



APPENDIX A6-9

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 9 - C-UGS, PILOT, LOW SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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>	\$793,179,460					\$793,179,460
<i>Operations & Maintenance (40 Year Life)</i>		\$532,356,575				\$532,356,575
<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>				\$117,623,149		\$117,623,149
<i>Escalation</i>					\$731,553,669	\$731,553,669
<i>Total Costs (40 year Life)</i>						\$2,213,221,541
<i>Present Value</i>						\$1,152,323,692

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$793,179,460					\$793,179,460
<i>Operations & Maintenance (80 Year Life)</i>		\$978,129,829				\$978,129,829
<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>				\$117,623,149		\$117,623,149
<i>Escalation</i>					\$2,365,192,495	\$2,365,192,495
<i>Total Costs (80 Year Life)</i>						\$4,292,633,622
<i>Present Value</i>						\$1,289,745,530



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COST DETAILS

ALTERNATIVE 9 - C-UGS, PILOT, LOW SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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-UGS 01			Interim Storage Facility and transportation Project	
	C-UGS 01.01		Pilot ISF Facility	\$485,377,127
		C-UGS 01.01.01	Storage Pads	\$0
		C-UGS 01.01.02	Cask Handling (Transfer) Facility	\$135,175,719
		C-UGS 01.01.03	Horizontal Dry Storage Modules	\$0
		C-UGS 01.01.04	Vertical Dry Storage Module	\$191,062,247
		C-UGS 01.01.05	Storage Cask Fabrication Facility	\$0
		C-UGS 01.01.06	Cask Maintenance Facility	\$0
		C-UGS 01.01.07	Concrete Batch Plant	\$1,850,000
		C-UGS 01.01.08	Visitor Center/ Auditorium	\$0
		C-UGS 01.01.09	Administration Building	\$3,140,000
		C-UGS 01.01.10	Security	\$24,148,975
		C-UGS 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-UGS 01.01.12	Utilities	\$18,682,150
		C-UGS 01.01.13	Roads	\$18,212,737
		C-UGS 01.01.14	Parking	\$735,000
		C-UGS 01.01.15	Site Work	\$23,417,500
		C-UGS 01.01.16	Warehouse	\$10,200,000
		C-UGS 01.01.17	Maintenance Facility	\$0
		C-UGS 01.01.18	Waste management Facility	\$0
		C-UGS 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-UGS 01.02		Expanded Interim Storage Facility	\$0
		C-UGS 01.02.01	Expanded Storage Pads and Dry Cask Storage Systems	\$0
		C-UGS 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-UGS 01.02.03	Horizontal Dry Storage Modules	\$0
		C-UGS 01.02.04	Vertical Dry Storage Casks	\$0
		C-UGS 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-UGS 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-UGS 01.02.07	Concrete Batch Plant (Expanded if needed)	\$0
		C-UGS 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$0
		C-UGS 01.02.09	Administration Building (Expanded if needed)	\$0
		C-UGS 01.02.10	Security (Expanded)	\$0
		C-UGS 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-UGS 01.02.12	Utilities Expanded as needed)	\$0
		C-UGS 01.02.13	Roads (Expanded)	\$0
		C-UGS 01.02.14	Parking (Expanded as needed)	\$0
		C-UGS 01.02.15	Site Work (Expanded)	\$0
		C-UGS 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-UGS 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-UGS 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-UGS 01.02.19	Hot Cell / Laboratories	\$0
		C-UGS 01.02.20	Pool Packaging Facility	\$0
		C-UGS 01.02.21	Standardized Storage System	\$0
		C-UGS 01.02.22	Standardized Disposal Canister	\$0
		C-UGS 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-UGS 01.03		Transportation Equipment	\$0
		C-UGS 01.03.01	Transportation Casks	\$0
		C-UGS 01.03.02	Rail Equipment	\$0
		C-UGS 01.03.03	Rail Maintenance Facility	\$0
		C-UGS 01.03.04	Transportation Systems Services	\$0
	C-UGS 01.04		Pre-Construction Capitalized Costs	\$56,269,000
		C-UGS 01.04.01	Land or Land Leases	\$1,920,000
		C-UGS 01.04.02	Site permits	\$200,000
		C-UGS 01.04.03	Site Licensing	\$6,240,000
		C-UGS 01.04.05	Plant Permits	\$0
		C-UGS 01.04.06	Planning and Alternative Studies	\$750,000



	C-UGS 01.04.07	Research and Development		\$0
	C-UGS 01.04.08	Design		\$23,955,000
	C-UGS 01.04.09	Other Pre-construction Costs		\$13,204,000
	C-UGS 01.04.10	Pre-construction contingencies		\$10,000,000
	C-UGS 01.04.xx	(Add Further Breakdown as needed)		\$0
C-UGS 01.05		Indirect Capitalized Costs	\$63,180,000	
	C-UGS 01.05.01	Project Management		\$2,700,000
	C-UGS 01.05.02	Construction Management		\$3,600,000
	C-UGS 01.05.03	Field indirect services		\$11,880,000
	C-UGS 01.05.04	Design Services in support of Construction		\$5,400,000
	C-UGS 01.05.05	QA/QC		\$12,600,000
	C-UGS 01.05.06	Commissioning and Startup		\$1,200,000
	C-UGS 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-UGS 01.05.08	Document Control		\$2,700,000
	C-UGS 01.05.09	Project Controls		\$3,600,000
	C-UGS 01.05.10	Construction Testing		\$2,700,000
	C-UGS 01.05.11	Inspections		\$3,600,000
	C-UGS 01.05.12	Startup and Testing		\$3,000,000
	C-UGS 01.05.13	Commissioning		\$3,000,000
C-UGS 01.06		Site Selection	\$0	
	C-UGS 01.06.01	Site Selection		\$0
	C-UGS 01.06.02	Public Information Process		\$0
C-UGS 01.07		Decontamination and Deconstruction	\$0	
	C-UGS 01.07.01	Decommissioning		\$0
	C-UGS 01.07.02	Decontamination		\$0
	C-UGS 01.07.03	Deconstruction		\$0
	C-UGS 01.07.04			\$0
	C-UGS 01.07.05			\$0
C-UGS 01.08		Project Financial Costs	\$81,477,699	
	C-UGS 01.08.01	Contractor Fees		\$48,643,402
	C-UGS 01.08.02	Escalation Costs		\$32,834,296
	C-UGS 01.08.03	Interest Payments		\$0
	C-UGS 01.08.04	Indirect costs to support shipments to repository		\$0
	C-UGS 01.08.05			\$0
	C-UGS 01.08.xx	(Add Further Breakdown as needed)		\$0
C-UGS 01.09		Project Contingencies	\$106,875,635	
	C-UGS 01.09.01	Management Reserve - Contractor Held		\$34,476,011
	C-UGS 01.09.02	Contingency - DOE held		\$72,399,624
C-UGS 01.10		Other Direct Costs	\$0	
	C-UGS 01.10.01	DOE Project Operations		\$0
	C-UGS 01.10.02	DOE TM&E		\$0
	C-UGS 01.10.03	DOE TM&E		\$0
	C-UGS 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-UGS 01.10.05	Miscellaneous ODC		\$0
C-UGS 01.11		Operational Costs	0	
	C-UGS 01.11.01	Operations Costs		\$0
	C-UGS 01.11.02	Transportation Costs		\$0
	C-UGS 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$720,779,837
		TPC (TEC plus Contingency, ODCs)		\$793,179,460
		LCC All Capitol, Operation, Transportation, Escalation		\$793,179,460



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LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

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

PILOT Project - C-UGS 60/40 Vertical/Horizontal - Low Seismic
Separate CHB

YEAR	Design/Const	O&M	Cask Handling	D&D	Annual Escalation		Discount Rate	
					Escalation	Annual Expense	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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$ 265,636,616	\$ 637,616,638	
10	\$ 265,291,061	\$ 23,603,013	\$ -	\$ -	\$ 59,828,831	\$ 348,722,905	\$ 986,339,543	
11		\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$ 45,379,232	\$ 1,031,718,775	
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$ 46,241,438	\$ 1,077,960,213	
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$ 47,120,025	\$ 1,125,080,238	
14	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,359,829	\$ 14,504,160	\$ 1,139,584,398	
15	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,635,408	\$ 14,779,739	\$ 1,154,364,138	
16	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,916,223	\$ 15,060,554	\$ 1,169,424,692	
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$ 15,346,705	\$ 1,184,771,397	
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$ 15,638,292	\$ 1,200,409,689	
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$ 15,935,420	\$ 1,216,345,109	
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$ 16,238,193	\$ 1,232,583,302	
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$ 16,546,719	\$ 1,249,130,021	
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$ 16,861,106	\$ 1,265,991,127	
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$ 17,181,467	\$ 1,283,172,594	
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$ 17,507,915	\$ 1,300,680,509	
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$ 17,840,566	\$ 1,318,521,075	
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$ 18,179,536	\$ 1,336,700,611	
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$ 18,524,947	\$ 1,355,225,559	
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$ 18,876,921	\$ 1,374,102,480	
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$ 19,235,583	\$ 1,393,338,063	
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$ 19,601,059	\$ 1,412,939,122	
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$ 19,973,479	\$ 1,432,912,601	
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$ 20,352,975	\$ 1,453,265,577	
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$ 20,739,682	\$ 1,474,005,258	
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$ 21,133,736	\$ 1,495,138,994	
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$ 21,535,277	\$ 1,516,674,271	
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$ 21,944,447	\$ 1,538,618,718	
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$ 22,361,391	\$ 1,560,980,109	
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$ 22,786,258	\$ 1,583,766,367	
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$ 23,219,197	\$ 1,606,985,564	
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$ 23,660,362	\$ 1,630,645,926	
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$ 24,109,908	\$ 1,654,755,834	
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$ 24,567,997	\$ 1,679,323,831	
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$ 25,034,789	\$ 1,704,358,619	
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$ 25,510,450	\$ 1,729,869,069	
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$ 25,995,148	\$ 1,755,864,217	
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$ 26,489,056	\$ 1,782,353,273	
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$ 26,992,348	\$ 1,809,345,621	
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$ 27,505,203	\$ 1,836,850,824	
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$ 28,027,801	\$ 1,864,878,625	
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$ 28,560,330	\$ 1,893,438,955	
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 1,948,736,621	
52	\$ -	\$ -	\$ -	\$ 20,000,000	\$ 33,221,556	\$ 53,221,556	\$ 2,001,958,177	
53	\$ -	\$ -	\$ -	\$ 25,482,716	\$ 43,617,192	\$ 69,099,908	\$ 2,071,058,085	
54	\$ -	\$ -	\$ -	\$ 25,482,716	\$ 44,930,090	\$ 70,412,806	\$ 2,141,470,891	
55	\$ -	\$ -	\$ -	\$ 25,482,716	\$ 46,267,933	\$ 71,750,650	\$ 2,213,221,541	
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,213,221,541	
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,213,221,541	
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,213,221,541	
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,213,221,541	
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,213,221,541	
	Total Design/Const	Total O&M		Total D&D	Total Escalation		Total Life Cycle	
	\$ 793,179,460	\$ 532,356,575	\$ 38,508,689	\$ 117,623,149	\$ 731,553,669		\$ 2,213,221,541	



