

Table C-3
Palo Verde NGS Unit 3
DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	ILRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 1a Period-Dependent Costs (continued)																					
1a.4.7	NRC Fees	-	-	-	-	-	-	475	48	523	523	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	674	67	742	-	742	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	658	99	757	-	757	-	-	-	-	-	-	-	-	-
1a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	28	4	32	-	32	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-	-	-	-	-	6,411	962	7,373	7,373	-	-	-	-	-	-	-	-	-	115,397
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	19,057	2,859	21,916	21,916	-	-	-	-	-	-	-	-	-	229,871
1a.4	Subtotal Period 1a Period-Dependent Costs	-	993	8	5	-	23	30,637	4,661	35,327	34,797	1,530	-	-	376	-	-	-	7,522	12	345,269
1a.0	TOTAL PERIOD 1a COST	-	993	8	5	-	23	84,138	12,687	97,854	96,135	1,530	188	-	376	-	-	-	7,522	12	378,720
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	173	23	197	178	-	20	-	-	-	-	-	-	-	2,023
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	428
1b.1.1.3	Reactor internals	-	-	-	-	-	-	91	14	104	104	-	-	-	-	-	-	-	-	-	1,070
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	49	7	56	14	-	42	-	-	-	-	-	-	-	578
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	428
1b.1.1.6	CRD housings & ICF tubes	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	428
1b.1.1.7	Incero instrumentation	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	428
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	132	20	151	151	-	-	-	-	-	-	-	-	-	1,554
1b.1.1.9	Facility closeout	-	-	-	-	-	-	43	7	50	25	-	25	-	-	-	-	-	-	-	514
1b.1.1.10	Missile shields	-	-	-	-	-	-	16	2	19	19	-	-	-	-	-	-	-	-	-	163
1b.1.1.11	Biological shield	-	-	-	-	-	-	43	7	50	50	-	-	-	-	-	-	-	-	-	514
1b.1.1.12	Steam generators	-	-	-	-	-	-	167	25	192	192	-	-	-	-	-	-	-	-	-	1,939
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	36	5	42	21	-	21	-	-	-	-	-	-	-	428
1b.1.1.14	Main Turbine	-	-	-	-	-	-	57	8	65	-	-	65	-	-	-	-	-	-	-	638
1b.1.1.15	Main Condensers	-	-	-	-	-	-	57	8	65	-	-	65	-	-	-	-	-	-	-	638
1b.1.1.16	Auxiliary building	-	-	-	-	-	-	36	15	114	102	-	11	-	-	-	-	-	-	-	1,168
1b.1.1.17	Reactor building	-	-	-	-	-	-	36	15	114	102	-	11	-	-	-	-	-	-	-	1,168
1b.1.1	Total	-	-	-	-	-	-	1,205	181	1,386	1,125	-	261	-	-	-	-	-	-	-	14,228
1b.1.2	Dexon primary loop	1,655	-																		

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
1b.4	Subtotal Period 1b Period-Dependent Costs	29	537	5	3	-	14	19,002	2,904	22,493	21,718	775	-	-	224	-	-	-	4,488	7	207,709
1b.0	TOTAL PERIOD 1b COST	5,402	1,938	227	567	-	3,569	52,569	7,981	52,252	51,217	775	261	-	678	1,329	-	-	173,324	14,453	229,578
PERIOD 1 TOTALS		5,402	2,932	235	571	-	3,582	116,707	20,667	150,106	147,352	2,305	449	-	1,054	1,329	-	-	180,846	14,465	605,297
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Reactor Coolant Piping	145	146	36	67	-	508	-	250	1,152	1,152	-	-	-	1,789	-	-	-	124,853	6,464	-
2a.1.1.2	Pressurizer Quench Tank	9	7	4	8	-	57	-	22	107	107	-	-	-	201	-	-	-	14,051	375	-
2a.1.1.3																					

