PSEG Nuclear LLC
P.O. Box 236, Hancocks Bridge, NJ 08038-0236

PSEG
Nuclear LLC

10 CFR 50.75

LR-N11-0289
September 15, 2011

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Salem Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-70 and DPR-75
NRC Docket Nos. 50-272 and 50-311

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Hope Creek Generating Station
Renewed Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: Site-Specific Cost Estimates for Hope Creek, Salem Unit Nos. 1 and 2, and Peach Bottom Units 2 and 3

References:

(1) LR-N11-0086, NRC Decommissioning Funding Status Report, dated March 31, 2011

(2) NRC Letter to Mr. Thomas Joyce, Request for Additional Information Regarding 2011 Decommissioning Funding Status Report, dated July 1, 2011

(3) LR-N11-0240, Response to Request for Additional Information, 2011 NRC Decommissioning Funding Status Report, dated August 1, 2011

In Reference 1 PSEG Nuclear LLC (PSEG) provided the NRC a status of its decommissioning funding pursuant to 10 CFR 50.75(f)(1).

The NRC Staff responded with a Request for Additional Information (RAI); see Reference 2. In Reference 3 PSEG provided a response to the RAI. In that August 1, 2011 letter, PSEG stated in response to RAI #3 that they intend to provide an update to the site-specific cost estimate for Hope Creek, as well as site-specific cost estimates for Salem Unit Nos. 1 and 2 and Peach Bottom Units 2 and 3.

A001
NRR

Attachment 1 to this submittal provides the updated site-specific cost estimate for Hope Creek. Attachment 2 to this submittal provides the site-specific cost estimate for Salem Unit Nos. 1 and 2, and Attachment 3 to this submittal provides the site-specific cost estimate for Peach Bottom Units 2 and 3.

There are no commitments contained in this letter.

If you have any questions or require additional information, please do not hesitate to contact Ms. Emily Maguire at (856)339-1023.

Sincerely,

Paul R. Duke, Jr.
Licensing Manager

cc: Mr. W. Dean, Administrator, Region I, NRC
Mr. R. Ennis, Project Manager, NRC
NRC Senior Resident Inspector, Salem
NRC Senior Resident Inspector, Hope Creek
Mr. P. Mulligan, Manager IV, NJBNE
Mr. L. Marabella, Corporate Commitment Tracking Coordinator

Attachment 1

PSEG Nuclear LLC

Forty-Year Safstor
Decommissioning Cost Analysis

for the

Hope Creek Generating Station

September 15, 2011

Attachment 1

Table of Contents

I. Summary

This report presents estimates of the cost to decommission the Hope Creek Generating Station Unit 1 ("Hope Creek") following the end of the current licensed operating period ending on April 11, 2046.

This report relies in part on a December 2002 report by TLG Services entitled *Decommissioning Cost Analysis for the Hope Creek Generating Station Unit1* ("TLG Report"), with updates to account for the time value of money and a change in decommissioning method from DECON to a forty-year SAFSTOR. The TLG Report is included in its entirety in Appendix B to this report.

This report is based on two fundamental assumptions: (1) spent nuclear fuel ("SNF") management costs will be borne by the United States Government; and (2) Hope Creek will be placed in a forty-year period of safe storage following end of license in 2046.

While spent fuels management costs are discussed in this report and its appendices, those costs are contractually the responsibility of the Government of the United States[1], and are therefore not considered a liability that must be funded by the Hope Creek Decommissioning Trust Fund. The Salem/Hope Creek site has an Independent Spent Fuel Storage Installation ("ISFSI"), that is appropriately sized to receive all SNF generated from the Hope Creek unit through its licensed life.

PSEG Nuclear considered the following three decommissioning options for Hope Creek:

- DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license after cessation of operations. Until 2008, this was the strategy that was to be used to decommission Hope Creek.
- SAFSTOR: The facility is placed in a safe stable condition and maintained in that state until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the levels of radioactivity in and on the material and potentially the quantity of material that must be disposed of during decontamination and dismantlement. This is the method PSEG will use to decommission Hope Creek.
- ENTOMB: involves encasing radioactive structures, systems, and components in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that

---

[1] *See* US Department of Energy Contract No. DE-CR01-83NE44411, Hope Creek Generating Station Nos. 1 Unit Contract for Disposal of Spent Fuel and/or High-Level Radioactive Waste (Jun. 13, 1983), as amended.

permits termination of the license. Because most power reactors will have radionuclides in concentrations exceeding the limits for unrestricted use even after 100 years, this option will generally not be feasible and was not deemed to be viable for Hope Creek.

This report assumes a forty-year period of safe storage for the Hope Creek unit after end of its current licensed operating period[2]. PSEG Nuclear LLC, the Operator of Hope Creek, has chosen a forty year SAFSTOR period (approximately 7.6 half-lives of the radioactive isotope Cobalt 60) as a prudent measure to reduce overall radiation exposure to workers during the decommissioning period. An added benefit of the SAFSTOR method is that worker efficiency will be greater due to fewer radiological restrictions during performance of the work. However, economic benefits from gains in efficiency will be partially off-set by maintenance and security costs during the SAFSTOR period, and these costs have been explicitly addressed in this report.

II. Methodology

The TLG Report provided in Appendix B to this report provided the primary source of information related to costs associated with decommissioning Hope Creek. PSEG personnel used the information in that report to develop the estimate applicable to SAFSTOR described in this report.

Because costs were reported in the TLG Report in 2002 dollars, the first step in the process was to escalate the 2002 costs to 2010 dollars. This re-evaluation produced an increase adjustment of 27% for 2010 Labor & Equipment Costs over the 2002 TLG Report. The New Jersey labor rates from 2003 through 2010 as well as Construction Equipment Costs over the same time frame were used to develop the overall adjustment. The SAFSTOR Decommissioning value was arrived at by taking the 2010 immediate decommissioning cost and adjusting it to reflect significant reduction in residual radioactivity thereby reducing/eliminating the radiation hazards during the dismantling and demolition. This expected improvement will lead to a reduction in overall decommissioning cost, and that improvement is reflected in this study. Details of the adjustment factors used are provided in Table 2.

Aside from the conversion from 2002 to 2010 dollars, two other significant changes were made to update the 2002 TLG Report to address the current forty-year SAFSTOR strategy for Hope Creek. The first change involved shifting the initial costs for preparing the plant for decommissioning from the start of the seven-year decommissioning and dismantlement period assumed in the DECON scenario to prior to the start of the SAFSTOR period. These up-front costs are incurred in three years immediately following termination of operations. The second major change was adding a forty-year period of safe storage prior to final decommissioning. A timeline of these activities is shown in Appendix A to this report. Detailed information showing cash flows, major events, and assumptions is contained in a one-page summary in Table 5 of this report.

[2] The forty-year SAFSTOR period will begin after a three-year period during which systems are drained, fuel is removed, and the plants are readied for safe storage.

Attachment 1

III. Tables

Attachment 1

Table 1: Summary of Decommissioning Cost Elements- Hope Creek

Work Category [3]	Cost 2002$ (thousands)	Cost 2010$ (thousands)	Percent of Total Costs
Decontamination	30,745	39,046	2.4%
Removal	192,120	243,992	14.3%
Packaging	16,049	20,382	2.1%
Transportation	6,008	7,630	2.1%
Waste Disposal	132,615	168,421	14.6%
Off-Site Waste Processing	53,630	68,110	3.0%
Program Management (incl. Eng. and Security)	260,625	330,994	42.0%
Spent Fuel Pool Isolation	9,060	11,506	1.6%
ISFSI Related (including capital)	40,239	51,103	12.1%
Insurance and Regulatory Fees	7,148	9,078	2.1%
Energy	11,769	14,947	1.4%
Characterization and Licensing Surveys	13,937	17,700	1.2%
Misc. Equipment and Site Services	9,157	11,629	1.1%
Total	783,102	994,539	100.0%
License termination (10 CFR § 50.75 decommissioning activities) [4]		794,000	
Site Restoration (non- 50.75 activities)		128,500	

[3] Includes contingencies.

[4] This total includes spent fuel management.

Attachment 1

Table 2: Summary of Cost Efficiency Adjustments- Hope Creek

	Factors	TLG 2002$ (thousands)	TLG 2010$ (thousands)	SAFSTOR Adjustment Factors: Cost Efficiency Factor	SAFSTOR Adjustment Factors: Cost Reduction Adjustment Contam. To Decontam.	SAFSTOR 2010$ (thousands)
Decommissioning						
Non Contaminated	71%	$ 399,653	$ 507,559	90%	0%	$ 456,803
Contaminated	29%	$ 163,239	$ 207,313	0%	25%	$ 155,485
Spent Fuel Mgmt	100%	$ 50,144	$ 63,683	100%	0%	$ 63,683
Other Fixed	100%	$ 40,823	$ 51,845	100%	0%	$ 51,845
Sub-Total		$ 653,859	$ 830,400			$ 727,816
Contingency		$ 129,241	$ 164,136			$ 143,380
Total Hope Creek 1[5]		**$ 783,100**	**$ 994,537**			**$ 871,196**

[5] Individual line items are rounded so totals may vary slightly due to round-off error.

Attachment 1

Location: Hope Creek Generating Station
Project: Decommissioning of Nuclear Plants After Safe Storage

Decommissioning Cost For Hope Creek Nuclear Power Plant After Forty Years of Safe Storage

Analysis:

Bases of Cost - TLG Cost 2002

Plant Prep & Temp Service
Rigging Construction Control & Tooling
Security Staff (except Spent Fuel Mgt.)
Utility Staff (except Spent Fuel Mgt.)
Final Site Survey

Based on the cost of items to be decontaminated (from TLG estimate), determined that Contaminated Factors represent approx. 29% of the total cost to decommission a Nuclear Plant. Therefore, Non - contaminated factors represent approx. 71% of the total cost.

Cost Efficiency Factors:

The 2002 TLG Estimate was based on single unit demolition basis for Hope Creek, and in our review we acknowledge an economy scale should be applied since Salem and Hope Creek will be done in tandem. We will reference EPRI study ESC-4685 SIA 83-420 a Nuclear Power Construction study prepared by United & Construction Inc. that supports multi unit construction has efficiency reduction (summarized below).

Station	Reactor Type	Multi Unit Efficiency Direct Craft Labor		
		1-2	1-3	
Hope Creek	BWR	11%-22%	28%-36%	Data Source EPRI p. 3-79 & 3-80

Cost Assumptions:

Hope Creek -
In consideration of the EPRI study, efficiency reduced the variable costs. Fixed cost elements (see base cost allocation above) remain constant on a per unit basis. The TLG cost was reduced by 10% since this will be a mass demolition (non contaminated) vs. controlled demolition (contaminated)

The Spent Fuel will follow the same fact pattern and cash flow pattern as in the 2002 TLG Study for Hope Creek.

Since decommissioning after 40 yrs would be equivalent to normal demolition work in a Fossil Plant an additional allowance of 15% savings has been made to contaminated portion of the work only. (Working in a contaminated area can account for a loss of productivity of an additional 25% or 2 Man Hrs/Day). The breakdown of unproductive time is listed below, is based on field observations made at the nuclear sites.

Security:	0.5 MH	6.25%
Suit Up requirements (two times/day)	1 MH	12.5%
Clean up at the end of day	0.5 MH	6.3%
Total	2 MH	25.0%

The other factors affecting productivity in a contaminated area physical restrictions congestion, height adjustment in work space (crawl space or 40ft. In the air), outage schedule (comprised time line) and ALARA (level of allowance radiation) & proximity of other on going projects. The cost assumptions correspond to present circumstances and to the present status & availability of technology.

Attachment 1

Table 3: Hope Creek Unit 1 SAFSTOR vs. Non-SAFSTOR Summary of Costs
2010$
(millions)

Description	Non SAFSTOR TLG 2002	Non SAFSTOR TLG (esc.) 2010	SAFSTOR PSEG 2010
Site Specific Cost			
Lic. Termination	625.2	794.0	670.7
Spent Fuel Mgmt.	56.7	72.0	72.0
Site Restoration	101.2	128.5	128.5
Total (100% Share)	**783.1**	**994.5**	**871.2**
PSEG Share (w/Spent Fuel)[6]	**783.1**	**994.5**	**871.2**
Spent Fuel Costs	(56.7)	(72.0)	(72.0)
PS share (w/o Spent Fuel)	**726.4**	**922.5**	**871.2**
Site Restoration (PSEG Share)	(101.2)	(128.5)	(128.5)
PS share (w/o Site Restoration & Spent Fuel)	**625.2**	**794.0**	**742.7**

[6] The spent fuel management cost include an allocation from the contingency shown on table 2.

Attachment 1

TABLE 4: SCHEDULE OF ANNUAL EXPENDITURES
Hope Creek Unit 1 - SAFSTOR
(millions, 2010 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total	O&M Security During SAFSTOR
2046	6.9	0.2	0.2	0.0	0.5	7.8	
2047	35.2	4.0	1.1	0.9	3.9	45.1	
2048	10.2	1.8	1.0	1.0	5.1	19.1	
2049							2.6
2050							2.6
2051							2.6
2052							2.6
2053							2.6
2054							2.6
2055							2.6
2056							2.6
2057							2.6
2058							2.6
2059							2.6
2060							2.6
2061							2.6
2062							2.6
2063							2.6
2064							2.6
2065							2.6
2066							2.6
2067							2.6
2068							2.6
2069							2.6
2070							2.6
2071							2.6
2072							2.6
2073							2.6
2074							2.6
2075							2.6
2076							2.6
2077							2.6
2078							2.6
2079							2.6
2080							2.6
2081							2.6
2082							2.6
2083							2.6
2084							2.6
2085							2.6
2086							2.6
2087							2.6
2088							2.6
2089	38.8	2.2	0.9	0.0	1.7	43.6	
2090	38.3	13.1	0.9	24.4	10.4	87.1	
2091	57.5	17.0	1.3	39.2	15.7	130.7	
2092	141.6	19.6	2.2	41.4	13.0	217.8	
2093	111.5	15.7	3.5	29.6	13.9	174.2	

Attachment 1

2094	109.8	14.4	1.3	0.0	5.2	130.7	
2095	58.4	24.4	0.9	0.0	3.4	87.1	
Total	608.2	112.4	13.3	136.5	72.8	943.2	104.0

Table 5 Hope Creek 1 Cash Flows

Year	Annual Expenditures thousands 2010	DTF Fund Balance 2% Real Rate of Return dollars less expenditures	SAFSTOR Year	Notes
		399,298		Balance as of 12/31/2010
2011		407,284		
2012		415,430		
2013		423,738		Fund balances escalates at 2% per annum during remaining period of operation
2014		432,213		
2015		440,857		
2016		449,674		
2017		458,668		
2018		467,841		
2019		477,198		
2020		486,742		
2021		496,477		
2022		506,406		
2023		516,535		
2024		526,865		
2025		537,402		
2026		548,151		
2027		559,113		
2028		570,295		
2029		581,702		
2030		593,336		
2031		605,202		
2032		617,307		
2033		629,653		
2034		642,246		
2035		655,091		
2036		668,192		
2037		681,556		
2038		695,187		
2039		709,091		
2040		723,273		
2041		737,738		
2042		752,493		
2043		767,543		
2044		782,894		
2045		798,552		
2046	7,800	806,723		Expenses to put plant in SAFSTOR Condition, includes security and O&M
2047	45,100	777,757		
2048	19,100	774,213		
2049		787,097	1	Annual Security and O&M cost during SAFSTOR is $2.6MM PSEG
2050		800,238	2	
2051		813,644	3	
2052		827,316	4	
2053		841,263	5	
2054		855,488	6	
2055		869,998	7	
2056		884,798	8	
2057		899,894	9	
2058		915,292	10	
2059		930,997	11	
2060		947,017	12	
2061		963,358	13	
2062		980,025	14	
2063		997,025	15	
2064		1,014,366	16	
2065		1,032,053	17	
2066		1,050,094	18	

2067		1,068,496	19	
2068		1,087,266	20	
2069		1,106,411	21	
2070		1,125,940	22	
2071		1,145,858	23	
2072		1,166,176	24	
2073		1,186,899	25	
2074		1,208,037	26	
2075		1,229,598	27	
2076		1,251,590	28	
2077		1,274,022	29	
2078		1,296,902	30	
2079		1,320,240	31	
2080		1,344,045	32	
2081		1,368,326	33	
2082		1,393,092	34	
2083		1,418,354	35	
2084		1,444,121	36	
2085		1,470,404	37	
2086		1,497,212	38	
2087		1,524,556	39	
2088		1,552,447	40	
2089	43,600	1,539,896		Costs during 7-year decommissioning period includes security and O&M
2090	87,100	1,483,594		
2091	130,700	1,382,566		
2092	217,800	1,192,417		
2093	174,200	1,042,065		
2094	130,700	932,207		
2095	87,100	863,751		

Table 6: Decommissioning Waste Summary

Please see Table 5.1, Decommissioning Waste Summary, in the TLG Report, attached as Appendix B to this report.

Attachment 1

Table 7: Detailed Cost Analysis
Please see Appendix C in the TLG Report, attached as Appendix B to this report.

IV. Appendices
A. Time Line
B. December 2002 TLG Decommissioning Cost Analysis

Attachment 1

Appendix A: Time Line

Hope Creek 1

Activity	2046	2047	2048	2049 - 2088	2089	2090	2091	2092	2093	2094	2095
Shutdown through Transition	x	x	x								
Safe storage period				x							
Decommissioning and Site Restoration					x	x	x	x	x	x	x

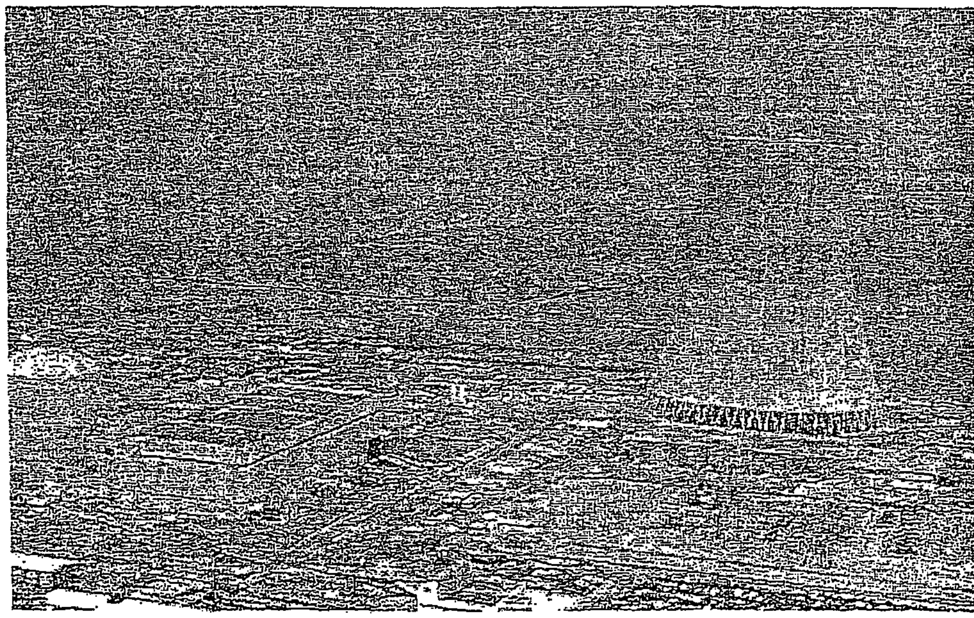
Attachment 1

Appendix B: December 2002 TLG Decommissioning Cost Analysis

DECOMMISSIONING COST ANALYSIS

for the

HOPE CREEK NUCLEAR GENERATING STATION



prepared for

PSEG NUCLEAR, LLC

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

December 2002

APPROVALS

Project Manager	William A. Cloutier, Jr.	12/4/02 Date
Project Engineer	Albert A. Koehl	12/4/02 Date
Technical Manager	Geoffrey M. Griffiths	12/5/02 Date
Quality Assurance Manager	Carolyn A. Palmer	12/05/02 Date

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLES

FIGURES

APPENDICES

REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
0		12-05-02		Original Issue

EXECUTIVE SUMMARY

This report presents the costs to promptly decommission (decontaminate and dismantle) the Hope Creek Nuclear Generating Station (Hope Creek) following a scheduled cessation of plant operation. The analysis relies upon the site-specific, technical information developed for a previous evaluation prepared in 1995-96, updated to reflect current plant conditions and operating assumptions. The estimate is designed to provide PSEG Power, LLC with sufficient information to assess its financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimate is based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The estimate incorporates a cooling period of approximately five years for the spent fuel that resides in the plant's storage pool when operations cease. Any residual fuel remaining in the pool after the five-year period will be relocated to an on-site, interim storage facility to await the transfer to a DOE facility. The estimate also includes the dismantling of non-essential structures and limited restoration of the site.

Alternatives and Regulations

The Nuclear Regulatory Commission (NRC) provided general decommissioning guidance in the rule adopted on June 27, 1988.[1] In this rule the NRC set forth technical and financial criteria for decommissioning licensed nuclear facilities. The regulations addressed planning needs, timing, funding methods, and environmental review requirements for decommissioning. The rule also defined three decommissioning alternatives as being acceptable to the NRC - DECON, SAFSTOR, and ENTOMB.

> DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."[2]

---

1 U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72 "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988.

2 Ibid. Page FR24022, Column 3.

SAFSTOR is defined as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use."[3] Decommissioning is to be completed within 60 years, although longer time periods will be considered when necessary to protect public health and safety.

ENTOMB is defined as "the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactive material decays to a level permitting unrestricted release of the property."[4] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years.

The 60-year restriction has limited the practicality of the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. As such, the NRC is currently re-evaluating this option and the technical requirements and regulatory actions that would be necessary for entombment to become a viable option.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning. Regulatory Guide 1.184, issued in July 2000, further describes the methods and procedures that are acceptable to the NRC staff for implementing the requirements of the 1996 revised rule that relate to the initial activities and the major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and process described in the amended regulations.

Methodology

The methodology used to develop the estimate described within this document follows the basic approach originally presented in the cost estimating guidelines[5] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference

3 Ibid.
4 Ibid. Page FR24023, Column 2.
5 T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

describes a unit factor method for determining decommissioning activity costs. The unit factors used in this analysis incorporate site-specific costs, and the latest available information on worker productivity in decommissioning.

The estimate also reflects lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee and San Onofre-1 nuclear units have provided additional insight into the process, the regulatory aspects, and technical challenges of decommissioning commercial nuclear units.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

Contingency

Consistent with industry practice, contingencies are applied to the decontamination and dismantling costs developed as "specific provision for unforeseeable elements of cost within the defined project scope, particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."[6] The cost elements in the estimate is based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a safety factor issue. Safety factors provide additional security and address situations that may never occur. Contingency funds, by contrast, are expected to be fully expended throughout the program. Inclusion of contingency is necessary to provide assurance that sufficient funding will be available to accomplish the intended tasks.

6 Project and Cost Engineers' Handbook, Second Edition, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, p. 239.

Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Disposal Act" in 1980, and its Amendments of 1985,[7] the states became ultimately responsible for the disposition of radioactive waste generated within their own borders.

New Jersey is a member of the three-state Atlantic Interstate Low-Level Radioactive Waste Management Compact, formed after South Carolina formally joined the Northeast Regional Compact. The Barnwell Low-Level Radioactive Waste Management Facility, located in South Carolina, is expected to be available to PSEG Nuclear to support the decommissioning of Hope Creek. It is also assumed that PSEG Nuclear could access other disposal sites should it prove cost effective. As such, rate schedules for both the Barnwell and the Envirocare facility in Utah were used to generate disposal costs.

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[8] in 1982, assigning the responsibility for disposal of spent nuclear fuel created by the commercial nuclear generating plants to the DOE. This legislation also created a Nuclear Waste Fund to cover the cost of the program, which is funded by the sale of electricity from nuclear reactors since 1993, and an estimated equivalent value for assemblies irradiated prior to 1983. The Nuclear Waste Policy Act, along with the individual disposal contracts with utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. Operation of DOE's yet-to-be constructed geologic repository is currently scheduled for the year 2010, assuming that the licensing could be completed expeditiously and a national transportation system established. The agency has no plans for receiving spent fuel from commercial nuclear plant sites prior to this date and startup operations may be phased in, creating additional delays.

The NRC requires licensees to establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE. For estimating purposes, PSEG Nuclear has assumed that the high-level waste repository, or some interim storage facility, will be fully

7 "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1/15/86.

8 "Nuclear Waste Policy Act of 1982 and Amendments," U.S. Department of Energy's Office of Civilian Radioactive Management, 1982.

operational by 2015. Interim storage of the fuel, until the DOE has completed the transfer, will be in an independent facility located on the Artificial Island site. This will allow PSEG Nuclear to proceed with decommissioning and terminate its operating licenses in the shortest time possible.

The spent fuel storage facility, which is independently licensed and operated, will be sized to accommodate the inventory of spent fuel residing in the plant's storage pools at the cessation of operations, in addition to any operational inventory already in residence. When emptied, the station could be dismantled without maintaining the wet storage pools. Based upon this scenario, and an anticipated rate of transfer, spent fuel is projected to remain on site for approximately 20 years following the cessation of plant operations.

Site Restoration

The efficient removal of the contaminated materials at the site may result in damage to many of the site structures. Blasting, coring, drilling, and the other decontamination activities will substantially damage power block structures, potentially weakening the footings and structural supports. Prompt demolition once the license is terminated is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized is more efficient and less costly than if the process were deferred. Experience at shutdown generating stations has shown that plant facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and to the demolition work force. Consequently, this study assumes that site structures will be removed to a nominal depth of three feet below the local grade level wherever possible. The site will then be graded and stabilized.

Summary

The DECON decommissioning alternative involves the prompt removal of the contaminated and activated plant components, including structural materials, from the site following permanent shutdown. The facility operator may then have unrestricted use of the site with no further requirement for a license. This study assumes that the remainder of the non-essential plant systems and structures, not previously removed in support of license termination, are dismantled and the site restored.

The scenario analyzed for the purpose of generating the estimate is described in Section 2. The assumptions are presented in Section 3, along with schedules of annual expenditures. The major cost contributors are identified in Section 6, with detailed activity costs, waste volumes, and associated manpower requirements delineated in Appendix C. A cost summary is provided at the end of this section for the major cost components.

COST SUMMARY
(Thousands of 2002 Dollars)

Activity	Cost
Decontamination	30,745
Removal	192,120
Packaging	16,049
Transportation	6,008
Waste Disposal	132,615
Off-site Waste Processing	53,630
Program Management (including Engineering and Security)	260,625
Spent Fuel Pool Isolation	9,060
ISFSI Related (including capital)	40,239
Insurance and Regulatory Fees	7,148
Energy	11,769
Characterization and Licensing Surveys	13,937
Misc. Equipment and Site Services	9,157
Total [1]	783,102
License Termination [2]	681,889
Site Restoration	101,213

[1] Columns may not add due to rounding.
[2] Includes spent fuel management expenditures.

1. INTRODUCTION

This decommissioning analysis is designed to provide PSEG Power with sufficient information to prepare the financial planning documents for decommissioning, as required by the Nuclear Regulatory Commission (NRC or Commission). It is not a detailed assessment, but a financial analysis prepared in advance of the engineering and planning that will be required to carry out the decommissioning of the Hope Creek Nuclear Generating Station (Hope Creek).

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the costs to decommission Hope Creek for the scenario outlined in Section 2; to define a sequence of events, and project the volume of waste produced from the decontamination and dismantling activities.

For the purposes of this study, the shutdown date was taken as April 11, 2026. This time frame, which reflects 40 years of operating life, was used as an input for scheduling the decommissioning activities.

1.2 SITE DESCRIPTION

Hope Creek is located on the southern part of Artificial Island on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County, New Jersey. The site is 15 miles south of the Delaware Memorial Bridge, 18 miles south of Wilmington, Delaware, 30 miles southwest of Philadelphia, Pennsylvania, and 7½ miles southwest of Salem, New Jersey.

The Nuclear Steam Supply System (NSSS) consists of a boiling water reactor and a two-loop recirculation system. The generating unit has a rated core thermal power of 3,293 MWt (thermal) with a corresponding gross electrical output of approximately 1,118 MWe and a net electrical output of 1,067 megawatts (electric).

The two-loop reactor recirculation system contains two, vertical centrifugal pumps and is located within the "primary containment structure." This structure consists of the drywell, the suppression system, and interconnecting vent system. The drywell is a steel pressure vessel in the shape of a light bulb. The pressure suppression chamber is a torus-shaped steel pressure vessel located below and encircling the drywell.

This chamber is connected to the drywell by eight equally spaced vent pipes. These vent pipes are connected to a common header within the suppression chamber. Eighty downcomers, connected to the header, terminate below the water level of the suppression pool. As a system, the drywell, suppression chamber, and interconnecting piping, acts to reduce the pressure increase in the event of a local process system piping failure.

Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of steam produced in the reactor vessel into mechanical shaft power and then into electrical energy. The unit's turbine generator consists of a tandem compound, six-flow, non-reheat unit. It is comprised of one double-flow, high-pressure turbine and three double-flow, low-pressure turbines driving a direct-coupled generator at 1,800 rpm. The turbine is operated in a closed feedwater cycle, which condenses the steam; the condensate/feedwater is returned to the reactor recirculation system. Heat rejected in the main condenser is removed by the circulating water system.

The circulating water system is designed to circulate the flow of water required to removed the heat load from the main condenser and other auxiliary equipment and to discharge it to the atmosphere through a natural draft cooling tower. Some heat may be rejected to the Delaware estuary from the cold water side of the cooling tower in the form of blowdown.

1.3 REGULATORY GUIDANCE

The NRC provided initial decommissioning guidance in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988.[1]* This rule set forth technical and financial criteria for decommissioning licensed nuclear facilities. The regulation addressed decommissioning planning needs, timing, funding methods, and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors,"[2] which provided guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the content and form of the financial assurance mechanisms indicated in the rule amendments.