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LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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	\$ -	\$ -	\$ -	\$ 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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$265,636,616	\$637,616,638
10	\$ 265,291,061	\$ 23,603,013	\$ -	\$ -	\$ 59,828,831	\$348,722,905	\$986,339,543
11	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$45,379,232	\$1,031,718,775
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$46,241,438	\$1,077,960,213
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$47,120,025	\$1,125,080,238
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15	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,635,408	\$14,779,739	\$1,154,364,138
16	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,916,223	\$15,060,554	\$1,169,424,692
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$15,346,705	\$1,184,771,397
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$15,638,292	\$1,200,409,689
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$15,935,420	\$1,216,345,109
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$16,238,193	\$1,232,583,302
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$16,546,719	\$1,249,130,021
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$16,861,106	\$1,265,991,127
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$17,181,467	\$1,283,172,594
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$17,507,915	\$1,300,680,509
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$17,840,566	\$1,318,521,075
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27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$18,524,947	\$1,355,225,559
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$18,876,921	\$1,374,102,480
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$19,235,583	\$1,393,338,063
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$19,601,059	\$1,412,939,122
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$19,973,479	\$1,432,912,601
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$20,352,975	\$1,453,265,577
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$20,739,682	\$1,474,005,258
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35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$21,535,277	\$1,516,674,271
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$21,944,447	\$1,538,618,718
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$22,361,391	\$1,560,980,109
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$22,786,258	\$1,583,766,367
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$23,219,197	\$1,606,985,564
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$23,660,362	\$1,630,645,926
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$24,109,908	\$1,654,755,834
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$24,567,997	\$1,679,323,831
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$25,034,789	\$1,704,358,619
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$25,510,450	\$1,729,869,069
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$25,995,148	\$1,755,864,217
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$26,489,056	\$1,782,353,273
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$26,992,348	\$1,809,345,621
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$27,505,203	\$1,836,850,824
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$28,027,801	\$1,864,878,625
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$28,560,330	\$1,893,438,955
51	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,958,645	\$29,102,976	\$1,922,541,931
52	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 18,511,601	\$29,655,933	\$1,952,197,864
53	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,075,064	\$30,219,395	\$1,982,417,259
54	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,649,232	\$30,793,564	\$2,013,210,823
55	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,234,310	\$31,378,641	\$2,044,589,464
56	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,830,504	\$31,974,836	\$2,076,564,300
57	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 21,438,026	\$32,582,358	\$2,109,146,657
58	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 22,057,091	\$33,201,422	\$2,142,348,080



59	\$	-	\$	11,144,331	\$	-	\$	-	\$	22,687,918	\$33,832,249	\$2,176,180,329
60	\$	-	\$	11,144,331	\$	-	\$	-	\$	23,330,731	\$34,475,062	\$2,210,655,391
61	\$	-	\$	11,144,331	\$	-	\$	-	\$	23,985,757	\$35,130,088	\$2,245,785,479
62	\$	-	\$	11,144,331	\$	-	\$	-	\$	24,653,229	\$35,797,560	\$2,281,583,039
63	\$	-	\$	11,144,331	\$	-	\$	-	\$	25,333,382	\$36,477,714	\$2,318,060,753
64	\$	-	\$	11,144,331	\$	-	\$	-	\$	26,026,459	\$37,170,790	\$2,355,231,543
65		\$0	\$	11,144,331	\$	-	\$	-	\$	26,732,704	\$37,877,035	\$2,393,108,578
66		\$0	\$	11,144,331	\$	-	\$	-	\$	27,452,367	\$38,596,699	\$2,431,705,277
67		\$0	\$	11,144,331	\$	-	\$	-	\$	28,185,705	\$39,330,036	\$2,471,035,313
68		\$0	\$	11,144,331	\$	-	\$	-	\$	28,932,975	\$40,077,307	\$2,511,112,620
69		\$0	\$	11,144,331	\$	-	\$	-	\$	29,694,444	\$40,838,776	\$2,551,951,396
70		\$0	\$	11,144,331	\$	-	\$	-	\$	30,470,381	\$41,614,712	\$2,593,566,108
71		\$0	\$	11,144,331	\$	-	\$	-	\$	31,261,061	\$42,405,392	\$2,635,971,500
72		\$0	\$	11,144,331	\$	-	\$	-	\$	32,066,763	\$43,211,094	\$2,679,182,594
73		\$0	\$	11,144,331	\$	-	\$	-	\$	32,887,774	\$44,032,105	\$2,723,214,699
74		\$0	\$	11,144,331	\$	-	\$	-	\$	33,724,384	\$44,868,715	\$2,768,083,414
75		\$0	\$	11,144,331	\$	-	\$	-	\$	34,576,889	\$45,721,221	\$2,813,804,635
76		\$0	\$	11,144,331	\$	-	\$	-	\$	35,445,593	\$46,589,924	\$2,860,394,559
77		\$0	\$	11,144,331	\$	-	\$	-	\$	36,330,801	\$47,475,132	\$2,907,869,692
78		\$0	\$	11,144,331	\$	-	\$	-	\$	37,232,829	\$48,377,160	\$2,956,246,852
79		\$0	\$	11,144,331	\$	-	\$	-	\$	38,151,995	\$49,296,326	\$3,005,543,178
80		\$0	\$	11,144,331	\$	-	\$	-	\$	39,088,625	\$50,232,956	\$3,055,776,134
81		\$0	\$	11,144,331	\$	-	\$	-	\$	40,043,051	\$51,187,382	\$3,106,963,516
82		\$0	\$	11,144,331	\$	-	\$	-	\$	41,015,611	\$52,159,943	\$3,159,123,459
83		\$0	\$	11,144,331	\$	-	\$	-	\$	42,006,650	\$53,150,982	\$3,212,274,440
84		\$0	\$	11,144,331	\$	-	\$	-	\$	43,016,519	\$54,160,850	\$3,266,435,291
85		\$0	\$	11,144,331	\$	-	\$	-	\$	44,045,575	\$55,189,906	\$3,321,625,197
86		\$0	\$	11,144,331	\$	-	\$	-	\$	45,094,183	\$56,238,515	\$3,377,863,712
87		\$0	\$	11,144,331	\$	-	\$	-	\$	46,162,715	\$57,307,046	\$3,435,170,758
88		\$0	\$	11,144,331	\$	-	\$	-	\$	47,251,549	\$58,395,880	\$3,493,566,638
89		\$0	\$	11,144,331	\$	-	\$	-	\$	48,361,071	\$59,505,402	\$3,553,072,040
90		\$0	\$	11,144,331	\$	-	\$	-	\$	49,491,673	\$60,636,005	\$3,613,708,045
91					\$	-	\$	21,175,000	\$	96,226,640	\$117,401,640	\$3,731,109,685
92					\$	-	\$	20,000,000	\$	92,993,881	\$112,993,881	\$3,844,103,565
93					\$	-	\$	25,482,716	\$	121,222,255	\$146,704,971	\$3,990,808,536
94					\$	-	\$	25,482,716	\$	124,009,649	\$149,492,365	\$4,140,300,902
95					\$	-	\$	25,482,716	\$	126,850,004	\$152,332,720	\$4,292,633,622
96							\$	-	\$	-	\$0	\$4,292,633,622
97							\$	-	\$	-	\$0	\$4,292,633,622
98									\$	-	\$0	\$4,292,633,622
99									\$	-	\$0	\$4,292,633,622
100									\$	-	\$0	\$4,292,633,622
		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation					Life Cycle	
		\$793,179,460	\$978,129,829	\$38,508,689	\$117,623,149	\$2,365,192,495					\$4,292,633,622	

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



APPENDIX A6-10

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 10 - C-UGS, PILOT, HIGH SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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>	\$846,002,405					\$846,002,405
<i>Operations & Maintenance (40 Year Life)</i>		\$532,356,575				\$532,356,575
<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>				\$139,867,276		\$139,867,276
<i>Escalation</i>					\$781,720,294	\$781,720,294
Total Costs (40 year Life)						\$2,338,455,240
Present Value						\$1,208,070,262

