment	\$0
		C-PAD EX 01.03.01	Transportation Casks	\$0
		C-PAD EX 01.03.02	Rail Equipment	\$0
		C-PAD EX 01.03.03	Rail Maintenance Facility	\$0
		C-PAD EX 01.03.04	Transportation Systems Services	\$0
	C-PAD EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-PAD EX 01.04.01	Land or Land Leases	\$7,680,000
		C-PAD EX 01.04.02	Site permits	\$200,000
		C-PAD EX 01.04.03	Site Licensing	\$6,240,000
		C-PAD EX 01.04.05	Plant Permits	\$0
		C-PAD EX 01.04.06	Planning and Alternative Studies	\$750,000

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



	C-PAD EX 01.04.07	Research and Development		\$0
	C-PAD EX 01.04.08	Design		\$23,955,000
	C-PAD EX 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-PAD EX 01.04.10	Pre-construction contingencies		\$10,000,000
	C-PAD EX 01.04.xx	(Add Further Breakdown as needed)		\$0
C-PAD EX 01.05		Indirect Capitalized Costs	\$63,180,000	
	C-PAD EX 01.05.01	Project Management		\$2,700,000
	C-PAD EX 01.05.02	Construction Management		\$3,600,000
	C-PAD EX 01.05.03	Field indirect services		\$11,880,000
	C-PAD EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-PAD EX 01.05.05	QA/QC		\$12,600,000
	C-PAD EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-PAD EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-PAD EX 01.05.08	Document Control		\$2,700,000
	C-PAD EX 01.05.09	Project Controls		\$3,600,000
	C-PAD EX 01.05.10	Construction Testing		\$2,700,000
	C-PAD EX 01.05.11	Inspections		\$3,600,000
	C-PAD EX 01.05.12	Startup and Testing		\$3,000,000
	C-PAD EX 01.05.13	Commissioning		\$3,000,000
C-PAD EX 01.06		Site Selection	\$0	
	C-PAD EX 01.06.01	Site Selection		\$0
	C-PAD EX 01.06.02	Public Information Process		\$0
C-PAD EX 01.07		Decontamination and Deconstruction	\$0	
	C-PAD EX 01.07.01	Decommissioning		\$0
	C-PAD EX 01.07.02	Decontamination		\$0
	C-PAD EX 01.07.03	Deconstruction		\$0
	C-PAD EX 01.07.04			\$0
	C-PAD EX 01.07.05			\$0
C-PAD EX 01.08		Project Financial Costs	\$111,949,774	
	C-PAD EX 01.08.01	Contractor Fees		\$66,835,686
	C-PAD EX 01.08.02	Escalation Costs		\$45,114,088
	C-PAD EX 01.08.03	Interest Payments		\$0
	C-PAD EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-PAD EX 01.08.05			\$0
	C-PAD EX 01.08.xx	(Add Further Breakdown as needed)		\$0
C-PAD EX 01.09		Project Contingencies	\$146,846,356	
	C-PAD EX 01.09.01	Management Reserve - Contractor Held		\$47,369,792
	C-PAD EX 01.09.02	Contingency - DOE held		\$99,476,564
C-PAD EX 01.10		Other Direct Costs	\$0	
	C-PAD EX 01.10.01	DOE Project Operations		\$0
	C-PAD EX 01.10.02	DOE TM&E		\$0
	C-PAD EX 01.10.03	DOE TM&E		\$0
	C-PAD EX 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-PAD EX 01.10.05	Miscellaneous ODC		\$0
C-PAD EX 01.11		Operational Costs	0	
	C-PAD EX 01.11.01	Operations Costs		\$0
	C-PAD EX 01.11.02	Transportation Costs		\$0
	C-PAD EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$994,765,641
		TPC (TEC plus Contingency, ODCs)		\$1,094,242,205
		LCC All Capitol, Operation, Transportation, Escalation		\$1,094,242,205



APPENDIX A6-3

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 3 - C-PAD, EXPANDED, LOW SEISMIC

LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (5,000 MTU)

Project: C-PAD Expanded (5,000 MTU)