* Annotated references for citations in Sections 1-6 are provided in Section 7.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB. It also placed limits on the time allowed to complete the decommissioning process. For SAFSTOR, the process is restricted in overall duration to 60 years unless it could be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the definition of unrestricted release and license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some if not most reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC is considering rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. Pending completion of such rulemaking, entombment requests will be handled on a case-by-case basis.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants.[3] When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the operating license life. Since that time, several licensees permanently and prematurely ceased operations without having submitted a decommissioning plan. In addition, these licensees requested exemptions from certain operating requirements as being unnecessary once the reactor is defueled. Each case was handled individually without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The new amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees would submit written certification to the NRC within 30 days after the decision to cease operations. Certification would also be required once the fuel was permanently removed from the reactor vessel. Submittal of these notices would entitle the licensee to a fee reduction and eliminate the obligation to follow certain requirements needed only during operation of the reactor. Within two years of submitting notice of permanent cessation of operations, the licensee would be required to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC. The PSDAR describes the planned decommissioning activities, the associated sequence and schedule, and an estimate of expected costs. Prior to completing decommissioning, the licensee would be required to submit an application to the NRC to terminate the license, along with a license termination plan (LTP).

1.3.1 Nuclear Waste Policy Act

Congress passed the Nuclear Waste Policy Act[4] in 1982, assigning the responsibility for disposal of spent nuclear fuel from the commercial nuclear generating plants to the Department of Energy (DOE). Two permanent disposal facilities were envisioned, as well as an interim facility. To recover the cost of permanent spent fuel disposal, this legislation created a Nuclear Waste Fund through which money was to be collected from the consumers of the electricity generated by commercial nuclear power plants. The Nuclear Waste Policy Act, along with the individual disposal contracts with utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

After pursuing a national site selection process, the Act was amended in 1987 to designate Yucca Mountain, Nevada, as the only site to be evaluated for geologic disposal of high-level waste. Also in 1987, the DOE announced a five-year delay in the opening date for the repository, from 1998 to 2003. Two years later, in 1989, an additional 7-year delay was announced, primarily due to problems in obtaining the required permits from the state of Nevada to perform the required characterization of the site.

Generators have responded to this impasse by initiating legal action and constructing supplemental storage as a means of maintaining necessary operating margins. In a recent decision, the U.S. Court of Appeals for the Federal Circuit reaffirmed the utility position that DOE had breached its contractual obligation. However, even with the August 2000 ruling,[5] DOE's position has remained unchanged. The agency continues to maintain that its delayed performance is unavoidable because it does not have an operational repository and does not have authority to provide storage in the interim. Consequently, DOE has no plans to receive spent fuel from commercial U.S. reactors before the year 2010.

The NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy in 10 CFR 50.54 (bb).[6] This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimates, as described below.

For estimating purposes, PSEG Nuclear has assumed that the high-level waste repository, or some interim storage facility, will be fully operational by 2015. Interim storage of the fuel, until the DOE has completed the transfer, will be in an independent facility located on the Artificial Island site. This will allow PSEG Nuclear to proceed with decommissioning and terminate its operating license in the shortest time possible.

Based upon the projected capacity of the spent fuel storage pool, supplemental storage will be required before the current operating license expires so as to maintain full core off-load capability. Therefore, this analysis assumes that an on-site independent spent fuel storage installation (ISFSI) will be constructed to support plant operation and will be available to support decommissioning

The spent fuel storage facility, which is independently licensed and operated, will be sized to accommodate the inventory of spent fuel residing in the plant's storage pool at the cessation of operations, in addition to any operational inventory already in residence. When emptied, the station could be dismantled without maintaining the wet storage pool. Based upon this scenario, and an anticipated rate of transfer, spent fuel is projected to remain on site for approximately 20 years following the cessation of plant operations.

Expenditures are included in the analysis for the isolation and continued operation of the spent fuel pool throughout the first five years of decommissioning. Expenses are also included for loading the spent fuel assemblies remaining in the storage pool after the cessation of plant operation into multi-purpose canisters, for canister costs and overpacks, and for the operation of the ISFSI through the year 2046, when all the fuel is expected to be transferred to the DOE.

1.3.2 Low-Level Radioactive Waste Policy Amendments Act

Congress passed the "Low-Level Radioactive Waste Disposal Act" in 1980, declaring the states as being ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. The federal law encouraged the formation of regional groups or compacts to implement this objective safely, efficiently and economically, and set a target date of 1986. With little progress, the "Amendments Act" of 1985[7] extended the target, with specific milestones and stiff sanctions for non-compliance.

New Jersey is a member of the three-state Atlantic Interstate Low-Level Radioactive Waste Management Compact, formed after South Carolina formally joined the Northeast Regional Compact. The Barnwell Low-Level Radioactive Waste Management Facility, located in South Carolina, is expected to be available to PSEG Nuclear to support the decommissioning of Hope Creek. It is also assumed that PSEG Nuclear could access other disposal sites should it prove cost-effective. As such, rate schedules for both the Barnwell as well as the Envirocare facility in Utah were used to generate disposal costs.

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination,"[8] amending Part 20 of Title 10 of the Code of Federal Regulations (10 CFR §20). This subpart provided radiological criteria for releasing a facility for unrestricted use. The regulation provides that the site could be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimate for Hope Creek assumes that the site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). An additional limit of 4 millirem per year, as defined in 40 CFR Part 141.16, is applied to drinking water.

On October 9, 2002, the NRC signed an agreement with the EPA on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding (MOU) provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC authority. The MOU also includes provisions for NRC and EPA consultation for certain sites when, at the time of license termination, (1) groundwater contamination exceeds EPA-permitted levels; (2) NRC contemplates restricted release of the site; and/or (3) residual radioactive soil concentrations exceed levels defined in the MOU.

The MOU does not impose any new requirements on NRC licensees and should reduce the involvement of EPA with NRC licensees who are decommissioning. Most sites are expected to meet the NRC criteria for unrestricted use, and the NRC believes that only a few sites will have groundwater or soil contamination in excess of the levels specified in the MOU that trigger consultation with EPA. However, if there are other hazardous materials on the site, EPA may be involved in the cleanup. As such, the possibility of dual regulation remains for certain licensees.

2. DECOMMISSIONING ALTERNATIVE

The following section describes the basic activities associated with the DECON decommissioning alternative. Although detailed procedures for each activity identified are not provided, and the actual sequence of work may vary, the activity descriptions provide a basis not only for estimating, but also for the expected scope of work, i.e., engineering and planning at the time of decommissioning.

The conceptual approach that the NRC has described in its regulations divides decommissioning into three phases. The initial phase commences with the effective date of permanent cessation of operations and involves the transition of both plant and licensee from reactor operations, i.e., power production, to facility de-activation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

The second phase encompasses activities during the storage period or during major decommissioning activities, or a combination of the two. The third phase pertains to the activities involved in license termination. The decommissioning estimates developed for Hope Creek are also divided into phases or periods; however, demarcation of the phases is based upon major milestones within the project or significant changes in the projected expenditures.

2.1 PERIOD 1 – PREPARATIONS

In anticipation of the cessation of plant operations, detailed preparations are undertaken to provide a smooth transition from plant operations to site decommissioning. Through implementation of a staffing transition plan, the organization required to manage the intended decommissioning activities is assembled from available plant staff and outside resources. Preparations include the planning for permanent defueling of the reactor, revision of technical specifications applicable to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

2.1.1 Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a

local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure, i.e., without specific NRC approval. Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing Greater-than-Class C waste (GTCC), as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

- foreclose release of the site for possible unrestricted use,
- significantly increase decommissioning costs,
- cause any significant environmental impact, or
- violate the terms of the licensee's existing license.

Existing operational technical specifications are reviewed and modified to reflect plant conditions and the safety concerns associated with permanent cessation of operations. The environmental impact associated with the planned decommissioning activities is also considered. Typically, a licensee will not be allowed to proceed if the consequences of a particular decommissioning activity are greater than bounded by previously evaluated environmental assessments or impact statements. In this instance, the licensee would have to submit a license amendment for the specific activity and update the environmental report.

The decommissioning program outlined in the PSDAR will be designed to accomplish the required tasks within the ALARA guidelines (as defined in 10 CFR §20) for protection of personnel from exposure to radiation hazards. It will also address the continued protection of the health and safety of the public and the environment during the dismantling activity. Consequently, in conjunction with the development of the PSDAR, activity specifications, cost-benefit and safety analyses, work packages and procedures must be assembled in support of the proposed decontamination and dismantling activities.

2.1.2 Site Preparations

Following final plant shutdown, and in preparation for actual decommissioning activities, the following activities are initiated:

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), sampling of internal piping contamination levels, and primary shield cores.

- Isolation of the spent fuel storage pool and fuel handling systems, such that decommissioning operations could commence on the balance of the plant. Decommissioning operations are scheduled around the fuel handling area to the greatest extent possible such that the overall project schedule is optimized. The fuel will be transferred to the DOE as it decays to the point that it meets the heat load criteria of the containers and, as such, it is assumed that the fuel pool will remain operational for a minimum of five years following the cessation of plant operations.

- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.

- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.2 PERIOD 2 – DECOMMISSIONING OPERATIONS

Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.

- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Building

modifications may be required to the Reactor Building to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the Reactor Building to support the segmentation of the reactor vessel internals and component extraction.

- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Disconnection of the control blades from the drives on the vessel lower head. Blades are transferred to the spent fuel pool for packaging.
- Transfer of the steam separator and dryer assemblies to the dryer-separator pool for segmentation. Segmentation will maximize the loading of the shielded transport casks, i.e., by weight and activity. The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly, segmentation and packaging of the core shroud and in-core guide tubes. Some of the material is expected to exceed Class C disposal requirements. As such, those segments will be packaged in a modified fuel canister for geologic disposal. Interim storage can be in the pool, as space permits, or in the ISFSI.
- Removal and segmentation of the remaining internals including the jet pump assemblies, fuel support castings and core plate assembly.
- Draining and decontamination of the reactor well and permanently sealing of the spent fuel transfer gate. Install shielded platform for segmentation of reactor vessel. Cutting operations are performed in-air using remotely operated equipment within a contamination control envelope, with the water level maintained just below the cut to minimize the working area dose rates.

Sections are transferred to the dryer-separator pool for packaging and interim storage.

- Disconnection of the control rod drives and instrumentation tubes from reactor vessel lower head. The lower reactor head and vessel supporting structure will then be segmented.

- Removal of the reactor recirculation pumps. Exterior surfaces are decontaminated and openings covered. Components can serve as their own burial containers provided that all penetrations are properly sealed.

- Demolition of the sacrificial shield activated concrete by controlled demolition.

At least two years prior to the anticipated date of license termination, a LTP is required. Submitted as a supplement to the Final Safety Analysis Report (FSAR), or equivalent, the plan must include: a site characterization, description of the remaining dismantling activities, plans for site remediation, procedures for the final radiation survey, designation of the end use of the site, an updated cost estimate to complete the decommissioning, and any associated environmental concerns. The NRC will notice the receipt of the plan, make the plan available for public comment, and schedule a local hearing. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).

- Removal of the steel liners from the drywell, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/ contaminated concrete.

- Removal of the steel liners from the steam separator and dryer pool, reactor well, and spent fuel storage pool.

- Surveys of the decontaminated areas of the containment structure.

- Removal of the contaminated equipment and material from the Turbine and Radwaste Buildings and any other contaminated facility. Use radiation and contamination control techniques until radiation surveys indicate that the structures could be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and components (both clean and contaminated) located within these buildings. This activity will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).
- Routing of material removed in the decontamination and dismantling to a central processing area. Material certified to be free of contamination would be released for unrestricted disposition, e.g., as scrap, recycle, or general disposal. Contaminated material is characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in NUREG/CR-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM).[9] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies state-of-the-art, commercially available, instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate the operating license if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release.

2.3 PERIOD 3 – SITE RESTORATION

Following completion of decommissioning operations, site restoration activities may begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits may result in substantial damage to many of the structures. Although performed in a controlled and safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade power block structures, including the Reactor, Auxiliary, and Fuel Handling Buildings. Verifying that subsurface radionuclide concentrations meet NRC site release requirements may require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process is deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and future workers. Abandonment creates a breeding ground for vermin infestation and other biological hazards.

This cost study presumes that non-essential structures and site facilities will be dismantled as a continuation of the decommissioning activity. Foundations and exterior walls are removed to a nominal depth of three feet below grade. The three-foot depth allows for the placement of gravel for drainage, and topsoil so that vegetation can be established for erosion control. Site areas affected by the dismantling activities are restored and the plant area graded as required to prevent ponding and inhibit the refloating of subsurface materials.

Concrete rubble produced by demolition activities is processed to remove rebar and miscellaneous embedments. The processed material is then used on-site to backfill voids. Excess materials are trucked off-site for disposal as construction debris.

2.4 POST PERIOD 3 – ISFSI OPERATIONS

The ISFSI will continue to operate under a separate and independent license (10 CFR §72) following the relocation of the spent fuel from the plant's storage pools. Transfer of spent fuel to a DOE or interim facility will be exclusively from the ISFSI once the fuel pools have been emptied and the structures released for decommissioning. Assuming initiation of the federal Waste Management System in 2015, transfer of spent fuel from Hope Creek is anticipated to continue through the year 2046. Any delay in the transfer process, for example, due to a delay in the scheduled opening of the geologic repository, a slower acceptance rate, or a combination of a delayed start date and lower transfer rate, will result in a longer on-site residence time for the fuel discharge from the reactor, and therefore additional caretaking expenses.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the §72 license if it determines that the remediation of the ISFSI has been performed in accordance with an ISFSI license termination plan and that the final radiation survey and associated documentation demonstrate that the facility is suitable for release. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

The currently proposed design for the ISFSI is based upon the use of concrete overpacks for pad storage. For purposes of this cost analysis, it is assumed that once the inner canisters containing the spent fuel assemblies have been removed and the license for the facility terminated, the modules can be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad is then removed, and the area graded and landscaped to conform to the surrounding environment.

3. COST ESTIMATE

The cost estimate prepared for decommissioning Hope Creek consider the unique features of the site, including the nuclear steam supply system, power generation systems, support services, site buildings, and ancillary facilities. The bases of the estimate, including the sources of information relied upon, the estimating methodology employed, site-specific considerations and other pertinent assumptions are described in this section.

3.1 BASIS OF ESTIMATE

The current estimate was developed using the basic design information originally generated for the decommissioning analysis prepared in 1995-96.[10] The information was reviewed for the current estimate and updated, as deemed necessary. The site-specific considerations and assumptions used in the previous estimate were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

The methodology used to develop this cost estimate follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[11] and the US DOE "Decommissioning Handbook."[12] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.[13]

This estimate reflects lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, and San Onofre-1 nuclear units has provided additional insight into the process, the

regulatory aspects, and technical challenges of decommissioning commercial nuclear units.

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, ensures that essential elements have not been omitted. Appendix A presents the detailed development of a typical unit factor. Appendix B provides the values contained within one set of factors developed for this analysis.

Work Difficulty Factors

TLG has historically applied work difficulty adjustment factors (WDFs) to account for the inefficiencies in working in a power plant environment. WDFs were assigned to each unique set of unit factors, commensurate with the inefficiencies associated with working in confined, hazardous environments. The ranges used for the WDFs are as follows:

• Access Factor	10% to 20%
• Respiratory Protection Factor	10% to 50%
• Radiation/ALARA Factor	10% to 37%
• Protective Clothing Factor	10% to 30%
• Work Break Factor	8.33%
• Productivity	adjustable

The factors and their associated range of values were developed in conjunction with the AIF/NESP-036 study. The application of the factors is discussed in more detail in that publication.

Scheduling Program Durations

The unit factors, adjusted by the WDFs as described above, are applied against the inventory of materials to be removed in the radiologically controlled areas. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities relied upon productivity information available from the "Building Construction Cost Data" publication.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field

engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

3.3 FINANCIAL COMPONENTS OF THE COST MODEL

TLG's proprietary decommissioning cost model, DECCER, produces a number of distinct cost elements. These direct expenditures, however, do not comprise the total cost to accomplish the project goal, i.e., license termination and site restoration.

Inherent in any cost estimate that does not rely on historical data is the inability to specify the precise source of costs imposed by factors such as tool breakage, accidents, illnesses, weather delays, and labor stoppages. In TLG's DECCER cost model, contingency fulfills this role. Contingency is added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude; therefore, this cost analysis includes funds to cover these types of expenses.

3.3.1 Contingency

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook"[14] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this estimate are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a "safety factor issue." Safety factors provide additional security and address situations that may never occur. Contingency funds are

expected to be fully expended throughout the program. They also provide assurance that sufficient funding is available to accomplish the intended tasks. An estimate without contingency, or from which contingency has been removed, could disrupt the orderly progression of events and jeopardize a successful conclusion to the decommissioning process.

For example, the most technologically challenging task in decommissioning a commercial nuclear station will be the disposition of the reactor vessel and internal components, which have become highly radioactive after a lifetime of exposure to radiation produced in the core. The disposition of these highly radioactive components forms the basis for the critical path (schedule) for decommissioning operations. Cost and schedule are inter-dependent and any deviation in schedule has a significant impact on cost for performing a specific activity.

Disposition of the reactor vessel internals involves the underwater cutting of complex components that are highly radioactive. Costs are based upon optimum segmentation, handling, and packaging scenarios. The schedule is primarily dependent upon the turnaround time for the heavily shielded shipping casks, including preparation, loading, and decontamination of the containers for transport. The number of casks required is a function of the pieces generated in the segmentation activity, a value calculated on optimum performance of the tooling employed in cutting the various subassemblies. The risk and uncertainties associated with this task are that the expected optimization may not be achieved, resulting in delays and additional program costs. For this reason, contingency must be included to mitigate the consequences of the expected inefficiencies inherent in this complex activity, along with related concerns associated with the operation of highly specialized tooling, field conditions, and water clarity.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies can range from 0% to 75%, depending on the degree of difficulty judged to be appropriate

from TLG's actual decommissioning experience. The contingency values used in this study are as follows:

Decontamination	50%
Contaminated Component Removal	25%
Contaminated Component Packaging	10%
Contaminated Component Transport	15%
Low-Level Radioactive Waste Disposal	25%
Reactor Segmentation	75%
NSSS Component Removal	25%
Reactor Waste Packaging	25%
Reactor Waste Transport	25%
Reactor Vessel Component Disposal	50%
GTCC Disposal	15%
Non-Radioactive Component Removal	15%
Heavy Equipment and Tooling	15%
Supplies	25%
Engineering	15%
Energy	15%
Characterization and Termination Surveys	30%
Construction	15%
Taxes and Fees	10%
Insurance	10%
Staffing	15%

The overall contingency, when applied to the appropriate components of the estimates on a line item basis, results in an average value of 19.8%.

3.3.2 Financial Risk

In addition to the routine uncertainties addressed by contingency, another cost element that is sometimes necessary to consider when bounding decommissioning costs relates to uncertainty, or risk. Examples can include changes in work scope, pricing, job performance, and other variations that could conceivably, but not necessarily, occur. Consideration is sometimes necessary to generate a level of confidence in the estimate, within a range of probabilities. TLG considers these types of costs under the broad term "financial risk." Included within the category of financial risk are:

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.

- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.

- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.

- Regulatory changes, e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal.

- Policy decisions altering national commitments, e.g., in the ability to accommodate certain waste forms for disposition, or in the timetable for such.

- Pricing changes for basic inputs, such as labor, energy, materials, and burial. Some of these inputs may vary slightly, e.g. -10% to +20%; burial could vary from -50% to +200% or more.

It has been TLG's experience that the results of a risk analysis, when compared with the base case estimate for decommissioning, indicate that the chances of the base decommissioning estimate's being too high is a low probability, and the chances that the estimate is too low is a much higher probability. This is mostly due to the pricing uncertainty for low-level radioactive waste burial, and to a lesser extent due to schedule increases from changes in plant conditions and to pricing variations in the cost of labor (both craft and staff). This cost study, however, does not add any additional costs to the estimate for financial risk since there is insufficient historical data from which to project future liabilities. Consequently, it is recommended that the areas of

uncertainty or risk be revisited periodically and addressed through repeated revisions or updates of the base estimate.

3.4 SITE-SPECIFIC CONSIDERATIONS

There are a number of site-specific considerations that affect the method for dismantling and removal of equipment from the site and the degree of restoration required. The cost impact of the considerations identified below is included in this cost study.

3.4.1 Spent Fuel

The cost to dispose of the spent fuel generated from plant operations is not reflected within the estimate to decommission Hope Creek. Ultimate disposition of the spent fuel is within the province of the DOE's Waste Management System, as defined by the Nuclear Waste Policy Act. As such, the disposal cost is financed by a 1 mill/kWhr surcharge paid into the DOE's waste fund during operations. However, the NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy. This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimate, as described herein.

The total inventory of assemblies that will need to be handled during decommissioning is based upon several assumptions. The pickup of commercial fuel is assumed to begin in the year 2015 and will proceed on an oldest fuel first basis. The rate at which the fuel is removed from the commercial sites is based upon an annual capacity at the geologic repository of 3,000 metric tons. A delay in the startup of the repository, or a decrease in the rate of acceptance rate, will correspondingly prolong the transfer process and extend the duration that the fuel remains at the site.

For estimating purposes, spent fuel will be removed from the Hope Creek site during, and following decommissioning, with the transfer complete by the end of year 2046. Built to support continuing plant operations, an ISFSI will be available to support decommissioning, i.e., the fuel residing in the pool following the cessation of plant operations could be relocated to the ISFSI so that decommissioning can proceed on the Reactor Building. The assemblies will be relocated to the ISFSI during the first five years following final shutdown. Costs are included for the purchase of the 25 canisters and overpacks required to empty the pool (an additional five will be used to package the GTCC).

Operation and maintenance costs for the ISFSI are included within the estimates and address the cost for staffing the facility, security, insurance, and licensing fees. Costs are also provided for the final disposition of the facility once the transfer is complete.

ISFSI Design Considerations

A multi-purpose (storage and transport) dry shielded storage canister with a vertical, reinforced concrete storage silo is used as a basis for the cost analyses. Approximately 50% of the silos are assumed to have some level of neutron-induced activation as a result of the long-term storage of the fuel, i.e., to levels exceeding free-release limits. Approximately 10% of the concrete and steel is assumed to be removed from the overpacks for controlled disposal. The cost of the disposition of this material, as well as the demolition of the ISFSI facility, is included in the estimate.

3.4.2 Reactor Vessel and Internal Components

The NSSS (reactor vessel and reactor recirculation system components) will be decontaminated using chemical agents prior to the start of cutting operations. A decontamination factor (average reduction) of 10 is presumed.

The reactor pressure vessel and internal components are segmented for disposal in shielded, reusable transportation casks. Segmentation will be performed in the dryer-separator pool, where a turntable and remote cutter are installed. The vessel will be segmented in place, using a mast-mounted cutter supported off the lower head and directed from a shielded work platform installed overhead in the reactor well. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology.

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal, i.e., GTCC. Although the material is not classified as high-level waste, DOE has indicated it will accept title to this waste for disposal at the future high-level waste repository.[15] However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has

been packaged and disposed of as high-level waste, at a cost equivalent to that envisioned for the spent fuel. It is not anticipated that DOE would accept this waste prior to completing the transfer of spent fuel. Therefore, until such time as the DOE is ready to accept GTCC waste, it is reasonable to assume that this material would remain in storage at Hope Creek.

Intact disposal of the reactor vessel and internal components could provide savings in cost and worker exposure by eliminating the complex segmentation requirements, isolation of the GTCC material, and transport/storage of the resulting waste packages. Portland General Electric (PGE) was able to dispose of the Trojan reactor as an intact package. However, the location of the Trojan Nuclear Plant on the Columbia River simplified the transportation analysis since:

- the reactor package could be secured to the transport vehicle for the entire journey, i.e., the package was not lifted during transport,
- there were no man-made or natural terrain features between the plant site and the disposal location that could produce a large drop, and
- transport speeds were very low, limited by the overland transport vehicle and the river barge.

As a member of the Northwest Compact, PGE had a site available for disposal of the package, the US Ecology facility in Washington State. The characteristics of this arid site proved favorable in demonstrating compliance with land disposal regulations.

It is not known whether this option will be available when Hope Creek ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, as a bounding condition, the study assumes the reactor vessel will have to be segmented.

3.4.3 Primary System Components

Reactor recirculation piping is cut from the reactor vessel once the water level in the vessel (used for personnel shielding during dismantling and cutting operations in and around the vessel) is dropped below the nozzle zone. The piping is boxed and shipped by shielded van. The reactor recirculation pumps and motors are lifted out intact, packaged, and transported for processing or disposal.

3.4.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condenser will also be disassembled and moved to a laydown area. Material will then be prepared for transportation to an off-site recycling facility where it will be surveyed and designated for decontamination, volume reduction, or conventional disposal or controlled disposal. Components will be packaged and readied for transport in accordance with the intended disposition.

3.4.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessel and internal components will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49 of the Code of Federal Regulations.[16] The contaminated material will be packaged in Industrial Packages (IP I, II, or III) for transport unless demonstrated to qualify as their own shipping containers. The reactor vessel and internal components are expected to be transported in accordance with §71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Transport of the highly activated metal, produced in the segmentation of the reactor vessel and internal components, will be by shielded truck cask. Cask shipments may exceed 95,000 pounds, including vessel segment(s), supplementary shielding, cask tie-downs, and tractor-trailer. The maximum level of activity per shipment assumed permissible was based upon the license limits of the available shielded transport casks.

The segmentation scheme for the vessel and internal segments are designed to meet these limits.

The transport of large intact components, e.g., large heat exchangers and other oversized components, will be by a combination of truck, barge, and/or multi-wheeled transporter.

The low-level radioactive waste requiring controlled disposal will be sent to one of two currently available burial facilities. Transportation costs are based upon the mileage to either the Envirocare facility in Clive, Utah, or the Barnwell facility in South Carolina. Memphis, Tennessee will be used as the destination for off-site processing. Transportation costs are estimated using published tariffs from Tri-State Motor Transit.[17]

3.4.6 Low-Level Radioactive Waste Disposal

To the greatest extent practical, metallic material generated in the decontamination and dismantling processes will be treated to reduce the total volume requiring controlled disposal. The treated material, meeting the regulatory and/or site release criterion, will be released as scrap, requiring no further cost consideration. Conditioning and recovery of the waste stream will be performed off site at a licensed processing center.

Material requiring controlled disposal will be packaged and transported to one of two currently available burial facilities. Very low-level radioactive material, e.g., structural steel and contaminated concrete, will be sent to Envirocare. More highly contaminated and activated material will be sent to Barnwell. Disposal fees are based upon current charges for operating waste with surcharges added for the highly activated components, e.g., generated in the segmentation of the reactor vessel.

3.4.7 Site Conditions Following Decommissioning

The NRC will terminate (or amend) the site licenses if it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the next step in the decommissioning process, as well as PSEG Nuclear's own future plans for the site, e.g., the electrical switchyard will remain in support of the electrical transmission and distribution system.

The large underground tunnels between the cooling water intake, Turbine Building, and cooling tower will be isolated, sealed, and abandoned in place. Site utility and service piping are abandoned in place. Electrical manholes are backfilled with suitable earthen material and abandoned. Asphalt surfaces in the immediate vicinity of site buildings are broken up and the material used for backfill on site, if needed. The site access road will remain.

The estimate does not assume the remediation of any significant volume of contaminated soil. This assumption may be affected by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

Structures will be removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities will be processed and made available as clean fill. The site will be graded following the removal of non-essential structures to conform to the adjacent landscape, and vegetation will be established to inhibit erosion. This degree of site restoration will constitute compliance with the CAFRA document dated July 9, 1976.

3.5 ASSUMPTIONS

The following are the major assumptions made in the development of the estimate for decommissioning the site. Decommissioning activities will be performed in accordance with the current regulations that are assumed to be in place at the time of decommissioning, including the Industrial Site Recovery Act (ISRA), which is mandatory under current New Jersey State Regulations.

3.5.1 Estimating Basis

The study follows the principles of ALARA through the use of work duration adjustment factors. These factors address the impact of activities such as radiological protection instruction, mock-up training, and the use of respiratory protection and protective clothing. The factors lengthen a task's duration, increasing costs and lengthening the overall schedule. ALARA planning is considered in the costs for engineering and planning, and in the development of activity specifications and detailed procedures. Changes to worker exposure limits may impact the decommissioning cost and project schedule.

3.5.2 Labor Costs

The craft labor required to decontaminate and dismantle the nuclear units will be acquired through standard site contracting practices. The current cost of labor at the site is used as an estimating basis. Costs for site administration, operations, construction, and maintenance personnel are based upon average salary information provided by PSEG Nuclear.

PSEG Nuclear, as the licensee, will oversee the decommissioning operations and provide site security, radiological controls, and overall site administration. PSEG Nuclear will provide contract management of the decommissioning labor force and subcontractors. Engineering services for preparing the activity specifications, work procedures, activation, and structural analyses, are provided by PSEG Nuclear personnel.

The costs associated for the transition of the operating organization to decommissioning, e.g., separation packages, retraining, severance, and incentives are not included in this estimate and are considered to be ongoing operating expenses.

3.5.3 Design Conditions

Any fuel cladding failure that occurred during the lifetime of the plant is assumed to have released fission products at sufficiently low levels that the buildup of quantities of long-lived isotopes (e.g., cesium-137, strontium-90, or transuranics) has been prevented from reaching levels exceeding those that permit the major NSSS components to be shipped under current transportation regulations and disposal requirements.

The curie contents of the vessel and internals at final shutdown are derived from those listed in NUREG/CR-3474.[18] Actual estimates are derived from the curie/gram values in NUREG/CR-3474 and adjusted for the different mass of Hope Creek components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from NUREG/CR-0130[19] and NUREG/CR-0672[20] and benchmarked to the long-lived values from NUREG/CR-3474.

The disposal cost for the control blades removed from the vessel with the final core load is included within the estimate. Disposition of any blades stored in the pools from operations is considered an operating expense and therefore not accounted for in the estimates.

Activation of the Reactor Building structure is confined to the sacrificial shield in this estimate. More extensive activation (at very low levels) of the interior structures within containment has been detected at several reactors and the owners have elected to dispose of the affected material at a controlled facility rather than reuse the material as fill on site or send it to a landfill. The ultimate disposition of the material removed from the Reactor Building will depend upon the site release criteria selected and the designated end use for the site.

3.5.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by PSEG Nuclear and its subcontractors. The warehouses may be dismantled as they become surplus to the decommissioning program. The plant's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Excess acid, caustic, and all chemicals listed (at shutdown) in the New Jersey "Right to Know Report" will be removed and the storage container returned to the vendor. It is assumed that these chemicals will have some value; therefore, the cost for their removal will be compensated through their subsequent sale.