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$846,002,405					\$846,002,405
<i>Operations & Maintenance (80 Year Life)</i>		\$978,129,829				\$978,129,829
<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>				\$139,867,276		\$139,867,276
<i>Escalation</i>					\$2,484,396,642	\$2,484,396,642
Total Costs (80 Year Life)						\$4,486,904,841
Present Value						\$1,341,019,283



APPENDIX A6-10

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 10 - C-UGS, PILOT, HIGH SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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-UGS LE 01			Interim Storage Facility and transportation Project	
	C-UGS LE 01.01		Pilot ISF Facility	\$516,711,768
		C-UGS LE 01.01.01	Storage UGSs	\$0
		C-UGS LE 01.01.02	Cask Handling (Transfer) Facility	\$163,293,960
		C-UGS LE 01.01.03	Horizontal Dry Storage Modules	\$0
		C-UGS LE 01.01.04	Vertical Dry Storage Module	\$194,278,647
		C-UGS LE 01.01.05	Storage Cask Fabrication Facility	\$0
		C-UGS LE 01.01.06	Cask Maintenance Facility	\$0
		C-UGS LE 01.01.07	Concrete Batch Plant	\$1,850,000
		C-UGS LE 01.01.08	Visitor Center/ Auditorium	\$0
		C-UGS LE 01.01.09	Administration Building	\$3,140,000
		C-UGS LE 01.01.10	Security	\$24,148,975
		C-UGS LE 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-UGS LE 01.01.12	Utilities	\$18,682,150
		C-UGS LE 01.01.13	Roads	\$18,212,737
		C-UGS LE 01.01.14	Parking	\$735,000
		C-UGS LE 01.01.15	Site Work	\$23,417,500
		C-UGS LE 01.01.16	Warehouse	\$10,200,000
		C-UGS LE 01.01.17	Maintenance Facility	\$0
		C-UGS LE 01.01.18	Waste management Facility	\$0
		C-UGS LE 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-UGS LE 01.02		Expanded Interim Storage Facility	\$0
		C-UGS LE 01.02.01	Expanded Storage UGSs and Dry Cask Storage Systems	\$0
		C-UGS LE 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-UGS LE 01.02.03	Horizontal Dry Storage Modules	\$0
		C-UGS LE 01.02.04	Vertical Dry Storage Casks	\$0
		C-UGS LE 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-UGS LE 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-UGS LE 01.02.07	Concrete Batch Plant (Expanded if needed)	\$0
		C-UGS LE 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$0
		C-UGS LE 01.02.09	Administration Building (Expanded if needed)	\$0
		C-UGS LE 01.02.10	Security (Expanded)	\$0
		C-UGS LE 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-UGS LE 01.02.12	Utilities Expanded as needed)	\$0
		C-UGS LE 01.02.13	Roads (Expanded)	\$0
		C-UGS LE 01.02.14	Parking (Expanded as needed)	\$0
		C-UGS LE 01.02.15	Site Work (Expanded)	\$0
		C-UGS LE 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-UGS LE 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-UGS LE 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-UGS LE 01.02.19	Hot Cell / Laboratories	\$0
		C-UGS LE 01.02.20	Pool Packaging Facility	\$0
		C-UGS LE 01.02.21	Standardized Storage System	\$0
		C-UGS LE 01.02.22	Standardized Disposal Canister	\$0
		C-UGS LE 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-UGS LE 01.03		Transportation Equipment	\$0
		C-UGS LE 01.03.01	Transportation Casks	\$0
		C-UGS LE 01.03.02	Rail Equipment	\$0
		C-UGS LE 01.03.03	Rail Maintenance Facility	\$0
		C-UGS LE 01.03.04	Transportation Systems Services	\$0
	C-UGS LE 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-UGS LE 01.04.01	Land or Land Leases	\$7,680,000
		C-UGS LE 01.04.02	Site permits	\$200,000
		C-UGS LE 01.04.03	Site Licensing	\$6,240,000
		C-UGS LE 01.04.05	Plant Permits	\$0
		C-UGS LE 01.04.06	Planning and Alternative Studies	\$750,000



	C-UGS LE 01.04.07	Research and Development		\$0
	C-UGS LE 01.04.08	Design		\$23,955,000
	C-UGS LE 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-UGS LE 01.04.10	Pre-construction contingencies		\$10,000,000
	C-UGS LE 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-UGS LE 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-UGS LE 01.05.01	Project Management		\$2,700,000
	C-UGS LE 01.05.02	Construction Management		\$3,600,000
	C-UGS LE 01.05.03	Field indirect services		\$11,880,000
	C-UGS LE 01.05.04	Design Services in support of Construction		\$5,400,000
	C-UGS LE 01.05.05	QA/QC		\$12,600,000
	C-UGS LE 01.05.06	Commissioning and Startup		\$1,200,000
	C-UGS LE 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-UGS LE 01.05.08	Document Control		\$2,700,000
	C-UGS LE 01.05.09	Project Controls		\$3,600,000
	C-UGS LE 01.05.10	Construction Testing		\$2,700,000
	C-UGS LE 01.05.11	Inspections		\$3,600,000
	C-UGS LE 01.05.12	Startup and Testing		\$3,000,000
	C-UGS LE 01.05.13	Commissioning		\$3,000,000
	C-UGS LE 01.06	Site Selection	\$0	
	C-UGS LE 01.06.01	Site Selection		\$0
	C-UGS LE 01.06.02	Public Information Process		\$0
	C-UGS LE 01.07	Decontamination and Deconstruction	\$0	
	C-UGS LE 01.07.01	Decommissioning		\$0
	C-UGS LE 01.07.02	Decontamination		\$0
	C-UGS LE 01.07.03	Deconstruction		\$0
	C-UGS LE 01.07.04			\$0
	C-UGS LE 01.07.05			\$0
	C-UGS LE 01.08	Project Financial Costs	\$86,552,847	
	C-UGS LE 01.08.01	Contractor Fees		\$51,673,341
	C-UGS LE 01.08.02	Escalation Costs		\$34,879,505
	C-UGS LE 01.08.03	Interest Payments		\$0
	C-UGS LE 01.08.04	Indirect costs to support shipments to repository		\$0
	C-UGS LE 01.08.05			\$0
	C-UGS LE 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-UGS LE 01.09	Project Contingencies	\$113,532,790	
	C-UGS LE 01.09.01	Management Reserve - Contractor Held		\$36,623,481
	C-UGS LE 01.09.02	Contingency - DOE held		\$76,909,310
	C-UGS LE 01.10	Other Direct Costs	\$0	
	C-UGS LE 01.10.01	DOE Project Operations		\$0
	C-UGS LE 01.10.02	DOE TM&E		\$0
	C-UGS LE 01.10.03	DOE TM&E		\$0
	C-UGS LE 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-UGS LE 01.10.05	Miscellaneous ODC		\$0
	C-UGS LE 01.11	Operational Costs	0	
	C-UGS LE 01.11.01	Operations Costs		\$0
	C-UGS LE 01.11.02	Transportation Costs		\$0
	C-UGS LE 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$769,093,096
		TPC (TEC plus Contingency, ODCs)		\$846,002,405
		LCC All Capital, Operation, Transportation, Escalation		\$846,002,405



APPENDIX A6-10

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 10 - C-UGS, PILOT, HIGH SEISMIC

LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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	\$ -	\$ -	\$ -	\$ 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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$ 265,636,616	\$ 637,616,638			
10	\$ 318,114,006	\$ 23,603,013	\$ -	\$ -	\$ 70,768,256	\$ 412,485,275	\$ 1,050,101,913			
11		\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$ 45,379,232	\$ 1,095,481,145			
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$ 46,241,438	\$ 1,141,722,583			
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$ 47,120,025	\$ 1,188,842,608			
14	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,359,829	\$ 14,504,160	\$ 1,203,346,768			
15	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,635,408	\$ 14,779,739	\$ 1,218,126,507			
16	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,916,223	\$ 15,060,554	\$ 1,233,187,062			
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$ 15,346,705	\$ 1,248,533,767			
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$ 15,638,292	\$ 1,264,172,059			
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$ 15,935,420	\$ 1,280,107,479			
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$ 16,238,193	\$ 1,296,345,672			
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$ 16,546,719	\$ 1,312,892,391			
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$ 16,861,106	\$ 1,329,753,497			
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$ 17,181,467	\$ 1,346,934,964			
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$ 17,507,915	\$ 1,364,442,879			
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$ 17,840,566	\$ 1,382,283,445			
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$ 18,179,536	\$ 1,400,462,981			
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$ 18,524,947	\$ 1,418,987,929			
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$ 18,876,921	\$ 1,437,864,850			
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$ 19,235,583	\$ 1,457,100,433			
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$ 19,601,059	\$ 1,476,701,492			
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$ 19,973,479	\$ 1,496,674,971			
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$ 20,352,975	\$ 1,517,027,947			
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$ 20,739,682	\$ 1,537,767,628			
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$ 21,133,736	\$ 1,558,901,364			
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$ 21,535,277	\$ 1,580,436,641			
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$ 21,944,447	\$ 1,602,381,088			
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$ 22,361,391	\$ 1,624,742,479			
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$ 22,786,258	\$ 1,647,528,737			
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$ 23,219,197	\$ 1,670,747,934			
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$ 23,660,362	\$ 1,694,408,296			
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$ 24,109,908	\$ 1,718,518,204			
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$ 24,567,997	\$ 1,743,086,201			
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$ 25,034,789	\$ 1,768,120,989			
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$ 25,510,450	\$ 1,793,631,439			
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$ 25,995,148	\$ 1,819,626,587			
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$ 26,489,056	\$ 1,846,115,643			
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$ 26,992,348	\$ 1,873,107,991			
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$ 27,505,203	\$ 1,900,613,194			
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$ 28,027,801	\$ 1,928,640,995			
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$ 28,560,330	\$ 1,957,201,325			
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 2,012,498,991			
52	\$ -	\$ -	\$ -	\$ 20,000,000	\$ 33,221,556	\$ 53,221,556	\$ 2,065,720,547			
53	\$ -	\$ -	\$ -	\$ 32,897,425	\$ 56,308,492	\$ 89,205,917	\$ 2,154,926,464			
54	\$ -	\$ -	\$ -	\$ 32,897,425	\$ 58,003,404	\$ 90,900,830	\$ 2,245,827,294			
55	\$ -	\$ -	\$ -	\$ 32,897,425	\$ 59,730,520	\$ 92,627,946	\$ 2,338,455,240			
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,338,455,240			
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,338,455,240			
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,338,455,240			
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,338,455,240			
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,338,455,240			
	Total Design/Const	Total O&M	\$ 38,508,689	Total D&D	Total Escalation		Total Life Cycle			
	\$ 846,002,405	\$ 532,356,575		\$ 139,867,276	\$ 781,720,294		\$ 2,338,455,240			