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

Separate CHB

YEAR	Design/Const	O&M	Cask Handling	D&D	Annual Escalation	Annual Expense	Discount Rate	Cumulative
					1.90%		3.40%	
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	\$ 27,647,777	\$ -	\$ -	\$ 42,021,251	\$ 269,669,028	\$ 641,649,050	
10	\$ 566,353,806	\$ 26,046,017	\$ -	\$ -	\$ 122,683,682	\$ 715,083,505	\$ 1,356,732,555	
11		\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,060,398	\$ 48,448,139	\$ 1,405,180,694	
12	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,980,912	\$ 49,368,653	\$ 1,454,549,347	
13	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 10,918,917	\$ 50,306,658	\$ 1,504,856,005	
14	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,380,176	\$ 31,859,734	\$ 1,536,715,738	
15	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,985,511	\$ 32,465,069	\$ 1,569,180,807	
16	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 8,602,347	\$ 33,081,905	\$ 1,602,262,712	
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$ 16,033,866	\$ 1,618,296,578	
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$ 16,338,510	\$ 1,634,635,088	
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$ 16,648,942	\$ 1,651,284,030	
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$ 16,965,271	\$ 1,668,249,301	
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$ 17,287,612	\$ 1,685,536,913	
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$ 17,616,076	\$ 1,703,152,989	
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$ 17,950,782	\$ 1,721,103,770	
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$ 18,291,846	\$ 1,739,395,617	
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$ 18,639,392	\$ 1,758,035,009	
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$ 18,993,540	\$ 1,777,028,549	
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$ 19,354,417	\$ 1,796,382,966	
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$ 19,722,151	\$ 1,816,105,117	
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$ 20,096,872	\$ 1,836,201,989	
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$ 20,478,713	\$ 1,856,680,702	
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$ 20,867,808	\$ 1,877,548,510	
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$ 21,264,297	\$ 1,898,812,806	
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$ 21,668,318	\$ 1,920,481,125	
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$ 22,080,016	\$ 1,942,561,141	
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$ 22,499,537	\$ 1,965,060,677	
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$ 22,927,028	\$ 1,987,987,705	
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$ 23,362,641	\$ 2,011,350,346	
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$ 23,806,531	\$ 2,035,156,878	
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$ 24,258,856	\$ 2,059,415,733	
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$ 24,719,774	\$ 2,084,135,507	
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$ 25,189,449	\$ 2,109,324,957	
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$ 25,668,049	\$ 2,134,993,006	
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$ 26,155,742	\$ 2,161,148,747	
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$ 26,652,701	\$ 2,187,801,449	
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$ 27,159,102	\$ 2,214,960,551	
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$ 27,675,125	\$ 2,242,635,676	
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$ 28,200,953	\$ 2,270,836,629	
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$ 28,736,771	\$ 2,299,573,400	
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$ 29,282,769	\$ 2,328,856,169	
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$ 29,839,142	\$ 2,358,695,311	
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 2,413,992,977	
52	\$ -	\$ -	\$ -	\$ 26,250,000	\$ 43,603,292	\$ 69,853,292	\$ 2,483,846,269	
53	\$ -	\$ -	\$ -	\$ 37,708,430	\$ 64,543,191	\$ 102,251,621	\$ 2,586,097,891	
54	\$ -	\$ -	\$ -	\$ 37,708,430	\$ 66,485,972	\$ 104,194,402	\$ 2,690,292,293	
55	\$ -	\$ -	\$ -	\$ 37,708,430	\$ 68,465,666	\$ 106,174,096	\$ 2,796,466,389	
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,796,466,389	
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,796,466,389	
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,796,466,389	
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,796,466,389	
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,796,466,389	
	Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation		Total Life Cycle	
	\$ 1,094,242,205	\$ 564,151,464	\$ 77,017,378	\$ 160,550,290	\$ 900,505,052		\$ 2,796,466,389	



APPENDIX A6-3

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 3 - C-PAD, EXPANDED, LOW SEISMIC

LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (5,000 MTU)

Project: C-PAD Expanded (5,000 MTU)