Scrap and Salvage

The existing plant equipment is considered obsolete and suitable for scrap as deadweight quantities only. PSEG Nuclear will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG for equipment in this estimate are not consistent with removal techniques required for salvage (resale) of equipment. Experience has indicated that some buyers wanted equipment stripped down to very specific requirements before they would consider purchase. This required expensive rework after the equipment had been removed from its installed location. Since placing a salvage value on this machinery and equipment would be speculative, and the value would be small in comparison to the overall decommissioning expenses, this estimate does not attempt to quantify the value that PSEG Nuclear may realize based upon those efforts.

It is assumed, for purposes of this estimate, that any value received from the sale of scrap generated in the dismantling process would be more than offset by the on-site processing costs. The dismantling techniques assumed in the decommissioning estimate do not include the additional cost for size reduction and preparation to meet "furnace ready" conditions. For example, the recovery of copper from electrical cabling from a facility currently being decommissioned has required the removal and disposition of the PCB-contaminated insulation, an added expense. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. This assumption is an implicit recognition of scrap value in the disposal of clean metallic waste at no additional cost to the project.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other such items of personal property owned by PSEG Nuclear will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other generating facilities. Spare parts will also be made available for alternative use.

Energy

For estimating purposes, the plant is assumed to be de-energized, with the exception of those facilities associated with spent fuel storage. Replacement power costs are used for the cost of energy consumption during decommissioning for tooling, lighting, ventilation, and essential services.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance and the limits for coverage defined in the NRC's proposed rulemaking "Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors." The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

Property Taxes

Property tax payments will cease upon shutdown of each unit.

Site Modifications

The perimeter fence and in-plant security barriers will be moved, as appropriate, to conform to the Site Security Plan in force during the various stages of the project.

3.6 COST ESTIMATE SUMMARY

The costs projected for the decommissioning of Hope Creek are provided in Table 3.1. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2002 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure.

The annual expenditures are based upon the detailed activity costs reported in Appendix C, along with the schedule discussed in Section 4.

TABLE 3.1
SCHEDULE OF ANNUAL EXPENDITURES BY PERIOD
(Thousands, 2002 Dollars)

Year	Period 1 Preparations	Period 2 Decommissioning Operations	Period 3 Site Restoration	Period 4 Dry Fuel Storage *	Period 5 ISFSI Decommissioning	Totals
2026	38,285					38,285
2027	55,590	30,410				86,000
2028		135,734				135,734
2029		99,099				99,099
2030		81,337				81,337
2031		89,928				89,928
2032		98,728				98,728
2033		19,599	24,792			44,391
2034			49,179			49,179
2035			38,804	105		38,910
2036				500		500
2037				499		499
2038				499		499
2039				499		499
2040				500		500
2041				499		499
2042				499		499
2043				499		499
2044				500		500
2045				499		499
2046				14,090	2,429	16,519
	93,874	554,835	112,775	19,188	2,429	783,102

* Operating and decommissioning costs for the ISFSI are shared with the Salem Station

4. SCHEDULE ESTIMATE

The schedule for the decommissioning scenario considered in this study follows the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints. In addition, the scheduling has been revised to reflect the required cooling period for the spent fuel.

A schedule or sequence of activities is presented in Figure 4.1. The schedule reflects the prompt decommissioning alternative and the start date consistent with a scheduled shutdown in 2026. The sequence assumes that fuel will be removed from the spent fuel pool within the first five years. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the Appendix C cost table, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2000" computer software.[21]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

The schedule was generated using a precedence network and associated software. Activity durations are based upon the actual man-hour estimates calculated for each area. The schedule was assembled by sequencing the work areas, considering work crew availability and material access/egress. The following assumptions were made in the development of the decommissioning schedule:

- The Reactor Building will continue to serve as the spent fuel storage/ transfer facility until such time that all spent fuel has been removed from site. The Reactor Building is expected to operate for approximately five years after the cessation of operations.

- All work (except vessel and internals removal activities) will be performed during an 8-hour workday, 5 days per week, with no overtime. There are eleven paid holidays per year.

- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.

- Multiple crews work parallel activities to the maximum extent possible, consistent with: optimum efficiency; adequate access for cutting, removal

and laydown space; and the stringent safety measures necessary during demolition of heavy components and structures.

- For plant systems removal, the systems with the longest removal durations in areas on the critical path are considered to determine the duration of the activity.

4.2 PROJECT SCHEDULE

The period-dependent costs presented in Appendix C are based upon the durations developed in the schedule for the decommissioning of Hope Creek. Durations are established between several milestones in each project period; these durations are used to establish a critical path for the entire project. In turn, the critical path duration for each period is used as the basis for determining the period-dependent costs.

The project timeline is shown in this section as Figure 4.2. Milestone dates are based on a 40-year plant operating life from the issuance of the operating license, a five-year wet storage period for the last core discharge, and continued operation of the ISFSI until DOE can complete the transfer.

FIGURE 4.1

DECOMMISSIONING ACTIVITY SCHEDULE

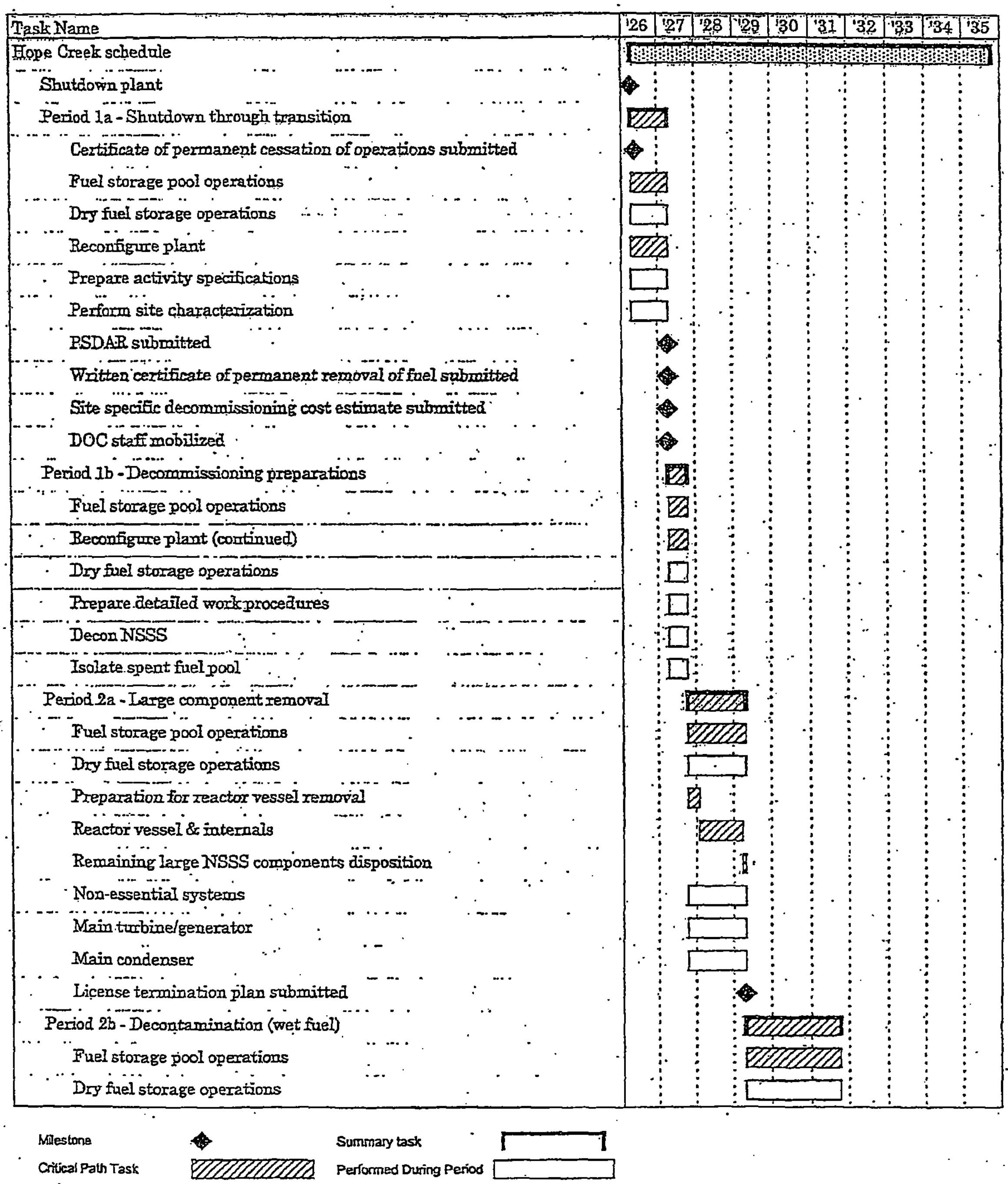


FIGURE 4.1

(continued)

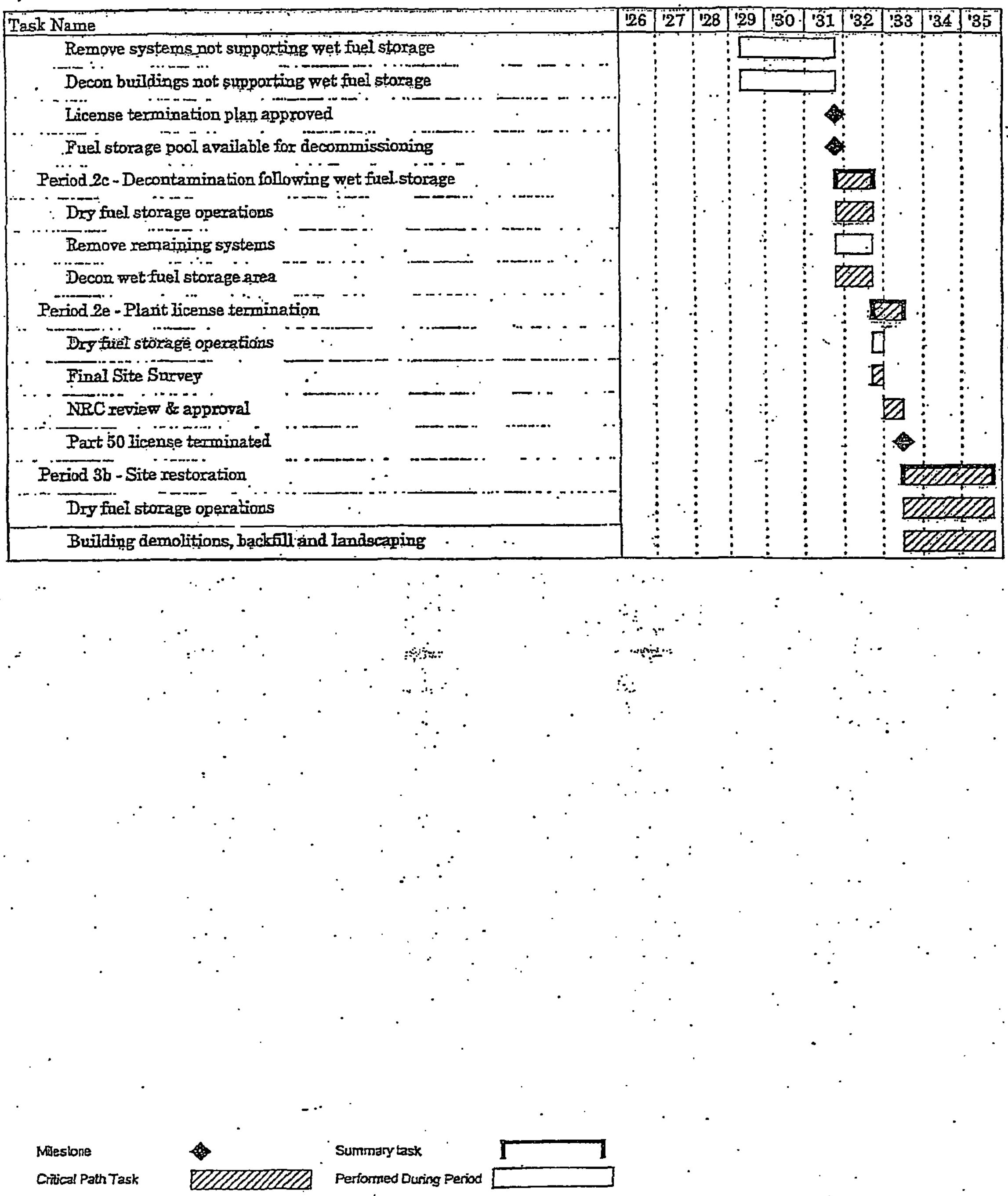
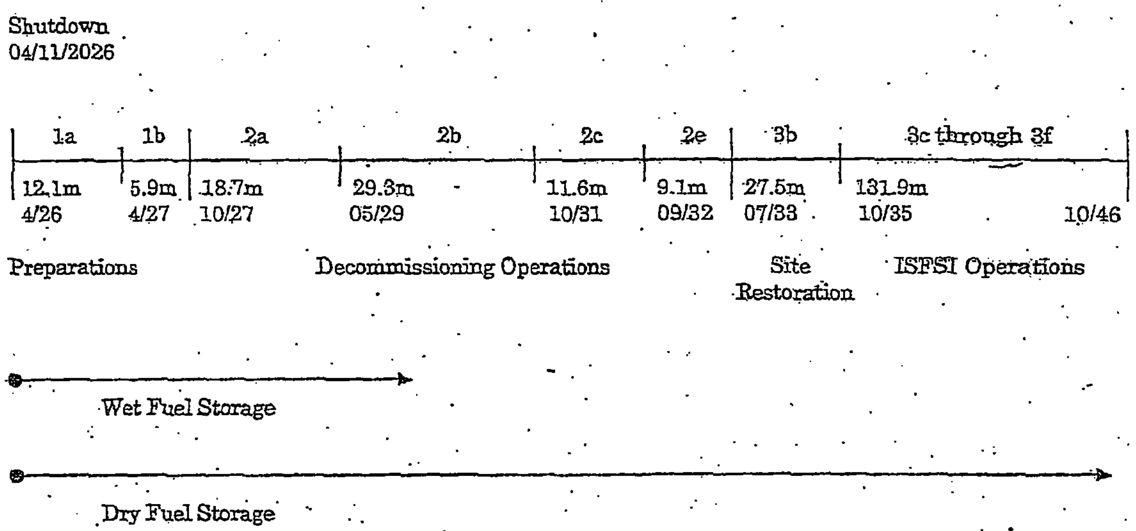


FIGURE 4.2

DECOMMISSIONING TIMELINE
(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,[22] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations delineates the production, utilization, and disposal of radioactive materials and processes. In particular, 10 CFR §71 defines radioactive material and 10 CFR §61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR §173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3). For this study, commercially available steel containers are presumed to be used for the disposal of piping, small components, and concrete. Larger components can serve as their own containers, with proper closure of all openings, access ways, and penetrations.

The volumes of radioactive waste generated during the various decommissioning activities at the site are shown on a line-item basis in Appendix C and summarized in Table 5.1. The quantified waste volume summary shown in this table is consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material. The volumes are calculated on the displaced volume of components serving as their own waste containers.

The reactor vessel and internals are categorized as large quantity shipments and, accordingly, will be shipped in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume and the special handling requirements of the payload. Packaging efficiencies are lower for the highly activated materials (greater than Type A quantity waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

No process system containing/handling radioactive substances at shutdown is presumed to meet material release criteria by decay alone, i.e., systems radioactive at shutdown will still be radioactive over the time period during which the decommissioning is accomplished, due to the presence of long-lived radionuclides. While the dose rates decrease with time, radionuclides such as ^{137}Cs will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of Hope Creek will primarily be generated during Period 2. Material considered potentially contaminated when removed from the radiologically controlled area will be sent to processing facilities for conditioning and disposal at a unit cost of $2.00 per pound. Heavily contaminated components and activated materials will be routed for controlled disposal. The disposal volumes reported in the table reflects the savings resulting from reprocessing and recycling.

For purposes of constructing the estimate, the rate schedule for the Barnwell facility was used as a proxy for the higher activity waste. This schedule was used to estimate the disposal fees for the majority of plant components and activated concrete deemed unsuitable for processing or recovery. An average disposal rate of $415 per cubic foot was used, with additional surcharges for activity, dose rate and/or handling added, as appropriate for the particular package.

The remaining volume of contaminated metallic and concrete debris will be disposed of at the Envirocare facility. This includes lower activity material such as miscellaneous steel, metal siding, scaffolding and structural steel. A rate of $298 per cubic foot was used for containerized waste, $70 per cubic foot for disposal of DAW, and approximately $20 per cubic foot for bulk material, e.g., concrete.

TABLE 5.1

DECOMMISSIONING WASTE SUMMARY

	Waste Class[1]	Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste			
Barnwell, South Carolina (contaminated/activated metallic waste and concrete)			
	A	107,679	9,328,192
	B	20,945	3,230,562
	C	918	64,020
Envirocare, Utah (miscellaneous steel, contaminated/activated concrete)			
Containerized/DAW	A	48,467	4,386,491
Bulk	A	49,513	2,656,402
Geologic Repository (Greater-than Class C)			
	>C	851	166,199
Total[2]		228,374	19,831,866
Processed Waste (Off-Site)		233,125	
Scrap Metal			224,718,000

[1] Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55
[2] Columns may not add due to rounding.

6. RESULTS

Costs were developed to decommission Hope Creek following a scheduled cessation of plant operations. The analysis relied upon the site-specific, technical information developed for a previous analysis prepared in 1995-96, then updated to reflect current plant conditions and operating assumptions. While not an engineering study, the estimate does provide PSEG Nuclear with sufficient information to assess its financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimate described in this report is based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenario assumes continued operation of the plant's spent fuel pool for approximately five years following the cessation of operations for continued cooling of the assemblies. An ISFSI will be used to safeguard the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository. The scenario also includes the costs for the dismantling of non-essential structures and limited restoration of the site.

The cost projected to promptly decommission Hope Creek is estimated to be $783.1 million. The majority of this cost (approximately 87.1%) is associated with the physical decontamination and dismantling of the nuclear unit and caretaking of the spent fuel, so that the license could be terminated. The remaining 12.9% is for the demolition of the remaining structures and limited restoration of the site.

The primary cost contributors, identified in Table 6.1, are either labor-related or associated with the management and disposition of the radioactive waste. Program management is the largest single contributor to the overall cost. The magnitude of the expense is a function of both the size of the organization required to manage the decommissioning and the duration of the program. It is assumed, for purposes of this analysis, that PSEG Nuclear will oversee the decommissioning program, managing the decommissioning labor force and the associated subcontractors. The size and composition of the management organization varies with the decommissioning phase and associated site activities. However, once the operating license has been terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel.

As described in this report, the spent fuel pool will remain operational for approximately five years following the cessation of plant operation. The pool will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the Reactor Building. Over the five-year period, the spent fuel will be packaged into transportable steel canisters for loading into a DOE-provided transport cask. The canisters will be stored in concrete overpacks at the ISFSI until DOE is able to receive them. Dry storage of the fuel under a separate license provides additional flexibility in the event DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses incurred by PSEG Nuclear.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the lower level material, including concrete and structural steel, will be at the Envirocare facility. The more highly radioactive material will be sent to the Barnwell facility, with the exception of selected reactor vessel components. Highly activated components, requiring additional isolation from the environment, are packaged for geologic disposal. The cost of geologic disposal is based upon a cost equivalent for spent fuel.

A significant portion of the metallic waste is designated for additional processing and treatment at an off-site facility. Processing reduces the volume of material requiring controlled disposal through such techniques and processes as survey and sorting, decontamination and volume reduction. The material that cannot be unconditionally released will be packaged for controlled disposal at one of the currently operating facilities. The costs identified for processing are all-inclusive, incorporating the ultimate disposition of the material.

Removal costs reflect the labor-intensive nature of the decommissioning process and the management controls required to ensure a safe and successful program. Decontamination and packaging costs also have a large labor component that is based upon prevailing union wages. Non-radiological demolition is a natural extension of the decommissioning process. The methods employed in decontamination and dismantling are generally destructive and indiscriminate in inflicting collateral damage. With a work force mobilized to support decommissioning operations, non-radiological demolition can be an integrated activity and a logical expansion of the work being performed in the process of terminating the operating license. Prompt demolition reduces future liabilities and could be more cost-effective than deferral, due to the ultimate deterioration of facilities (and therefore the working conditions).

The reported cost for transport includes the tariffs and surcharges associated with moving large components and/or overweight shielded casks overland, as well as the general expense, e.g., labor and fuel, of transporting material to the destinations identified in this report. For purposes of this estimate, material will be primarily moved overland by truck.

Decontamination will be used to reduce the plant's radiation fields and minimize worker exposure. Slightly contaminated material or material located within a contaminated area will be sent to an off-site processing center, i.e., this estimate does not assume that contaminated plant components and equipment could be economically decontaminated for uncontrolled release in-situ. Centralized processing centers have proven to be a more efficient means of handling the large volumes of material produced in the dismantling of a nuclear unit.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling, isotopic analysis and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also need to be confirmed and will add to the expense of surveying the facilities alone.

The remaining costs include allocations for heavy equipment and temporary services, and other expenses such as regulatory fees and the premiums for nuclear insurance. While site operating costs are greatly reduced following the final cessation of plant operations, certain administrative functions do need to be maintained either at a basic functional or regulatory level.

TABLE 6.1

SUMMARY OF DECOMMISSIONING COST ELEMENTS

Work Category	Cost 2002$ (thousands)	Percent of Total Costs
Decontamination	30,745.4	3.9
Removal	192,120.4	24.5
Packaging	16,049.0	2.0
Transportation	6,008.1	0.8
Waste Disposal	132,615.0	16.9
Off-site Waste Processing	53,629.8	6.8
Program Management (including Engineering and Security)	260,624.7	33.3
Spent Fuel Pool Isolation	9,060.3	1.2
ISFSI Related (including capital)	40,238.9	5.1
Insurance and Regulatory Fees	7,147.7	0.9
Energy	11,768.5	1.5
Characterization and Licensing Surveys	13,936.8	1.8
Misc. Equipment and Site Services	9,156.8	1.2
Total	783,101.6	100.0

Note: Columns may not add due to rounding

7. REFERENCES

1. U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72, "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988.

2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," August 1990.

3. U.S. Code of Federal Regulations, Title 10, Parts 2, 50 and 51, "Decommissioning of Nuclear Power Reactors," Nuclear Regulatory Commission, Federal Register Volume 61 (p 39278 et seq.), July 29, 1996.

4. "Nuclear Waste Policy Act of 1982 and Amendments," U.S. Department of Energy's Office of Civilian Radioactive Management, 1982.

5. Maine Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company, and Yankee Atomic Power Company v. United States, U.S. Court of Appeals for the Federal Circuit decision, Docket No. 99-5138, -5139, -5140, August 31, 2000.

6. U.S. Code of Federal Regulations, Title 10, Part 50 — Domestic Licensing of Production and Utilization Facilities, Subpart 54 (bb), "Conditions of Licenses," January 2001 Edition.

7. "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, January 15, 1986.

8. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Radiological Criteria for License Termination," Federal Register, Volume 62, Number 139 (p 39058 et seq.), July 21, 1997.

9. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG/CR-1575, EPA 402-R-97-016, December 1997.

10. "Decommissioning Cost Estimate for the Hope Creek Nuclear Generating Station," Document No. P07-1180-004, TLG Services, Inc., September 1996.

11. T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

7. REFERENCES
(continued)

12. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980.

13. "Building Construction Cost Data 2002," Robert Snow Means Company, Inc., Kingston, Massachusetts.

14. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984.

15. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995.

16. U.S. Department of Transportation, Section 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178, 1996.

17. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-109397 and Supplements, 2000.

18. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. August 1984.

19. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1978.

20. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1980.

21. "Microsoft Project 2000," Microsoft Corporation, Redmond, WA, 1997.

22. "Atomic Energy Act of 1954," (68 Stat. 919).

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

APPENDIX A
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 waste processing area.

2. CALCULATIONS

Act ID	Activity Description	Activity Duration	Critical Duration
a	Remove insulation	60	(b)
b	Mount pipe cutters	60	60
c	Install contamination controls	20	(b)
d	Disconnect inlet and outlet lines	60	60
e	Cap openings	20	(d)
f	Rig for removal	30	30
g	Unbolt from mounts	30	30
h	Remove contamination controls	15	15
i	Remove, wrap in plastic, send to the waste processing area	60	60
	Totals (Activity/Critical)	355	255

Duration adjustment(s):	
+ Respiratory protection adjustment (50% of critical duration)	128
+ Radiation/ALARA adjustment (37.08% of critical duration)	95
Adjusted work duration	478
+ Protective clothing adjustment (30% of adjusted duration)	143
Productive work duration	621
+ Work break adjustment (8.33 % of productive duration)	52
Total work duration min	673 min

*** Total duration = 11.217 hr ***

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate ($/hr)	Cost
Laborers	3.00	11.217	40.61	1,366.57
Craftsmen	2.00	11.217	56.29	1,262.81
Foreman	1.00	11.217	60.17	674.93
General Foreman	0.25	11.217	67.66	189.74
Fire Watch	0.05	11.217	40.61	22.78
Health Physics Technician	1.00	11.217	45.90	514.86
Total labor cost				$4,031.69

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Gas torch consumables 1 @ $4.57/hr x 1 hr {1}	$4.57
-Blotting paper 50 @ $0.47 sq ft {2}	$23.50
-Plastic sheets/bags 50 @ $0.12/sq ft {3}	$6.00
Subtotal cost of equipment and materials	$34.07
Overhead & sales tax on equipment and materials @ 16.00 %	$5.45
Total costs, equipment & material	$39.52

TOTAL COST:

Removal of contaminated heat exchanger <3000 pounds: $4,071.21

Total labor cost:	$4,031.69
Total equipment/material costs:	$39.52
Total craft labor man-hours required per unit:	81.884

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the AIF (now NEI) program to standardize nuclear decommissioning cost estimates 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 (2002) Division 01590, Section 400-6360 pg 24
  2. McMaster-Carr Ed. 106 pg 1778
  3. R.S. Means (2002) Division 01540, Section 800-0200 pg 17

- Material and consumable costs were adjusted using the regional indices for Wilmington, Delaware.