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Disposal of Plant Systems (continued)																					
2a.1.5.33	Secondary Chemical Control (SC)	-	171	-	-	-	-	-	26	197	-	-	197	-	-	-	-	-	-	6,637	-
2a.1.5.34	Sewage Treatment Plant - Common	-	1	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	44	-
2a.1.5.35	Stator Cooling (CT)	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	139	-
2a.1.5.36	Steam Gen Feedwater Pump Turbine (FT)	-	192	85	71	-	920	-	297	1,566	1,566	-	-	-	3,530	-	-	-	226,098	4,717	-
2a.1.5.37	Turbine Cooling Water (TC)	-	159	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	4,675	-
2a.1.5.38	Turbine Steam Seal & Drain (GS)	-	114	23	19	-	242	-	94	492	492	-	-	-	927	-	-	-	56,477	2,731	-
2a.1.5	Totals	-	4,060	1,437	1,267	-	16,867	-	5,380	26,101	26,743	-	2,358	-	65,169	-	-	-	4,161,624	120,341	-
2a.1.6	Scaffolding in support of decommissioning	-	3,195	23	20	-	261	-	869	4,368	4,568	-	-	-	1,008	-	-	-	64,061	34,758	-
2a.1	Subtotal Period 2a Activity Costs	818	30,230	41,489																	

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Disposal of Plant Systems (continued)																					
2b.1.1.20	Fire Protection (FP)	-	105	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	3,645	-
2b.1.1.21	Fire Protection (FP) - RCA	-	657	154	116	-	1,512	-	550	2,890	2,890	-	-	-	5,785	-	-	-	371,572	12,003	-
2b.1.1.22	Fire Protection - Common (FP) - RCA	-	368	137	126	-	1,658	-	534	2,803	2,803	-	-	-	6,526	-	-	-	402,376	7,877	-
2b.1.1.23	Gaseous Radwaste (GR)	-	252	38	27	-	348	-	153	798	798	-	-	-	1,927	-	-	-	85,625	5,181	-
2b.1.1.24	ITVAC - Ancillary Building (ITN) - Common	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	83	-
2b.1.1.25	ITVAC - Auxiliary Building (ITA)	-	436	299	211	-	2,756	-	860	4,561	4,561	-	-	-	10,477	-	-	-	677,114	10,352	-
2b.1.1.26	ITVAC - Containment Building (TIC)	-	461	179	157	-	1,788	-	601	3,166	3,166	-	-	-	6,829	-	-	-	439,260	9,573	-
2b.1.1.27	ITVAC - Control Building (ITJ)	-	87	-	-	-	-	-	13	100	-	-	100	-	-	-	-	-	-	3,112	-
2b.1.1.28	ITVAC - Diesel Generator																				

Table C-3
Palo Verde NGS Unit 3
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(Thousands of 2023 Dollars)