Expanded Project - C-PAD 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 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	\$ 27,647,777	\$ -	\$ -	\$ 42,021,251	\$269,669,028	\$641,649,050
10	\$ 566,353,806	\$ 26,046,017	\$ -	\$ -	\$ 122,683,682	\$715,083,505	\$1,356,732,555
11	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,060,398	\$48,448,139	\$1,405,180,694
12	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,980,912	\$49,368,653	\$1,454,549,347
13	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 10,918,917	\$50,306,658	\$1,504,856,005
14	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,380,176	\$31,859,734	\$1,536,715,738
15	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,985,511	\$32,465,069	\$1,569,180,807
16	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 8,602,347	\$33,081,905	\$1,602,262,712
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$16,033,866	\$1,618,296,578
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$16,338,510	\$1,634,635,088
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$16,648,942	\$1,651,284,030
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$16,965,271	\$1,668,249,301
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$17,287,612	\$1,685,536,913
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$17,616,076	\$1,703,152,989
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$17,950,782	\$1,721,103,770
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$18,291,846	\$1,739,395,617
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$18,639,392	\$1,758,035,009
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$18,993,540	\$1,777,028,549
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$19,354,417	\$1,796,382,966
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$19,722,151	\$1,816,105,117
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$20,096,872	\$1,836,201,989
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$20,478,713	\$1,856,680,702
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$20,867,808	\$1,877,548,510
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$21,264,297	\$1,898,812,806
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$21,668,318	\$1,920,481,125
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$22,080,016	\$1,942,561,141
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$22,499,537	\$1,965,060,677
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$22,927,028	\$1,987,987,705
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$23,362,641	\$2,011,350,346
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$23,806,531	\$2,035,156,878
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$24,258,856	\$2,059,415,733
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$24,719,774	\$2,084,135,507
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$25,189,449	\$2,109,324,957
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$25,668,049	\$2,134,993,006
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$26,155,742	\$2,161,148,747
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$26,652,701	\$2,187,801,449
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$27,159,102	\$2,214,960,551
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$27,675,125	\$2,242,635,676
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$28,200,953	\$2,270,836,629
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$28,736,771	\$2,299,573,400
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$29,282,769	\$2,328,856,169
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$29,839,142	\$2,358,695,311
51	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,762,758	\$30,406,086	\$2,389,101,397
52	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 19,340,473	\$30,983,801	\$2,420,085,198
53	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 19,929,166	\$31,572,494	\$2,451,657,692
54	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 20,529,043	\$32,172,371	\$2,483,830,063
55	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 21,140,318	\$32,783,646	\$2,516,613,709
56	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 21,763,207	\$33,406,535	\$2,550,020,244
57	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 22,397,931	\$34,041,259	\$2,584,061,504
58	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 23,044,715	\$34,688,043	\$2,618,749,547
59	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 23,703,788	\$35,347,116	\$2,654,096,663
60	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 24,375,383	\$36,018,711	\$2,690,115,375
61	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 25,059,739	\$36,703,067	\$2,726,818,442
62	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 25,757,097	\$37,400,425	\$2,764,218,867



63	\$	-	\$ 11,643,328	\$	-	\$	-	\$	26,467,705	\$38,111,033	\$2,802,329,900
64	\$	-	\$ 11,643,328	\$	-	\$	-	\$	27,191,815	\$38,835,143	\$2,841,165,043
65		\$0	\$ 11,643,328	\$	-	\$	-	\$	27,929,683	\$39,573,011	\$2,880,738,054
66		\$0	\$ 11,643,328	\$	-	\$	-	\$	28,681,570	\$40,324,898	\$2,921,062,952
67		\$0	\$ 11,643,328	\$	-	\$	-	\$	29,447,743	\$41,091,071	\$2,962,154,023
68		\$0	\$ 11,643,328	\$	-	\$	-	\$	30,228,473	\$41,871,801	\$3,004,025,824
69		\$0	\$ 11,643,328	\$	-	\$	-	\$	31,024,038	\$42,667,366	\$3,046,693,190
70		\$0	\$ 11,643,328	\$	-	\$	-	\$	31,834,717	\$43,478,045	\$3,090,171,235
71		\$0	\$ 11,643,328	\$	-	\$	-	\$	32,660,800	\$44,304,128	\$3,134,475,363
72		\$0	\$ 11,643,328	\$	-	\$	-	\$	33,502,579	\$45,145,907	\$3,179,621,270
73		\$0	\$ 11,643,328	\$	-	\$	-	\$	34,360,351	\$46,003,679	\$3,225,624,949
74		\$0	\$ 11,643,328	\$	-	\$	-	\$	35,234,421	\$46,877,749	\$3,272,502,698
75		\$0	\$ 11,643,328	\$	-	\$	-	\$	36,125,098	\$47,768,426	\$3,320,271,124
76		\$0	\$ 11,643,328	\$	-	\$	-	\$	37,032,698	\$48,676,026	\$3,368,947,150
77		\$0	\$ 11,643,328	\$	-	\$	-	\$	37,957,543	\$49,600,871	\$3,418,548,021
78		\$0	\$ 11,643,328	\$	-	\$	-	\$	38,899,959	\$50,543,287	\$3,469,091,308
79		\$0	\$ 11,643,328	\$	-	\$	-	\$	39,860,282	\$51,503,610	\$3,520,594,918
80		\$0	\$ 11,643,328	\$	-	\$	-	\$	40,838,850	\$52,482,178	\$3,573,077,096
81		\$0	\$ 11,643,328	\$	-	\$	-	\$	41,836,012	\$53,479,340	\$3,626,556,436
82		\$0	\$ 11,643,328	\$	-	\$	-	\$	42,852,119	\$54,495,447	\$3,681,051,883
83		\$0	\$ 11,643,328	\$	-	\$	-	\$	43,887,533	\$55,530,861	\$3,736,582,744
84		\$0	\$ 11,643,328	\$	-	\$	-	\$	44,942,619	\$56,585,947	\$3,793,168,691
85		\$0	\$ 11,643,328	\$	-	\$	-	\$	46,017,752	\$57,661,080	\$3,850,829,771
86		\$0	\$ 11,643,328	\$	-	\$	-	\$	47,113,312	\$58,756,640	\$3,909,586,411
87		\$0	\$ 11,643,328	\$	-	\$	-	\$	48,229,689	\$59,873,017	\$3,969,459,428
88		\$0	\$ 11,643,328	\$	-	\$	-	\$	49,367,276	\$61,010,604	\$4,030,470,032
89		\$0	\$ 11,643,328	\$	-	\$	-	\$	50,526,477	\$62,169,805	\$4,092,639,837
90		\$0	\$ 11,643,328	\$	-	\$	-	\$	51,707,704	\$63,351,032	\$4,155,990,869
91				\$	-	\$ 21,175,000	\$		96,226,640	\$117,401,640	\$4,273,392,509
92				\$	-	\$ 26,250,000	\$		122,054,468	\$148,304,468	\$4,421,696,977
93				\$	-	\$ 37,708,430	\$		179,380,443	\$217,088,873	\$4,638,785,850
94				\$	-	\$ 37,708,430	\$		183,505,131	\$221,213,561	\$4,859,999,411
95				\$	-	\$ 37,708,430	\$		187,708,189	\$225,416,619	\$5,085,416,030
96						\$ -	\$		-	\$0	\$5,085,416,030
97						\$ -	\$		-	\$0	\$5,085,416,030
98						\$ -	\$		-	\$0	\$5,085,416,030
99						\$ -	\$		-	\$0	\$5,085,416,030
100						\$ -	\$		-	\$0	\$5,085,416,030
		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation				Life Cycle	
		\$1,094,242,205	\$1,029,884,584	\$77,017,378	\$160,550,290	\$2,723,721,574				\$5,085,416,030	