APPENDIX B

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

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean instrument and sampling tubing, $/linear foot	0.46
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	4.80
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	6.93
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	13.70
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	26.29
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	34.03
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	50.10
Removal of clean pipe >36 inches diameter, $/linear foot	59.60
Removal of clean valves >2 to 4 inches	91.18
Removal of clean valves >4 to 8 inches	136.96
Removal of clean valves >8 to 14 inches	262.88
Removal of clean valves >14 to 20 inches	340.30
Removal of clean valves >20 to 36 inches	501.04
Removal of clean valves >36 inches	595.95
Removal of clean pipe fittings >2 to 4 in	101.25
Removal of clean pipe fittings >4 to 8 in	160.64
Removal of clean pipe fittings >8 to 14 in	262.88
Removal of clean pipe fittings >14 to 20	340.30
Removal of clean pipe fittings > 20 to 36	501.04
Removal of clean pipe hangers for small bore piping	28.12
Removal of clean pipe hangers for large bore piping	103.45
Removal of clean pumps, <300 pound	227.86
Removal of clean pumps, 300-1000 pound	640.33
Removal of clean pumps, 1000-10,000 pound	2,542.96
Removal of clean pumps, >10,000 pound	4,906.95

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean pump motors, 300-1000 pound	271.14
Removal of clean pump motors, 1000-10,000 pound	1,061.82
Removal of clean pump motors, >10,000 pound	2,389.10
Removal of clean turbine-driven pumps > 10,000 pounds	6,577.50
Removal of clean heat exchanger <3000 pound	1,363.81
Removal of clean heat exchanger >3000 pound	3,417.62
Removal of clean feedwater heater/deaerator	9,646.37
Removal of clean moisture separator/reheater	19,849.31
Removal of clean tanks, <300 gallons	293.47
Removal of clean tanks, 300-3000 gallons	931.33
Removal of clean tanks, >3000 gallons, $/square foot surface area	7.81
Removal of clean electrical equipment, <300 pound	126.22
Removal of clean electrical equipment, 300-1000 pound	441.45
Removal of clean electrical equipment, 1000-10,000 pound	882.90
Removal of clean electrical equipment, >10,000 pound	2,112.91
Removal of clean electrical transformers < 30 tons	1,467.39
Removal of clean electrical transformers > 30 tons	4,225.80
Removal of clean standby diesel-generator, <100 kW	1,498.81
Removal of clean standby diesel-generator, 100 kW to 1 MW	3,345.43
Removal of clean standby diesel-generator, >1 MW	6,925.72
Removal of clean electrical cable tray, $/linear foot	11.66
Removal of clean electrical conduit, $/linear foot	5.08
Removal of clean mechanical equipment, <300 pound	126.22
Removal of clean mechanical equipment, 300-1000 pound	441.45
Removal of clean mechanical equipment, 1000-10,000 pound	882.90
Removal of clean mechanical equipment, >10,000 pound	2,112.91
Removal of clean HVAC equipment, <300 pound	126.22

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean HVAC equipment, 300-1000 pound	441.45
Removal of clean HVAC equipment, 1000-10,000 pound	882.90
Removal of clean HVAC equipment, >10,000 pound	2,112.91
Removal of clean HVAC ductwork, $/pound	0.48
Removal of contaminated instrument and sampling tubing, $/linear foot	1.42
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	18.49
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	32.88
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	52.70
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	103.92
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	125.17
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	174.16
Removal of contaminated pipe >36 inches diameter, $/linear foot	206.34
Removal of contaminated valves >2 to 4 inches409.23	
Removal of contaminated valves >4 to 8 inches491.64	
Removal of contaminated valves >8 to 14 inches	1,004.93
Removal of contaminated valves >14 to 20 inches	1,279.12
Removal of contaminated valves >20 to 36 inches	1,707.42
Removal of contaminated valves >36 inches	2,029.16
Removal of contaminated pipe fittings >2 to 4 inches	222.48
Removal of contaminated pipe fittings > 4 to 8 inches	562.42
Removal of contaminated pipe fittings > 8 to 14 inches	1,004.93
Removal of contaminated pipe fittings > 14 to 20 inches	1,279.12
Removal of contaminated pipe fittings >20 to 36 inches	1,707.42
Removal of contaminated pipe hangers for small bore piping	96.90
Removal of contaminated pipe hangers for large bore piping 317.71	
Removal of contaminated pumps, <300 pound	872.56
Removal of contaminated pumps, 300-1000 pound	2,038.66
Removal of contaminated pumps, 1000-10,000 pound	6,721.04

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated pumps, >10,000 pound	16,369.44
Removal of contaminated pump motors, 300-1000 pound	856.70
Removal of contaminated pump motors, 1000-10,000 pound	2,726.06
Removal of contaminated pump motors, >10,000 pound	6,120.23
Removal of contaminated turbine-driven pumps < 10,000 pounds	18,918.88
Removal of contaminated heat exchanger <3000 pound	4,071.21
Removal of contaminated heat exchanger >3000 pound	11,752.21
Removal of contaminated feedwater heater / deaerator	28,760.26
Removal of contaminated moisture separator / reheater	63,002.71
Removal of contaminated tanks, <300 gallons	1,448.59
Removal of contaminated tanks, >300 gallons, $/square foot	28.80
Removal of contaminated electrical equipment, <300 pound	684.21
Removal of contaminated electrical equipment, 300-1000 pound	1,664.73
Removal of contaminated electrical equipment, 1000-10,000 pound	3,204.54
Removal of contaminated electrical equipment, >10,000 pound	6,299.81
Removal of electrical transformers < 30 tons	5,079.02
Removal of electrical transformers > 30 tons	12,470.88
Removal of standby diesel-generator, < 100 kW	4,387.47
Removal of standby diesel-generator, 100 kW to 1 MW	9,471.87
Removal of standby diesel-generator, >1 MW	20,474.76
Removal of contaminated electrical cable tray, $/linear foot	32.93
Removal of contaminated electrical conduit, $/linear foot	14.92
Removal of contaminated mechanical equipment, <300 pound	761.89
Removal of contaminated mechanical equipment, 300-1000 pound	1,841.14
Removal of contaminated mechanical equipment, 1000-10,000 pound	3,538.42

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated mechanical equipment, >10,000 pound	6,299.81
Removal of contaminated HVAC equipment, <300 pound	761.89
Removal of contaminated HVAC equipment, 300-1000 pound	1,841.14
Removal of contaminated HVAC equipment, 1000-10,000 pound	3,538.42
Removal of contaminated HVAC equipment, >10,000 pound	6,299.81
Removal of contaminated HVAC ductwork, $/pound	3.03
Removal of clean standard reinforced concrete, $/cubic yard	72.07
Removal of grade slab concrete, $/cubic yard	204.33
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	211.46
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	267.46
Removal of below-grade suspended floors, $/cubic yard	316.55
Removal of clean monolithic concrete structures, $/cubic yard	1,897.58
Removal of clean foundation concrete, $/cubic yard	626.97
Removal of clean hollow masonry block wall, $/cubic yard	75.24
Removal of clean solid masonry block wall, $/cubic yard	75.24
Placement of concrete for below-grade voids, $/cubic yard	99.90
Removal of subterranean tunnels/voids, $/ linear foot	141.76
Backfill of below grade voids, $/cubic yard	17.31
Excavation of clean material, $cubic yard	3.05
Removal of clean building metal siding, $/square foot	1.34
Removal of standard asphalt roofing, $/square foot	2.15
Removal of Galbestos panels, $/square foot	2.19
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	12.54
Scabbling contaminated concrete floors, $/square foot	7.42
Scabbling contaminated concrete walls, $/square foot	8.15
Scabbling contaminated ceilings, $/square foot	73.38
Removal of clean overhead cranes/monorails < 10 ton capacity, each	623.14
Removal of contaminated overhead cranes/monorails < 10 ton capacity, ea.	1,734.71

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean overhead cranes/monorails >10-50 ton capacity, each	1,495.51
Removal of contaminated overhead cranes/monorails >10-50 ton capacity, each	4,162.61
Removal of polar cranes > 50 ton capacity, each	6,286.50
Removal of gantry cranes > 50 ton capacity, each	26,411.28
Removal of clean structural steel, $/pound	0.35
Removal of clean steel floor grating, $/square foot	3.19
Removal of contaminated steel floor grating, $/square foot	9.69
Removal of clean free-standing steel liner, $/square foot	33.75
Removal of clean concrete-anchored steel liner, $/square foot	5.85
Removal of contaminated concrete-anchored steel liner, $/square foot	39.31
Placement of scaffolding in clean areas, $/square foot	13.73
Placement of scaffolding in contaminated areas, $/square foot	22.10
Removal of chain link fencing, $/linear foot	2.10
Removal of asphalt pavement, $/square foot	1.05
Core drilling 2 to 4 inch diameter, linear foot	354.68

APPENDIX C

DETAILED COST ANALYSES

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
...IOD 1a - Shutdown through Transition																					
...od 1a Direct Decommissioning Activities																					
.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	95	14	109	109	-	-	-	-	-	-	-	-	-	1,300
.1.2	Notification of Cessation of Operations									a											
.1.3	Remove fuel & source material									n/a											
.1.4	Notification of Permanent Defueling									a											
.1.5	Deactivate plant systems & process waste									a											
.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	146	22	168	168	-	-	-	-	-	-	-	-	-	2,000
.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	336	50	386	386	-	-	-	-	-	-	-	-	-	4,500
.1.8	Perform detailed rad survey									a											
.1.9	Estimate by-product inventory	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
.1.10	End product description	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
.1.11	Detailed by-product inventory	-	-	-	-	-	-	95	14	109	109	-	-	-	-	-	-	-	-	-	1,300
.1.12	Define major work sequence	-	-	-	-	-	-	547	82	629	629	-	-	-	-	-	-	-	-	-	7,500
.1.13	Perform SER and EA	-	-	-	-	-	-	226	34	260	260	-	-	-	-	-	-	-	-	-	3,100
.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	365	55	420	420	-	-	-	-	-	-	-	-	-	5,000
.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	299	45	344	344	-	-	-	-	-	-	-	-	-	4,096
.1.16	Receive NRC approval of termination plan									a											
...ivity Specifications																					
.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	359	54	413	372	-	41	-	-	-	-	-	-	-	4,920
.1.17.2	Plant systems	-	-	-	-	-	-	304	46	350	315	-	35	-	-	-	-	-	-	-	4,157
.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	36	6	42	42	-	-	-	-	-	-	-	-	-	500
.1.17.4	Reactor internals	-	-	-	-	-	-	518	78	596	596	-	-	-	-	-	-	-	-	-	7,100
.1.17.5	Reactor vessel	-	-	-	-	-	-	474	71	545	545	-	-	-	-	-	-	-	-	-	6,500
.1.17.6	Sacrificial shield	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	500
.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
.1.17.8	Reinforced concrete	-	-	-	-	-	-	117	18	134	67	-	67	-	-	-	-	-	-	-	1,500
.1.17.9	Turbine & condenser	-	-	-	-	-	-	304	46	350	350	-	-	-	-	-	-	-	-	-	4,157
.1.17.10	Pressure suppression structure	-	-	-	-	-	-	146	22	168	168	-	-	-	-	-	-	-	-	-	2,000
.1.17.11	Drywell	-	-	-	-	-	-	117	18	134	134	-	-	-	-	-	-	-	-	-	1,600
.1.17.12	Plant structures & buildings	-	-	-	-	-	-	228	34	262	131	-	131	-	-	-	-	-	-	-	3,120
.1.17.13	Waste management	-	-	-	-	-	-	336	50	386	386	-	-	-	-	-	-	-	-	-	4,500
.1.17.14	Facility & site closeout	-	-	-	-	-	-	68	10	78	39	-	39	-	-	-	-	-	-	-	900
.1.17	Total	-	-	-	-	-	-	3,118	467	3,585	3,268	-	312	-	-	-	-	-	-	-	42,874
...nning & Site Preparations																					
.1.18	Prepare dismantling sequence	-	-	-	-	-	-	175	26	201	201	-	-	-	-	-	-	-	-	-	2,400
.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,304	346	2,650	2,650	-	-	-	-	-	-	-	-	-	-
.1.20	Design water clean-up system	-	-	-	-	-	-	102	15	117	117	-	-	-	-	-	-	-	-	-	1,400
.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	1,950	293	2,243	2,243	-	-	-	-	-	-	-	-	-	-
.1.22	Procure casks/liners & containers	-	-	-	-	-	-	90	13	103	103	-	-	-	-	-	-	-	-	-	1,330
.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	9,989	1,498	11,487	11,175	-	312	-	-	-	-	-	-	-	76,600
.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
...riod 1a Period-Dependent Costs																					
.4.1	Insurance	-	-	-	-	-	-	653	65	718	718	-	-	-	-	-	-	-	-	-	-
.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.4.3	Health physics supplies	-	462	-	-	-	-	-	116	578	578	-	-	-	-	-	-	-	-	-	-
.4.4	Heavy equipment rental	-	350	-	-	-	-	-	52	402	402	-	-	-	-	-	-	-	-	-	-
.4.5	Disposal of DAW generated	-	-	14	4	-	52	-	18	88	88	-	-	-	748	-	-	-	14,991	184	-
.4.6	Plant energy budget	-	-	-	-	-	-	1,646	247	1,893	1,893	-	-	-	-	-	-	-	-	-	-
.4.7	NRC Fees	-	-	-	-	-	-	803	80	883	883	-	-	-	-	-	-	-	-	-	-
.4.8	Emergency Planning Fees	-	-	-	-	-	-	34	3	37	-	37	-	-	-	-	-	-	-	-	-

Defense in Depth

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 1a Period-Dependent Costs (continued)																				
1a.4.9	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	366	55	421	-	421	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	953	143	1,096	-	1,096	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Compliance Staff	-	-	-	-	-	-	816	122	939	939	-	-	-	-	-	-	-	-	-	-
1a.4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	28	3	27	-	37	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	1,160	172	1,332	1,332	-	-	-	-	-	-	-	-	-	59,244
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	29,290	4,394	33,684	33,684	-	-	-	-	-	-	-	-	-	442,497
1a.4	Subtotal Period 1a Period-Dependent Costs	-	812	14	4	-	52	35,288	5,419	41,684	39,953	1,581	-	-	748	-	-	-	14,991	184	501,741
1a.0	TOTAL PERIOD 1a COST	-	812	14	4	-	52	46,222	6,917	53,031	51,138	1,581	312	-	748	-	-	-	14,991	184	580,341
	PERIOD 1b - Decommissioning Preparations																				
	Period 1b Direct Decommissioning Activities																				
	Detailed Work Procedures																				
1b.1.1.1	Plant systems	-	-	-	-	-	-	346	52	397	357	-	40	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	292	44	336	336	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	98	15	113	28	-	85	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	11	2	12	12	-	-	-	-	-	-	-	-	-	146
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	265	40	305	305	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	88	13	101	50	-	50	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	88	13	101	101	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	73	11	84	42	-	42	-	-	-	-	-	-	-	1,000
1b.1.1.12	Turbine & condensers	-	-	-	-	-	-	304	46	350	350	-	-	-	-	-	-	-	-	-	4,167
1b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	146	22	168	168	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.14	Radwaste building	-	-	-	-	-	-	199	30	229	206	-	23	-	-	-	-	-	-	-	2,730
1b.1.1.15	Reactor building	-	-	-	-	-	-	199	30	229	206	-	23	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	2,326	349	2,676	2,413	-	263	-	-	-	-	-	-	-	31,886
1b.1.2	Decon NSSS	534	-	-	-	-	-	-	267	801	801	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	534	-	-	-	-	-	2,326	616	3,477	3,214	-	263	-	-	-	-	-	-	1,067	31,886
	Period 1b Additional Costs																				
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	7,878	1,182	9,060	9,060	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	696	104	800	800	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	8,574	1,286	9,860	9,860	-	-	-	-	-	-	-	-	-	-
	Period 1b Collateral Costs																				
1b.3.1	Decon equipment	710	-	-	-	-	-	-	107	817	817	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process liquid waste	28	-	224	222	-	2,137	-	604	3,215	3,215	-	-	-	-	2,642	-	-	437,254	97	-
1b.3.3	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
1b.3.4	Pipe cutting equipment	-	911	-	-	-	-	-	137	1,048	1,048	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	738	912	224	222	-	2,137	-	847	5,081	5,081	-	-	-	-	2,642	-	-	437,254	97	-
	Period 1b Period-Dependent Costs																				
1b.4.1	Decon supplies	22	-	-	-	-	-	-	5	27	27	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	322	32	354	354	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	232	-	-	-	-	-	58	290	290	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	173	-	-	-	-	-	26	198	198	-	-	-	-	-	-	-	-	-	-

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 Dollars)

...ivity ...dex	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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
...d 1b Period-Dependent Costs (continued)																					
.6	Disposal of DAW generated	-	-	7	2	-	27	-	8	44	44	-	-	-	885	-	-	-	7,725	95	-
.7	Plant energy budget	-	-	-	-	-	-	1,623	244	1,867	1,867	-	-	-	-	-	-	-	-	-	-
.8	NRC Fees	-	-	-	-	-	-	181	18	199	199	-	-	-	-	-	-	-	-	-	-
.9	Emergency Planning Fees	-	-	-	-	-	-	17	2	18	-	18	-	-	-	-	-	-	-	-	-
.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	1,007	151	1,158	-	1,158	-	-	-	-	-	-	-	-	-
.11	Spent Fuel Pool O&M	-	-	-	-	-	-	470	71	541	-	541	-	-	-	-	-	-	-	-	-
.12	ISRA Compliance Staff	-	-	-	-	-	-	408	60	468	468	-	-	-	-	-	-	-	-	-	-
.13	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	11	2	13	-	13	-	-	-	-	-	-	-	-	-
.14	Security Staff Cost	-	-	-	-	-	-	567	85	652	652	-	-	-	-	-	-	-	-	-	29,219
.15	Utility Staff Cost	-	-	-	-	-	-	14,449	2,167	16,612	16,612	-	-	-	-	-	-	-	-	-	218,234
.	Subtotal Period 1b Period-Dependent Costs	22	404	7	2	-	27	19,048	2,928	22,486	20,706	1,780	-	-	885	-	-	-	7,725	95	247,453
	TOTAL PERIOD 1b COST	1,294	1,817	381	224	-	2,164	29,049	5,877	40,884	38,801	1,780	263	-	886	2,642	-	-	444,979	1,258	379,389
...OD 1 TOTALS		1,294	2,129	346	228	-	2,416	75,169	12,894	93,874	89,939	3,910	575	-	1,134	2,642	-	-	459,970	1,442	869,680
...OD 2a - Large Component Removal																					
...d 2a Direct Decommissioning Activities																					
...ar Steam Supply System Removal																					
.1.1	Recirculation System Piping & Valves	123	102	28	16	-	697	-	260	1,227	1,227	-	-	-	1,564	-	-	-	142,614	4,936	-
.1.2	Recirculation Pumps & Motors	33	46	15	12	80	784	-	210	1,089	1,089	-	-	104	1,031	-	-	-	160,250	1,626	-
.1.3	CRDMs & NIs Removal	220	165	329	47	-	589	-	364	1,814	1,814	-	-	-	5,536	-	-	-	141,063	7,193	-
.1.4	Reactor Vessel Internals	214	2,288	5,656	1,260	-	11,806	225	8,303	30,610	30,610	-	-	-	876	2,353	918	-	455,555	33,348	1,466
.1.5	Reactor Vessel	99	4,671	1,708	476	-	9,068	225	8,564	24,906	24,906	-	-	-	10,925	2,379	-	-	1,429,550	23,346	1,466
.1	Totals	690	7,272	7,709	1,610	80	22,769	449	18,896	59,646	59,645	-	-	104	18,933	4,732	918	-	2,819,141	70,852	2,932
...val of Major Equipment																					
.2	Main Turbine/Generator	-	482	607	197	8,462	3,552	-	1,917	12,207	12,207	-	-	27,260	11,811	-	-	-	1,014,885	9,403	-
.3	Main Condensers	-	2,119	534	148	5,598	1,931	-	1,928	12,257	12,257	-	-	27,988	6,148	-	-	-	881,850	41,623	-
...val of Plant Systems																					
.4.1	Circulating Water (DA)	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	2,958	-
.4.2	Circulating Water - ROA (DA)	-	259	8	15	892	-	-	217	1,401	1,401	-	-	4,060	-	-	-	-	-	5,212	-
.4.3	Circulating Water Acid Injection (DE)	1	8	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	184	-
.4.4	Circulating Water Dispersion (DG)	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	203	-
.4.5	Circulating Water Hypochlorination (DD)	-	46	-	-	-	-	-	7	53	-	-	53	-	-	-	-	-	-	955	-
.4.6	Condensate (AD)	-	1,775	221	70	1,839	6,091	-	2,270	12,281	12,281	-	-	8,191	13,897	-	-	-	1,246,886	36,676	-
.4.7	Condensate Demineralizer Process (AK)	-	664	98	12	887	829	-	484	2,854	2,854	-	-	1,937	2,044	-	-	-	169,574	13,285	-
.4.8	Condensate Pre-filter	-	174	19	6	146	461	-	188	1,014	1,014	-	-	729	1,192	-	-	-	98,462	3,532	-
.4.9	Condensate Transfer (AP)	-	930	50	15	613	1,082	-	587	3,176	3,176	-	-	2,567	2,692	-	-	-	221,371	18,882	-
.4.10	Condenser Air Removal (CG)	-	469	19	8	810	441	-	270	1,491	1,491	-	-	1,649	1,014	-	-	-	90,909	8,678	-
.4.11	Containment Atmosphere Control (GS)	-	262	2	4	247	-	-	109	618	618	-	-	1,283	-	-	-	-	-	5,258	-
.4.12	Cooling Tower (DB)	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	394	-
.4.13	Extraction Steam (AF)	-	1,102	53	28	1,070	1,218	-	740	4,215	4,215	-	-	5,952	2,776	-	-	-	248,800	22,439	-
.4.14	Feedwater (AE)	-	701	76	24	644	2,090	-	808	4,341	4,341	-	-	8,222	4,766	-	-	-	427,504	14,466	-
.4.15	Gaseous Radwaste (HA)	-	848	31	17	791	649	-	498	2,834	2,834	-	-	3,953	1,526	-	-	-	132,798	17,146	-
.4.16	Generator Gas Control (GC)	-	28	0	0	16	-	-	9	53	53	-	-	79	-	-	-	-	-	514	-
.4.17	Generator Seal Oil (OD)	-	47	0	1	51	-	-	20	119	119	-	-	256	-	-	-	-	-	923	-
.4.18	Gland Steam Removal (CJ,CP,OV)	-	267	2	4	242	-	-	104	618	618	-	-	1,209	-	-	-	-	-	5,874	-
.4.19	Leak Detection (SK)	-	4	0	0	1	8	-	2	10	10	-	-	3	8	-	-	-	685	79	-
.4.20	Leak Rate Test Equipment (GP)	-	13	0	0	4	6	-	5	27	27	-	-	20	12	-	-	-	1,066	256	-
.4.21	Lube Oil Storage/Transfer/Purification (UF)	-	46	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	938	-

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Disposal of Plant Systems (continued)																				
2a.1.4.22	MSIV Sealing (HP)	-	6	0	0	3	-	-	2	11	11	-	-	16	-	-	-	-	-	103	-
2a.1.4.23	Main Generator (MA)	-	6	0	0	16	-	-	5	31	31	-	-	90	-	-	-	-	-	152	-
2a.1.4.24	Main Steam (AB)	-	820	89	20	893	892	-	569	3,283	3,283	-	-	4,467	2,034	-	-	-	182,467	16,659	-
2a.1.4.25	Main Turbine (AC)	-	769	71	30	1,158	1,788	-	825	4,641	4,641	-	-	5,790	4,079	-	-	-	365,924	15,761	-
2a.1.4.26	Main Turbine Control Oil (CH)	-	96	1	1	62	-	-	34	193	193	-	-	310	-	-	-	-	-	1,784	-
2a.1.4.27	Miscellaneous (QO,QM,XX)	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	8	-
2a.1.4.28	Neutron Monitoring (SE)	-	80	4	1	17	112	-	46	258	258	-	-	88	256	-	-	-	22,955	1,181	-
2a.1.4.29	Reactor Protection (SB)	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	267	-
2a.1.4.30	Safety & Turbine Auxiliary Cooling (EG)	-	2,811	87	70	4,588	-	-	1,406	8,911	8,911	-	-	22,938	-	-	-	-	-	57,303	-
2a.1.4.31	Sampling (RC)	-	289	5	1	26	80	-	97	498	498	-	-	125	162	-	-	-	16,328	6,235	-
2a.1.4.32	Stator Cooling (CE)	-	47	0	1	88	-	-	16	108	108	-	-	191	-	-	-	-	-	914	-
2a.1.4.33	Steam Removal (FW)	-	61	-	-	-	-	-	9	70	-	-	70	-	-	-	-	-	-	1,315	-
2a.1.4.34	Turbine Generator Lube Oil (CB)	-	157	4	8	493	-	-	115	777	777	-	-	2,468	-	-	-	-	-	3,119	-
2a.1.4.35	Turbine Sealing Steam (CA)	-	502	19	7	275	431	-	278	1,513	1,513	-	-	1,977	984	-	-	-	88,255	10,136	-
2a.1.4	Totals	-	13,405	711	338	14,828	16,194	-	9,711	55,182	54,789	-	393	74,115	87,389	-	-	-	3,313,668	273,807	-
2a.1.5	Scaffolding in support of decommissioning	-	2,066	20	5	222	48	-	566	2,926	2,926	-	-	1,109	153	-	-	-	18,760	46,433	-
2a.1	Subtotal Period 2a Activity Costs	590	25,344	9,581	2,498	26,125	44,813	449	38,016	142,210	141,828	-	393	130,677	74,936	4,782	918	-	7,213,104	460,818	2,932
	Period 2a Additional Costs																				
2a.2.1	Curie Surcharge (Excluding RPV)	-	-	-	-	-	1,347	-	337	1,684	1,684	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	1,347	-	337	1,684	1,684	-	-	-	-	-	-	-	-	-	-
	Period 2a Collateral Costs																				
2a.3.1	Process liquid waste	56	-	21	30	-	242	-	98	457	407	-	-	-	-	392	-	-	49,459	77	-
2a.3.2	Small tool allowance	-	401	-	-	-	-	-	60	461	415	-	46	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	56	401	21	30	-	242	-	158	928	882	-	46	-	-	392	-	-	49,459	77	-
	Period 2a Period-Dependent Costs																				
2a.4.1	Decon supplies	67	-	-	-	-	-	-	17	84	84	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,010	101	1,111	1,111	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	2,258	-	-	-	-	-	564	2,822	2,822	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,932	-	-	-	-	-	440	3,372	3,372	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	175	48	-	659	-	189	1,071	1,071	-	-	-	9,409	-	-	-	188,558	2,310	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,420	363	2,783	2,783	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	498	50	548	548	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	52	5	57	-	57	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	275	41	316	-	316	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,476	221	1,697	-	1,697	-	-	-	-	-	-	-	-	-
2a.4.12	ISRA Compliance Staff	-	-	-	-	-	-	1,268	189	1,458	1,458	-	-	-	-	-	-	-	-	-	-
2a.4.13	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	36	5	41	-	41	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	2,220	338	2,558	2,558	-	-	-	-	-	-	-	-	-	114,411
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	41,666	6,250	47,916	47,916	-	-	-	-	-	-	-	-	-	626,423
2a.4	*Subtotal Period 2a Period-Dependent Costs*	67	5,190	175	48	-	659	50,912	8,769	55,820	53,710	2,110	-	-	9,409	-	-	-	188,558	2,310	740,834
2a.0	TOTAL PERIOD 2a COST	813	30,934	9,777	2,596	26,125	46,761	51,361	42,260	210,848	208,098	2,110	439	130,677	84,344	5,125	918	-	7,451,121	463,205	743,766

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 Dollars)

...vity ...lex	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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	...OD 2b - Site Decontamination																				
	...d 2b Direct Decommissioning Activities																				
	...al of Plant Systems																				
1	Control Rod Drive Hydraulic Supply (BF)	-	1,522	84	16	274	1,590	-	830	4,315	4,315	-	-	1,371	8,630	-	-	-	825,269	29,898	-
2	Core Spray Control (BE)	207	349	82	7	110	807	-	418	1,926	1,926	-	-	802	1,842	-	-	-	166,189	8,524	-
3	Drywell Ventilation (GT)	-	50	2	1	23	24	-	34	204	204	-	-	418	56	-	-	-	4,986	1,185	-
4	HPCI Steam (FD)	-	147	9	3	70	217	-	103	549	549	-	-	852	494	-	-	-	44,930	2,995	-
5	High Pressure Coolant Injection (BJ)	120	181	39	6	111	893	-	350	1,700	1,700	-	-	557	2,038	-	-	-	182,761	4,412	-
6	Miscellaneous Nuclear Boiler Recirc (BB)	1	139	5	3	88	219	-	105	562	562	-	-	491	501	-	-	-	44,910	2,888	-
7	RCIC Steam (FB,FC)	318	384	13	7	308	344	-	390	1,765	1,765	-	-	1,538	785	-	-	-	70,389	10,236	-
8	Reactor Auxiliaries Cooling (ED)	-	529	10	16	1,154	-	-	309	2,019	2,019	-	-	5,771	-	-	-	-	-	10,490	-
9	Reactor Core Isolation Cooling (BD)	49	87	11	2	81	276	-	124	589	589	-	-	155	629	-	-	-	56,446	2,620	-
10	Reactor Water Cleanup (BG)	240	359	23	5	71	876	-	370	1,654	1,654	-	-	854	1,314	-	-	-	117,888	10,340	-
11	Refueling Water Transfer (BN)	41	82	3	2	82	69	-	71	349	349	-	-	408	135	-	-	-	12,136	2,146	-
12	Residual Heat Removal (BC)	1,130	1,178	190	42	695	4,787	-	2,188	10,030	10,030	-	-	2,973	10,808	-	-	-	989,875	30,400	-
13	Standby Liquid Control (BH)	-	41	0	1	41	-	-	16	99	99	-	-	204	-	-	-	-	-	799	-
	Totals	2,106	5,088	424	113	3,016	9,743	-	5,272	25,760	25,760	-	-	15,079	22,233	-	-	-	1,993,667	116,770	-
	Scaffolding in support of decommissioning	-	2,582	25	6	277	60	-	706	3,656	3,656	-	-	1,986	192	-	-	-	17,199	58,041	-
	...tamination of Site Buildings																				
.1	Reactor Building	6,041	8,096	615	275	3,170	6,367	-	5,965	26,529	25,529	-	-	15,801	24,764	-	-	-	2,239,997	172,651	-
.2	Low Level Radwaste Storage Facility	119	59	9	7	8	18	-	81	295	295	-	-	39	594	-	-	-	59,076	9,900	-
.3	Service & Radwaste Building	459	252	41	31	37	105	-	353	1,319	1,319	-	-	185	2,662	-	-	-	265,202	14,335	-
.4	Turbine Building	1,989	1,311	165	128	918	289	-	1,568	6,368	6,368	-	-	4,569	10,176	-	-	-	1,000,920	63,894	-
	Totals	8,648	4,719	880	442	4,133	6,774	-	7,968	33,511	33,511	-	-	20,593	38,196	-	-	-	3,565,195	259,746	-
	Subtotal Period 2b Activity Costs	10,754	12,887	1,278	561	7,426	16,577	-	13,944	62,927	62,927	-	-	37,128	60,620	-	-	-	5,566,061	428,557	-
	...d 2b Collateral Costs																				
	Process liquid waste	83	-	578	670	-	8,430	-	1,817	9,674	9,674	-	-	-	-	7,954	-	-	1,315,776	295	-
	Small tool allowance	-	386	-	-	-	-	-	58	444	444	-	-	-	-	-	-	-	-	-	-
	Subtotal Period 2b Collateral Costs	83	386	578	670	-	8,430	-	1,875	10,119	10,119	-	-	-	-	7,954	-	-	1,315,776	295	-
	...d 2b Period-Dependent Costs																				
1	Decon supplies	1,832	-	-	-	-	-	-	468	2,290	2,290	-	-	-	-	-	-	-	-	-	-
2	Insurance	-	-	-	-	-	-	624	62	686	686	-	-	-	-	-	-	-	-	-	-
3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Health physics supplies	-	2,590	-	-	-	-	-	648	3,238	3,238	-	-	-	-	-	-	-	-	-	-
5	Heavy equipment rental	-	4,800	-	-	-	-	-	720	5,520	5,520	-	-	-	-	-	-	-	-	-	-
6	Disposal of DAW generated	-	-	169	47	-	696	-	123	1,035	1,035	-	-	-	9,089	-	-	-	182,142	2,282	-
7	Plant energy budget	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
8	NRC Fees	-	-	-	-	-	-	708	71	779	779	-	-	-	-	-	-	-	-	-	-
9	Emergency Planning Fees	-	-	-	-	-	-	81	8	90	-	90	-	-	-	-	-	-	-	-	-
10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	23,006	3,451	26,456	-	26,456	-	-	-	-	-	-	-	-	-
11	Spent Fuel Pool O&M	-	-	-	-	-	-	2,317	340	2,684	-	2,664	-	-	-	-	-	-	-	-	-
12	Radwaste Processing Equipment/Services	-	-	-	-	-	-	440	66	506	506	-	-	-	-	-	-	-	-	-	-
13	ISRA Compliance Staff	-	-	-	-	-	-	1,984	298	2,281	2,281	-	-	-	-	-	-	-	-	-	-
14	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	58	8	66	-	66	-	-	-	-	-	-	-	-	-
15	Security Staff Cost	-	-	-	-	-	-	2,794	419	3,213	3,213	-	-	-	-	-	-	-	-	-	143,994
16	Utility Staff Cost	-	-	-	-	-	-	63,874	9,581	73,465	73,465	-	-	-	-	-	-	-	-	-	963,360
	Subtotal Period 2b Period-Dependent Costs	1,832	7,390	169	47	-	696	95,884	16,770	126,728	98,463	29,275	-	-	9,089	-	-	-	182,142	2,282	1,107,354
	TOTAL PERIOD 2b COST	12,670	20,163	2,120	1,278	7,426	25,644	95,884	32,689	198,770	169,498	29,275	-	37,128	69,709	7,854	-	-	7,053,979	431,083	1,107,354