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



APPENDIX A6-10

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 10 - C-UGS, PILOT, HIGH SEISMIC

LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Pilot Storage Facility (5,000 MTU)

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

PILOT Project - C-UGS 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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$265,636,616	\$637,616,638
10	\$ 318,114,006	\$ 23,603,013	\$ -	\$ -	\$ 70,768,256	\$412,485,275	\$1,050,101,913
11		\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$45,379,232	\$1,095,481,145
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$46,241,438	\$1,141,722,583
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$47,120,025	\$1,188,842,608
14	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,359,829	\$14,504,160	\$1,203,346,768
15	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,635,408	\$14,779,739	\$1,218,126,507
16	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 3,916,223	\$15,060,554	\$1,233,187,062
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$15,346,705	\$1,248,533,767
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$15,638,292	\$1,264,172,059
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$15,935,420	\$1,280,107,479
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$16,238,193	\$1,296,345,672
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$16,546,719	\$1,312,892,391
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$16,861,106	\$1,329,753,497
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$17,181,467	\$1,346,934,964
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$17,507,915	\$1,364,442,879
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$17,840,566	\$1,382,283,445
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$18,179,536	\$1,400,462,981
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$18,524,947	\$1,418,987,929
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$18,876,921	\$1,437,864,850
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$19,235,583	\$1,457,100,433
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$19,601,059	\$1,476,701,492
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$19,973,479	\$1,496,674,971
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$20,352,975	\$1,517,027,947
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$20,739,682	\$1,537,767,628
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$21,133,736	\$1,558,901,364
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$21,535,277	\$1,580,436,641
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$21,944,447	\$1,602,381,088
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$22,361,391	\$1,624,742,479
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$22,786,258	\$1,647,528,737
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$23,219,197	\$1,670,747,934
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$23,660,362	\$1,694,408,296
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$24,109,908	\$1,718,518,204
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$24,567,997	\$1,743,086,201
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$25,034,789	\$1,768,120,989
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$25,510,450	\$1,793,631,439
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$25,995,148	\$1,819,626,587
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$26,489,056	\$1,846,115,643
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$26,992,348	\$1,873,107,991
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$27,505,203	\$1,900,613,194
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$28,027,801	\$1,928,640,995
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$28,560,330	\$1,957,201,325
51	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,958,645	\$29,102,976	\$1,986,304,301
52	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 18,511,601	\$29,655,933	\$2,015,960,234
53	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,075,064	\$30,219,395	\$2,046,179,629
54	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,649,232	\$30,793,564	\$2,076,973,193
55	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,234,310	\$31,378,641	\$2,108,351,834
56	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,830,504	\$31,974,836	\$2,140,326,670
57	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 21,438,026	\$32,582,358	\$2,172,909,027
58	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 22,057,091	\$33,201,422	\$2,206,110,450



59	\$	-	\$ 11,144,331	\$	-	\$	-	\$	22,687,918	\$33,832,249	\$2,239,942,699
60	\$	-	\$ 11,144,331	\$	-	\$	-	\$	23,330,731	\$34,475,062	\$2,274,417,761
61	\$	-	\$ 11,144,331	\$	-	\$	-	\$	23,985,757	\$35,130,088	\$2,309,547,849
62	\$	-	\$ 11,144,331	\$	-	\$	-	\$	24,653,229	\$35,797,560	\$2,345,345,409
63	\$	-	\$ 11,144,331	\$	-	\$	-	\$	25,333,382	\$36,477,714	\$2,381,823,123
64	\$	-	\$ 11,144,331	\$	-	\$	-	\$	26,026,459	\$37,170,790	\$2,418,993,913
65	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	26,732,704	\$37,877,035	\$2,456,870,948
66	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	27,452,367	\$38,596,699	\$2,495,467,647
67	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	28,185,705	\$39,330,036	\$2,534,797,683
68	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	28,932,975	\$40,077,307	\$2,574,874,990
69	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	29,694,444	\$40,838,776	\$2,615,713,765
70	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	30,470,381	\$41,614,712	\$2,657,328,478
71	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	31,261,061	\$42,405,392	\$2,699,733,870
72	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	32,066,763	\$43,211,094	\$2,742,944,964
73	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	32,887,774	\$44,032,105	\$2,786,977,069
74	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	33,724,384	\$44,868,715	\$2,831,845,784
75	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	34,576,889	\$45,721,221	\$2,877,567,005
76	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	35,445,593	\$46,589,924	\$2,924,156,929
77	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	36,330,801	\$47,475,132	\$2,971,632,061
78	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	37,232,829	\$48,377,160	\$3,020,009,221
79	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	38,151,995	\$49,296,326	\$3,069,305,547
80	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	39,088,625	\$50,232,956	\$3,119,538,504
81	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	40,043,051	\$51,187,382	\$3,170,725,886
82	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	41,015,611	\$52,159,943	\$3,222,885,829
83	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	42,006,650	\$53,150,982	\$3,276,036,810
84	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	43,016,519	\$54,160,850	\$3,330,197,660
85	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	44,045,575	\$55,189,906	\$3,385,387,567
86	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	45,094,183	\$56,238,515	\$3,441,626,081
87	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	46,162,715	\$57,307,046	\$3,498,933,128
88	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	47,251,549	\$58,395,880	\$3,557,329,008
89	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	48,361,071	\$59,505,402	\$3,616,834,410
90	\$0	\$	\$ 11,144,331	\$	-	\$	-	\$	49,491,673	\$60,636,005	\$3,677,470,415
91				\$	-	\$	21,175,000	\$	96,226,640	\$117,401,640	\$3,794,872,055
92				\$	-	\$	20,000,000	\$	92,993,881	\$112,993,881	\$3,907,865,935
93				\$	-	\$	32,897,425	\$	156,494,310	\$189,391,736	\$4,097,257,671
94				\$	-	\$	32,897,425	\$	160,092,753	\$192,990,179	\$4,290,247,849
95				\$	-	\$	32,897,425	\$	163,759,566	\$196,656,992	\$4,486,904,841
96					\$	-		\$	-	\$0	\$4,486,904,841
97					\$	-		\$	-	\$0	\$4,486,904,841
98						\$		\$	-	\$0	\$4,486,904,841
99								\$	-	\$0	\$4,486,904,841
100								\$	-	\$0	\$4,486,904,841
		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation				Life Cycle	
		\$846,002,405	\$978,129,829	\$38,508,689	\$139,867,276	\$2,484,396,642				\$4,486,904,841	

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



APPENDIX A6-11

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 11 - C-UGS, EXPANDED, LOW SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

Expanded Project - C-UGS 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>	\$1,099,347,594					\$1,099,347,594
<i>Operations & Maintenance (40 Year Life)</i>		\$532,356,575				\$532,356,575
<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>				\$170,280,450		\$170,280,450
<i>Escalation</i>					\$899,748,242	\$899,748,242
Total Costs (40 year Life)						\$2,778,750,239
Present Value						\$1,471,803,203

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$1,099,347,594					\$1,099,347,594
<i>Operations & Maintenance (80 Year Life)</i>		\$978,129,829				\$978,129,829
<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>				\$170,280,450		\$170,280,450
<i>Escalation</i>					\$2,696,096,969	\$2,696,096,969
Total Costs (80 Year Life)						\$5,020,872,220
Present Value						\$1,598,599,606