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



APPENDIX A6-4

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 4 - C-PAD, EXPANDED, HIGH SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

Expanded Project - C-PAD 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 & Construction</i>	\$1,169,825,664					\$1,169,825,664
<i>Operations & Maintenance (40 Year Life)</i>		\$564,151,464				\$564,151,464
<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&D</i>				\$179,036,744		\$179,036,744
<i>Escalation</i>					\$947,785,812	\$947,785,812
<i>Total Costs (40 year Life)</i>						\$2,937,817,062
<i>Present Value</i>						\$1,559,890,067

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$1,169,825,664					\$1,169,825,664
<i>Operations & Maintenance (80 Year Life)</i>		\$1,029,884,584				\$1,029,884,584
<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&D</i>				\$179,036,744		\$179,036,744
<i>Escalation</i>					\$2,827,284,809	\$2,827,284,809
<i>Total Costs (80 Year Life)</i>						\$5,283,049,179
<i>Present Value</i>						\$1,692,095,302



APPENDIX A6-4

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 4 - C-PAD, EXPANDED, HIGH SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

Level 3 Cost Summary - First of A kind module

Level 1	Level 2	Level 3	Description	Level 3 Total
C-PAD LE EX 01			Interim Storage Facility and transportation Project	
	C-PAD LE EX 01.01		Pilot ISF Facility	\$529,557,398
		C-PAD LE EX 01.01.01	Storage Pads	\$0
		C-PAD LE EX 01.01.02	Cask Handling (Transfer) Facility	\$163,293,960
		C-PAD LE EX 01.01.03	Horizontal Dry Storage Modules	\$113,041,942
		C-PAD LE EX 01.01.04	Vertical Dry Storage Module	\$94,082,334
		C-PAD LE EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-PAD LE EX 01.01.06	Cask Maintenance Facility	\$0
		C-PAD LE EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-PAD LE EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-PAD LE EX 01.01.09	Administration Building	\$3,140,000
		C-PAD LE EX 01.01.10	Security	\$24,148,975
		C-PAD LE EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-PAD LE EX 01.01.12	Utilities	\$18,682,150
		C-PAD LE EX 01.01.13	Roads	\$18,212,737
		C-PAD LE EX 01.01.14	Parking	\$735,000
		C-PAD LE EX 01.01.15	Site Work	\$23,417,500
		C-PAD LE EX 01.01.16	Warehouse	\$10,200,000
		C-PAD LE EX 01.01.17	Maintenance Facility	\$0
		C-PAD LE EX 01.01.18	Waste management Facility	\$0
		C-PAD LE EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-PAD LE EX 01.02		Expanded Interim Storage Facility	\$234,391,105
		C-PAD LE EX 01.02.01	Expanded Storage Pads and Dry Cask Storage Systems	\$0
		C-PAD LE EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-PAD LE EX 01.02.03	Horizontal Dry Storage Modules	\$113,041,942
		C-PAD LE EX 01.02.04	Vertical Dry Storage Casks	\$94,082,334
		C-PAD LE EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-PAD LE EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-PAD LE EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$1,850,000
		C-PAD LE EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$745,000
		C-PAD LE EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-PAD LE EX 01.02.10	Security (Expanded)	\$10,074,488
		C-PAD LE EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-PAD LE EX 01.02.12	Utilities Expanded as needed)	\$3,624,200
		C-PAD LE EX 01.02.13	Roads (Expanded)	\$83,142
		C-PAD LE EX 01.02.14	Parking (Expanded as needed)	\$0
		C-PAD LE EX 01.02.15	Site Work (Expanded)	\$10,890,000