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2c - Decontamination Following Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Remove spent fuel racks	827	76	137	85	1,921	456	-	768	3,616	3,616	-	-	6,606	1,451	-	-	-	180,901	1,522	-
Disposal of Plant Systems																					
2c.1.2.1	Administration Building HVAC (GO)	-	49	-	-	-	-	-	7	56	-	-	56	-	-	-	-	-	-	1,082	-
2c.1.2.2	Asphlt Strg/Pmp Hse/Aux Boiler HVAC (GF)	-	32	-	-	-	-	-	5	37	-	-	37	-	-	-	-	-	-	649	-
2c.1.2.3	Auxiliary Oil Storage (JA)	-	190	-	-	-	-	-	28	218	-	-	218	-	-	-	-	-	-	3,861	-
2c.1.2.4	Auxiliary Steam Generators (FA)	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	920	-
2c.1.2.5	Breathing Air (KO,KH)	-	300	2	4	242	-	-	112	660	660	-	-	1,212	-	-	-	-	-	6,830	-
2c.1.2.6	Building & Equip Radwaste Drains (HG)	2,637	2,960	145	30	162	4,108	-	3,127	13,160	13,160	-	-	761	9,637	-	-	-	840,655	104,933	-
2c.1.2.7	Chemical Waste (LD)	-	20	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	421	-
2c.1.2.8	Chilled Water (GB)	-	861	12	22	1,428	-	-	431	2,744	2,744	-	-	7,140	-	-	-	-	-	16,733	-
2c.1.2.9	Control Area Chilled Water (GJ)	-	195	-	-	-	-	-	29	225	-	-	225	-	-	-	-	-	-	4,271	-
2c.1.2.10	Control Room Supply & Exhaust (GK)	-	34	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	732	-
2c.1.2.11	Decon Facility (HD)	-	101	3	1	18	94	-	52	269	269	-	-	92	213	-	-	-	19,149	1,999	-
2c.1.2.12	Demineralized Water Makeup/Transfer (AN)	-	708	7	13	844	-	-	306	1,878	1,878	-	-	4,220	-	-	-	-	-	13,623	-
2c.1.2.13	Diesel Area Supply & Exhaust (GM)	-	49	-	-	-	-	-	7	57	-	-	57	-	-	-	-	-	-	1,052	-
2c.1.2.14	Diesel Fuel Oil Storage & Transfer (JE)	-	170	-	-	-	-	-	26	196	-	-	196	-	-	-	-	-	-	3,518	-
2c.1.2.15	Domestic Water (KD)	-	76	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	1,636	-
2c.1.2.16	Domestic Water - RCA (KD)	-	164	1	2	101	-	-	57	324	324	-	-	504	-	-	-	-	-	3,022	-
2c.1.2.17	Electrical	-	3,810	-	-	-	-	-	572	4,382	-	-	4,382	-	-	-	-	-	-	77,827	-
2c.1.2.18	Electrical - RCA	-	1,016	11	14	827	118	-	411	2,397	2,397	-	-	4,135	271	-	-	-	24,309	20,565	-
2c.1.2.19	Electrical - RCA (Clean)	-	2,215	18	32	2,101	-	-	875	5,241	5,241	-	-	10,506	-	-	-	-	-	43,910	-
2c.1.2.20	Filtration/Recirc & Ventilation (GU)	-	85	2	1	66	86	-	41	281	281	-	-	332	82	-	-	-	7,331	1,689	-
2c.1.2.21	Fire Protection (KC)	-	321	-	-	-	-	-	48	369	-	-	369	-	-	-	-	-	-	6,540	-
2c.1.2.22	Fire Protection - RCA (KC)	-	930	6	11	699	-	-	339	1,986	1,986	-	-	3,497	-	-	-	-	-	18,689	-
2c.1.2.23	Fresh Water (AN)	-	57	-	-	-	-	-	9	66	-	-	66	-	-	-	-	-	-	1,187	-
2c.1.2.24	Fuel Pool Cooling (EC)	-	660	40	11	280	938	-	447	2,376	2,376	-	-	1,402	2,166	-	-	-	191,922	13,411	-
2c.1.2.25	Instrument Compressed Air (KB)	-	529	3	6	319	-	-	181	1,037	1,037	-	-	1,693	-	-	-	-	-	10,082	-
2c.1.2.26	Intake Structure HVAC (GQ)	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	231	-
2c.1.2.27	Liquid/Chemical Radwaste (HB)	1,672	2,098	130	39	771	3,914	-	2,453	11,077	11,077	-	-	3,866	10,011	-	-	-	800,834	67,521	-
2c.1.2.28	Normal Drains (LF,LG)	-	76	-	-	-	-	-	11	88	-	-	88	-	-	-	-	-	-	1,676	-
2c.1.2.29	Oily Waste (LE)	-	107	-	-	-	-	-	16	123	-	-	123	-	-	-	-	-	-	2,273	-
2c.1.2.30	Plant Heating (GA)	-	639	4	7	461	-	-	255	1,366	1,366	-	-	2,305	-	-	-	-	-	12,789	-
2c.1.2.31	Primary Containment Instrument Gas (KL)	-	82	1	2	106	-	-	37	228	228	-	-	532	-	-	-	-	-	1,526	-
2c.1.2.32	Process Radiation Monitoring (SP)	-	115	1	1	59	22	-	48	242	242	-	-	296	50	-	-	-	4,466	2,318	-
2c.1.2.33	Rad Laundry (HH,ZZ)	-	72	2	1	22	58	-	36	192	192	-	-	109	134	-	-	-	11,868	1,431	-
2c.1.2.34	Radwaste Tank Vent Filters (GH)	-	416	7	8	244	127	-	174	972	972	-	-	1,220	290	-	-	-	25,989	8,098	-
2c.1.2.35	Reactor Building HVAC (GR)	-	638	6	7	416	78	-	242	1,381	1,381	-	-	2,080	188	-	-	-	14,861	11,863	-
2c.1.2.36	Security (RO)	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	100	-
2c.1.2.37	Service Area Supply & Exhaust Air (GL)	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	882	-
2c.1.2.38	Service Compressed Air (KA)	-	536	3	6	374	-	-	191	1,110	1,110	-	-	1,868	-	-	-	-	-	10,167	-
2c.1.2.39	Service Water (EA)	-	57	-	-	-	-	-	8	65	-	-	65	-	-	-	-	-	-	1,152	-
2c.1.2.40	Service Water - RCA (EA)	-	214	6	10	678	-	-	157	1,065	1,065	-	-	3,389	-	-	-	-	-	4,289	-
2c.1.2.41	Service Water Hypochlorination (EP,EQ)	-	65	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	1,340	-
2c.1.2.42	Solid Radwaste (HC)	-	841	86	16	267	1,980	-	757	3,948	3,948	-	-	1,335	4,693	-	-	-	403,187	16,886	-
2c.1.2.43	Standby/Emergency Diesel Generator (KJ)	-	137	-	-	-	-	-	21	158	-	-	158	-	-	-	-	-	-	2,854	-
2c.1.2.44	Storm Drains (LA,LB)	-	1,227	-	-	-	-	-	184	1,411	-	-	1,411	-	-	-	-	-	-	26,161	-
2c.1.2.45	Suppression Pool/Torus Cleanup (EE)	-	64	2	1	80	48	-	33	178	178	-	-	151	109	-	-	-	9,785	1,307	-
2c.1.2.46	Turbine Building HVAC (GE)	-	849	9	10	666	135	-	333	1,900	1,900	-	-	2,832	304	-	-	-	27,228	15,932	-
2c.1.2	Totals	4,309	23,813	557	250	11,074	11,649	-	12,097	63,747	55,959	-	7,789	55,370	28,128	-	-	-	2,983,484	649,156	-

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	...econtamination of Site Buildings																				
...1.3.1	Reactor (post fuel)	725	1,024	125	87	93	1,393	-	1,009	4,464	4,464	-	-	467	7,854	-	-	-	740,573	32,835	-
...1.3	Totals	725	1,024	125	87	93	1,393	-	1,006	4,464	4,464	-	-	467	7,854	-	-	-	740,573	32,835	-
...1.4	Scaffolding in support of decommissioning	-	516	5	1	58	12	-	141	731	731	-	-	277	38	-	-	-	8,440	11,608	-
...1	Subtotal Period 2e Activity Costs	5,861	26,426	825	878	12,544	18,509	-	14,008	72,846	64,789	-	7,789	62,720	87,468	-	-	-	3,257,698	695,263	-
	...riod 2e Collateral Costs																				
...3.1	Process liquid waste	228	-	401	498	-	3,960	-	1,219	6,306	6,306	-	-	-	-	8,226	-	-	810,924	413	-
...3.2	Small tool allowance	-	543	-	-	-	-	-	81	625	625	-	-	-	-	-	-	-	-	-	-
...3.3	Decommissioning Equipment Disposition	-	-	48	19	540	117	-	117	835	835	-	-	2,700	373	-	-	-	39,507	739	-
...3	Subtotal Period 2e Collateral Costs	228	543	449	511	540	4,077	-	1,417	7,766	7,766	-	-	2,700	378	5,225	-	-	843,881	1,152	-
	...riod 2e Period-Dependent Costs																				
...4.1	Decon supplies	140	-	-	-	-	-	-	36	175	175	-	-	-	-	-	-	-	-	-	-
...4.2	Insurance	-	-	-	-	-	-	103	10	118	118	-	-	-	-	-	-	-	-	-	-
...4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
...4.4	Health physics supplies	-	2,486	-	-	-	-	-	632	3,108	3,108	-	-	-	-	-	-	-	-	-	-
...4.5	Heavy equipment rental	-	1,905	-	-	-	-	-	286	2,191	2,191	-	-	-	-	-	-	-	-	-	-
...4.6	Disposal of DAW generated	-	-	156	44	-	595	-	171	966	966	-	-	-	8,505	-	-	-	170,446	2,088	-
...4.7	Plant energy budget	-	-	-	-	-	-	635	95	730	730	-	-	-	-	-	-	-	-	-	-
...4.8	NRC Fees	-	-	-	-	-	-	856	36	892	892	-	-	-	-	-	-	-	-	-	-
...4.9	Emergency Planning Fees	-	-	-	-	-	-	92	8	80	-	38	-	-	-	-	-	-	-	-	-
...4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	349	52	401	401	-	-	-	-	-	-	-	-	-	-
...4.11	ISRA Compliance Staff	-	-	-	-	-	-	787	118	905	905	-	-	-	-	-	-	-	-	-	-
...4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
...4.13	Security Staff Cost	-	-	-	-	-	-	1,109	166	1,275	1,275	-	-	-	-	-	-	-	-	-	57,145
...4.14	Utility Staff Cost	-	-	-	-	-	-	21,647	3,247	24,895	24,895	-	-	-	-	-	-	-	-	-	329,726
...4	Subtotal Period 2e Period-Dependent Costs	140	4,391	156	44	-	595	25,041	4,846	35,214	35,153	61	-	-	8,505	-	-	-	170,446	2,088	386,871
...0	*TOTAL PERIOD 2e COST*	6,229	30,363	1,431	928	13,084	13,181	25,041	20,270	115,826	107,679	61	7,789	65,420	46,347	5,225	-	-	4,271,975	698,504	386,871
	...ERIOD 2e - License Termination																				
	...riod 2e Direct Decommissioning Activities																				
...1.1	ORISE confirmatory survey	-	-	-	-	-	-	122	37	158	158	-	-	-	-	-	-	-	-	-	-
...1.2	Terminate license									a											
...1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	122	37	159	158	-	-	-	-	-	-	-	-	-	-
	...riod 2e Additional Costs																				
...2.1	Final Site Survey	-	-	-	-	-	-	11,286	1,692	12,978	12,978	-	-	-	-	-	-	-	-	227,317	-
...2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	11,286	1,692	12,978	12,978	-	-	-	-	-	-	-	-	227,317	-
	...riod 2e Period-Dependent Costs																				
...4.1	Insurance	-	-	-	-	-	-	80	8	88	88	-	-	-	-	-	-	-	-	-	-
...4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
...4.3	Health physics supplies	-	1,125	-	-	-	-	-	281	1,406	1,406	-	-	-	563	-	-	-	11,274	138	-
...4.4	Disposal of DAW generated	-	-	10	8	-	39	-	11	64	64	-	-	-	-	-	-	-	-	-	-
...4.5	Plant energy budget	-	-	-	-	-	-	248	37	285	285	-	-	-	-	-	-	-	-	-	-
...4.6	NRC Fees	-	-	-	-	-	-	305	31	336	336	-	-	-	-	-	-	-	-	-	-
...4.7	Emergency Planning Fees	-	-	-	-	-	-	25	3	28	-	28	-	-	-	-	-	-	-	-	-
...4.8	ISRA Compliance Staff	-	-	-	-	-	-	614	92	706	706	-	-	-	-	-	-	-	-	-	-
...4.9	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	17	3	20	-	20	-	-	-	-	-	-	-	-	24,446
...4.10	Security Staff Cost	-	-	-	-	-	-	474	71	545	545	-	-	-	-	-	-	-	-	-	-

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 2a Period-Dependent Costs (continued)																				
2a.4.11	Utility Staff Cost	-	-	-	-	-	-	11,540	1,731	13,271	13,271	-	-	-	-	-	-	-	-	-	167,177
2a.4	Subtotal Period 2a Period-Dependent Costs	-	1,125	10	3	-	89	13,304	2,268	16,749	16,701	48	-	-	563	-	-	-	11,274	138	191,533
2a.0	TOTAL PERIOD 2a COST	-	1,125	10	3	-	89	24,711	3,987	29,886	29,838	48	-	-	563	-	-	-	11,274	227,455	191,523
	PERIOD 2 TOTALS	19,712	82,583	13,339	4,806	46,635	38,626	199,997	99,135	554,836	516,113	31,494	8,228	233,125	200,953	13,304	918	-	18,798,860	1,710,248	2,429,616
	PERIOD 3b - Site Restoration																				
	Period 3b Direct Decommissioning Activities																				
	Demolition of Remaining Site Buildings																				
3b.1.1.1	Reactor Building	-	13,159	-	-	-	-	-	1,974	15,133	2,270	-	12,863	-	-	-	-	-	-	164,666	-
3b.1.1.2	Administration Bldg (U2 Turbine Bldg)	-	1,887	-	-	-	-	-	283	2,170	-	-	2,170	-	-	-	-	-	-	25,538	-
3b.1.1.3	Administration Building (TB2)	-	1,671	-	-	-	-	-	251	1,921	-	-	1,921	-	-	-	-	-	-	26,644	-
3b.1.1.4	Aux Boiler & Domestic Wtr Pre-Treat Bldg	-	458	-	-	-	-	-	69	527	-	-	527	-	-	-	-	-	-	5,922	-
3b.1.1.5	Barge Facility	-	3,125	-	-	-	-	-	469	3,594	-	-	3,594	-	-	-	-	-	-	40,381	-
3b.1.1.6	Carpenter Shop	-	34	-	-	-	-	-	5	39	-	-	39	-	-	-	-	-	-	549	-
3b.1.1.7	Centralized Warehouse	-	1,541	-	-	-	-	-	231	1,772	-	-	1,772	-	-	-	-	-	-	18,426	-
3b.1.1.8	Change House	-	139	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	1,793	-
3b.1.1.9	Circulating Water Pump Structure	-	1,919	-	-	-	-	-	288	2,207	-	-	2,207	-	-	-	-	-	-	29,328	-
3b.1.1.10	Cooling Tower	-	496	-	-	-	-	-	74	570	-	-	570	-	-	-	-	-	-	7,673	-
3b.1.1.11	Diesel & Control Building	-	4,662	-	-	-	-	-	699	5,362	-	-	5,362	-	-	-	-	-	-	57,685	-
3b.1.1.12	Fire Water Pump House	-	36	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	518	-
3b.1.1.13	Fire Water Tank Fdn and Valve Pit	-	91	-	-	-	-	-	14	104	-	-	104	-	-	-	-	-	-	1,160	-
3b.1.1.14	Guard House	-	157	-	-	-	-	-	24	180	-	-	180	-	-	-	-	-	-	2,658	-
3b.1.1.15	Guard House Emergency Generator Building	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	110	-
3b.1.1.16	Low Level Radwaste Storage Facility	-	879	-	-	-	-	-	132	1,011	51	-	960	-	-	-	-	-	-	12,018	-
3b.1.1.17	Miscellaneous Site Structures	-	326	-	-	-	-	-	49	374	-	-	374	-	-	-	-	-	-	5,516	-
3b.1.1.18	Miscellaneous Yard Tanks & Pads	-	1,408	-	-	-	-	-	211	1,619	-	-	1,619	-	-	-	-	-	-	17,417	-
3b.1.1.19	Nuclear Service Building	-	386	-	-	-	-	-	58	444	-	-	444	-	-	-	-	-	-	6,197	-
3b.1.1.20	Service & Radwaste Building	-	6,021	-	-	-	-	-	903	6,924	692	-	6,232	-	-	-	-	-	-	88,764	-
3b.1.1.21	Service Water Intake Structure	-	1,364	-	-	-	-	-	205	1,568	-	-	1,568	-	-	-	-	-	-	16,880	-
3b.1.1.22	Turbine Building	-	14,436	-	-	-	-	-	2,165	16,601	1,660	-	14,941	-	-	-	-	-	-	238,892	-
3b.1.1.23	Turbine Pedestal	-	1,606	-	-	-	-	-	241	1,848	-	-	1,848	-	-	-	-	-	-	19,164	-
3b.1.1.24	Unit 2 Reactor Building Foundation	-	6,143	-	-	-	-	-	921	7,065	-	-	7,065	-	-	-	-	-	-	74,280	-
3b.1.1.25	Unit 2 Turbine Pedestal	-	1,444	-	-	-	-	-	217	1,660	-	-	1,660	-	-	-	-	-	-	17,091	-
3b.1.1	Totals	-	63,394	-	-	-	-	-	9,509	72,903	4,673	-	68,230	-	-	-	-	-	-	889,469	-
	Site Closeout Activities																				
3b.1.2	BackFill Site	-	1,351	-	-	-	-	-	203	1,554	-	-	1,554	-	-	-	-	-	-	6,011	-
3b.1.3	Grade & landscape site	-	593	-	-	-	-	-	88	681	-	-	681	-	-	-	-	-	-	1,946	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	65,338	-	-	-	-	114	9,818	75,270	4,804	-	70,466	-	-	-	-	-	-	897,416	1,560
	Period 3b Additional Costs																				
3b.2.1	Concrete Crushing	-	-	-	-	-	-	1,515	227	1,742	-	-	1,742	-	-	-	-	-	-	9,071	-
3b.2.2	Asbestos Disposal	-	-	-	-	-	-	1,405	211	1,616	1,616	-	-	-	-	-	-	-	-	-	-
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	2,920	438	3,358	1,616	-	1,742	-	-	-	-	-	-	9,071	-
	Period 3b Collateral Costs																				
3b.3.1	Small tool allowance	-	822	-	-	-	-	-	123	945	-	-	945	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	822	-	-	-	-	-	123	945	-	-	945	-	-	-	-	-	-	-	-

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	od 3b Period-Dependent Costs																				
1	Insurance	-	-	-	-	-	-	243	24	268	0	241	27	-	-	-	-	-	-	-	-
2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Heavy equipment rental	-	6,097	-	-	-	-	-	915	7,012	-	-	7,012	-	-	-	-	-	-	-	-
4	Plant energy budget	-	-	-	-	-	-	376	56	432	-	216	216	-	-	-	-	-	-	-	-
5	NRC ISFSI Fees	-	-	-	-	-	-	183	18	201	-	201	-	-	-	-	-	-	-	-	-
6	Emergency Planning Fees	-	-	-	-	-	-	76	8	84	-	84	-	-	-	-	-	-	-	-	-
7	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	503	75	579	-	579	-	-	-	-	-	-	-	-	-
8	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	53	8	61	-	61	-	-	-	-	-	-	-	-	-
9	Security Staff Cost	-	-	-	-	-	-	1,438	216	1,654	(0)	1,108	546	-	-	-	-	-	-	-	74,134
4.10	Utility Staff Cost	-	-	-	-	-	-	19,025	2,959	22,918	-	11,457	11,457	-	-	-	-	-	-	-	283,776
4	Subtotal Period 3b Period-Dependent Costs	-	6,097	-	-	-	-	22,797	4,809	33,703	(0)	13,946	19,257	-	-	-	-	-	-	-	357,910
0	TOTAL PERIOD 3b COST	-	72,257	-	-	-	-	26,830	14,868	112,776	6,419	13,946	92,410	-	-	-	-	-	-	806,487	361,470
	RIOD 3c - Fuel Storage Operations/Shipping																				
	od 3c Direct Decommissioning Activities																				
	o direct activities in this period																				
	od 3c Period-Dependent Costs																				
.1	Insurance	-	-	-	-	-	-	1,109	111	1,220	-	1,220	-	-	-	-	-	-	-	-	-
.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.3	Plant energy budget	-	-	-	-	-	-	285	43	328	-	328	-	-	-	-	-	-	-	-	-
.4	NRC ISFSI Fees	-	-	-	-	-	-	857	85	942	-	942	-	-	-	-	-	-	-	-	-
.5	Emergency Planning Fees	-	-	-	-	-	-	359	36	395	-	395	-	-	-	-	-	-	-	-	-
.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	1,784	268	2,052	-	2,052	-	-	-	-	-	-	-	-	-
.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	240	36	276	-	276	-	-	-	-	-	-	-	-	-
.8	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	4,634	579	5,213	-	5,213	-	-	-	-	-	-	-	-	-
.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	4,634	579	5,213	-	5,213	-	-	-	-	-	-	-	-	-
	RIOD 3d - GTCC shipping																				
	iod 3d Direct Decommissioning Activities																				
	clear Steam Supply System Removal																				
1.1.1	Vessel & Internals GTCC Disposal	-	-	-	-	-	11,910	-	1,787	13,697	13,697	-	-	-	-	-	-	851	-	-	-
1.1	Totals	-	-	-	-	-	11,910	-	1,787	13,697	13,697	-	-	-	-	-	-	851	-	-	-
1	Subtotal Period 3d Activity Costs	-	-	-	-	-	11,910	-	1,787	13,697	13,697	-	-	-	-	-	-	851	-	-	-
	iod 3d Period-Dependent Costs																				
4.1	Insurance	-	-	-	-	-	-	4	0	5	-	5	-	-	-	-	-	-	-	-	-
4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.3	Plant energy budget	-	-	-	-	-	-	1	0	1	-	1	-	-	-	-	-	-	-	-	-
4.4	NRC ISFSI Fees	-	-	-	-	-	-	5	0	5	-	5	-	-	-	-	-	-	-	-	-
4.5	Emergency Planning Fees	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	229	34	263	-	263	-	-	-	-	-	-	-	-	-
4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	1	0	1	-	1	-	-	-	-	-	-	-	-	-
4.8	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	242	36	278	-	278	-	-	-	-	-	-	-	-	-
.0	TOTAL PERIOD 3d COST	-	-	-	-	-	11,910	242	1,822	13,975	13,697	278	-	-	-	-	-	851	-	-	-

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3e Additional Costs																					
3e.2.1	ISFSI License Termination	-	515	5	40	-	159	487	248	1,454	-	1,454	-	-	8,563	-	-	-	407,348	8,422	864
3e.2	Subtotal Period 3e Additional Costs	-	515	5	40	-	159	487	248	1,454	-	1,454	-	-	8,563	-	-	-	407,348	8,422	864
Period 3e Collateral Costs																					
3e.3.1	Small tool allowance	-	7	-	-	-	-	-	1	8	-	8	-	-	-	-	-	-	-	-	-
3e.3	Subtotal Period 3e Collateral Costs	-	7	-	-	-	-	-	1	8	-	8	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.3	Heavy equipment rental	-	170	-	-	-	-	-	26	196	-	196	-	-	-	-	-	-	-	-	-
3e.4.4	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.5	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4	Subtotal Period 3e Period-Dependent Costs	-	170	-	-	-	-	-	26	196	-	196	-	-	-	-	-	-	-	-	-
3e.0	TOTAL PERIOD 3e COST	-	692	5	40	-	159	487	275	1,657	-	1,657	-	-	8,563	-	-	-	407,348	8,422	864
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3f Additional Costs																					
3f.2.1	ISFSI Site Restoration	-	547	-	-	-	-	12	139	698	-	698	-	-	-	-	-	-	-	2,497	64
3f.2	Subtotal Period 3f Additional Costs	-	547	-	-	-	-	12	139	698	-	698	-	-	-	-	-	-	-	2,497	64
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	2	-	-	-	-	-	0	3	-	3	-	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	2	-	-	-	-	-	0	3	-	3	-	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	62	-	-	-	-	-	9	71	-	71	-	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.5	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4	Subtotal Period 3f Period-Dependent Costs	-	62	-	-	-	-	-	9	71	-	71	-	-	-	-	-	-	-	-	-
3f.0	TOTAL PERIOD 3f COST	-	611	-	-	-	-	12	148	771	-	771	-	-	-	-	-	-	-	2,497	64
PERIOD 3 TOTALS		-	73,560	5	40	-	12,069	81,205	17,612	184,892	20,116	21,866	92,410	-	8,563	-	-	861	407,348	917,406	362,368
TOTAL COST TO DECOMMISSION		21,006	168,274	13,589	5,078	46,636	102,911	306,871	129,248	788,102	325,219	86,670	101,213	233,125	206,859	20,945	919	861	19,665,870	2,629,095	3,551,883

178

TABLE C
HOPE CREEK NUCLEAR GENERATING STATION
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours

TOTAL COST TO DECOMMISSION WITH 13.77% CONTINGENCY:	$783,102	thousands of 2002 dollars
TOTAL NRC LICENSE TERMINATION COST IS 79.84% OR:	$625,119	thousands of 2002 dollars
SPENT FUEL MANAGEMENT COST IS 7.24% OR:	$56,270	thousands of 2002 dollars
NON-NUCLEAR DEMOLITION COST IS 12.92% OR:	$101,213	thousands of 2002 dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	129,615	cubic feet
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	67,080	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	861	cubic feet
TOTAL SCRAP METAL REMOVED:	112,389	tons
TOTAL CRAFT LABOR REQUIREMENTS:	2,929,096	man-hours

End Notes:
n/a - indicates that this activity not charged as decommissioning expense.
a - indicates that this activity performed by decommissioning staff.
0 - indicates that this value is less than 0.5 but is non-zero.
a cell containing " - " indicates a zero value

Attachment 2

PSEG Nuclear LLC

Forty-Year Safstor
Decommissioning Cost Analysis

for the

Salem Generating Stations

September 15, 2011

Attachment 2

Table of Contents

I. Summary

This report presents estimates of the cost to decommission the Salem Nuclear Generating Station Units 1 and 2 (together, "Salem") following the end of their current licensed operating period ending on August 13, 2036 and April 18, 2040, respectively.

This report relies in part on a December 2002 report by TLG Services entitled *Decommissioning Cost Analysis for the Salem Generating Station, Unit 1 and 2* ("TLG Report"), with updates to account for the time value of money and a change in decommissioning method from DECON to a forty-year SAFSTOR. The TLG Report is included in its entirety in Appendix B to this report.

This report is based on two fundamental assumptions: (1) spent nuclear fuel ("SNF") management costs will be borne by the United States Government; and (2) Salem Units 1 and 2 will be placed in a forty-year period of safe storage following end of license in 2036 and 2040, respectively.

While spent fuels management costs are discussed in this report and its appendices, those costs are contractually the responsibility of the Government of the United States[1], and are therefore not considered a liability that must be funded by the Salem Decommissioning Trust Fund. The Salem/Hope Creek site has an Independent Spent Fuel Storage Installation ("ISFSI"), that is appropriately sized to receive all SNF generated from the Salem units through their licensed life.

PSEG Nuclear considered the following three decommissioning options for Salem:

- DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license after cessation of operations. Until 2008, this was the strategy that was to be used to decommission Salem.
- SAFSTOR: The facility is placed in a safe stable condition and maintained in that state until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the levels of radioactivity in and on the material and potentially the quantity of material that must be disposed of during decontamination and dismantlement. This is the method PSEG will use to decommission Salem.
- ENTOMB: involves encasing radioactive structures, systems, and components in a structurally long-lived substance, such as concrete. The

[1] *See* US Department of Energy Contract No. DE-CR01-83NE44480, Salem Generating Station Nos. 1 and 2 Units Contract for Disposal of Spent Fuel and/or High-Level Radioactive Waste (Jun. 13, 1983), as amended.

entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license. Because most power reactors will have radionuclides in concentrations exceeding the limits for unrestricted use even after 100 years, this option will generally not be feasible and was not deemed to be viable for Salem.

This report assumes a forty-year period of safe storage for each Salem unit after end of its current licensed operating period[2]. PSEG Nuclear LLC, the Operator of Salem, has chosen a forty year SAFSTOR period (approximately 7.6 half-lives of the radioactive isotope Cobalt 60) as a prudent measure to reduce overall radiation exposure to workers during the decommissioning period. An added benefit of the SAFSTOR method is that worker efficiency will be greater due to fewer radiological restrictions during performance of the work. However, economic benefits from gains in efficiency will be partially off-set by maintenance and security costs during the SAFSTOR period, and these costs have been explicitly addressed in this report.

II. Methodology

The TLG Report provided in Appendix B to this report provided the primary source of information related to costs associated with decommissioning Salem. PSEG personnel used the information in that report to develop the estimate applicable to SAFSTOR described in this report.

Because costs were reported in the TLG Report in 2002 dollars, the first step in the process was to escalate the 2002 costs to 2010 dollars. This re-evaluation produced an increase adjustment of 27% for 2010 Labor & Equipment Costs over the 2002 TLG Report. The New Jersey labor rates from 2003 through 2010 as well as Construction Equipment Costs over the same time frame were used to develop the overall adjustment. The SAFSTOR Decommissioning value was arrived at by taking the 2010 immediate decommissioning cost and adjusting it to reflect significant reduction in residual radioactivity thereby reducing/eliminating the radiation hazards during the dismantling and demolition. This expected improvement will lead to a reduction in overall decommissioning cost, and that improvement is reflected in this study. Details of the adjustment factors used are provided in Table 2.