APPENDIX A6-11

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 11 - C-UGS, EXPANDED, LOW SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-UGS Expanded (10,000 MTU)
 Expanded Project - C-UGS 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-UGS EX 01			Interim Storage Facility and transportation Project	
	C-UGS EX 01.01		Pilot ISF Facility	\$488,593,527
		C-UGS EX 01.01.01	Storage UGSs	\$0
		C-UGS EX 01.01.02	Cask Handling (Transfer) Facility	\$135,175,719
		C-UGS EX 01.01.03	Horizontal Dry Storage Modules	\$0
		C-UGS EX 01.01.04	Vertical Dry Storage Module	\$194,278,647
		C-UGS EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-UGS EX 01.01.06	Cask Maintenance Facility	\$0
		C-UGS EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-UGS EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-UGS EX 01.01.09	Administration Building	\$3,140,000
		C-UGS EX 01.01.10	Security	\$24,148,975
		C-UGS EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-UGS EX 01.01.12	Utilities	\$18,682,150
		C-UGS EX 01.01.13	Roads	\$18,212,737
		C-UGS EX 01.01.14	Parking	\$735,000
		C-UGS EX 01.01.15	Site Work	\$23,417,500
		C-UGS EX 01.01.16	Warehouse	\$10,200,000
		C-UGS EX 01.01.17	Maintenance Facility	\$0
		C-UGS EX 01.01.18	Waste management Facility	\$0
		C-UGS EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-UGS EX 01.02		Expanded Interim Storage Facility	\$221,545,476
		C-UGS EX 01.02.01	Expanded Storage UGSs and Dry Cask Storage Systems	\$0
		C-UGS EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-UGS EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-UGS EX 01.02.04	Vertical Dry Storage Casks	\$194,278,647
		C-UGS EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-UGS EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-UGS EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$1,850,000
		C-UGS EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$745,000
		C-UGS EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-UGS EX 01.02.10	Security (Expanded)	\$10,074,488
		C-UGS EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-UGS EX 01.02.12	Utilities Expanded as needed)	\$3,624,200
		C-UGS EX 01.02.13	Roads (Expanded)	\$83,142
		C-UGS EX 01.02.14	Parking (Expanded as needed)	\$0
		C-UGS EX 01.02.15	Site Work (Expanded)	\$10,890,000
		C-UGS EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-UGS EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-UGS EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-UGS EX 01.02.19	Hot Cell / Laboratories	\$0
		C-UGS EX 01.02.20	Pool Packaging Facility	\$0
		C-UGS EX 01.02.21	Standardized Storage System	\$0
		C-UGS EX 01.02.22	Standardized Disposal Canister	\$0
		C-UGS EX 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-UGS EX 01.03		Transportation Equipment	\$0
		C-UGS EX 01.03.01	Transportation Casks	\$0
		C-UGS EX 01.03.02	Rail Equipment	\$0
		C-UGS EX 01.03.03	Rail Maintenance Facility	\$0
		C-UGS EX 01.03.04	Transportation Systems Services	\$0
	C-UGS EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-UGS EX 01.04.01	Land or Land Leases	\$7,680,000
		C-UGS EX 01.04.02	Site permits	\$200,000
		C-UGS EX 01.04.03	Site Licensing	\$6,240,000
		C-UGS EX 01.04.05	Plant Permits	\$0
		C-UGS 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-UGS EX 01.04.07	Research and Development		\$0
	C-UGS EX 01.04.08	Design		\$23,955,000
	C-UGS EX 01.04.09	Other Pre-construction Costs		\$17,200,000
	C-UGS EX 01.04.10	Pre-construction contingencies		\$10,000,000
	C-UGS EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-UGS EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-UGS EX 01.05.01	Project Management		\$2,700,000
	C-UGS EX 01.05.02	Construction Management		\$3,600,000
	C-UGS EX 01.05.03	Field indirect services		\$11,880,000
	C-UGS EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-UGS EX 01.05.05	QA/QC		\$12,600,000
	C-UGS EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-UGS EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-UGS EX 01.05.08	Document Control		\$2,700,000
	C-UGS EX 01.05.09	Project Controls		\$3,600,000
	C-UGS EX 01.05.10	Construction Testing		\$2,700,000
	C-UGS EX 01.05.11	Inspections		\$3,600,000
	C-UGS EX 01.05.12	Startup and Testing		\$3,000,000
	C-UGS EX 01.05.13	Commissioning		\$3,000,000
	C-UGS EX 01.06	Site Selection	\$0	
	C-UGS EX 01.06.01	Site Selection		\$0
	C-UGS EX 01.06.02	Public Information Process		\$0
	C-UGS EX 01.07	Decontamination and Deconstruction	\$0	
	C-UGS EX 01.07.01	Decommissioning		\$0
	C-UGS EX 01.07.02	Decontamination		\$0
	C-UGS EX 01.07.03	Deconstruction		\$0
	C-UGS EX 01.07.04			\$0
	C-UGS EX 01.07.05			\$0
	C-UGS EX 01.08	Project Financial Costs	\$112,472,096	
	C-UGS EX 01.08.01	Contractor Fees		\$67,147,520
	C-UGS EX 01.08.02	Escalation Costs		\$45,324,576
	C-UGS EX 01.08.03	Interest Payments		\$0
	C-UGS EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-UGS EX 01.08.05			\$0
	C-UGS EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-UGS EX 01.09	Project Contingencies	\$147,531,495	
	C-UGS EX 01.09.01	Management Reserve - Contractor Held		\$47,590,805
	C-UGS EX 01.09.02	Contingency - DOE held		\$99,940,690
	C-UGS EX 01.10	Other Direct Costs	\$0	
	C-UGS EX 01.10.01	DOE Project Operations		\$0
	C-UGS EX 01.10.02	DOE TM&E		\$0
	C-UGS EX 01.10.03	DOE TM&E		\$0
	C-UGS EX 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-UGS EX 01.10.05	Miscellaneous ODC		\$0
	C-UGS EX 01.11	Operational Costs	0	
	C-UGS EX 01.11.01	Operations Costs		\$0
	C-UGS EX 01.11.02	Transportation Costs		\$0
	C-UGS EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		TEC (All Direct & indirect Costs, MR, Escalation)		\$999,406,904
		TPC (TEC plus Contingency, ODCs)		\$1,099,347,594
		LCC All Capital, Operation, Transportation, Escalation		\$1,099,347,594



APPENDIX A6-11

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 11 - C-UGS, EXPANDED, LOW SEISMIC

LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

Expanded Project - C-UGS 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	\$ -	\$ -	\$ -	\$ 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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$ 265,636,616	\$ 637,616,638	
10	\$ 571,459,195	\$ 23,603,013	\$ -	\$ -	\$ 123,235,052	\$ 718,297,260	\$ 1,355,913,897	
11		\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$ 45,379,232	\$ 1,401,293,130	
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$ 46,241,438	\$ 1,447,534,567	
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$ 47,120,025	\$ 1,494,654,592	
14	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,229,737	\$ 31,210,298	\$ 1,525,864,890	
15	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,822,733	\$ 31,803,294	\$ 1,557,668,184	
16	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 8,426,995	\$ 32,407,556	\$ 1,590,075,740	
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$ 15,346,705	\$ 1,605,422,445	
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$ 15,638,292	\$ 1,621,060,738	
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$ 15,935,420	\$ 1,636,996,157	
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$ 16,238,193	\$ 1,653,234,350	
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$ 16,546,719	\$ 1,669,781,069	
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$ 16,861,106	\$ 1,686,642,175	
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$ 17,181,467	\$ 1,703,823,643	
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$ 17,507,915	\$ 1,721,331,558	
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$ 17,840,566	\$ 1,739,172,123	
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$ 18,179,536	\$ 1,757,351,659	
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$ 18,524,947	\$ 1,775,876,607	
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$ 18,876,921	\$ 1,794,753,528	
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$ 19,235,583	\$ 1,813,989,111	
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$ 19,601,059	\$ 1,833,590,170	
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$ 19,973,479	\$ 1,853,563,650	
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$ 20,352,975	\$ 1,873,916,625	
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$ 20,739,682	\$ 1,894,656,307	
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$ 21,133,736	\$ 1,915,790,042	
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$ 21,535,277	\$ 1,937,325,319	
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$ 21,944,447	\$ 1,959,269,766	
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$ 22,361,391	\$ 1,981,631,158	
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$ 22,786,258	\$ 2,004,417,415	
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$ 23,219,197	\$ 2,027,636,612	
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$ 23,660,362	\$ 2,051,296,974	
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$ 24,109,908	\$ 2,075,406,882	
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$ 24,567,997	\$ 2,099,974,879	
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$ 25,034,789	\$ 2,125,009,668	
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$ 25,510,450	\$ 2,150,520,117	
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$ 25,995,148	\$ 2,176,515,265	
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$ 26,489,056	\$ 2,203,004,321	
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$ 26,992,348	\$ 2,229,996,669	
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$ 27,505,203	\$ 2,257,501,872	
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$ 28,027,801	\$ 2,285,529,674	
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$ 28,560,330	\$ 2,314,090,003	
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666	\$ 2,369,387,670	
52	\$ -	\$ -	\$ -	\$ 26,250,000	\$ 43,603,292	\$ 69,853,292	\$ 2,439,240,961	
53	\$ -	\$ -	\$ -	\$ 40,951,817	\$ 70,094,696	\$ 111,046,513	\$ 2,550,287,474	
54	\$ -	\$ -	\$ -	\$ 40,951,817	\$ 72,204,580	\$ 113,156,397	\$ 2,663,443,871	
55	\$ -	\$ -	\$ -	\$ 40,951,817	\$ 74,354,551	\$ 115,306,368	\$ 2,778,750,239	
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,778,750,239	
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,778,750,239	
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,778,750,239	
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,778,750,239	
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,778,750,239	
	Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Annual Expense	Total Life Cycle	
	\$ 1,099,347,594	\$ 532,356,575	\$ 77,017,378	\$ 170,280,450	\$ 899,748,242	\$ 2,778,750,239		



APPENDIX A6-11

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 11 - C-UGS, EXPANDED, LOW SEISMIC

LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

Expanded Project - C-UGS 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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$265,636,616	\$637,616,638
10	\$ 571,459,195	\$ 23,603,013	\$ -	\$ -	\$ 123,235,052	\$718,297,260	\$1,355,913,897
11	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$45,379,232	\$1,401,293,130
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$46,241,438	\$1,447,534,567
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$47,120,025	\$1,494,654,592
14	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,229,737	\$31,210,298	\$1,525,864,890
15	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,822,733	\$31,803,294	\$1,557,668,184
16	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 8,426,995	\$32,407,556	\$1,590,075,740
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$15,346,705	\$1,605,422,445
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$15,638,292	\$1,621,060,738
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$15,935,420	\$1,636,996,157
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$16,238,193	\$1,653,234,350
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$16,546,719	\$1,669,781,069
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$16,861,106	\$1,686,642,175
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$17,181,467	\$1,703,823,643
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$17,507,915	\$1,721,331,558
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$17,840,566	\$1,739,172,123
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$18,179,536	\$1,757,351,659
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$18,524,947	\$1,775,876,607
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$18,876,921	\$1,794,753,528
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$19,235,583	\$1,813,989,111
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$19,601,059	\$1,833,590,170
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$19,973,479	\$1,853,563,650
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$20,352,975	\$1,873,916,625
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$20,739,682	\$1,894,656,307
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$21,133,736	\$1,915,790,042
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$21,535,277	\$1,937,325,319
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$21,944,447	\$1,959,269,766
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$22,361,391	\$1,981,631,158
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$22,786,258	\$2,004,417,415
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$23,219,197	\$2,027,636,612
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$23,660,362	\$2,051,296,974
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$24,109,908	\$2,075,406,882
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$24,567,997	\$2,099,974,879
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$25,034,789	\$2,125,009,668
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$25,510,450	\$2,150,520,117
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$25,995,148	\$2,176,515,265
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$26,489,056	\$2,203,004,321
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$26,992,348	\$2,229,996,669
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$27,505,203	\$2,257,501,872
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$28,027,801	\$2,285,529,674
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$28,560,330	\$2,314,090,003
51	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,958,645	\$29,102,976	\$2,343,192,979
52	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 18,511,601	\$29,655,933	\$2,372,848,912
53	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,075,064	\$30,219,395	\$2,403,068,307
54	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,649,232	\$30,793,564	\$2,433,861,871
55	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,234,310	\$31,378,641	\$2,465,240,512
56	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,830,504	\$31,974,836	\$2,497,215,348
57	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 21,438,026	\$32,582,358	\$2,529,797,706
58	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 22,057,091	\$33,201,422	\$2,562,999,128
59	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 22,687,918	\$33,832,249	\$2,596,831,377
60	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 23,330,731	\$34,475,062	\$2,631,306,439
61	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 23,985,757	\$35,130,088	\$2,666,436,528
62	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 24,653,229	\$35,797,560	\$2,702,234,088



63	\$	-	\$ 11,144,331	\$	-	\$	-	\$ 25,333,382	\$36,477,714	\$2,738,711,801
64	\$	-	\$ 11,144,331	\$	-	\$	-	\$ 26,026,459	\$37,170,790	\$2,775,882,591
65		\$0	\$ 11,144,331	\$	-	\$	-	\$ 26,732,704	\$37,877,035	\$2,813,759,626
66		\$0	\$ 11,144,331	\$	-	\$	-	\$ 27,452,367	\$38,596,699	\$2,852,356,325
67		\$0	\$ 11,144,331	\$	-	\$	-	\$ 28,185,705	\$39,330,036	\$2,891,686,361
68		\$0	\$ 11,144,331	\$	-	\$	-	\$ 28,932,975	\$40,077,307	\$2,931,763,668
69		\$0	\$ 11,144,331	\$	-	\$	-	\$ 29,694,444	\$40,838,776	\$2,972,602,444
70		\$0	\$ 11,144,331	\$	-	\$	-	\$ 30,470,381	\$41,614,712	\$3,014,217,156
71		\$0	\$ 11,144,331	\$	-	\$	-	\$ 31,261,061	\$42,405,392	\$3,056,622,548
72		\$0	\$ 11,144,331	\$	-	\$	-	\$ 32,066,763	\$43,211,094	\$3,099,833,642
73		\$0	\$ 11,144,331	\$	-	\$	-	\$ 32,887,774	\$44,032,105	\$3,143,865,748
74		\$0	\$ 11,144,331	\$	-	\$	-	\$ 33,724,384	\$44,868,715	\$3,188,734,463
75		\$0	\$ 11,144,331	\$	-	\$	-	\$ 34,576,889	\$45,721,221	\$3,234,455,683
76		\$0	\$ 11,144,331	\$	-	\$	-	\$ 35,445,593	\$46,589,924	\$3,281,045,607
77		\$0	\$ 11,144,331	\$	-	\$	-	\$ 36,330,801	\$47,475,132	\$3,328,520,740
78		\$0	\$ 11,144,331	\$	-	\$	-	\$ 37,232,829	\$48,377,160	\$3,376,897,900
79		\$0	\$ 11,144,331	\$	-	\$	-	\$ 38,151,995	\$49,296,326	\$3,426,194,226
80		\$0	\$ 11,144,331	\$	-	\$	-	\$ 39,088,625	\$50,232,956	\$3,476,427,182
81		\$0	\$ 11,144,331	\$	-	\$	-	\$ 40,043,051	\$51,187,382	\$3,527,614,564
82		\$0	\$ 11,144,331	\$	-	\$	-	\$ 41,015,611	\$52,159,943	\$3,579,774,507
83		\$0	\$ 11,144,331	\$	-	\$	-	\$ 42,006,650	\$53,150,982	\$3,632,925,489
84		\$0	\$ 11,144,331	\$	-	\$	-	\$ 43,016,519	\$54,160,850	\$3,687,086,339
85		\$0	\$ 11,144,331	\$	-	\$	-	\$ 44,045,575	\$55,189,906	\$3,742,276,245
86		\$0	\$ 11,144,331	\$	-	\$	-	\$ 45,094,183	\$56,238,515	\$3,798,514,760
87		\$0	\$ 11,144,331	\$	-	\$	-	\$ 46,162,715	\$57,307,046	\$3,855,821,806
88		\$0	\$ 11,144,331	\$	-	\$	-	\$ 47,251,549	\$58,395,880	\$3,914,217,686
89		\$0	\$ 11,144,331	\$	-	\$	-	\$ 48,361,071	\$59,505,402	\$3,973,723,088
90		\$0	\$ 11,144,331	\$	-	\$	-	\$ 49,491,673	\$60,636,005	\$4,034,359,093
91				\$	-	\$ 21,175,000	\$	\$ 96,226,640	\$117,401,640	\$4,151,760,733
92				\$	-	\$ 26,250,000	\$	\$ 122,054,468	\$148,304,468	\$4,300,065,201
93				\$	-	\$ 40,951,817	\$	\$ 194,809,357	\$235,761,174	\$4,535,826,375
94				\$	-	\$ 40,951,817	\$	\$ 199,288,820	\$240,240,636	\$4,776,067,012
95				\$	-	\$ 40,951,817	\$	\$ 203,853,392	\$244,805,208	\$5,020,872,220
96						\$	-	\$	\$0	\$5,020,872,220
97						\$	-	\$	\$0	\$5,020,872,220
98								\$	\$0	\$5,020,872,220
99								\$	\$0	\$5,020,872,220
100								\$	\$0	\$5,020,872,220
		Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation			Life Cycle	
		\$1,099,347,594	\$978,129,829	\$77,017,378	\$170,280,450	\$2,696,096,969			\$5,020,872,220	

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



APPENDIX A6-12

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 12 - C-UGS, EXPANDED, HIGH SEISMIC

LIFE CYCLE COST SUMMARIES



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-UGS Expanded (10,000 MTU)
 expanded Project - C-UGS 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>	\$1,136,176,023					\$1,136,176,023
<i>Operations & Maintenance (40 Year Life)</i>		\$532,356,575				\$532,356,575
<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>				\$179,266,905		\$179,266,905
<i>Escalation</i>					\$923,222,749	\$923,222,749
<i>Total Costs (40 year Life)</i>						\$2,848,039,629
<i>Present Value</i>						\$1,507,707,035

Life Cycle Costs (80 Year Life)

	Capital	Operations	Transport	Decommissioning	Escalation	Total Costs
<i>Design & Construction</i>	\$1,136,176,023					\$1,136,176,023
<i>Operations & Maintenance (80 Year Life)</i>		\$978,129,829				\$978,129,829
<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>				\$179,266,905		\$179,266,905
<i>Escalation</i>					\$2,747,462,096	\$2,747,462,096
<i>Total Costs (80 Year Life)</i>						\$5,118,052,231
<i>Present Value</i>						\$1,632,696,455



APPENDIX A6-12

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 12 - C-UGS, EXPANDED, HIGH SEISMIC