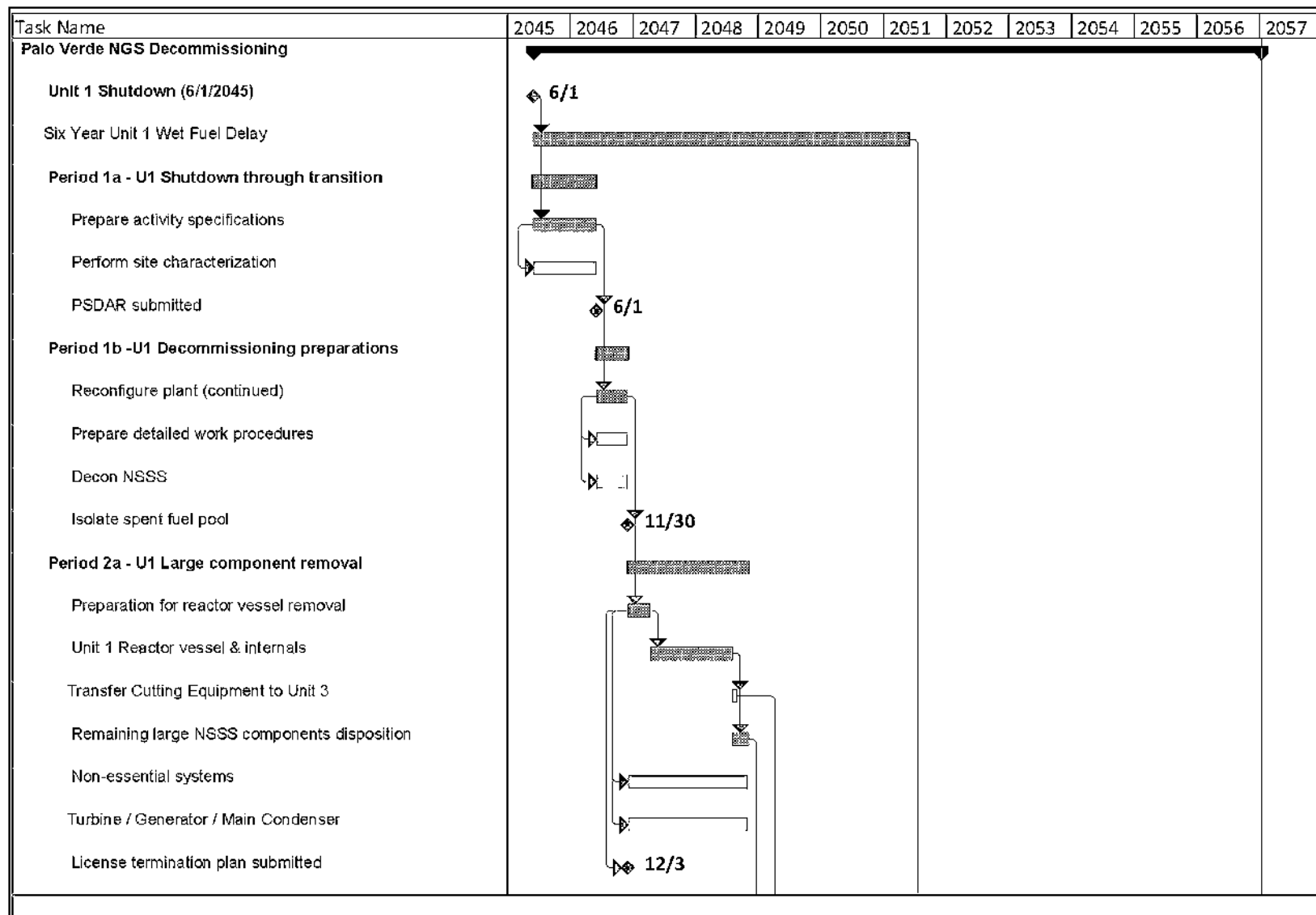
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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 2b Period-Dependent Costs																					
2b.4.1	Dexon supplies	2,555	-	-	-	-	-	-	589	2,944	2,944	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,465	147	1,612	1,612	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	1,020	102	1,122	1,122	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	9,855	-	-	-	-	-	2,464	12,319	12,319	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	6,980	-	-	-	-	-	1,047	8,027	8,027	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	247	138	-	712	-	223	1,320	1,320	-	-	-	11,519	-	-	-	230,374	376	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	5,384	808	6,192	6,192	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,313	131	1,444	1,444	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	2,449	245	2,694	-	2,694	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	3,													

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DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