		C-PAD LE EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-PAD LE EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-PAD LE EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-PAD LE EX 01.02.19	Hot Cell / Laboratories	\$0
		C-PAD LE EX 01.02.20	Pool Packaging Facility	\$0
		C-PAD LE EX 01.02.21	Standardized Storage System	\$0
		C-PAD LE EX 01.02.22	Standardized Disposal Canister	\$0
		C-PAD LE EX 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-PAD LE EX 01.03		Transportation Equipment	\$0
		C-PAD LE EX 01.03.01	Transportation Casks	\$0
		C-PAD LE EX 01.03.02	Rail Equipment	\$0
		C-PAD LE EX 01.03.03	Rail Maintenance Facility	\$0
		C-PAD LE EX 01.03.04	Transportation Systems Services	\$0
	C-PAD LE EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-PAD LE EX 01.04.01	Land or Land Leases	\$7,680,000
		C-PAD LE EX 01.04.02	Site permits	\$200,000
		C-PAD LE EX 01.04.03	Site Licensing	\$6,240,000
		C-PAD LE EX 01.04.05	Plant Permits	\$0
		C-PAD LE EX 01.04.06	Planning and Alternative Studies	\$750,000
		C-PAD LE EX 01.04.07	Research and Development	\$0
		C-PAD LE EX 01.04.08	Design	\$23,955,000
		C-PAD LE EX 01.04.09	Other Pre-construction Costs	\$17,200,000
		C-PAD LE EX 01.04.10	Pre-construction contingencies	\$10,000,000



	C-PAD LE EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-PAD LE EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-PAD LE EX 01.05.01	Project Management		\$2,700,000
	C-PAD LE EX 01.05.02	Construction Management		\$3,600,000
	C-PAD LE EX 01.05.03	Field indirect services		\$11,880,000
	C-PAD LE EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-PAD LE EX 01.05.05	QA/QC		\$12,600,000
	C-PAD LE EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-PAD LE EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-PAD LE EX 01.05.08	Document Control		\$2,700,000
	C-PAD LE EX 01.05.09	Project Controls		\$3,600,000
	C-PAD LE EX 01.05.10	Construction Testing		\$2,700,000
	C-PAD LE EX 01.05.11	Inspections		\$3,600,000
	C-PAD LE EX 01.05.12	Startup and Testing		\$3,000,000
	C-PAD LE EX 01.05.13	Commissioning		\$3,000,000
	C-PAD LE EX 01.06	Site Selection	\$0	
	C-PAD LE EX 01.06.01	Site Selection		\$0
	C-PAD LE EX 01.06.02	Public Information Process		\$0
	C-PAD LE EX 01.07	Decontamination and Deconstruction	\$0	
	C-PAD LE EX 01.07.01	Decommissioning		\$0
	C-PAD LE EX 01.07.02	Decontamination		\$0
	C-PAD LE EX 01.07.03	Deconstruction		\$0
	C-PAD LE EX 01.07.04			\$0
	C-PAD LE EX 01.07.05			\$0
	C-PAD LE EX 01.08	Project Financial Costs	\$119,682,569	
	C-PAD LE EX 01.08.01	Contractor Fees		\$71,452,280
	C-PAD LE EX 01.08.02	Escalation Costs		\$48,230,289
	C-PAD LE EX 01.08.03	Interest Payments		\$0
	C-PAD LE EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-PAD LE EX 01.08.05			\$0
	C-PAD LE EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-PAD LE EX 01.09	Project Contingencies	\$156,989,591	
	C-PAD LE EX 01.09.01	Management Reserve - Contractor Held		\$50,641,804
	C-PAD LE EX 01.09.02	Contingency - DOE held		\$106,347,788
	C-PAD LE EX 01.10			
	C-PAD LE EX 01.10.01	Other Direct Costs	\$0	
	C-PAD LE EX 01.10.02	DOE Project Operations		\$0
	C-PAD LE EX 01.10.03	DOE TM&E		\$0
	C-PAD LE EX 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-PAD LE EX 01.10.05	Miscellaneous ODC		\$0
	C-PAD LE EX 01.11	Operational Costs	0	
	C-PAD LE EX 01.11.01	Operations Costs		\$0
	C-PAD LE EX 01.11.02	Transportation Costs		\$0
	C-PAD LE EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		(All Direct & indirect Costs, MR, Escalation)	TEC	\$1,063,477,876
		(TEC plus Contingency, ODCs)	TPC	\$1,169,825,664
		All Capitol, Operation, Transportation, Escalation	LCC	\$1,169,825,664