CAPITAL COST SUMMARY



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-UGS Expanded (10,000 MTU)
 expanded Project - C-UGS 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-UGC LE EX 01			Interim Storage Facility and transportation Project	
	C-UGC LE EX 01.01		Pilot ISF Facility	\$516,711,768
		C-UGC LE EX 01.01.01	Storage UGC LE s	\$0
		C-UGC LE EX 01.01.02	Cask Handling (Transfer) Facility	\$163,293,960
		C-UGC LE EX 01.01.03	Horizontal Dry Storage Modules	\$0
		C-UGC LE EX 01.01.04	Vertical Dry Storage Module	\$194,278,647
		C-UGC LE EX 01.01.05	Storage Cask Fabrication Facility	\$0
		C-UGC LE EX 01.01.06	Cask Maintenance Facility	\$0
		C-UGC LE EX 01.01.07	Concrete Batch Plant	\$1,850,000
		C-UGC LE EX 01.01.08	Visitor Center/ Auditorium	\$0
		C-UGC LE EX 01.01.09	Administration Building	\$3,140,000
		C-UGC LE EX 01.01.10	Security	\$24,148,975
		C-UGC LE EX 01.01.11	Rail Spur/ Receiving Yard	\$58,752,800
		C-UGC LE EX 01.01.12	Utilities	\$18,682,150
		C-UGC LE EX 01.01.13	Roads	\$18,212,737
		C-UGC LE EX 01.01.14	Parking	\$735,000
		C-UGC LE EX 01.01.15	Site Work	\$23,417,500
		C-UGC LE EX 01.01.16	Warehouse	\$10,200,000
		C-UGC LE EX 01.01.17	Maintenance Facility	\$0
		C-UGC LE EX 01.01.18	Waste management Facility	\$0
		C-UGC LE EX 01.01.01.xx	(Add Further Breakdown as needed)	\$0
	C-UGC LE EX 01.02		Expanded Interim Storage Facility	\$221,545,476
		C-UGC LE EX 01.02.01	Expanded Storage UGC LE s and Dry Cask Storage Systems	\$0
		C-UGC LE EX 01.02.02	Expanded Cask Handling Facility (if required)	\$0
		C-UGC LE EX 01.02.03	Horizontal Dry Storage Modules	\$0
		C-UGC LE EX 01.02.04	Vertical Dry Storage Casks	\$194,278,647
		C-UGC LE EX 01.02.05	Storage Cask Fabrication Facility (Expanded)	\$0
		C-UGC LE EX 01.02.06	Cask Maintenance Facility (Expanded)	\$0
		C-UGC LE EX 01.02.07	Concrete Batch Plant (Expanded if needed)	\$1,850,000
		C-UGC LE EX 01.02.08	Visitor Center/ Auditorium (expanded if needed)	\$745,000
		C-UGC LE EX 01.02.09	Administration Building (Expanded if needed)	\$0
		C-UGC LE EX 01.02.10	Security (Expanded)	\$10,074,488
		C-UGC LE EX 01.02.11	Rail Spur/ Receiving Yard (Expanded)	\$0
		C-UGC LE EX 01.02.12	Utilities Expanded as needed)	\$3,624,200
		C-UGC LE EX 01.02.13	Roads (Expanded)	\$83,142
		C-UGC LE EX 01.02.14	Parking (Expanded as needed)	\$0
		C-UGC LE EX 01.02.15	Site Work (Expanded)	\$10,890,000
		C-UGC LE EX 01.02.16	Warehouse (Expanded if Needed)	\$0
		C-UGC LE EX 01.02.17	Maintenance Facility (Expanded if needed)	\$0
		C-UGC LE EX 01.02.18	Waste management Facility (Expanded if needed)	\$0
		C-UGC LE EX 01.02.19	Hot Cell / Laboratories	\$0
		C-UGC LE EX 01.02.20	Pool Packaging Facility	\$0
		C-UGC LE EX 01.02.21	Standardized Storage System	\$0
		C-UGC LE EX 01.02.22	Standardized Disposal Canister	\$0
		C-UGC LE EX 01.02.23	Canister Repackaging Facility (For Repository	\$0
	C-UGC LE EX 01.03		Transportation Equipment	\$0
		C-UGC LE EX 01.03.01	Transportation Casks	\$0
		C-UGC LE EX 01.03.02	Rail Equipment	\$0
		C-UGC LE EX 01.03.03	Rail Maintenance Facility	\$0
		C-UGC LE EX 01.03.04	Transportation Systems Services	\$0
	C-UGC LE EX 01.04		Pre-Construction Capitalized Costs	\$66,025,000
		C-UGC LE EX 01.04.01	Land or Land Leases	\$7,680,000
		C-UGC LE EX 01.04.02	Site permits	\$200,000
		C-UGC LE EX 01.04.03	Site Licensing	\$6,240,000
		C-UGC LE EX 01.04.05	Plant Permits	\$0
		C-UGC LE EX 01.04.06	Planning and Alternative Studies	\$750,000
		C-UGC LE EX 01.04.07	Research and Development	\$0
		C-UGC LE EX 01.04.08	Design	\$23,955,000
		C-UGC LE EX 01.04.09	Other Pre-construction Costs	\$17,200,000
		C-UGC LE EX 01.04.10	Pre-construction contingencies	\$10,000,000

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	C-UGC LE EX 01.04.xx	(Add Further Breakdown as needed)		\$0
	C-UGC LE EX 01.05	Indirect Capitalized Costs	\$63,180,000	
	C-UGC LE EX 01.05.01	Project Management		\$2,700,000
	C-UGC LE EX 01.05.02	Construction Management		\$3,600,000
	C-UGC LE EX 01.05.03	Field indirect services		\$11,880,000
	C-UGC LE EX 01.05.04	Design Services in support of Construction		\$5,400,000
	C-UGC LE EX 01.05.05	QA/QC		\$12,600,000
	C-UGC LE EX 01.05.06	Commissioning and Startup		\$1,200,000
	C-UGC LE EX 01.05.07	Home office Engineering support to Construction		\$7,200,000
	C-UGC LE EX 01.05.08	Document Control		\$2,700,000
	C-UGC LE EX 01.05.09	Project Controls		\$3,600,000
	C-UGC LE EX 01.05.10	Construction Testing		\$2,700,000
	C-UGC LE EX 01.05.11	Inspections		\$3,600,000
	C-UGC LE EX 01.05.12	Startup and Testing		\$3,000,000
	C-UGC LE EX 01.05.13	Commissioning		\$3,000,000
	C-UGC LE EX 01.06	Site Selection	\$0	
	C-UGC LE EX 01.06.01	Site Selection		\$0
	C-UGC LE EX 01.06.02	Public Information Process		\$0
	C-UGC LE EX 01.07	Decontamination and Deconstruction	\$0	
	C-UGC LE EX 01.07.01	Decommissioning		\$0
	C-UGC LE EX 01.07.02	Decontamination		\$0
	C-UGC LE EX 01.07.03	Deconstruction		\$0
	C-UGC LE EX 01.07.04			\$0
	C-UGC LE EX 01.07.05			\$0
	C-UGC LE EX 01.08	Project Financial Costs	\$116,239,941	
	C-UGC LE EX 01.08.01	Contractor Fees		\$69,396,980
	C-UGC LE EX 01.08.02	Escalation Costs		\$46,842,961
	C-UGC LE EX 01.08.03	Interest Payments		\$0
	C-UGC LE EX 01.08.04	Indirect costs to support shipments to repository		\$0
	C-UGC LE EX 01.08.05			\$0
	C-UGC LE EX 01.08.xx	(Add Further Breakdown as needed)		\$0
	C-UGC LE EX 01.09	Project Contingencies	\$152,473,839	
	C-UGC LE EX 01.09.01	Management Reserve - Contractor Held		\$49,185,109
	C-UGC LE EX 01.09.02	Contingency - DOE held		\$103,288,729
	C-UGC LE EX 01.10			
	C-UGC LE EX 01.10.01	Other Direct Costs	\$0	
	C-UGC LE EX 01.10.02	DOE Project Operations		\$0
	C-UGC LE EX 01.10.03	DOE TM&E		\$0
	C-UGC LE EX 01.10.04	Host site Operational Costs Miscellaneous		\$0
	C-UGC LE EX 01.10.05	Miscellaneous ODC		\$0
	C-UGC LE EX 01.11	Operational Costs	0	
	C-UGC LE EX 01.11.01	Operations Costs		\$0
	C-UGC LE EX 01.11.02	Transportation Costs		\$0
	C-UGC LE EX 01.11.03	Escalation (Operations/Transportation)		\$0
Project Total				
		(All Direct & indirect Costs, MR, Escalation)	TEC	\$1,032,887,294
		(TEC plus Contingency, ODCs)	TPC	\$1,136,176,023
		All Capitol, Operation, Transportation, Escalation	LCC	\$1,136,176,023



APPENDIX A6-12

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 12 - C-UGS, EXPANDED, HIGH SEISMIC

LIFE CYCLE COST – 40 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

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

YEAR	Design/Const	O&M	Cask Handling	D&D	Annual Escalation	Discount Rate
					1.90%	3.40%
40 Year Operating life					Escalation	Cumulative
					Annual Expense	
1	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 190,000	\$ 10,190,000
2	\$ 10,000,000	\$ -	\$ -	\$ -	\$ 383,610	\$ 10,383,610
3	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,161,797	\$ 21,161,797
4	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,563,871	\$ 21,563,871
5	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 1,973,585	\$ 21,973,585
6	\$ 20,000,000	\$ -	\$ -	\$ -	\$ 2,391,083	\$ 22,391,083
7	\$ 27,888,399	\$ -	\$ -	\$ -	\$ 3,927,403	\$ 31,815,802
8	\$ 200,000,000	\$ -	\$ -	\$ -	\$ 32,500,273	\$ 232,500,273
9	\$ 200,000,000	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$ 265,636,616
10	\$ 608,287,624	\$ 23,603,013	\$ -	\$ -	\$ 130,862,075	\$ 762,752,712
11		\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$ 45,379,232
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$ 46,241,438
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$ 47,120,025
14	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,229,737	\$ 31,210,298
15	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,822,733	\$ 31,803,294
16	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 8,426,995	\$ 32,407,556
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$ 15,346,705
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$ 15,638,292
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$ 15,935,420
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$ 16,238,193
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$ 16,546,719
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$ 16,861,106
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$ 17,181,467
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$ 17,507,915
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$ 17,840,566
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$ 18,179,536
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$ 18,524,947
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$ 18,876,921
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$ 19,235,583
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$ 19,601,059
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$ 19,973,479
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$ 20,352,975
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$ 20,739,682
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$ 21,133,736
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$ 21,535,277
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$ 21,944,447
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$ 22,361,391
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$ 22,786,258
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$ 23,219,197
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$ 23,660,362
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$ 24,109,908
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$ 24,567,997
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$ 25,034,789
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$ 25,510,450
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$ 25,995,148
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$ 26,489,056
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$ 26,992,348
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$ 27,505,203
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$ 28,027,801
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$ 28,560,330
51	\$ -	\$ -	\$ -	\$ 21,175,000	\$ 34,122,666	\$ 55,297,666
52	\$ -	\$ -	\$ -	\$ 26,250,000	\$ 43,603,292	\$ 69,853,292
53	\$ -	\$ -	\$ -	\$ 43,947,302	\$ 75,221,883	\$ 119,169,184
54	\$ -	\$ -	\$ -	\$ 43,947,302	\$ 77,486,097	\$ 121,433,399
55	\$ -	\$ -	\$ -	\$ 43,947,302	\$ 79,793,332	\$ 123,740,633
56	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,848,039,629
57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,848,039,629
58	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,848,039,629
59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,848,039,629
60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,848,039,629
	Total Design/Const	Total O&M	Total Cask Handling	Total D&D	Total Escalation	Total Life Cycle
	\$ 1,136,176,023	\$ 532,356,575	\$ 77,017,378	\$ 179,266,905	\$ 923,222,749	\$ 2,848,039,629