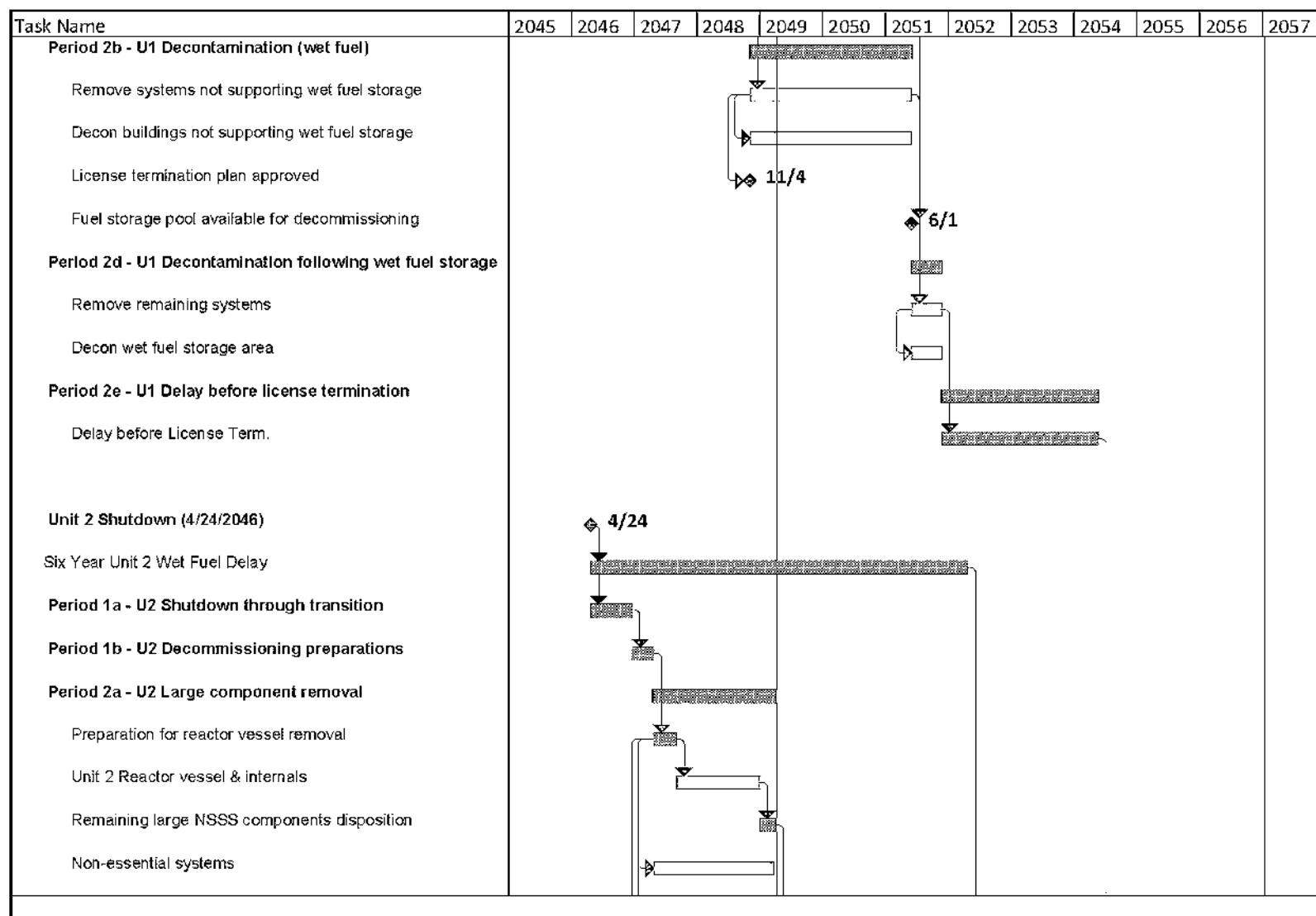
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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet																				
PERIOD 3d - GTCC shipping																																						
Period 3d Direct Decommissioning Activities																																						
Nuclear Steam Supply System Removal																																						
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,246	-	-	20,402	-	3,372	25,020	25,020	-	-	-	-	-	-	3,547	724,410	-	-																	
3d.1.1	Totals	-	-	1,246	-	-	20,402	-	3,372	25,020	25,020	-	-	-	-	-	-	3,547	724,410	-	-																	
3d.1	Subtotal Period 3d Activity Costs	-	-	1,246	-	-	20,402	-	3,372	25,020	25,020	-	-	-	-	-	-	3,547	724,410	-	-																	
3d.0	TOTAL PERIOD 3d COST	-	-	1,246	-	-	20,402	-	3,372	25,020	25,020	-	-	-	-	-	-	3,547	724,410	-	-																	
PERIOD 3 TOTALS		-	33,407	1,246	-	-	20,402	22,772	11,740	89,568	25,417	3,824	60,326	-	-	-	-	3,547	724,410	239,258	255,268																	
TOTAL COST TO DECOMMISSION		18,114	131,381	49,548	15,214	-	158,840	463,350	1																													