APPENDIX A6-4

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 4 - C-PAD, EXPANDED, HIGH SEISMIC

LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

Expanded Project - C-PAD 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	\$ 27,647,777	\$ -	\$ -	\$ 42,021,251	\$ 269,669,028	\$ 641,649,050	
10	\$ 641,937,265	\$ 26,046,017	\$ -	\$ -	\$ 138,336,720	\$ 806,320,002	\$ 1,447,969,052	
11		\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,060,398	\$ 48,448,139	\$ 1,496,417,190	
12	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,980,912	\$ 49,368,653	\$ 1,545,785,844	
13	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 10,918,917	\$ 50,306,658	\$ 1,596,092,501	
14	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,380,176	\$ 31,859,734	\$ 1,627,952,235	
15	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,985,511	\$ 32,465,069	\$ 1,660,417,304	
16	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 8,602,347	\$ 33,081,905	\$ 1,693,499,209	
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$ 16,033,866	\$ 1,709,533,075	
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$ 16,338,510	\$ 1,725,871,585	
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$ 16,648,942	\$ 1,742,520,526	
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$ 16,965,271	\$ 1,759,485,798	
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$ 17,287,612	\$ 1,776,773,409	
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$ 17,616,076	\$ 1,794,389,486	
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$ 17,950,782	\$ 1,812,340,267	
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$ 18,291,846	\$ 1,830,632,114	
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$ 18,639,392	\$ 1,849,271,505	
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$ 18,993,540	\$ 1,868,265,045	
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$ 19,354,417	\$ 1,887,619,463	
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$ 19,722,151	\$ 1,907,341,614	
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$ 20,096,872	\$ 1,927,438,486	
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$ 20,478,713	\$ 1,947,917,198	
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$ 20,867,808	\$ 1,968,785,007	
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$ 21,264,297	\$ 1,990,049,303	
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$ 21,668,318	\$ 2,011,717,621	
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$ 22,080,016	\$ 2,033,797,638	
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$ 22,499,537	\$ 2,056,297,174	
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$ 22,927,028	\$ 2,079,224,202	
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$ 23,362,641	\$ 2,102,586,843	
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$ 23,806,531	\$ 2,126,393,374	
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$ 24,258,856	\$ 2,150,652,230	
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$ 24,719,774	\$ 2,175,372,004	
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$ 25,189,449	\$ 2,200,561,453	
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$ 25,668,049	\$ 2,226,229,502	
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$ 26,155,742	\$ 2,252,385,244	
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$ 26,652,701	\$ 2,279,037,945	
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$ 27,159,102	\$ 2,306,197,048	
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$ 27,675,125	\$ 2,333,872,173	
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$ 28,200,953	\$ 2,362,073,126	
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$ 28,736,771	\$ 2,390,809,896	
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$ 29,282,769	\$ 2,420,092,666	
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$ 29,839,142	\$ 2,449,931,808	
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 2,505,229,474	
52	\$ -	\$ -	\$ -	\$ 35,750,000	\$ 59,383,531	\$ 95,133,531	\$ 2,600,363,005	
53	\$ -	\$ -	\$ -	\$ 40,703,915	\$ 69,670,378	\$ 110,374,293	\$ 2,710,737,297	
54	\$ -	\$ -	\$ -	\$ 40,703,915	\$ 71,767,489	\$ 112,471,404	\$ 2,823,208,701	
55	\$ -	\$ -	\$ -	\$ 40,703,915	\$ 73,904,446	\$ 114,608,361	\$ 2,937,817,062	
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,937,817,062	
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,937,817,062	
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,937,817,062	
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,937,817,062	
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,937,817,062	
	Total Design/Const	Total O&M		Total D&D	Total Escalation		Total Life Cycle	
	\$ 1,169,825,664	\$ 564,151,464	\$ 77,017,378	\$ 179,036,744	\$ 947,785,812		\$ 2,937,817,062	