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



APPENDIX A6-12

STUDY 1 - ALTERNATIVE STORAGE SYSTEMS FOR DUAL PURPOSE CANISTERS

COST DETAILS

ALTERNATIVE 12 - C-UGS, EXPANDED, HIGH SEISMIC

LIFE CYCLE COST – 80 YEAR OPERATING LIFE



Interim Storage Facility

Expanded Storage Facility (10,000 MTU)

Project: C-UGS Expanded (10,000 MTU)
 expanded Project - C-UGS 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	\$ 24,243,717	\$ -	\$ -	\$ 41,392,899	\$265,636,616	\$637,616,638
10	\$ 608,287,624	\$ 23,603,013	\$ -	\$ -	\$ 130,862,075	\$762,752,712	\$1,400,369,350
11		\$ 24,056,528	\$ 12,836,230	\$ -	\$ 8,486,475	\$45,379,232	\$1,445,748,582
12	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 9,348,680	\$46,241,438	\$1,491,990,020
13	\$ -	\$ 24,056,528	\$ 12,836,230	\$ -	\$ 10,227,267	\$47,120,025	\$1,539,110,045
14	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,229,737	\$31,210,298	\$1,570,320,343
15	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 7,822,733	\$31,803,294	\$1,602,123,636
16	\$ -	\$ 11,144,331	\$ 12,836,230	\$ -	\$ 8,426,995	\$32,407,556	\$1,634,531,192
17	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,202,374	\$15,346,705	\$1,649,877,897
18	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,493,961	\$15,638,292	\$1,665,516,190
19	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 4,791,089	\$15,935,420	\$1,681,451,610
20	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,093,862	\$16,238,193	\$1,697,689,803
21	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,402,387	\$16,546,719	\$1,714,236,521
22	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 5,716,775	\$16,861,106	\$1,731,097,627
23	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,037,136	\$17,181,467	\$1,748,279,095
24	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,363,584	\$17,507,915	\$1,765,787,010
25	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 6,696,234	\$17,840,566	\$1,783,627,575
26	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,035,205	\$18,179,536	\$1,801,807,112
27	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,380,616	\$18,524,947	\$1,820,332,059
28	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 7,732,590	\$18,876,921	\$1,839,208,981
29	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,091,252	\$19,235,583	\$1,858,444,564
30	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,456,728	\$19,601,059	\$1,878,045,623
31	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 8,829,148	\$19,973,479	\$1,898,019,102
32	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,208,644	\$20,352,975	\$1,918,372,077
33	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,595,350	\$20,739,682	\$1,939,111,759
34	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 9,989,404	\$21,133,736	\$1,960,245,495
35	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,390,945	\$21,535,277	\$1,981,780,771
36	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 10,800,116	\$21,944,447	\$2,003,725,218
37	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,217,060	\$22,361,391	\$2,026,086,610
38	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 11,641,927	\$22,786,258	\$2,048,872,868
39	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,074,865	\$23,219,197	\$2,072,092,064
40	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,516,030	\$23,660,362	\$2,095,752,426
41	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 12,965,577	\$24,109,908	\$2,119,862,334
42	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,423,665	\$24,567,997	\$2,144,430,331
43	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 13,890,457	\$25,034,789	\$2,169,465,120
44	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,366,118	\$25,510,450	\$2,194,975,569
45	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 14,850,817	\$25,995,148	\$2,220,970,718
46	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,344,725	\$26,489,056	\$2,247,459,774
47	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 15,848,017	\$26,992,348	\$2,274,452,122
48	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,360,871	\$27,505,203	\$2,301,957,324
49	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 16,883,470	\$28,027,801	\$2,329,985,126
50	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,415,998	\$28,560,330	\$2,358,545,455
51	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 17,958,645	\$29,102,976	\$2,387,648,431
52	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 18,511,601	\$29,655,933	\$2,417,304,364
53	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,075,064	\$30,219,395	\$2,447,523,759
54	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 19,649,232	\$30,793,564	\$2,478,317,323
55	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,234,310	\$31,378,641	\$2,509,695,964
56	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 20,830,504	\$31,974,836	\$2,541,670,800
57	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 21,438,026	\$32,582,358	\$2,574,253,158
58	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 22,057,091	\$33,201,422	\$2,607,454,580
59	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 22,687,918	\$33,832,249	\$2,641,286,829
60	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 23,330,731	\$34,475,062	\$2,675,761,891
61	\$ -	\$ 11,144,331	\$ -	\$ -	\$ 23,985,757	\$35,130,088	\$2,710,891,980



62	\$	-	\$ 11,144,331	\$	-	\$	-	\$	24,653,229	\$35,797,560	\$2,746,689,540
63	\$	-	\$ 11,144,331	\$	-	\$	-	\$	25,333,382	\$36,477,714	\$2,783,167,253
64	\$	-	\$ 11,144,331	\$	-	\$	-	\$	26,026,459	\$37,170,790	\$2,820,338,043
65		\$0	\$ 11,144,331	\$	-	\$	-	\$	26,732,704	\$37,877,035	\$2,858,215,079
66		\$0	\$ 11,144,331	\$	-	\$	-	\$	27,452,367	\$38,596,699	\$2,896,811,777
67		\$0	\$ 11,144,331	\$	-	\$	-	\$	28,185,705	\$39,330,036	\$2,936,141,814
68		\$0	\$ 11,144,331	\$	-	\$	-	\$	28,932,975	\$40,077,307	\$2,976,219,120
69		\$0	\$ 11,144,331	\$	-	\$	-	\$	29,694,444	\$40,838,776	\$3,017,057,896
70		\$0	\$ 11,144,331	\$	-	\$	-	\$	30,470,381	\$41,614,712	\$3,058,672,608
71		\$0	\$ 11,144,331	\$	-	\$	-	\$	31,261,061	\$42,405,392	\$3,101,078,000
72		\$0	\$ 11,144,331	\$	-	\$	-	\$	32,066,763	\$43,211,094	\$3,144,289,095
73		\$0	\$ 11,144,331	\$	-	\$	-	\$	32,887,774	\$44,032,105	\$3,188,321,200
74		\$0	\$ 11,144,331	\$	-	\$	-	\$	33,724,384	\$44,868,715	\$3,233,189,915
75		\$0	\$ 11,144,331	\$	-	\$	-	\$	34,576,889	\$45,721,221	\$3,278,911,136
76		\$0	\$ 11,144,331	\$	-	\$	-	\$	35,445,593	\$46,589,924	\$3,325,501,059
77		\$0	\$ 11,144,331	\$	-	\$	-	\$	36,330,801	\$47,475,132	\$3,372,976,192
78		\$0	\$ 11,144,331	\$	-	\$	-	\$	37,232,829	\$48,377,160	\$3,421,353,352
79		\$0	\$ 11,144,331	\$	-	\$	-	\$	38,151,995	\$49,296,326	\$3,470,649,678
80		\$0	\$ 11,144,331	\$	-	\$	-	\$	39,088,625	\$50,232,956	\$3,520,882,634
81		\$0	\$ 11,144,331	\$	-	\$	-	\$	40,043,051	\$51,187,382	\$3,572,070,017
82		\$0	\$ 11,144,331	\$	-	\$	-	\$	41,015,611	\$52,159,943	\$3,624,229,959
83		\$0	\$ 11,144,331	\$	-	\$	-	\$	42,006,650	\$53,150,982	\$3,677,380,941
84		\$0	\$ 11,144,331	\$	-	\$	-	\$	43,016,519	\$54,160,850	\$3,731,541,791
85		\$0	\$ 11,144,331	\$	-	\$	-	\$	44,045,575	\$55,189,906	\$3,786,731,697
86		\$0	\$ 11,144,331	\$	-	\$	-	\$	45,094,183	\$56,238,515	\$3,842,970,212
87		\$0	\$ 11,144,331	\$	-	\$	-	\$	46,162,715	\$57,307,046	\$3,900,277,258
88		\$0	\$ 11,144,331	\$	-	\$	-	\$	47,251,549	\$58,395,880	\$3,958,673,139
89		\$0	\$ 11,144,331	\$	-	\$	-	\$	48,361,071	\$59,505,402	\$4,018,178,540
90		\$0	\$ 11,144,331	\$	-	\$	-	\$	49,491,673	\$60,636,005	\$4,078,814,545
91				\$	-	\$ 21,175,000		\$	96,226,640	\$117,401,640	\$4,196,216,185
92				\$	-	\$ 26,250,000		\$	122,054,468	\$148,304,468	\$4,344,520,653
93				\$	-	\$ 43,947,302		\$	209,058,993	\$253,006,294	\$4,597,526,948
94				\$	-	\$ 43,947,302		\$	213,866,113	\$257,813,414	\$4,855,340,362
95				\$	-	\$ 43,947,302		\$	218,764,567	\$262,711,869	\$5,118,052,231
96						\$	-	\$		\$0	\$5,118,052,231
97						\$	-	\$		\$0	\$5,118,052,231
98								\$		\$0	\$5,118,052,231
99								\$		\$0	\$5,118,052,231
100								\$		\$0	\$5,118,052,231
		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
		Design/Const	O&M	Cask Handling	D&D	Escalation				Life Cycle	
		\$1,136,176,023	\$978,129,829	\$77,017,378	\$179,266,905	\$2,747,462,096				\$5,118,052,231	

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