APPENDIX D DECOMMISSIONING SCHEDULE

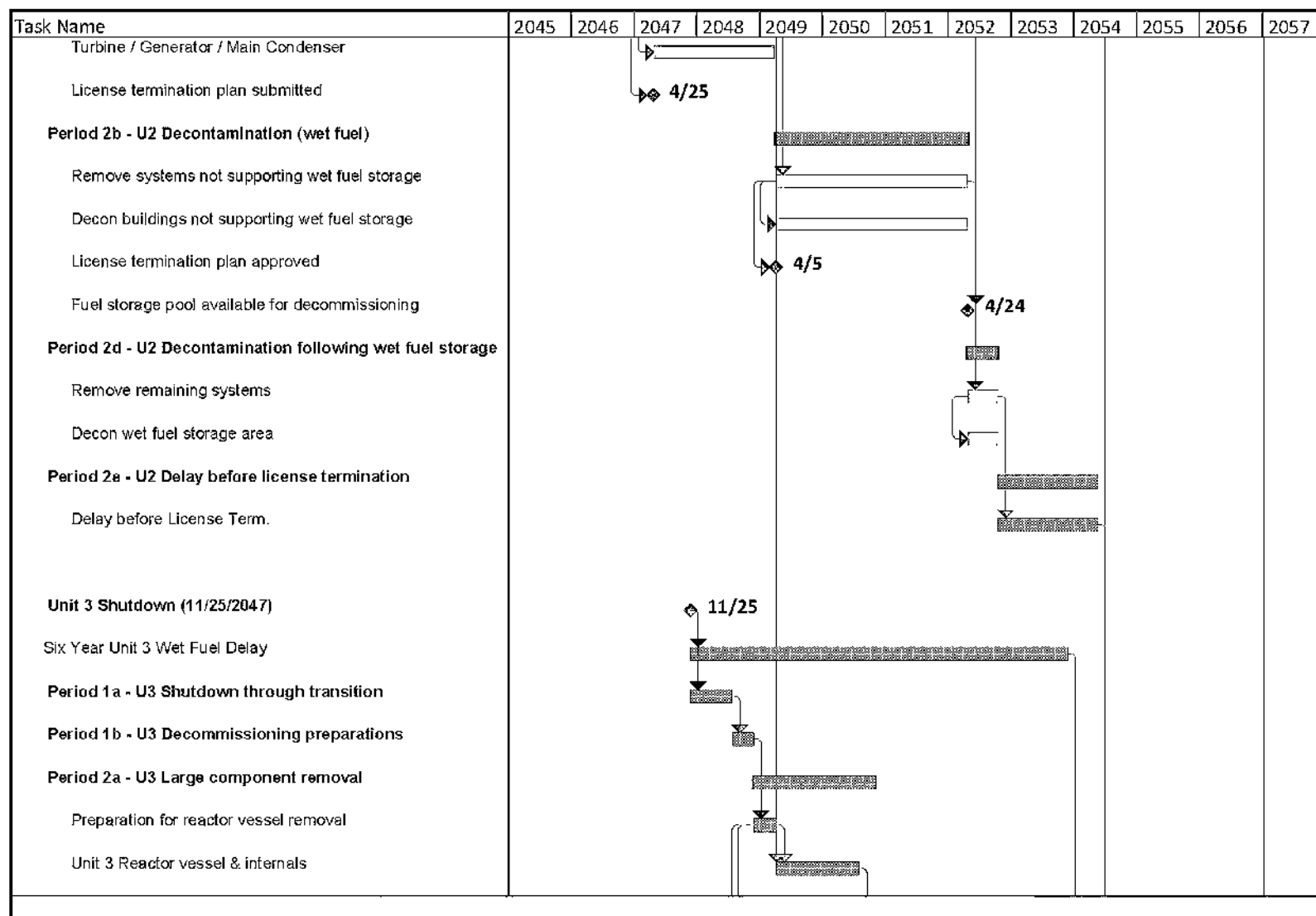
DECOMMISSIONING SCHEDULE



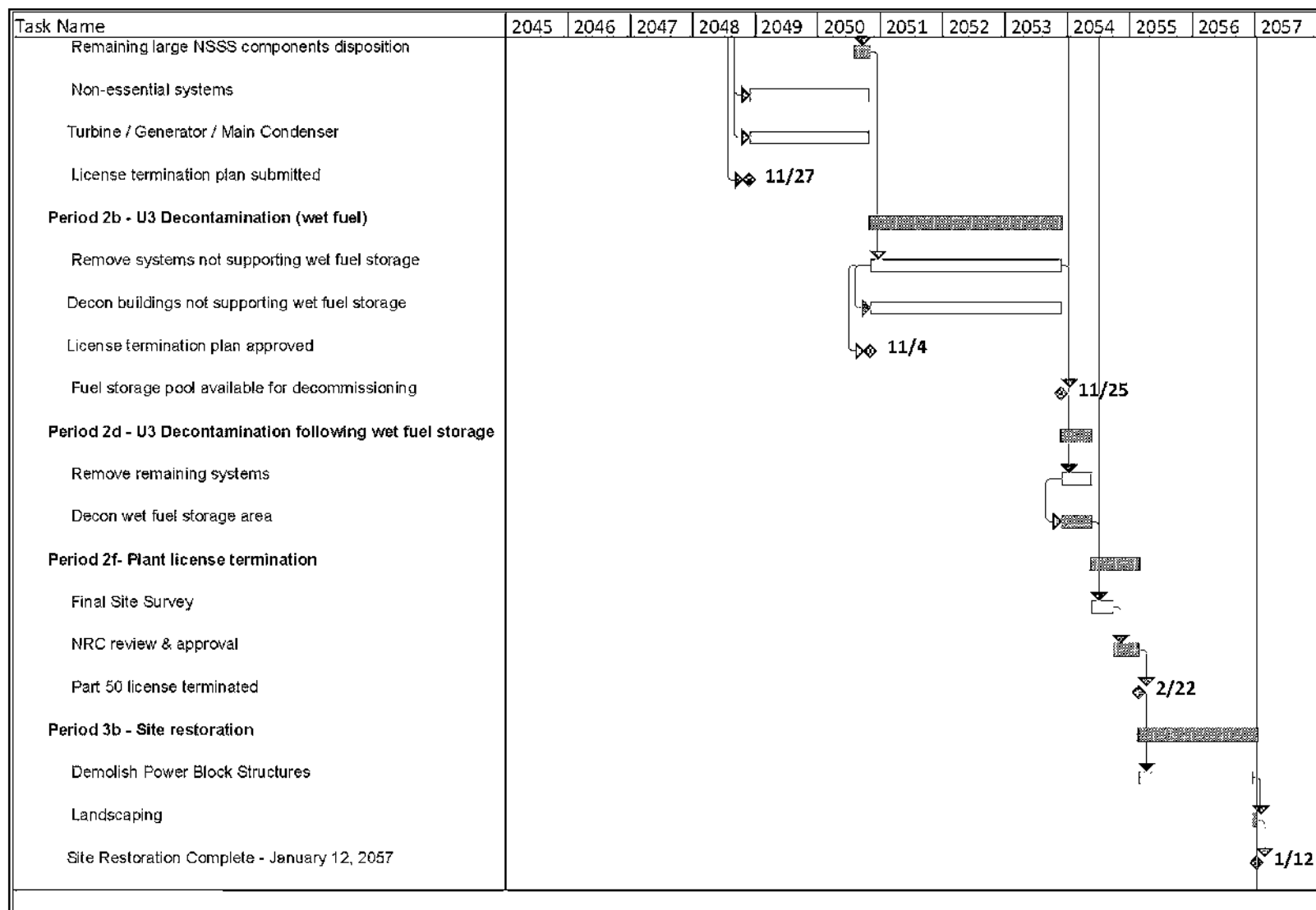
DECOMMISSIONING SCHEDULE (continued)



DECOMMISSIONING SCHEDULE (continued)



DECOMMISSIONING SCHEDULE (continued)



APPENDIX E

UNIT COST FACTOR DEVELOPMENT

APPENDIX E

UNIT COST FACTOR DEVELOPMENT

Example: Unit Factor for Removal of Contaminated Heat Exchanger < 3,000 lbs.