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



APPENDIX A6-4

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 4 - C-PAD, EXPANDED, HIGH SEISMIC

LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-PAD Expanded (10,000 MTU)
 Expanded Project - C-PAD 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	\$ 27,647,777	\$ -	\$ -	\$ 42,021,251	\$269,669,028	\$641,649,050
10	\$ 641,937,265	\$ 26,046,017	\$ -	\$ -	\$ 138,336,720	\$806,320,002	\$1,447,969,052
11	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,060,398	\$48,448,139	\$1,496,417,190
12	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 9,980,912	\$49,368,653	\$1,545,785,844
13	\$ -	\$ 26,551,511	\$ 12,836,230	\$ -	\$ 10,918,917	\$50,306,658	\$1,596,092,501
14	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,380,176	\$31,859,734	\$1,627,952,235
15	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 7,985,511	\$32,465,069	\$1,660,417,304
16	\$ -	\$ 11,643,328	\$ 12,836,230	\$ -	\$ 8,602,347	\$33,081,905	\$1,693,499,209
17	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,390,538	\$16,033,866	\$1,709,533,075
18	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 4,695,182	\$16,338,510	\$1,725,871,585
19	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,005,614	\$16,648,942	\$1,742,520,526
20	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,321,943	\$16,965,271	\$1,759,485,798
21	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,644,284	\$17,287,612	\$1,776,773,409
22	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 5,972,748	\$17,616,076	\$1,794,389,486
23	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,307,454	\$17,950,782	\$1,812,340,267
24	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,648,518	\$18,291,846	\$1,830,632,114
25	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 6,996,064	\$18,639,392	\$1,849,271,505
26	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,350,212	\$18,993,540	\$1,868,265,045
27	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 7,711,089	\$19,354,417	\$1,887,619,463
28	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,078,823	\$19,722,151	\$1,907,341,614
29	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,453,544	\$20,096,872	\$1,927,438,486
30	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 8,835,385	\$20,478,713	\$1,947,917,198
31	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,224,480	\$20,867,808	\$1,968,785,007
32	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 9,620,969	\$21,264,297	\$1,990,049,303
33	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,024,990	\$21,668,318	\$2,011,717,621
34	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,436,688	\$22,080,016	\$2,033,797,638
35	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 10,856,209	\$22,499,537	\$2,056,297,174
36	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,283,700	\$22,927,028	\$2,079,224,202
37	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 11,719,313	\$23,362,641	\$2,102,586,843
38	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,163,203	\$23,806,531	\$2,126,393,374
39	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 12,615,528	\$24,258,856	\$2,150,652,230
40	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,076,446	\$24,719,774	\$2,175,372,004
41	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 13,546,121	\$25,189,449	\$2,200,561,453
42	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,024,721	\$25,668,049	\$2,226,229,502
43	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 14,512,414	\$26,155,742	\$2,252,385,244
44	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,009,373	\$26,652,701	\$2,279,037,945
45	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 15,515,774	\$27,159,102	\$2,306,197,048
46	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,031,797	\$27,675,125	\$2,333,872,173
47	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 16,557,625	\$28,200,953	\$2,362,073,126
48	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,093,443	\$28,736,771	\$2,390,809,896
49	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 17,639,441	\$29,282,769	\$2,420,092,666
50	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,195,814	\$29,839,142	\$2,449,931,808
51	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 18,762,758	\$30,406,086	\$2,480,337,894
52	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 19,340,473	\$30,983,801	\$2,511,321,695
53	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 19,929,166	\$31,572,494	\$2,542,894,189
54	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 20,529,043	\$32,172,371	\$2,575,066,560
55	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 21,140,318	\$32,783,646	\$2,607,850,206
56	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 21,763,207	\$33,406,535	\$2,641,256,741
57	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 22,397,931	\$34,041,259	\$2,675,298,001
58	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 23,044,715	\$34,688,043	\$2,709,986,044
59	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 23,703,788	\$35,347,116	\$2,745,333,160
60	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 24,375,383	\$36,018,711	\$2,781,351,872
61	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 25,059,739	\$36,703,067	\$2,818,054,939
62	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 25,757,097	\$37,400,425	\$2,855,455,364
63	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 26,467,705	\$38,111,033	\$2,893,566,397
64	\$ -	\$ 11,643,328	\$ -	\$ -	\$ 27,191,815	\$38,835,143	\$2,932,401,540
65	\$0	\$ 11,643,328	\$ -	\$ -	\$ 27,929,683	\$39,573,011	\$2,971,974,551
66	\$0	\$ 11,643,328	\$ -	\$ -	\$ 28,681,570	\$40,324,898	\$3,012,299,449
67	\$0	\$ 11,643,328	\$ -	\$ -	\$ 29,447,743	\$41,091,071	\$3,053,390,520
68	\$0	\$ 11,643,328	\$ -	\$ -	\$ 30,228,473	\$41,871,801	\$3,095,262,321
69	\$0	\$ 11,643,328	\$ -	\$ -	\$ 31,024,038	\$42,667,366	\$3,137,929,686
70	\$0	\$ 11,643,328	\$ -	\$ -	\$ 31,834,717	\$43,478,045	\$3,181,407,732