Aside from the conversion from 2002 to 2010 dollars, two other significant changes were made to update the 2002 TLG Report to address the current forty-year SAFSTOR strategy for Salem. The first change involved shifting the initial costs for preparing the plant for decommissioning from the start of the seven-year decommissioning and dismantlement period assumed in the DECON scenario to prior to the start of the SAFSTOR period. These up-front costs are incurred in three years immediately following termination of operations. The second major change was adding a forty-year period of safe storage prior to final decommissioning. A timeline of these activities is

[2] The forty-year SAFSTOR period will begin after a three-year period during which systems are drained, fuel is removed, and the plants are readied for safe storage.

shown in Appendix A to this report. Detailed information showing cash flows, major events, and assumptions is contained in a one-page summary in Table 5 of this report.

Attachment 2

III. Tables

Attachment 2

Table 1A: Summary of Decommissioning Cost Elements- Salem 1

Work Category [3]	Cost 2002$ (thousands)	Cost 2010$ (thousands)	Percent of Total Costs
Decontamination	13,463	17,098	2.4%
Removal	79,587	101,075	14.3%
Packaging	11,727	14,893	2.1%
Transportation	11,632	14,773	2.1%
Waste Disposal	80,911	102,757	14.6%
Off-Site Waste Processing	16,802	21,338	3.0%
Program Management (incl. Eng. and Security)	233,535	296,589	42.0%
Spent Fuel Pool Isolation	9,060	11,506	1.6%
ISFSI Related (including capital)	67,207	85,353	12.1%
Insurance and Regulatory Fees	11,464	14,559	2.1%
Energy	8,046	10,218	1.4%
Characterization and Licensing Surveys	6,440	8,179	1.2%
Misc. Equipment and Site Services	6,025	7,652	1.1%
Total	555,899	705,992	100.0%
License termination (10 CFR § 50.75 decommissioning activities) [4]	523,818	665,249	
Site Restoration (non- 50.75 activities)	32,081	40,743	

[3] Includes contingencies.

[4] This total includes spent fuel management.

Attachment 2

Table 1B: Summary of Decommissioning Cost Elements- Salem 2

Work Category [5]	Cost 2002$ (thousands)	Cost 2010$ (thousands)	Percent of Total Costs
Decontamination	13,577	17,243	2.3%
Removal	100,874	128,110	16.8%
Packaging	11,746	14,917	2.0%
Transportation	11,734	14,902	2.0%
Waste Disposal	80,039	101,649	13.7%
Off-Site Waste Processing	17,175	21,812	2.9%
Program Management (incl. Eng. and Security)	272,325	345,853	45.5%
Spent Fuel Pool Isolation	6,040	7,671	1.0%
ISFSI Related (including capital)	53,776	68,295	19.0%
Insurance and Regulatory Fees	9,209	11,695	1.5%
Energy	7,344	9,327	1.2%
Characterization and Licensing Surveys	6,440	8,179	1.1%
Misc. Equipment and Site Services	6,423	8,157	1.1%
Total	598,702	694,494	100.0%
License termination (10 CFR § 50.75 decommissioning activities) [6]	544,985	692,131	
Site Restoration (non- 50.75 activities)	53,717	68,221	

[5] Includes contingencies.

[6] This total includes spent fuel management.

Attachment 2

Table 2A: Summary of Cost Efficiency Adjustments- Salem 1

	Factors	TLG 2002$ (thousands)	TLG 2010$ (thousands)	SAFSTOR Adjustment Factors: Cost Efficiency Factor	SAFSTOR Adjustment Factors: Cost Reduction Adjustment Contam. To Decontam.	SAFSTOR 2010$ (thousands)
Decommissioning						
Non Contaminated	71%	$ 249,358	$ 316,685	90%	0%	$ 285,017
Contaminated	29%	$ 101,851	$ 129,351	0%	25%	$ 97,013
Spent Fuel Mgmt	100%	$ 64,655	$ 82,112	100%	0%	$ 82,112
Other Fixed	100%	$ 53,656	$ 68,143	100%	0%	$ 68,143
Sub-Total		$ 469,520	$ 544,643			$ 532,285
Contingency		$ 86,379	$ 100,200			$ 97,408
Total Salem 1[7]		**$ 555,899**	**$ 644,843**			**$ 629,693**

[7] Individual line items are rounded so totals may vary slightly due to round-off error.

Attachment 2

Table 2B: Summary of Cost Efficiency Adjustments- Salem 2

	Factors	TLG 2002$ (thousands)	TLG 2010$ (thousands)	SAFSTOR Adjustment Factors: Cost Efficiency Factor	SAFSTOR Adjustment Factors: Cost Reduction Adjustment Contam. To Decontam.	SAFSTOR 2010$ (thousands)
Decommissioning						
Non Contaminated	71%	$ 256,847	$ 326,197	90%	0%	$ 293,577
Contaminated	29%	$ 104,909	$ 133,234	0%	25%	$ 99,923
Spent Fuel Mgmt	100%	$ 105,973	$ 134,586	100%	0%	$ 134,586
Other Fixed	100%	$ 38,635	$ 49,066	100%	0%	$ 49,066
Sub-Total		$ 506,364	$ 643.082			$ 577,152
Contingency		$ 92,388	$ 117,333			$ 105,619
Total Salem 2[8]		**$ 598,702**	**$ 748,922**			**$ 682,771**

8 Individual line items are rounded so totals may vary slightly due to round-off error.

Attachment 2

Location: Salem Generating Station
Project: Decommissioning of Nuclear Plants After Safe Storage

Decommissioning Cost For Salem Nuclear Power Plant After
Forty Years of Safe Storage

Analysis:

Bases of Cost - TLG Cost 2002

Plant Prep & Temp Service
Rigging Construction Control & Tooling
Security Staff (except Spent Fuel Mgt.)
Utility Staff (except Spent Fuel Mgt.)
Final Site Survey

Based on the cost of items to be decontaminated (from TLG estimate), determined that Contaminated Factors represent approx. 29% of the total cost to decommission a Nuclear Plant. Therefore, Non - contaminated factors represent approx. 71% of the total cost.

Cost Efficiency Factors:

The 2002 TLG Estimate was based on single unit demolition basis for Salem, and in our review we acknowledge an economy scale should be applied since Salem and Hope Creek will be done in tandem. We will reference EPRI study ESC-4685 SIA 83-420 a Nuclear Power Construction study prepared by United & Construction Inc. that supports multi unit construction has efficiency reduction (summarized below).

Station	Reactor Type	Multi Unit Efficiency Direct Craft Labor 1-2	1-3
Salem	PWR	11%-22%	28%-36% Data Source EPRI p. 3-79 & 3-80

Cost Assumptions:

Salem -
In consideration of the EPRI study, efficiency reduced the variable costs. Fixed cost elements (see base cost allocation above) remain constant on a per unit basis. The TLG cost was reduced by 10% since this will be a mass demolition (non contaminated) vs. controlled demolition (contaminated)

The Spent Fuel will follow the same fact pattern and cash flow pattern as in the 2002 TLG Study for Salem.

Since decommissioning after 40 yrs would be equivalent to normal demolition work in a Fossil Plant an additional allowance of 15% savings has been made to contaminated portion of the work only. (Working in a contaminated area can account for a loss of productivity of an additional 25% or 2 Man Hrs/Day). The breakdown of unproductive time is listed below, is based on field observations made at the nuclear sites.

Security:	0.5 MH	6.25%
Suit Up requirements (two times/day)	1 MH	12.5%
Clean up at the end of day	0.5 MH	6.3%
Total	2 MH	25.0%

The other factors affecting productivity in a contaminated area physical restrictions congestion, height adjustment in work space (crawl space or 40ft. In the air), outage schedule (comprised time line) and ALARA (level of allowance radiation) & proximity of other on going projects. The cost assumptions correspond to present circumstances and to the present status & availability of technology.

Table 3A: Salem Unit 1 SAFSTOR vs. Non-SAFSTOR Summary of Costs

2010$
(millions)

Description	Non SAFSTOR TLG 2002	Non SAFSTOR TLG (esc.) 2010	SAFSTOR PSEG 2010
Site Specific Cost			
Lic. Termination	449.8	571.3	495.0
Spent Fuel Mgmt.	74.0	94.0	94.0
Site Restoration	32.1	40.7	40.7
Total (100% Share)	**555.9**	**706.0**	**629.7**
PSEG Share (w/Spent Fuel)[9]	**319.1**	**405.3**	**361.5**
Spent Fuel Costs	(42.5)	(54.0)	(54.0)
PS share (w/o Spent Fuel)	**276.7**	**351.3**	**307.5**
Site Restoration (PSEG Share)	(18.4)	(23.4)	(23.4)
PS share (w/o Site Restoration & Spent Fuel)	**258.2**	**327.9**	**286.1**

9 The spent fuel management cost include an allocation from the contingency shown on table 2.

Table 3B: Salem Unit 2 SAFSTOR vs. Non-SAFSTOR Summary of Costs
2010$
(millions)

Description	Non SAFSTOR TLG 2002	Non SAFSTOR TLG (esc.) 2010	SAFSTOR PSEG 2010
Site Specific Cost			
Lic. Termination	420.2	533.6	456.0
Spent Fuel Mgmt.	124.8	158.5	158.5
Site Restoration	53.7	68.2	68.2
Total (100% Share)	**598.7**	**748.9**	**682.7**
PSEG Share (w/Spent Fuel)[10]	**343.7**	**429.9**	**391.9**
Spent Fuel Costs	(71.6)	(90.9)	(90.0)
PS share (w/o Spent Fuel)	**272.1**	**339.0**	**301.9**
Site Restoration (PSEG Share)	(30.8)	(39.1)	(39.1)
PS share (w/o Site Restoration & Spent Fuel)	**241.2**	**299.9**	**262.8**

[10] The spent fuel management cost include an allocation from the contingency shown on table 2.

TABLE 4A: SCHEDULE OF ANNUAL EXPENDITURES
Salem Unit 1 - SAFSTOR
(millions, 2010 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total	O&M Security During SAFSTOR
2036	5.1	0.2	0.2	0.0	0.3	5.8	
2037	26.4	3.0	0.8	0.7	2.9	33.8	
2038	7.7	1.4	0.7	0.8	3.8	14.4	
2039							2.6
2040							2.6
2041							2.6
2042							2.6
2043							2.6
2044							2.6
2045							2.6
2046							2.6
2047							2.6
2048							2.6
2049							2.6
2050							2.6
2051							2.6
2052							2.6
2053							2.6
2054							2.6
2055							2.6
2056							2.6
2057							2.6
2058							2.6
2059							2.6
2060							2.6
2061							2.6
2062							2.6
2063							2.6
2064							2.6
2065							2.6
2066							2.6
2067							2.6
2068							2.6
2069							2.6
2070							2.6
2071							2.6
2072							2.6
2073							2.6
2074							2.6
2075							2.6
2076							2.6
2077							2.6
2078							2.6
2079	13.6	0.8	0.3	0.0	0.6	15.3	
2080	13.5	4.6	0.3	8.6	3.8	30.8	
2081	20.3	6.0	0.5	13.9	5.4	46.1	
2082	50.0	6.9	0.6	14.6	4.8	76.9	
2083	39.4	5.5	1.2	10.5	4.9	61.5	

Attachment 2

2084	39.0	5.1	0.5	0.0	1.5	46.1	
2085	20.6	8.6	0.3	0.0	1.3	30.8	
Total	235.6	42.1	5.4	49.1	29.3	361.5	104.0

TABLE 4B: SCHEDULE OF ANNUAL EXPENDITURES
Salem Unit 2 - SAFSTOR
(millions, 2010 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total	O&M Security During SAFSTOR
2040	8.5	0.2	0.3	0.0	0.7	9.7	
2041	43.9	5.0	1.4	1.1	4.9	56.3	
2042	12.8	2.3	1.2	1.3	6.4	24.0	
2043							2.6
2044							2.6
2045							2.6
2046							2.6
2047							2.6
2048							2.6
2049							2.6
2050							2.6
2051							2.6
2052							2.6
2053							2.6
2054							2.6
2055							2.6
2056							2.6
2057							2.6
2058							2.6
2059							2.6
2060							2.6
2061							2.6
2062							2.6
2063							2.6
2064							2.6
2065							2.6
2066							2.6
2067							2.6
2068							2.6
2069							2.6
2070							2.6
2071							2.6
2072							2.6
2073							2.6
2074							2.6
2075							2.6
2076							2.6
2077							2.6
2078							2.6
2079							2.6
2080							2.6
2081							2.6
2082							2.6
2083	13.3	0.8	0.3	0.0	0.7	15.1	
2084	13.2	4.5	0.3	8.4	3.8	30.2	
2085	20.0	5.9	0.5	13.6	5.3	45.3	
2086	48.9	6.8	0.7	14.3	4.6	75.3	
2087	38.5	5.4	1.2	10.2	5.0	60.3	

Attachment 2

2088	38.2	5.0	0.4	0.0	1.7	45.3	
2089	20.2	8.4	0.3	0.0	1.5	30.4	
Total	257.5	44.3	6.6	48.9	34.6	391.9	104.0

Attachment 2

Table 5A Salem 1 Cash Flows

Year	Annual Expenditures thousands 2010	DTF Fund Balance 2% Real Rate of Return dollars less expenditures	SAFSTOR Year	Notes
		255,599		Balance as of 12/31/2010
2011		260,711		
2012		265,925		
2013		271,244		Fund balances escalates at 2% per annum during remaining period of operation
2014		276,669		
2015		282,202		
2016		287,846		
2017		293,603		
2018		299,475		
2019		305,464		
2020		311,574		
2021		317,805		
2022		324,161		
2023		330,645		
2024		337,257		
2025		344,002		
2026		350,883		
2027		357,900		
2028		365,058		
2029		372,359		
2030		379,807		
2031		387,403		
2032		395,151		
2033		403,054		
2034		411,115		
2035		419,337		
2036	5,800	421,924		Expenses to put plant in SAFSTOR Condition, includes security and O&M
2037	33,800	396,592		
2038	14,400	390,124		
2039		395,326	1	Annual Security and O&M cost during SAFSTOR is $2.6MM (PSEG Share)
2040		400,632	2	
2041		406,045	3	
2042		411,566	4	
2043		417,197	5	
2044		422,941	6	
2045		428,800	7	
2046		434,776	8	
2047		440,871	9	
2048		447,089	10	
2049		453,431	11	
2050		459,899	12	
2051		466,497	13	
2052		473,227	14	
2053		480,092	15	
2054		487,094	16	
2055		494,236	17	
2056		501,520	18	
2057		508,951	19	
2058		516,530	20	
2059		524,260	21	
2060		532,146	22	
2061		540,188	23	
2062		548,392	24	
2063		556,760	25	
2064		565,760	26	
2065		574,001	27	
2066		582,881	28	

Attachment 2

2067		591,939	29	
2068		601,177	30	
2069		610,601	31	
2070		620,213	32	
2071		630,017	33	
2072		640,017	34	
2073		650,218	35	
2074		660,626	36	
2075		671,235	37	
2076		682,060	38	
2077		693,101	39	
2078		704,363	40	
2079	15,300	703,150		Costs during 7-year decommissioning period includes security and O&M
2080	30,800	686,413		
2081	46,100	654,041		
2082	76,900	590,222		
2083	61,500	540,527		
2084	46,100	505,237		
2085	30,800	484,542		

Attachment 2

Table 5B Salem 2 Cash Flows

Year	Annual Expenditures thousands 2010	DTF Fund Balance 2% Real Rate of Return dollars less expenditures	SAFSTOR Year	Notes
		234,780		Balance as of 12/31/2010
2011		239,476		
2012		244,265		
2013		249,150		Fund balances escalates at 2% per annum during remaining period of operation
2014		254,133		
2015		259,216		
2016		264,400		
2017		269,688		
2018		275,082		
2019		280,584		
2020		286,196		
2021		291,919		
2022		297,758		
2023		303,713		
2024		309,787		
2025		315,983		
2026		322,303		
2027		328,749		
2028		335,324		
2029		342,030		
2030		348,871		
2031		355,848		
2032		362,965		
2033		370,224		
2034		377,628		
2035		385,181		
2036		392,885		
2037		400,743		
2038		408,758		
2039		416,934		
2040	9,700	415,574		Expenses to put plant in SAFSTOR Condition, includes security and O&M
2041	56,300	367,584		
2042	24,000	350,936		
2043		355,354	1	Annual Security and O&M cost during SAFSTOR is $2.6MM (PSEG Share)
2044		359,861	2	
2045		364,459	3	
2046		369,148	4	
2047		373,931	5	
2048		378,809	6	
2049		383,786	7	
2050		388,861	8	
2051		394,039	9	
2052		399,319	10	
2053		404,706	11	
2054		410,200	12	
2055		415,804	13	
2056		421,520	14	
2057		427,350	15	
2058		433,297	16	
2059		439,363	17	
2060		445,551	18	
2061		451,862	19	
2062		458,299	20	
2063		464,865	21	
2064		471,562	22	
2065		478,393	23	
2066		485,361	24	
2067		492,469	25	

Attachment 2

2068		499,718	26
2069		507,112	27
2070		514,655	28
2071		522,348	29
2072		530,195	30
2073		538,198	31
2074		546,362	32
2075		554,690	33
2076		563,183	34
2077		571,847	35
2078		580,684	36
2079		589,698	37
2080		598,892	38
2081		608,270	39
2082		617,835	40
2083	15,100	615,092	
2084	30,200	597,193	
2085	45,300	563,837	
2086	75,300	499,510	
2087	60,300	449,510	
2088	45,300	413,201	
2089	30,400	391,065	

Costs during 7-year decommissioning period includes security and O&M

Attachment 2

Table 6: Decommissioning Waste Summary

Please see Table 5.1, Decommissioning Waste Summary, in the TLG Report, attached as Appendix B to this report.

Attachment 2

Table 7: Detailed Cost Analysis
Please see Appendix C in the TLG Report, attached as Appendix B to this report.

IV. Appendices

A. Time Line

B. December 2002 TLG Decommissioning Cost Analysis

Attachment 2

Appendix A: Time Line

Salem 1

Activity	2036	2037	2038	2039 - 2078	2079	2080	2081	2082	2083	2084	2085
Shutdown through Transition	x	x	x								
Safe storage period				x							
Decommissioning and Site Restoration					x	x	x	x	x	x	x

Salem 2

Activity	2040	2041	2042	2043 - 2082	2083	2084	2085	2086	2087	2088	2089
Shutdown through Transition	x	x	x								
Safe Storage period				x							
Decommissioning and Site Restoration					x	x	x	x	x	x	x

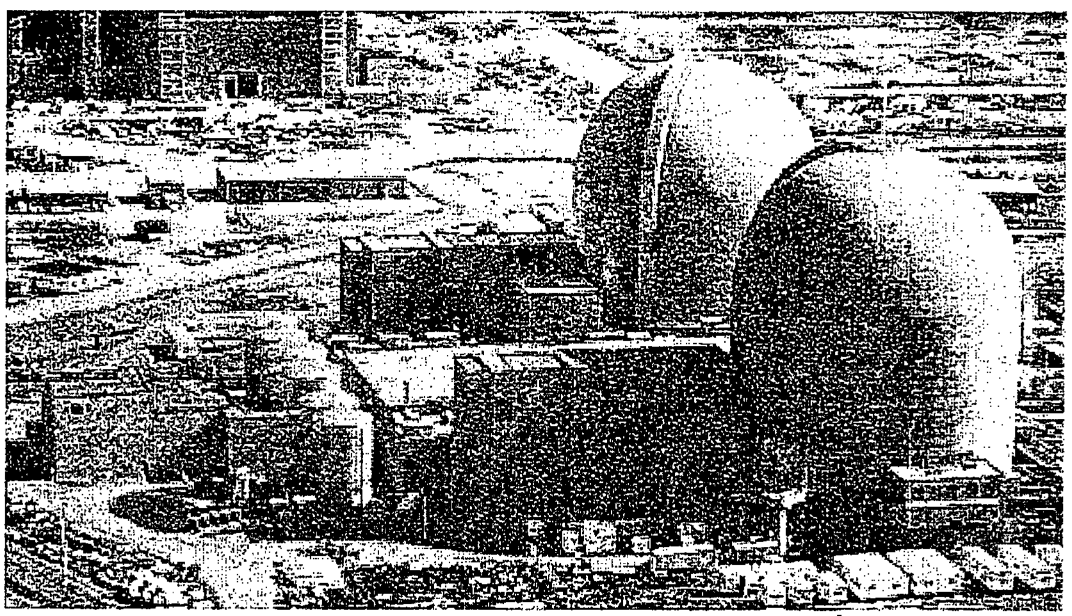
Attachment 2

Appendix B: December 2002 TLG Decommissioning Cost Analysis

DECOMMISSIONING COST ANALYSIS

for the

SALEM GENERATING STATION,
UNITS 1 AND 2



prepared for

PSEG NUCLEAR, LLC

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

December 2002

03

APPROVALS

Project Manager	William A. Cloutier, Jr.	12/4/02 Date
Project Engineer	Albert A. Koehl	12/4/02 Date
Technical Manager	Geoffrey M. Griffiths	12/4/02 Date
Quality Assurance Manager	Carolyn A. Palmer	12/05/02 Date

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
0		12-05-02		Original Issue

EXECUTIVE SUMMARY

This report presents the costs to promptly decommission (decontaminate and dismantle) the Salem Generating Station (Salem Station) following a scheduled cessation of plant operations. The analysis relies upon the site-specific, technical information developed for a previous evaluation prepared in 1995-96, updated to reflect current plant conditions and operating assumptions. The estimates are designed to provide PSEG Power, LLC with sufficient information to assess its financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimates are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The estimates incorporate a cooling period of approximately five years for the spent fuel that resides in the plant's storage pools when operations cease. Any residual fuel remaining in the pools after the five-year period will be relocated to an on-site, interim storage facility to await the transfer to a DOE facility. The estimates also include the dismantling of non-essential structures and limited restoration of the site.

Alternatives and Regulations

The Nuclear Regulatory Commission (NRC) provided general decommissioning guidance in the rule adopted on June 27, 1988.[1] In this rule the NRC set forth technical and financial criteria for decommissioning licensed nuclear facilities. The regulations addressed planning needs, timing, funding methods, and environmental review requirements for decommissioning. The rule also defined three decommissioning alternatives as being acceptable to the NRC - DECON, SAFSTOR, and ENTOMB.

> DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."[2]

1 U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72 "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988.

2 Ibid. Page FR24022, Column 3.

SAFSTOR is defined as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use."[3] Decommissioning is to be completed within 60 years, although longer time periods will be considered when necessary to protect public health and safety.

ENTOMB is defined as "the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactive material decays to a level permitting unrestricted release of the property."[4] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years.

The 60-year restriction has limited the practicality of the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. As such, the NRC is currently re-evaluating this option and the technical requirements and regulatory actions that would be necessary for entombment to become a viable option.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning. Regulatory Guide 1.184, issued in July 2000, further describes the methods and procedures that are acceptable to the NRC staff for implementing the requirements of the 1996 revised rule that relate to the initial activities and the major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and process described in the amended regulations.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines[5] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference

3 Ibid.
4 Ibid. Page FR24023, Column 2.
5 T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

describes a unit factor method for determining decommissioning activity costs. The unit factors used in this analysis incorporate site-specific costs and the latest available information on worker productivity in decommissioning.

The estimates also reflect lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee and San Onofre-1 nuclear units have provided additional insight into the process, the regulatory aspects, and technical challenges of decommissioning commercial nuclear units.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

Contingency

Consistent with industry practice, contingencies are applied to the decontamination and dismantling costs developed as "specific provision for unforeseeable elements of cost within the defined project scope, particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."[6] The cost elements in the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a safety factor issue. Safety factors provide additional security and address situations that may never occur. Contingency funds, by contrast, are expected to be fully expended throughout the program. Inclusion of contingency is necessary to provide assurance that sufficient funding will be available to accomplish the intended tasks.

---

6 Project and Cost Engineers' Handbook, Second Edition, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, p. 239.

Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Disposal Act" in 1980, and its Amendments of 1985,[7] the states became ultimately responsible for the disposition of radioactive waste generated within their own borders.

New Jersey is a member of the three-state Atlantic Interstate Low-Level Radioactive Waste Management Compact, formed after South Carolina formally joined the Northeast Regional Compact. The Barnwell Low-Level Radioactive Waste Management Facility, located in South Carolina, is expected to be available to PSEG Nuclear to support the decommissioning of the Salem Station. It is also assumed that PSEG Nuclear could access other disposal sites should it prove cost effective. As such, rate schedules for both the Barnwell and the Envirocare facility in Utah were used to generate disposal costs.

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[8] in 1982, assigning the responsibility for disposal of spent nuclear fuel created by the commercial nuclear generating plants to the DOE. This legislation also created a Nuclear Waste Fund to cover the cost of the program, which is funded by the sale of electricity from nuclear reactors since 1993, and an estimated equivalent value for assemblies irradiated prior to 1983. The Nuclear Waste Policy Act, along with the individual disposal contracts with utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. Operation of DOE's yet-to-be constructed geologic repository is currently scheduled for the year 2010, assuming that the licensing could be completed expeditiously and a national transportation system established. The agency has no plans for receiving spent fuel from commercial nuclear plant sites prior to this date and startup operations may be phased in, creating additional delays.

The NRC requires licensees to establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE. For estimating purposes, PSEG Nuclear has assumed that the high-level waste repository, or some interim storage facility, will be fully

7 "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1/15/86.

8 "Nuclear Waste Policy Act of 1982 and Amendments," U.S. Department of Energy's Office of Civilian Radioactive Management, 1982.

operational by 2015. Interim storage of the fuel, until the DOE has completed the transfer, will be in an independent facility located on the Artificial Island site. This will allow PSEG Nuclear to proceed with decommissioning and terminate its operating licenses in the shortest time possible.

The spent fuel storage facility, which is independently licensed and operated, will be sized to accommodate the inventory of spent fuel residing in the plant's storage pools at the cessation of operations, in addition to any operational inventory already in residence. When emptied, the station could be dismantled without maintaining the wet storage pools. Based upon this scenario, and an anticipated rate of transfer, spent fuel is projected to remain on site for approximately 30 years following the cessation of Unit 1 operations.

Site Restoration

The efficient removal of the contaminated materials at the site may result in damage to many of the site structures. Blasting, coring, drilling, and the other decontamination activities will substantially damage power block structures, potentially weakening the footings and structural supports. Prompt demolition once the license is terminated is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized is more efficient and less costly than if the process were deferred. Experience at shutdown generating stations has shown that plant facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and the demolition work force. Consequently, this study assumes that site structures will be removed to a nominal depth of three feet below the local grade level wherever possible. The site will then be graded and stabilized.

Summary

The DECON decommissioning alternative involves the prompt removal of the contaminated and activated plant components, including structural materials, from the site following permanent shutdown. The facility operator may then have unrestricted use of the site with no further requirement for a license. This study assumes that the remainder of the non-essential plant systems and structures, not previously removed in support of license termination, are dismantled and the site restored.

The scenario analyzed for the purpose of generating the estimates is described in Section 2. The assumptions are presented in Section 3, along with schedules of annual expenditures. The major cost contributors are identified in Section 6, with detailed activity costs, waste volumes, and associated manpower requirements delineated in Appendix C. A cost summary is provided at the end of this section for the major cost components.

COST SUMMARY
(Thousands of 2002 Dollars)

Activity	Unit 1	Unit 2	Station
Decontamination	13,463	13,577	27,040
Removal	79,587	100,874	180,461
Packaging	11,726	11,746	23,473
Transportation	11,632	11,734	23,366
Waste Disposal	80,911	82,039	162,950
Off-site Waste Processing	16,802	17,175	33,977
Program Management (including Engineering and Security)	233,535	272,325	505,860
Spent Fuel Pool Isolation	9,060	6,040	15,101
ISFSI Related (including capital)	67,207	53,776	120,983
Insurance and Regulatory Fees	11,464	9,209	20,672
Energy	8,046	7,344	15,390
Characterization and Licensing Surveys	6,440	6,440	12,880
Misc. Equipment and Site Services	6,026	6,423	12,449
Total [1]	555,899	598,702	1,154,601
License Termination [2]	523,818	544,985	1,068,803
Site Restoration	32,081	53,717	85,798

[1] Columns may not add due to rounding.
[2] Includes spent fuel management expenditures.

1. INTRODUCTION

This decommissioning analysis is designed to provide PSEG Power with sufficient information to prepare the financial planning documents for decommissioning, as required by the Nuclear Regulatory Commission (NRC or Commission). It is not a detailed assessment, but a financial analysis prepared in advance of the engineering and planning that will be required to carry out the decommissioning of the Salem Generating Station (Salem Station).

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the costs to decommission Salem Station for the scenario outlined in Section 2, to define a sequence of events, and project the volume of waste produced from the decontamination and dismantling activities.

The Salem Station is jointly owned by PSEG Power, LLC (57%) and Exelon Generation Corporation (43%). However, for purposes of this study, only the undivided decommissioning costs (100%) are presented, since the division of ownership has no effect on the total expenditures required. PSEG Nuclear operates the station.

The Station is comprised of two identical units, constructed concurrently, with the construction permits being issued on the same date. For the purposes of this study, the shutdown dates were taken as August 13, 2016, and April 18, 2020, for Units 1 and 2, respectively. This time frame, which reflects 40 years of operating life for each unit, was used as an input for scheduling the decommissioning activities.

1.2 SITE DESCRIPTION

The Salem Station is located on the southern part of Artificial Island on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County, New Jersey. The site is 15 miles south of the Delaware Memorial Bridge, 18 miles south of Wilmington, Delaware, 30 miles southwest of Philadelphia, Pennsylvania, and 7½ miles southwest of Salem, New Jersey.

The Nuclear Steam Supply System (NSSS) consists of a pressurized water reactor and a four-loop Reactor Coolant System (RCS). The system was supplied by the Westinghouse Electric Corporation. The licensed ratings for each of the two units is 3,411 MWt. The corresponding net dependable electrical output is 1,115 MWe.

The NSSS is housed within a "containment structure," a seismic Category I, reinforced-concrete, dry structure. The containment is a cylinder with a hemispherical dome and a flat, reinforced-concrete foundation mat. A welded steel liner plate anchored to the inside face of the containment serves as a leak-tight membrane.