1. SCOPE

Heat exchangers weighing < 3,000 lbs. will be removed in one piece using a crane or small hoist. They will be disconnected from the inlet and outlet piping. The heat exchanger will be sent to the packing area.

2. CALCULATIONS

Activity Description	Critical Duration (minutes)

Install contamination controls, remove insulation, and mount pipe cutters	60
Disconnect inlet and outlet lines, cap openings	60
Rig for removal	30
Unbolt from mounts	30
Remove contamination controls	15
Remove heat exchanger, wrap in plastic, and send to packing area	<u>60</u>
Critical Duration	255

Work Adjustments (Work Difficulty Factors)

+ Respiratory Protection (50% of Critical Duration)	128
+ Radiation/ALARA (37.08333% of Critical Duration)	<u>95</u>
Adjusted Work Duration	478
+ Protective Clothing (30% of Adjusted Work Duration)	<u>143</u>
Productive Work Duration	621
+ Work break adjustment (8.33 % of Productive Work Duration)	<u>52</u>
Total Work Duration	673

***** Total Work Duration = 673 minutes or 11.217 hours *****

APPENDIX E (continued)

3. LABOR REQUIRED

Crew	Number	Duration (hours)	Rate (\$/hr)	Cost
Laborers	3.00	11.217	\$19.78	\$665.62
Craftsmen	2.00	11.217	\$40.87	\$916.88
Foreman	1.00	11.217	\$43.95	\$492.99
General Foreman	0.25	11.217	\$47.02	\$131.86
Fire Watch	0.05	11.217	\$19.78	\$11.09
Health Physics Technician	1.00	11.217	\$67.20	<u>\$753.78</u>
Total labor cost				\$2,972.22

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Gas torch consumables 1 @ \$23.89/hour x 1 hour {1}	\$23.89
-Blotting paper 50 @ \$0.81/sq. ft {2}	\$40.50
-Tarpaulin 7.5 mils 50 @ \$0.49/sq. ft {3}	<u>\$23.89</u>
Subtotal cost of equipment and materials	\$88.89
Overhead & sales tax on equipment and materials @ 16.300%	<u>\$14.49</u>
Total costs, equipment & material	\$103.38
TOTAL COST: Removal of contaminated heat exchanger <3000 pounds:	\$3,075.60
Total labor cost:	\$2,972.22
Total equipment/material costs:	\$103.38
Total craft labor man-hours required per unit:	81.884

APPENDIX E (continued)

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the AIF (now NEI) program to standardize nuclear DCEs and are delineated in Volume 1, Chapter 5 of the “Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,” AIF/NESP-036, May 1986.
- References for equipment & consumables costs:
 1. R.S. Means (2023) Division 01 54 33, Section 40-6360, page 744
 2. www.mcmaster.com online catalog (7193T88)
 3. R.S. Means (2023) Division 01 56, Section 13.60-0600, page 23
- Material and consumable costs were adjusted using the regional indices for Phoenix, Arizona.

APPENDIX F
UNIT COST FACTOR LISTING
(DECON: Power Block Structures Only)

APPENDIX F

UNIT COST FACTOR LISTING (DECON: Power Block Structures Only)

Unit Cost Factor	Cost/Unit (\$)
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,738.44
Cost of CPC B-144 LSA box & preparation for use	11,549.73
Cost of LSA drum & preparation for use	370.00
Cost of cask liner for CNSI 8 120A cask (resins)	15,409.10
Cost of cask liner for CNSI 8 120A cask (filters)	10,826.94
Decontamination of surfaces with vacuuming, \$/square foot	0.68