71	\$0	\$ 11,643,328	\$ -	\$ -	\$ 32,660,800	\$44,304,128	\$3,225,711,860
72	\$0	\$ 11,643,328	\$ -	\$ -	\$ 33,502,579	\$45,145,907	\$3,270,857,767
73	\$0	\$ 11,643,328	\$ -	\$ -	\$ 34,360,351	\$46,003,679	\$3,316,861,446
74	\$0	\$ 11,643,328	\$ -	\$ -	\$ 35,234,421	\$46,877,749	\$3,363,739,195
75	\$0	\$ 11,643,328	\$ -	\$ -	\$ 36,125,098	\$47,768,426	\$3,411,507,621
76	\$0	\$ 11,643,328	\$ -	\$ -	\$ 37,032,698	\$48,676,026	\$3,460,183,647
77	\$0	\$ 11,643,328	\$ -	\$ -	\$ 37,957,543	\$49,600,871	\$3,509,784,518
78	\$0	\$ 11,643,328	\$ -	\$ -	\$ 38,899,959	\$50,543,287	\$3,560,327,805
79	\$0	\$ 11,643,328	\$ -	\$ -	\$ 39,860,282	\$51,503,610	\$3,611,831,415
80	\$0	\$ 11,643,328	\$ -	\$ -	\$ 40,838,850	\$52,482,178	\$3,664,313,593
81	\$0	\$ 11,643,328	\$ -	\$ -	\$ 41,836,012	\$53,479,340	\$3,717,792,933
82	\$0	\$ 11,643,328	\$ -	\$ -	\$ 42,852,119	\$54,495,447	\$3,772,288,380
83	\$0	\$ 11,643,328	\$ -	\$ -	\$ 43,887,533	\$55,530,861	\$3,827,819,240
84	\$0	\$ 11,643,328	\$ -	\$ -	\$ 44,942,619	\$56,585,947	\$3,884,405,187
85	\$0	\$ 11,643,328	\$ -	\$ -	\$ 46,017,752	\$57,661,080	\$3,942,066,267
86	\$0	\$ 11,643,328	\$ -	\$ -	\$ 47,113,312	\$58,756,640	\$4,000,822,908
87	\$0	\$ 11,643,328	\$ -	\$ -	\$ 48,229,689	\$59,873,017	\$4,060,695,925
88	\$0	\$ 11,643,328	\$ -	\$ -	\$ 49,367,276	\$61,010,604	\$4,121,706,529
89	\$0	\$ 11,643,328	\$ -	\$ -	\$ 50,526,477	\$62,169,805	\$4,183,876,334
90	\$0	\$ 11,643,328	\$ -	\$ -	\$ 51,707,704	\$63,351,032	\$4,247,227,366
91			\$ -	\$ 21,175,000	\$ 96,226,640	\$117,401,640	\$4,364,629,006
92			\$ -	\$ 35,750,000	\$ 166,226,562	\$201,976,562	\$4,566,605,567
93			\$ -	\$ 40,703,915	\$ 193,630,078	\$234,333,993	\$4,800,939,561
94			\$ -	\$ 40,703,915	\$ 198,082,424	\$238,786,339	\$5,039,725,900
95			\$ -	\$ 40,703,915	\$ 202,619,365	\$243,323,279	\$5,283,049,179
96				\$ -	\$ -	\$0	\$5,283,049,179
97				\$ -	\$ -	\$0	\$5,283,049,179
98					\$ -	\$0	\$5,283,049,179
99					\$ -	\$0	\$5,283,049,179
100					\$ -	\$0	\$5,283,049,179
	Total	Total	Total	Total	Total	Total	Total
	Design/Const	O&M	Cask Handling	D&D	Escalation	Life Cycle	
	\$1,169,825,664	\$1,029,884,584	\$77,017,378	\$179,036,744	\$2,827,284,809	\$5,283,049,179	