Heat produced in the reactor is converted to electrical energy by the steam and power conversion system. A turbine-generator system converts the thermal energy of steam produced in the steam generators into mechanical shaft power and then into electrical energy. The plant's turbine-generators are each tandem-compound, four-element units. They consist of one high-pressure, double-flow, and three low-pressure, double-flow elements driving a direct-coupled generator at 1,800 rpm. The turbines are operated in a closed feedwater cycle that condenses the steam; the heated feedwater is returned to the steam generators. Heat rejected in the main condensers is removed by the circulating water system.

The circulating water system provides the heat sink required for removal of waste heat in the power plant's thermal cycle. The system has the principal function of removing heat by absorbing this energy in the main condenser. Water is withdrawn from the Delaware River by the circulating water pumps located at the intake structure. After passing through the plant condensers, the discharge is routed back into the Delaware estuary.

1.3 REGULATORY GUIDANCE

The NRC provided initial decommissioning guidance in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988.[1]* This rule set forth technical and financial criteria for decommissioning licensed nuclear facilities. The regulation addressed decommissioning planning needs, timing, funding methods, and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors,"[2] which provided guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the

* Annotated references for citations in Sections 1-6 are provided in Section 7.

content and form of the financial assurance mechanisms indicated in the rule amendments.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB. It also placed limits on the time allowed to complete the decommissioning process. For SAFSTOR, the process is restricted in overall duration to 60 years unless it could be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the definition of unrestricted release and license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some if not most reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC is considering rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. Pending completion of such rulemaking, entombment requests will be handled on a case-by-case basis.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants.[3] When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the operating license life. Since that time, several licensees permanently and prematurely ceased operations without having submitted a decommissioning plan. In addition, these licensees requested exemptions from certain operating requirements as being unnecessary once the reactor is defueled. Each case was handled individually without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The new amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees would submit written certification to the NRC within 30 days after the decision to cease operations. Certification would also be required once the fuel was permanently removed from the reactor vessel. Submittal of these notices would entitle the licensee to a fee reduction and eliminate the obligation to follow certain requirements needed only during operation of the reactor. Within two years of submitting notice of permanent cessation of operations, the licensee would be required to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC. The PSDAR describes the planned decommissioning activities, the associated sequence and schedule, and an estimate of expected costs. Prior to completing decommissioning, the licensee would be required to submit an application to the NRC to terminate the license, along with a license termination plan (LTP).

1.3.1 Nuclear Waste Policy Act

Congress passed the Nuclear Waste Policy Act[4] in 1982, assigning the responsibility for disposal of spent nuclear fuel from the commercial nuclear generating plants to the Department of Energy (DOE). Two permanent disposal facilities were envisioned, as well as an interim facility. To recover the cost of permanent spent fuel disposal, this legislation created a Nuclear Waste Fund through which money was to be collected from the consumers of the electricity generated by commercial nuclear power plants. The Nuclear Waste Policy Act, along with the individual disposal contracts with utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

After pursuing a national site selection process, the Act was amended in 1987 to designate Yucca Mountain, Nevada, as the only site to be evaluated for geologic disposal of high-level waste. Also in 1987, the DOE announced a five-year delay in the opening date for the repository, from 1998 to 2003. Two years later, in 1989, an additional 7-year delay was announced, primarily due to problems in obtaining the required permits from the state of Nevada to perform the required characterization of the site.

Generators have responded to this impasse by initiating legal action and constructing supplemental storage as a means of maintaining necessary operating margins. In a recent decision, the U.S. Court of Appeals for the Federal Circuit reaffirmed the utility position that

DOE had breached its contractual obligation. However, even with the August 2000 ruling,[5] DOE's position has remained unchanged. The agency continues to maintain that its delayed performance is unavoidable because it does not have an operational repository and does not have authority to provide storage in the interim. Consequently, DOE has no plans to receive spent fuel from commercial U.S. reactors before the year 2010.

The NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy in 10 CFR 50.54 (bb).[6] This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimates, as described below.

For estimating purposes, PSEG Nuclear has assumed that the high-level waste repository, or some interim storage facility, will be fully operational by 2015. Interim storage of the fuel, until the DOE has completed the transfer, will be in an independent facility located on the Artificial Island site. This will allow PSEG Nuclear to proceed with decommissioning and terminate its operating licenses in the shortest time possible.

Based upon the projected capacity of the spent fuel storage pools, supplemental storage will be required before the current operating licenses expire so as to maintain full core off-load capability. Therefore, this analysis assumes that an on-site independent spent fuel storage installation (ISFSI) will be constructed to support plant operations and will be available to support decommissioning

The spent fuel storage facility, which is independently licensed and operated, will be sized to accommodate the inventory of spent fuel residing in the plant's storage pools at the cessation of operations, in addition to any operational inventory already in residence. When emptied, the station could be dismantled without maintaining the wet storage pools. Based upon this scenario, and an anticipated rate of transfer, spent fuel is projected to remain on site for approximately 30 years following the cessation of Unit 1 operations.

Expenditures are included in the analysis for the isolation and continued operation of the spent fuel pools throughout the first five years of decommissioning. Expenses are also included for loading the spent fuel assemblies remaining in the storage pools after the cessation of plant operations into multi-purpose canisters, for canister costs and overpacks, and for the operation of the ISFSI through the year 2046, when all the fuel is expected to be transferred to the DOE.

1.3.2 Low-Level Radioactive Waste Policy Amendments Act

Congress passed the "Low-Level Radioactive Waste Disposal Act" in 1980, declaring the states as being ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. The federal law encouraged the formation of regional groups or compacts to implement this objective safely, efficiently and economically, and set a target date of 1986. With little progress, the "Amendments Act" of 1985[7] extended the target, with specific milestones and stiff sanctions for non-compliance.

New Jersey is a member of the three-state Atlantic Interstate Low-Level Radioactive Waste Management Compact, formed after South Carolina formally joined the Northeast Regional Compact. The Barnwell Low-Level Radioactive Waste Management Facility, located in South Carolina, is expected to be available to PSEG Nuclear to support the decommissioning of the Salem Station. It is also assumed that PSEG Nuclear could access other disposal sites should it prove cost-effective. As such, rate schedules for both the Barnwell and the Envirocare facility in Utah were used to generate disposal costs.

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination,"[8] amending Part 20 of Title 10 of the Code of Federal Regulations (10 CFR §20). This subpart provided radiological criteria for releasing a facility for unrestricted use. The regulation provides that the site could be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimate for the Salem Station assumes that the site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). An additional limit of 4 millirem per year, as defined in 40 CFR Part 141.16, is applied to drinking water.

On October 9, 2002, the NRC signed an agreement with the EPA on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding (MOU) provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC authority. The MOU also includes provisions for NRC and EPA consultation for certain sites when, at the time of license termination, (1) groundwater contamination exceeds EPA-permitted levels; (2) NRC contemplates restricted release of the site; and/or (3) residual radioactive soil concentrations exceed levels defined in the MOU.

The MOU does not impose any new requirements on NRC licensees and should reduce the involvement of EPA with NRC licensees who are decommissioning. Most sites are expected to meet the NRC criteria for unrestricted use, and the NRC believes that only a few sites will have groundwater or soil contamination in excess of the levels specified in the MOU that trigger consultation with EPA. However, if there are other hazardous materials on the site, EPA may be involved in the cleanup. As such, the possibility of dual regulation remains for certain licensees.

2. DECOMMISSIONING ALTERNATIVE

The following section describes the basic activities associated with the DECON decommissioning alternative. Although detailed procedures for each activity identified are not provided, and the actual sequence of work may vary, the activity descriptions provide a basis not only for estimating, but also for the expected scope of work, i.e., engineering and planning at the time of decommissioning.

The conceptual approach that the NRC has described in its regulations divides decommissioning into three phases. The initial phase commences with the effective date of permanent cessation of operations and involves the transition of both plant and licensee from reactor operations, i.e., power production, to facility de-activation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

The second phase encompasses activities during the storage period or during major decommissioning activities, or a combination of the two. The third phase pertains to the activities involved in license termination. The decommissioning estimates developed for the Salem Station are also divided into phases or periods; however, demarcation of the phases is based upon major milestones within the project or significant changes in the projected expenditures.

2.1 PERIOD 1 – PREPARATIONS

In anticipation of the cessation of plant operations, detailed preparations are undertaken to provide a smooth transition from plant operations to site decommissioning. Through implementation of a staffing transition plan, the organization required to manage the intended decommissioning activities is assembled from available plant staff and outside resources. Preparations include the planning for permanent defueling of the reactor, revision of technical specifications applicable to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

2.1.1 Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a

local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure, i.e., without specific NRC approval. Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing Greater-than-Class C waste (GTCC), as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

- foreclose release of the site for possible unrestricted use,
- significantly increase decommissioning costs,
- cause any significant environmental impact, or
- violate the terms of the licensee's existing license.

Existing operational technical specifications are reviewed and modified to reflect plant conditions and the safety concerns associated with permanent cessation of operations. The environmental impact associated with the planned decommissioning activities is also considered. Typically, a licensee will not be allowed to proceed if the consequences of a particular decommissioning activity are greater than bounded by previously evaluated environmental assessments or impact statements. In this instance, the licensee would have to submit a license amendment for the specific activity and update the environmental report.

The decommissioning program outlined in the PSDAR will be designed to accomplish the required tasks within the ALARA guidelines (as defined in 10 CFR §20) for protection of personnel from exposure to radiation hazards. It will also address the continued protection of the health and safety of the public and the environment during the dismantling activity. Consequently, in conjunction with the development of the PSDAR, activity specifications, cost-benefit and safety analyses, work packages and procedures must be assembled in support of the proposed decontamination and dismantling activities.

2.1.2 Site Preparations

Following final plant shutdown, and in preparation for actual decommissioning activities, the following activities are initiated:

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), sampling of internal piping contamination levels, and primary shield cores.

- Isolation of the spent fuel storage pool and fuel handling systems, such that decommissioning operations could commence on the balance of the plant. Decommissioning operations are scheduled around the fuel handling area to the greatest extent possible such that the overall project schedule is optimized. The fuel will be transferred to the DOE as it decays to the point that it meets the heat load criteria of the containers and, as such, it is assumed that the fuel pool will remain operational for a minimum of five years following the cessation of plant operations.

- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.

- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.2 PERIOD 2 – DECOMMISSIONING OPERATIONS

Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.

- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Building

modifications may be required to the Reactor Building to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the Reactor Building to support the segmentation of the reactor vessel internals and component extraction.

- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.

- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.

- Decontamination of components and piping systems as required to control (minimize) worker exposure.

- Removal of piping and components no longer essential to support decommissioning operations.

- Removal of control rod drive housings and the head service structure from reactor vessel head. Segmentation of the vessel closure head.

- Removal and segmentation of the upper internals assemblies. Segmentation will maximize the loading of the shielded transport casks, i.e., by weight and activity. The operations are conducted under water using remotely operated tooling and contamination controls.

- Disassembly and segmentation of the remaining reactor internals, including core former and lower core support assembly. Some material is expected to exceed Class C disposal requirements. As such, the segments will be packaged in a modified fuel canister for geologic disposal.

- Segmentation of the reactor vessel. Install shielded platform for segmentation of reactor vessel. Cutting operations are performed in-air using remotely operated equipment within a contamination control envelope, with the water level maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the refueling canal.

- Removal of the activated portions of the concrete biological shield and accessible contaminated concrete surfaces. If dictated by the steam generator and pressurizer removal scenarios, those portions of the associated cubicles necessary for access and component extraction are removed.

- Removal of the steam generators and pressurizer for controlled disposal. Decontaminate exterior surfaces, as required, and seal-weld openings (nozzles, inspection hatches, and other penetrations). These components can serve as their own burial containers provided that all penetrations are properly sealed and the internal contaminants are stabilized. Steel shields are added to those external areas of the steam generators necessary in order to meet transportation limits and regulations.

At least two years prior to the anticipated date of license termination, a LTP is required. Submitted as a supplement to the Final Safety Analysis Report (FSAR), or equivalent, the plan must include: a site characterization, description of the remaining dismantling activities, plans for site remediation, procedures for the final radiation survey, designation of the end use of the site, an updated cost estimate to complete the decommissioning, and any associated environmental concerns. The NRC will notice the receipt of the plan, make the plan available for public comment, and schedule a local hearing. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).

- Removal of the steel liners from refueling canal, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/contaminated concrete.

- Surveys of the decontaminated areas of the containment structure.

- Removal of the contaminated equipment and material from the Auxiliary and Fuel Handling Building and any other contaminated facility. Radiation and contamination control techniques are used until radiation surveys indicate that the structures could be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and components (both clean and contaminated) located within these buildings. This activity will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).

- Routing of material removed in the decontamination and dismantling to a central processing area. Material certified to be free of contamination would be released for unrestricted disposition, e.g., as scrap, recycle, or general disposal. Contaminated material will be characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in NUREG/CR-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM).[9] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies state-of-the-art, commercially available, instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate the operating license if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release.

2.3 PERIOD 3 – SITE RESTORATION

Following completion of decommissioning operations, site restoration activities may begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits may result in substantial damage to many of the structures. Although performed in a controlled and safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade power block structures, including the Reactor, Auxiliary, and Fuel Handling Buildings. Verifying that subsurface radionuclide concentrations meet NRC site release requirements may require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process is deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and future workers. Abandonment creates a breeding ground for vermin infestation and other biological hazards.

This cost study presumes that non-essential structures and site facilities will be dismantled as a continuation of the decommissioning activity. Foundations and exterior walls are removed to a nominal depth of three feet below grade. The three-foot depth allows for the placement of gravel for drainage, and topsoil so that vegetation can be established for erosion control. Site areas affected by the dismantling activities are restored and the plant area graded as required to prevent ponding and inhibit the refloating of subsurface materials.

Concrete rubble produced by demolition activities will processed to remove rebar and miscellaneous embedments. The processed material will then be used on-site to backfill voids. Excess materials are trucked off-site for disposal as construction debris.

2.4 POST PERIOD 3 – ISFSI OPERATIONS

The ISFSI will continue to operate under a separate and independent license (10 CFR §72) following the relocation of the spent fuel from the plant's storage pools. Transfer of spent fuel to a DOE or interim facility will be exclusively from the ISFSI once the fuel pools have been emptied and the structures released for decommissioning. Assuming initiation of the federal Waste Management System in 2015, transfer of spent fuel from Salem Station is anticipated to continue through the year 2046. Any delay in the transfer process, for example, due to a delay in the scheduled opening of the geologic repository, a slower acceptance rate, or a combination of a delayed start date and lower transfer rate, will result in a longer on-site residence time for the fuel discharge from the reactor and therefore additional caretaking expenses.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the §72 license if it determines that the remediation of the ISFSI has been performed in accordance with an ISFSI license termination plan and that the final radiation survey and associated documentation demonstrate that the facility is suitable for release. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

The currently proposed design for the ISFSI is based upon the use of concrete overpacks for pad storage. For purposes of this cost analysis, it is assumed that once the inner canisters containing the spent fuel assemblies have been removed and the license for the facility terminated, the modules could be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad will then be removed, and the area graded and landscaped to conform to the surrounding environment.

3. COST ESTIMATE

The cost estimates prepared for decommissioning the Salem Station consider the unique features of the site, including the nuclear steam supply system, power generation systems, support services, site buildings, and ancillary facilities. The bases of the estimates, including the sources of information relied upon, the estimating methodology employed, site-specific considerations and other pertinent assumptions are described in this section.

3.1 BASIS OF ESTIMATE

The current estimates were developed using the basic design information originally generated for the decommissioning analysis prepared in 1995-96.[10] The information was reviewed for the current estimate and updated, as deemed necessary. The site-specific considerations and assumptions used in the previous estimate were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

The methodology used to develop this cost estimate follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[11] and the US DOE "Decommissioning Handbook."[12] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.[13]

This estimate reflects lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, and San Onofre-1 nuclear units has provided additional insight into the process, the

regulatory aspects, and technical challenges of decommissioning commercial nuclear units.

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, ensures that essential elements have not been omitted. Appendix A presents the detailed development of a typical unit factor. Appendix B provides the values contained within one set of factors developed for this analysis.

Work Difficulty Factors

TLG has historically applied work difficulty adjustment factors (WDFs) to account for the inefficiencies in working in a power plant environment. WDFs were assigned to each unique set of unit factors, commensurate with the inefficiencies associated with working in confined, hazardous environments. The ranges used for the WDFs are as follows:

- Access Factor — 10% to 20%
- Respiratory Protection Factor — 10% to 50%
- Radiation/ALARA Factor — 10% to 37%
- Protective Clothing Factor — 10% to 30%
- Work Break Factor — 8.33%
- Productivity — adjustable

The factors and their associated range of values were developed in conjunction with the AIF/NESP-036 study. The application of the factors is discussed in more detail in that publication.

Scheduling Program Durations

The unit factors, adjusted by the WDFs as described above, are applied against the inventory of materials to be removed in the radiologically controlled areas. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities relied upon productivity information available from the "Building Construction Cost Data" publication.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field

engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

3.3 FINANCIAL COMPONENTS OF THE COST MODEL

TLG's proprietary decommissioning cost model, DECCER, produces a number of distinct cost elements. These direct expenditures, however, do not comprise the total cost to accomplish the project goal, i.e., license termination and site restoration.

Inherent in any cost estimate that does not rely on historical data is the inability to specify the precise source of costs imposed by factors such as tool breakage, accidents, illnesses, weather delays, and labor stoppages. In TLG's DECCER cost model, contingency fulfills this role. Contingency is added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude; therefore, this cost analysis includes funds to cover these types of expenses.

3.3.1 Contingency

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook"[14] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this estimate are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a "safety factor issue." Safety factors provide additional security and address situations that may never occur. Contingency funds are

expected to be fully expended throughout the program. They also provide assurance that sufficient funding is available to accomplish the intended tasks. An estimate without contingency, or from which contingency has been removed, could disrupt the orderly progression of events and jeopardize a successful conclusion to the decommissioning process.

For example, the most technologically challenging task in decommissioning a commercial nuclear station will be the disposition of the reactor vessel and internal components, which have become highly radioactive after a lifetime of exposure to radiation produced in the core. The disposition of these highly radioactive components forms the basis for the critical path (schedule) for decommissioning operations. Cost and schedule are inter-dependent and any deviation in schedule has a significant impact on cost for performing a specific activity.

Disposition of the reactor vessel internals involves the underwater cutting of complex components that are highly radioactive. Costs are based upon optimum segmentation, handling, and packaging scenarios. The schedule is primarily dependent upon the turnaround time for the heavily shielded shipping casks, including preparation, loading, and decontamination of the containers for transport. The number of casks required is a function of the pieces generated in the segmentation activity, a value calculated on optimum performance of the tooling employed in cutting the various subassemblies. The risk and uncertainties associated with this task are that the expected optimization may not be achieved, resulting in delays and additional program costs. For this reason, contingency must be included to mitigate the consequences of the expected inefficiencies inherent in this complex activity, along with related concerns associated with the operation of highly specialized tooling, field conditions, and water clarity.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies can range from 0% to 75%, depending on the degree of difficulty judged to be appropriate

from TLG's actual decommissioning experience. The contingency values used in this study are as follows:

Decontamination	50%
Contaminated Component Removal	25%
Contaminated Component Packaging	10%
Contaminated Component Transport	15%
Low-Level Radioactive Waste Disposal	25%
Reactor Segmentation	75%
NSSS Component Removal	25%
Reactor Waste Packaging	25%
Reactor Waste Transport	25%
Reactor Vessel Component Disposal	50%
GTCC Disposal	15%
Non-Radioactive Component Removal	15%
Heavy Equipment and Tooling	15%
Supplies	25%
Engineering	15%
Energy	15%
Characterization and Termination Surveys	30%
Construction	15%
Taxes and Fees	10%
Insurance	10%
Staffing	15%

The overall contingency, when applied to the appropriate components of the estimates on a line item basis, results in an average value of 18.3%.

3.3.2 Financial Risk

In addition to the routine uncertainties addressed by contingency, another cost element that is sometimes necessary to consider when bounding decommissioning costs relates to uncertainty, or risk. Examples can include changes in work scope, pricing, job performance, and other variations that could conceivably, but not necessarily, occur. Consideration is sometimes necessary to generate a level of confidence in the estimate, within a range of probabilities. TLG considers these types of costs under the broad term "financial risk." Included within the category of financial risk are:

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.

- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.

- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.

- Regulatory changes, e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal.

- Policy decisions altering national commitments, e.g., in the ability to accommodate certain waste forms for disposition, or in the timetable for such.

- Pricing changes for basic inputs, such as labor, energy, materials, and burial. Some of these inputs may vary slightly, e.g. -10% to +20%; burial could vary from -50% to +200% or more.

It has been TLG's experience that the results of a risk analysis, when compared with the base case estimate for decommissioning, indicate that the chances of the base decommissioning estimate's being too high is a low probability, and the chances that the estimate is too low is a much higher probability. This is mostly due to the pricing uncertainty for low-level radioactive waste burial, and to a lesser extent due to schedule increases from changes in plant conditions and to pricing variations in the cost of labor (both craft and staff). This cost study, however, does not add any additional costs to the estimate for financial risk since there is insufficient historical data from which to project future liabilities. Consequently, it is recommended that the areas of

uncertainty or risk be revisited periodically and addressed through repeated revisions or updates of the base estimate.

3.4 SITE-SPECIFIC CONSIDERATIONS

There are a number of site-specific considerations that affect the method for dismantling and removal of equipment from the site and the degree of restoration required. The cost impact of the considerations identified below is included in this cost study.

3.4.1 Spent Fuel

The cost to dispose of the spent fuel generated from plant operations is not reflected within the estimate to decommission the Salem Station. Ultimate disposition of the spent fuel is within the province of the DOE's Waste Management System, as defined by the Nuclear Waste Policy Act. As such, the disposal cost is financed by a 1 mill/kWhr surcharge paid into the DOE's waste fund during operations. However, the NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy. This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimates, as described herein.

The total inventory of assemblies that will need to be handled during decommissioning is based upon several assumptions. The pickup of commercial fuel is assumed to begin in the year 2015 and will proceed on an oldest fuel first basis. The rate at which the fuel is removed from the commercial sites is based upon an annual capacity at the geologic repository of 3,000 metric tonnes. A delay in the startup of the repository, or a decrease in the rate of acceptance rate, will correspondingly prolong the transfer process and extend the duration that the fuel remains at the site.

For estimating purposes, spent fuel will be removed from the Salem Station site beginning in the year 2020, with the transfer complete by the end of year 2046. Built to support continuing plant operations, an ISFSI will be available to support decommissioning, i.e., the fuel residing in the pools following the cessation of plant operations could be relocated to the ISFSI so that decommissioning can proceed on the Fuel Handling Buildings. The assemblies will be relocated to the ISFSI during the first five years following final shutdown. Costs are included for the purchase of the 94 canisters and overpacks required to empty the pool (an additional eight will be used to package the GTCC).

Operation and maintenance costs for the ISFSI are included within the estimates and address the cost for staffing the facility, security, insurance, and licensing fees. Costs are also provided for the final disposition of the facility once the transfer is complete.

ISFSI Design Considerations

A multi-purpose (storage and transport) dry shielded storage canister with a vertical, reinforced concrete storage silo is used as a basis for the cost analyses. Approximately 50% of the silos are assumed to have some level of neutron-induced activation as a result of the long-term storage of the fuel, i.e., to levels exceeding free-release limits. Approximately 10% of the concrete and steel is assumed to be removed from the overpacks for controlled disposal. The cost of the disposition of this material, as well as the demolition of the ISFSI facility, is included in the estimate.

3.4.2 Reactor Vessel and Internal Components

The NSSS (reactor vessel and reactor coolant system components) will be decontaminated using chemical agents prior to the start of cutting operations. A decontamination factor (average reduction) of 10 is presumed.

The reactor pressure vessel and internal components are segmented for disposal in shielded, reusable transportation casks. Segmentation will be performed in the refueling canal, where a turntable and remote cutter are installed. The vessel will be segmented in place, using a mast-mounted cutter supported off the lower head and directed from a shielded work platform installed overhead in the reactor cavity. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology.

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal, i.e., GTCC. Although the material is not classified as high-level waste, DOE has indicated it will accept title to this waste for disposal at the future high-level waste repository.[15] However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has

been packaged and disposed of as high-level waste, at a cost equivalent to that envisioned for the spent fuel. It is not anticipated that DOE would accept this waste prior to completing the transfer of spent fuel. Therefore, until such time as the DOE is ready to accept GTCC waste, it is reasonable to assume that this material would remain in storage at Salem Station.

Intact disposal of the reactor vessel and internal components could provide savings in cost and worker exposure by eliminating the complex segmentation requirements, isolation of the GTCC material, and transport/storage of the resulting waste packages. Portland General Electric (PGE) was able to dispose of the Trojan reactor as an intact package. However, the location of the Trojan Nuclear Plant on the Columbia River simplified the transportation analysis since:

- the reactor package could be secured to the transport vehicle for the entire journey, i.e., the package was not lifted during transport,
- there were no man-made or natural terrain features between the plant site and the disposal location that could produce a large drop, and
- transport speeds were very low, limited by the overland transport vehicle and the river barge.

As a member of the Northwest Compact, PGE had a site available for disposal of the package, the US Ecology facility in Washington State. The characteristics of this arid site proved favorable in demonstrating compliance with land disposal regulations.

It is not known whether this option will be available when the Salem Station ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, as a bounding condition, the study assumes the reactor vessel will have to be segmented.

3.4.3 Primary System Components

The following discussion deals with the removal and disposition of the steam generators, but the techniques involved are also applicable to other large components, such as heat exchangers, component coolers and the pressurizer. The steam generators' size, weight, and location within the Reactor Building will ultimately determine the removal strategy.

A potential method for removal (and the one used as the basis in this estimate) is the extraction of the generators through the existing equipment hatch. Sections of the steam generator cubicle walls, adjoining floor slabs, and floor grating may need to be removed to allow for the generators to be maneuvered to the hatch.

Grating within the work area will be decontaminated and removed. Next, a trolley crane will be set up for removal of the generators. By setting the trolley crane first, it can be used to move portions of the steam generator cubicle walls and floor slabs from the Reactor Building to a location where they can be decontaminated and transported to the material handling area.

The generators will be rigged for removal, disconnected from the surrounding piping and supports, and maneuvered into the open area where they will be lowered onto a dolly. Once each steam generator has been placed in the horizontal position, nozzles and other openings will be welded closed. The lower shell will have a carbon steel membrane welded to its outside surface for shielding, if required, during transport. The interior volume will be filled with low-density cellular concrete for stabilization of the internal contamination and to satisfy burial ground packaging requirements. When this stage has been completed, each generator will be moved out of containment and lowered onto a multi-wheeled transporter. The generators will be staged at an on-site storage area to await transport to the disposal facility. The pressurizer will be removed using the same technique. Each component will then be loaded onto a barge for transport to the disposal facility.

Reactor coolant piping will be cut from the reactor vessel once the water level in the vessel (used for personnel shielding during dismantling and cutting operations in and around the vessel) drops below the nozzle zone. The piping will be boxed and transported by shielded van. The reactor coolant pumps and motors will be lifted out intact, packaged, and transported for disposal.

3.4.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condenser will also be disassembled and moved to a laydown area. Material will then be prepared for transportation to an off-site recycling facility where it will be surveyed and designated for decontamination, volume reduction, or conventional disposal. Components will be packaged and readied for transport in accordance with the intended disposition.

3.4.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessel and internal components will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49 of the Code of Federal Regulations.[16] The contaminated material will be packaged in Industrial Packages (IP I, II, or III) for transport unless demonstrated to qualify as their own shipping containers. The reactor vessel and internal components are expected to be transported in accordance with §71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Transport of the highly activated metal, produced in the segmentation of the reactor vessel and internal components, will be by shielded truck cask. Cask shipments may exceed 95,000 pounds, including vessel segment(s), supplementary shielding, cask tie-downs, and tractor-trailer. The maximum level of activity per shipment assumed permissible was based upon the license limits of the available shielded transport casks. The segmentation scheme for the vessel and internal segments are designed to meet these limits.

The transport of large intact components, e.g., large heat exchangers and other oversized components, will be by a combination of truck, barge, and/or multi-wheeled transporter.

The low-level radioactive waste requiring controlled disposal will be sent to one of two currently available burial facilities. Transportation costs are based upon the mileage to either the Envirocare facility in Clive, Utah, or the Barnwell facility in South Carolina. Memphis, Tennessee will be used as the destination for off-site processing. Transportation costs are estimated using published tariffs from Tri-State Motor Transit.[17]

3.4.6 Low-Level Radioactive Waste Disposal

To the greatest extent practical, metallic material generated in the decontamination and dismantling processes will be treated to reduce the total volume requiring controlled disposal. The treated material, meeting the regulatory and/or site release criterion, will be released as scrap, requiring no further cost consideration. Conditioning and recovery of the waste stream will be performed off site at a licensed processing center.

Material requiring controlled disposal will be packaged and transported to one of two currently available burial facilities. Very low-level radioactive material, e.g., structural steel and contaminated concrete, will be sent to Envirocare. More highly contaminated and activated material will be sent to Barnwell. Disposal fees are based upon current charges for operating waste with surcharges added for the highly activated components, e.g., generated in the segmentation of the reactor vessel.

3.4.7 Site Conditions Following Decommissioning

The NRC will terminate (or amend) the site licenses if it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the next step in the decommissioning process, as well as PSEG Nuclear's own future plans for the site, e.g., the electrical switchyard will remain in support of the electrical transmission and distribution system.

The large underground tunnels between the cooling water intake, Turbine Building, and discharge structure will be isolated, sealed, and abandoned in place. Site utility and service piping are abandoned in place. Electrical manholes are backfilled with suitable earthen material and abandoned. Asphalt surfaces in the immediate vicinity of site buildings are broken up and the material used for backfill on site, if needed. The site access road will remain.

The estimate does not assume the remediation of any significant volume of contaminated soil. This assumption may be affected by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

Structures will be removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities will be processed and made available as clean fill. The site will be graded following the removal of non-essential structures to conform to the adjacent landscape, and vegetation will be established to inhibit erosion. This degree of site restoration will constitute compliance with the CAFRA document dated July 9, 1976.