APPENDIX G

STORED STEAM GENERATORS & STORAGE FACILITY, DECON DECOMMISSIONING COST ESTIMATE

APPENDIX H

WATER RECLAMATION FACILITY, DECON DECOMMISSIONING COST ESTIMATE

APPENDIX I

WATER RECLAMATION SUPPLY SYSTEM PIPELINE & STRUCTURES, DECON DECOMMISSIONING COST ESTIMATE

APPENDIX J

EVAPORATION PONDS, DECON DECOMMISSIONING COST ESTIMATE

APPENDIX K

MAKE-UP WATER RESERVOIR, DECON DECOMMISSIONING COST ESTIMATE

APPENDIX L

ISFSI

DECON DECOMMISSIONING COST ESTIMATE

Table L
Palo Verde NGS - ISFSI
DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				GTCC Cu. Feet	Burial/ Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours															
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet																				
TOTAL COST TO OPERATE AND DECOMMISSION ISFSI WITH 14.6% CONTINGENCY:					\$506,724 thousands of 2023 dollars																																
TOTAL CRAFT LABOR REQUIREMENTS:					112,544 Man-hours																																

APPENDIX M

STORED REACTOR CLOSURE HEADS & STORAGE FACILITY, DECON DECOMMISSIONING COST ESTIMATE

APPENDIX N

ISFSI CAMPAIGN COSTS DECON DECOMMISSIONING COST ESTIMATE

APPENDIX O

SCHEDULE OF ANNUAL EXPENDITURES - CONSOLIDATED

<u>Table</u>	<u>Page</u>
O-1	Schedule of Palo Verde Annual Expenditures, Unit 1.....2
O-2	Schedule of Palo Verde Annual Expenditures, Unit 1.....5
O-3	Schedule of Palo Verde Annual Expenditures, Unit 3.....8

TABLE O-2 (continued)
SCHEDULE OF ANNUAL EXPENDITURES
UNIT 2 - CONSOLIDATED (INCLUDES SITE FACILITIES)
(Thousands of 2023 Dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
Total	651,110	243,996	16,219	225,724	132,837	1,269,887

Note: One third of the decommissioning cost of each of the Site Facilities (Stored Steam Generators and Storage Facility, Water Reclamation Facility, Water Reclamation Supply System Pipeline & Structures, Evaporation Ponds, Make-up Water Reservoir, Stored Reactor Closure Heads & Storage Facility, and ISFSD) has been allocated to each unit's cash flow.

TABLE O-3 (continued)
SCHEDULE OF ANNUAL EXPENDITURES
UNIT 3 - CONSOLIDATED (INCLUDES SITE FACILITIES)
(Thousands of 2023 Dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
Total	683,472	240,670	16,219	200,524	127,661	1,268,546

Note: One third of the decommissioning cost of each of the Site Facilities (Stored Steam Generators and Storage Facility, Water Reclamation Facility, Water Reclamation Supply System Pipeline & Structures, Evaporation Ponds, Make-up Water Reservoir, Stored Reactor Closure Heads & Storage Facility, and ISFSD) has been allocated to each unit's cash flow.

APPENDIX P

SCHEDULE OF ANNUAL EXPENDITURES - CONSOLIDATED 25% CONTINGENCY*

<u>Table</u>	<u>Page</u>
P-1	Schedule of Palo Verde Annual Expenditures, Unit 1 - 25% contingency.....2
P-2	Schedule of Palo Verde Annual Expenditures, Unit 2 - 25% contingency.....5
P-3	Schedule of Palo Verde Annual Expenditures, Unit 3 - 25% contingency.....8

* Calculated with 25% contingency as required to comply with the California Public Utility Commission as detailed in "Technical Position Paper for Establishing an Appropriate Contingency Factor for Inclusion in the Decommissioning Revenue Requirements", Study Number: DECON-POS-11002, Revision B

TABLE P-2 (continued)
SCHEDULE OF ANNUAL EXPENDITURES - 25% CONTINGENCY
UNIT 2 - CONSOLIDATED (INCLUDES SITE FACILITIES)
(Thousands of 2023 Dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
Total	680,970	257,050	16,707	237,506	137,986	1,330,219

Note: One third of the decommissioning cost of each of the Site Facilities (Stored Steam Generators and Storage Facility, Water Reclamation Facility, Water Reclamation Supply System Pipeline & Structures, Evaporation Ponds, Make-up Water Reservoir, Stored Reactor Closure Heads & Storage Facility, and ISFSI) has been allocated to each unit's cash flow.