3.5 ASSUMPTIONS

The following are the major assumptions made in the development of the estimate for decommissioning the site. Decommissioning activities will be performed in accordance with the current regulations that are assumed to be in place at the time of decommissioning, including the Industrial Site Recovery Act (ISRA), which is mandatory under current New Jersey State Regulations.

3.5.1 Estimating Basis

The study follows the principles of ALARA through the use of work duration adjustment factors. These factors address the impact of activities such as radiological protection instruction, mock-up training, and the use of respiratory protection and protective clothing. The factors lengthen a task's duration, increasing costs and lengthening the overall schedule. ALARA planning is considered in the costs for engineering and planning, and in the development of activity specifications and detailed procedures. Changes to worker exposure limits may impact the decommissioning cost and project schedule.

3.5.2 Labor Costs

The craft labor required to decontaminate and dismantle the nuclear units will be acquired through standard site contracting practices. The current cost of labor at the site is used as an estimating basis. Costs for site administration, operations, construction, and maintenance personnel are based upon average salary information provided by PSEG Nuclear.

PSEG Nuclear, as the licensee, will oversee the decommissioning operations and provide site security, radiological controls, and overall site administration. PSEG Nuclear will provide contract management of the decommissioning labor force and subcontractors. Engineering services for preparing the activity specifications, work procedures, activation, and structural analyses, are provided by PSEG Nuclear personnel.

The costs associated for the transition of the operating organization to decommissioning, e.g., separation packages, retraining, severance, and incentives are not included in this estimate and are considered to be ongoing operating expenses.

3.5.3 Design Conditions

Any fuel cladding failure that occurred during the lifetime of the plant is assumed to have released fission products at sufficiently low levels that the buildup of quantities of long-lived isotopes (e.g., cesium-137, strontium-90, or transuranics) has been prevented from reaching levels exceeding those that permit the major NSSS components to be shipped under current transportation regulations and disposal requirements.

The curie contents of the vessel and internals at final shutdown are derived from those listed in NUREG/CR-3474.[18] Actual estimates are derived from the curie/gram values in NUREG/CR-3474 and adjusted for the different mass of Salem Station components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from NUREG/CR-0130[19] and NUREG/CR-0672[20] and benchmarked to the long-lived values from NUREG/CR-3474.

Contamination has been found in the heat exchanger tube sheets at several shutdown U.S. pressurized water reactors (due to primary to secondary side leakage in the steam generators). For purposes of this estimate, selected secondary-side components are designated for off-site processing, including portions of the turbine and condenser.

Activation of the Reactor Building structure is confined to the biological shield in this estimate. More extensive activation (at very low levels) of the interior structures within containment has been detected at several reactors and the owners have elected to dispose of the affected material at a controlled facility rather than reuse the material as fill on site or send it to a landfill. The ultimate disposition of the material removed from the Reactor Building will depend upon the site release criteria selected and the designated end use for the site.

3.5.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by PSEG Nuclear and its subcontractors. The warehouses may be dismantled as they become surplus to the decommissioning program. The plant's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Excess acid, caustic, and all chemicals listed (at shutdown) in the New Jersey "Right to Know Report" will be removed and the storage container returned to the vendor. It is assumed that these chemicals will have some value; therefore, the cost for their removal will be compensated through their subsequent sale.

Scrap and Salvage

The existing plant equipment is considered obsolete and suitable for scrap as deadweight quantities only. PSEG Nuclear will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG for equipment in this estimate are not consistent with removal techniques required for salvage (resale) of equipment. Experience has indicated that some buyers wanted equipment stripped down to very specific requirements before they would consider purchase. This required expensive rework after the equipment had been removed from its installed location. Since placing a salvage value on this machinery and equipment would be speculative, and the value would be small in comparison to the overall decommissioning expenses, this estimate does not attempt to quantify the value that PSEG Nuclear may realize based upon those efforts.

It is assumed, for purposes of this estimate, that any value received from the sale of scrap generated in the dismantling process would be more than offset by the on-site processing costs. The dismantling techniques assumed in the decommissioning estimate do not include the additional cost for size reduction and preparation to meet "furnace ready" conditions. For example, the recovery of copper from electrical cabling from a facility currently being decommissioned has required the removal and disposition of the PCB-contaminated insulation, an added expense. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. This assumption is an implicit recognition of scrap value in the disposal of clean metallic waste at no additional cost to the project.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other such items of personal property owned by PSEG Nuclear will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other generating facilities. Spare parts will also be made available for alternative use.

Energy

For estimating purposes, the plant is assumed to be de-energized, with the exception of those facilities associated with spent fuel storage. Replacement power costs are used for the cost of energy consumption during decommissioning for tooling, lighting, ventilation, and essential services.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance and the limits for coverage defined in the NRC's proposed rulemaking "Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors." The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

Property Taxes

Property tax payments will cease upon shutdown of each unit.

Site Modifications

The perimeter fence and in-plant security barriers will be moved, as appropriate, to conform to the Site Security Plan in force during the various stages of the project.

3.6 COST ESTIMATE SUMMARY

The costs projected for the decommissioning of Salem Station are provided in Tables 3.1 and 3.2. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2002 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure.

The annual expenditures are based upon the detailed activity costs reported in Appendix C, along with the schedule discussed in Section 4. Since the common plant systems and services will be needed to support Unit 2 operations (with several needed to support post shutdown fuel storage and decommissioning), the cost to decontaminate, dismantle, and dispose of the common systems is included within the decommissioning cost for Unit 2.

TABLE 3.1
SCHEDULE OF ANNUAL EXPENDITURES BY PERIOD
UNIT 1
(Thousands, 2002 Dollars)

Year	Period 1 Preparations	Period 2 Decommissioning Operations	Period 3 Site Restoration	Period 4 Dry Fuel Storage	Period 5 ISFSI Decommissioning	Totals
2016	19,764					19,764
2017	65,091					65,091
2018	10,691	87,654				98,345
2019		94,939				94,939
2020		77,754				77,754
2021		77,541				77,541
2022		35,518				35,518
2023		4,680				4,680
2024		4,693				4,693
2025		4,680				4,680
2026		15,889				15,889
2027		3,374	20,847			24,221
2028			9,434	332		9,766
2029				544		544
2030				544		544
2031				544		544
2032				545		545
2033				544		544
2034				544		544
2035				544		544
2036				545		545
2037				544		544
2038				544		544
2039				544		544
2040				545		545
2041				544		544
2042				544		544
2043				544		544
2044				545		545
2045				14,311		14,311
	95,546	406,722	30,281	23,350	[Unit 2]	555,899

TABLE 3.2
SCHEDULE OF ANNUAL EXPENDITURES BY PERIOD
UNIT 2
(Thousands, 2002 Dollars)

Year	Period 1 Preparations	Period 2 Decommissioning Operations	Period 3 Site Restoration	Period 4 Dry Fuel Storage	Period 5 ISFSI Decommissioning	Totals
2020	24,791					24,791
2021	43,611	20,369				63,980
2022		100,471				100,471
2023		86,380				86,380
2024		74,298				74,298
2025		68,497				68,497
2026		37,888				37,888
2027		3,978	37,022			40,999
2028			16,754	2,186		18,939
2029				3,577		3,577
2030				3,577		3,577
2031				3,577		3,577
2032				3,587		3,587
2033				3,577		3,577
2034				3,577		3,577
2035				3,577		3,577
2036				3,587		3,587
2037				3,577		3,577
2038				3,577		3,577
2039				3,577		3,577
2040				3,587		3,587
2041				3,577		3,577
2042				3,577		3,577
2043				3,577		3,577
2044				3,587		3,587
2045				3,577		3,577
2046				15,611	5,997	21,607
	68,402	391,880	53,775	78,648	5,997	598,702

4. SCHEDULE ESTIMATE

The schedule for the decommissioning scenarios considered in this study follows the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints. In addition, the scheduling has been revised to reflect the required cooling period for the spent fuel.

A schedule or sequence of activities is presented in Figure 4.1. The schedule reflects the prompt decommissioning alternative and the start date consistent with a scheduled shutdown in 2016 for Unit 1 and 2020 for Unit 2. The sequence assumes that fuel will be removed from the spent fuel pool within the first five years. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the Appendix C cost table, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2000" computer software.[21]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

The schedule was generated using a precedence network and associated software. Activity durations are based upon the actual man-hour estimates calculated for each area. The schedule was assembled by sequencing the work areas, considering work crew availability and material access/egress. The following assumptions were made in the development of the decommissioning schedule:

- The Fuel Handling Building will continue to serve as the spent fuel storage/transfer facility until such time that all spent fuel has been removed from site. The Fuel Handling Building is expected to operate for approximately five years after the cessation of operations.

- All work (except vessel and internals removal activities) will be performed during an 8-hour workday, 5 days per week, with no overtime. There are eleven paid holidays per year.

- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.

- Multiple crews work parallel activities to the maximum extent possible, consistent with: optimum efficiency; adequate access for cutting, removal

and laydown space; and the stringent safety measures necessary during demolition of heavy components and structures.

- For plant systems removal, the systems with the longest removal durations in areas on the critical path are considered to determine the duration of the activity.

4.2 PROJECT SCHEDULE

The period-dependent costs presented in Appendix C are based upon the durations developed in the schedule for the decommissioning of Salem Station. Durations are established between several milestones in each project period; these durations are used to establish a critical path for the entire project. In turn, the critical path duration for each period is used as the basis for determining the period-dependent costs.

Project timelines are shown in this section as Figure 4.2. Milestone dates are based on a 40-year plant operating life from the issuance of the operating license, a five-year wet storage period for the last core discharge, and continued operation of the ISFSI until DOE can complete the transfer.

FIGURE 4.1

DECOMMISSIONING ACTIVITY SCHEDULE

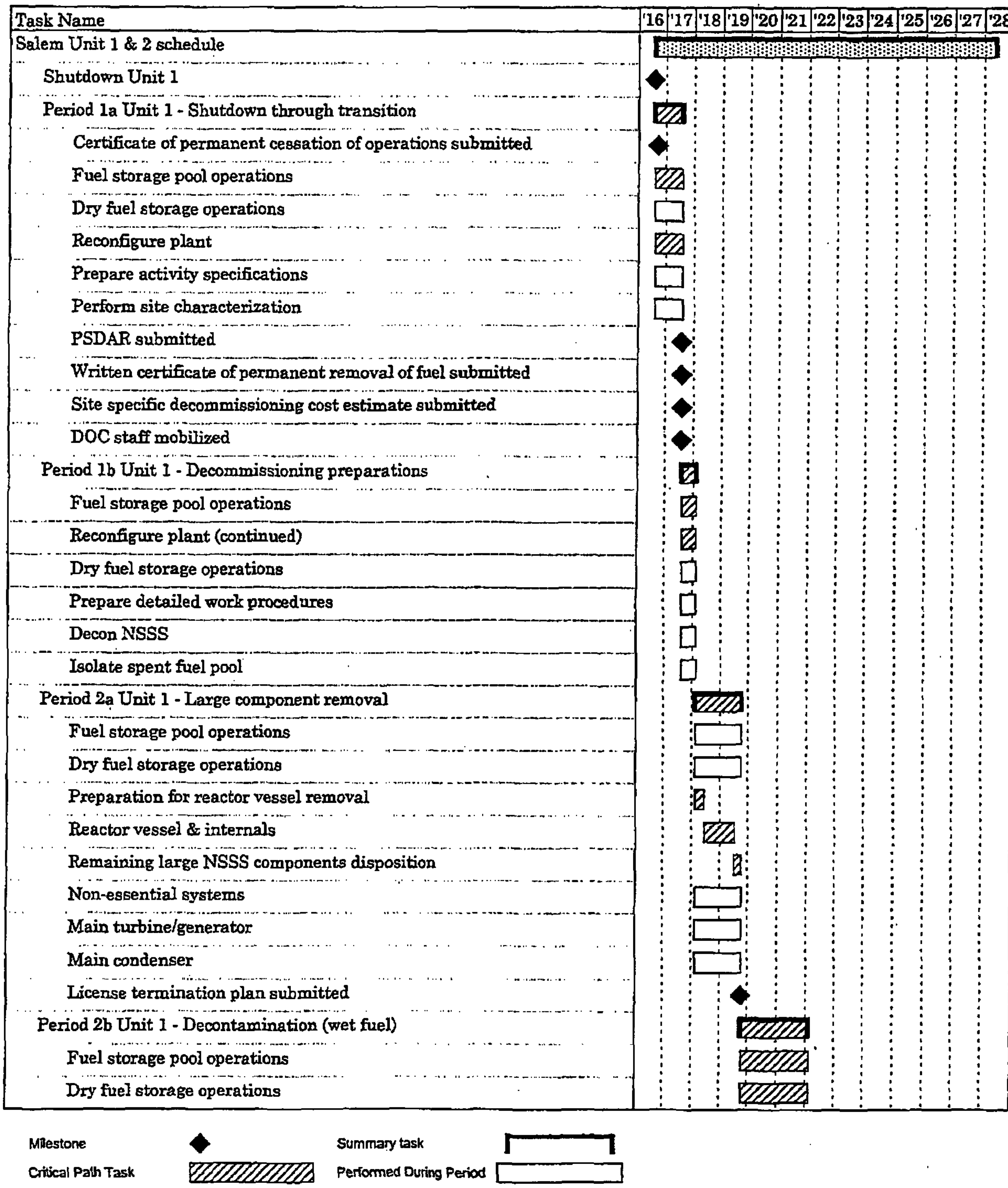


FIGURE 4.1

(continued)

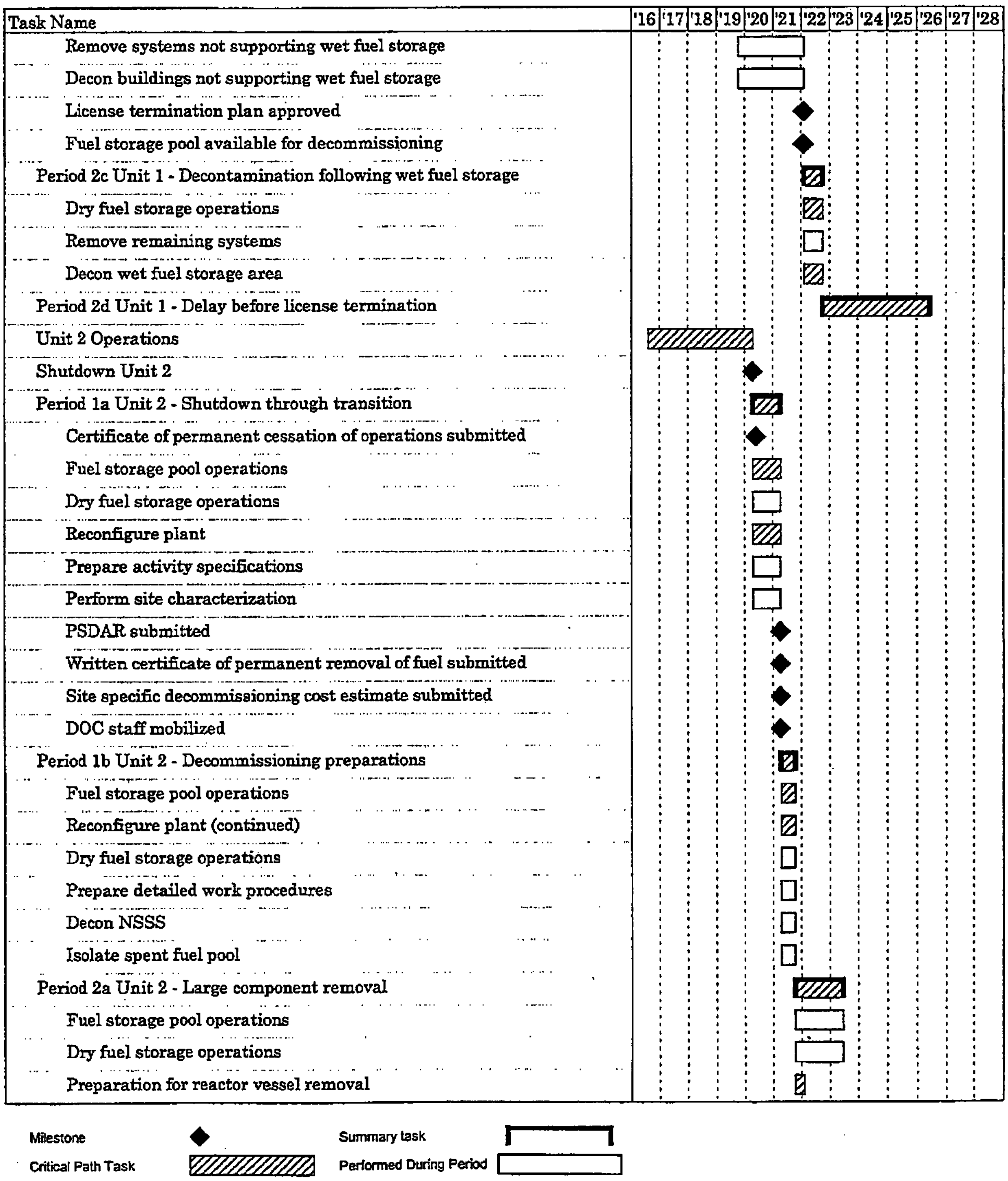
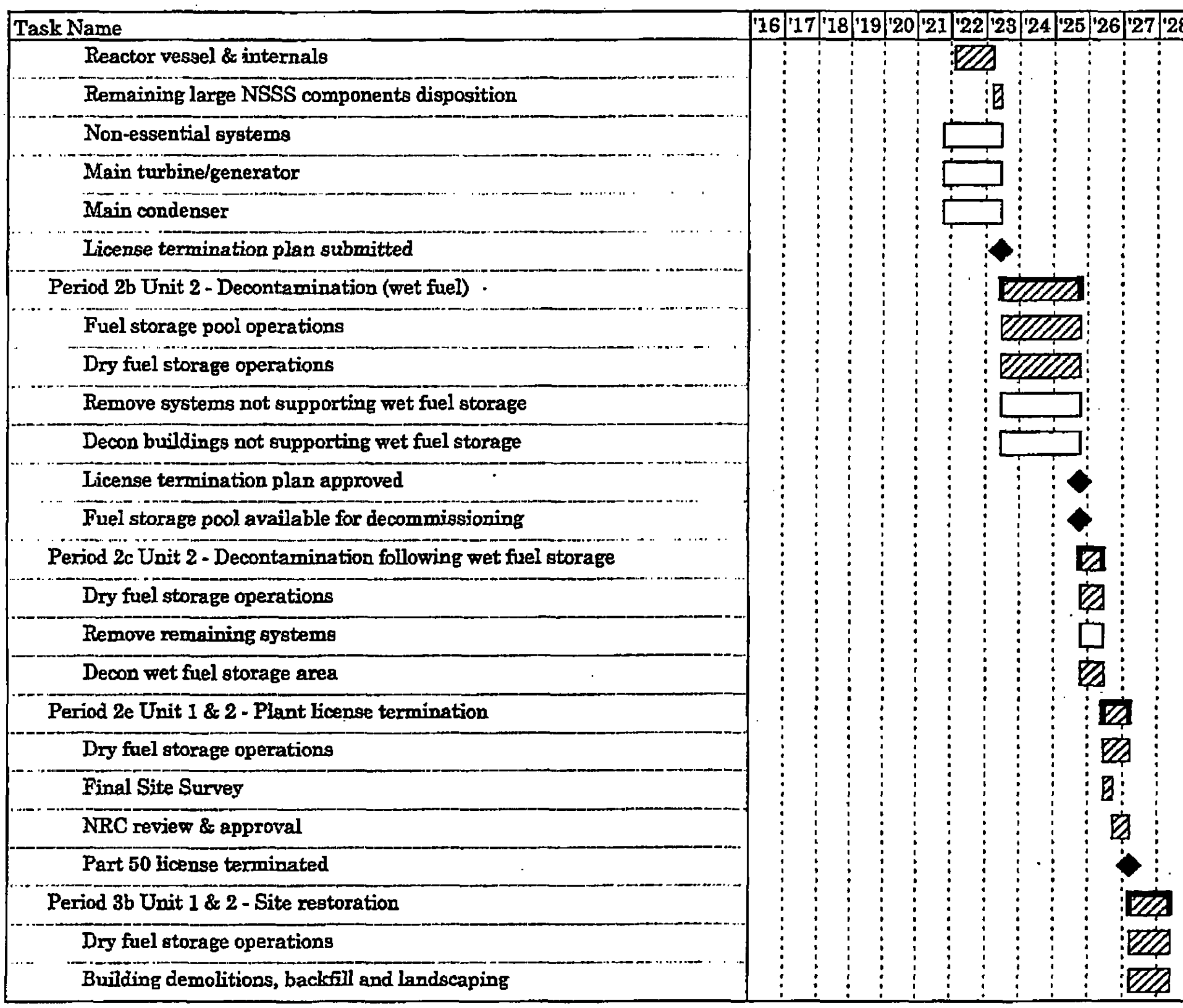


FIGURE 4.1

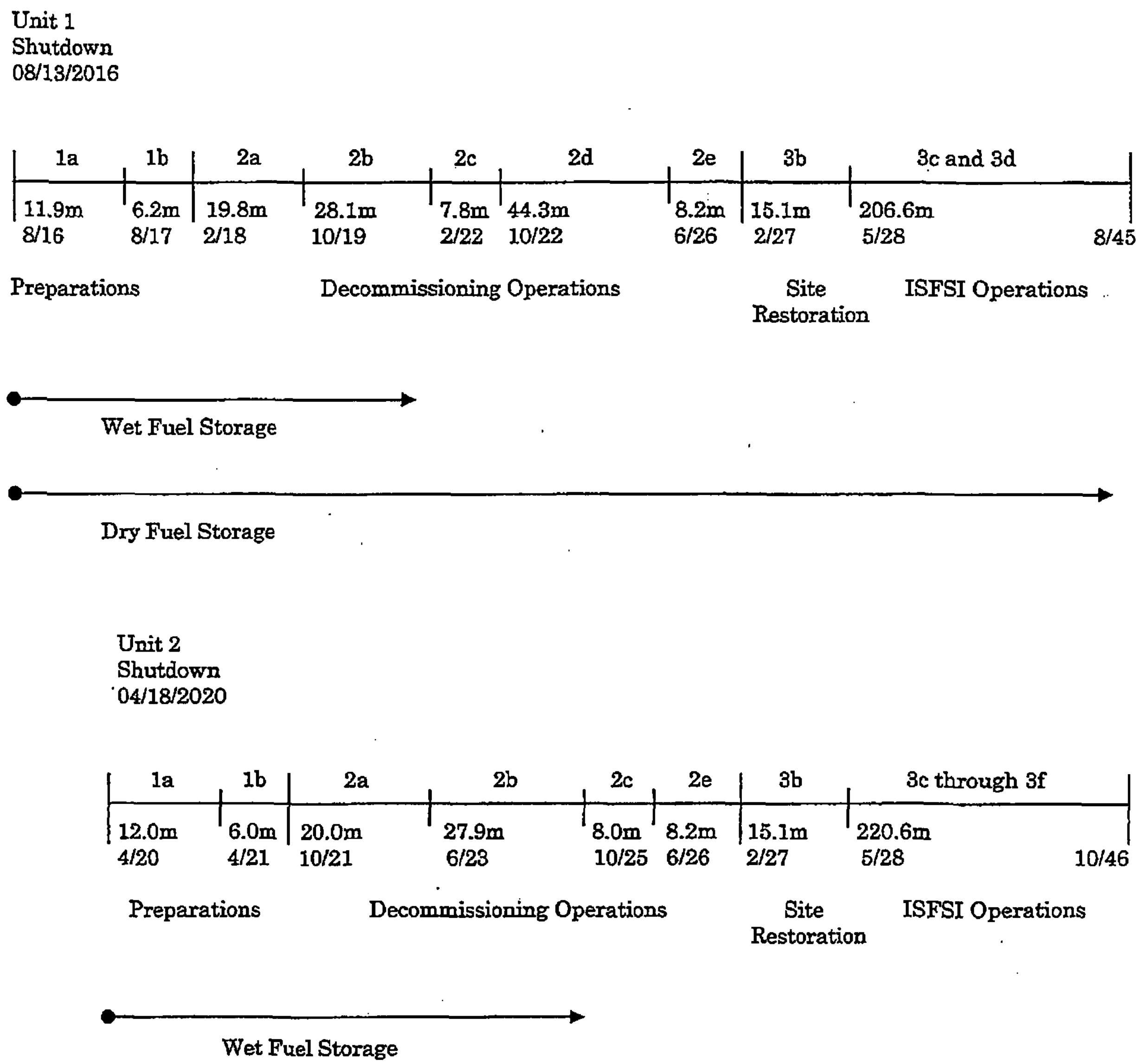
(continued)



Milestone ◆ Summary task
Critical Path Task Performed During Period

FIGURE 4.2

DECOMMISSIONING TIMELINE
(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,[22] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations delineates the production, utilization, and disposal of radioactive materials and processes. In particular, 10 CFR §71 defines radioactive material and 10 CFR §61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR §173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3). For this study, commercially available steel containers are presumed to be used for the disposal of piping, small components, and concrete. Larger components can serve as their own containers, with proper closure of all openings, access ways, and penetrations.

The volumes of radioactive waste generated during the various decommissioning activities at the site are shown on a line-item basis in Appendix C and summarized in Tables 5.1 and 5.2. The quantified waste volume summaries shown in these tables are consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material. The volumes are calculated on the displaced volume of components serving as their own waste containers.

The reactor vessel and internals are categorized as large quantity shipments and, accordingly, will be shipped in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume and the special handling requirements of the payload. Packaging efficiencies are lower for the highly activated materials (greater than Type A quantity waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

No process system containing/handling radioactive substances at shutdown is presumed to meet material release criteria by decay alone, i.e., systems radioactive at shutdown will still be radioactive over the time period during which the decommissioning is accomplished, due to the presence of long-lived radionuclides. While the dose rates decrease with time, radionuclides such as ^{137}Cs will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of Salem Station will primarily be generated during Period 2. Material considered potentially contaminated when removed from the radiologically controlled area will be sent to processing facilities for conditioning and disposal at a unit cost of $2.00 per pound. Heavily contaminated components and activated materials will be routed for controlled disposal. The disposal volumes reported in the tables reflect the savings resulting from reprocessing and recycling.

For purposes of constructing the estimate, the rate schedule for the Barnwell facility was used as a proxy for the higher activity waste. This schedule was used to estimate the disposal fees for the majority of plant components and activated concrete deemed unsuitable for processing or recovery. An average disposal rate of $415 per cubic foot was used, with additional surcharges for activity, dose rate and/or handling added, as appropriate for the particular package.

The remaining volume of contaminated metallic and concrete debris will be disposed of at the Envirocare facility. This includes lower activity material such as miscellaneous steel, metal siding, scaffolding and structural steel. A rate of $298 per cubic foot was used for containerized waste, $70 per cubic foot for disposal of DAW, and approximately $20 per cubic foot for bulk material, e.g., concrete.

TABLE 5.1

DECOMMISSIONING WASTE SUMMARY - UNIT 1

	Waste Class[1]	Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste			
Barnwell, South Carolina (contaminated/activated metallic waste and concrete)			
	A	67,763	6,908,944
	B	13,149	1,959,703
	C	459	48,448
Envirocare, Utah (miscellaneous steel, contaminated/activated concrete)			
Containerized/DAW	A	5,186	444,519
Bulk	A	18,219	863,724
Geologic Repository (Greater-than Class C)			
	>C	613	126,165
Total [2]		105,389	10,351,503
Processed Waste (Off-Site)		72,765	
Scrap Metal			96,278,000

1 Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55
2 Columns may not add due to rounding.

TABLE 5.2

DECOMMISSIONING WASTE SUMMARY - UNIT 2

	Waste Class[1]	Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste			
Barnwell, South Carolina (contaminated/activated metallic waste and concrete)			
	A	68,016	6,930,802
	B	13,167	1,961,982
	C	459	48,448
Envirocare, Utah (miscellaneous steel, contaminated/activated concrete)			
Containerized/DAW	A	12,184	1,244,448
Bulk	A	18,276	885,906
Geologic Repository (Greater-than Class C)			
	>C	613	126,165
Total [2]		112,714	11,197,751
Processed Waste (Off-Site)		74,384	
Scrap Metal			108,886,000

1 Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55
2 Columns may not add due to rounding.

6. RESULTS

Costs were developed to decommission the Salem Station following a scheduled cessation of plant operations. The analysis relied upon the site-specific, technical information developed for a previous analysis prepared in 1995-96, then updated to reflect current plant conditions and operating assumptions. While not an engineering study, the estimates do provide PSEG Power with sufficient information to assess its financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenario assumes continued operation of the plant's spent fuel pool for approximately five years following the cessation of operations for continued cooling of the assemblies. An ISFSI will be used to safeguard the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository. The scenarios also include the costs for the dismantling of non-essential structures and limited restoration of the site.

The costs projected to promptly decommission Salem Station are estimated to be $1,154.6 million. The majority of this cost (approximately 92.6%) is associated with the physical decontamination and dismantling of the nuclear units and caretaking of the spent fuel, so that the license could be terminated. The remaining 7.4% is for the demolition of the remaining structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 and 6.2, are either labor-related or associated with the management and disposition of the radioactive waste. Program management is the largest single contributor to the overall cost. The magnitude of the expense is a function of both the size of the organization required to manage the decommissioning and the duration of the program. It is assumed, for purposes of this analysis, that PSEG Nuclear will oversee the decommissioning program, managing the decommissioning labor force and the associated subcontractors. The size and composition of the management organization varies with the decommissioning phase and associated site activities. However, once the operating licenses have been terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel.

As described in this report, the spent fuel pools will remain operational for approximately five years following the cessation of plant operations. The pools will be isolated and independent spent fuel islands created. This will allow decommissioning operations to proceed in and around the Fuel Handling Building. Over the five-year period, the spent fuel will be packaged into transportable steel canisters for loading into a DOE-provided transport cask. The canisters will be stored in concrete overpacks at the ISFSI until DOE is able to receive them. Dry storage of the fuel under a separate license provides additional flexibility in the event DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses incurred by PSEG Nuclear.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the lower level material, including concrete and structural steel, will be at the Envirocare facility. The more highly radioactive material will be sent to the Barnwell facility, with the exception of selected reactor vessel components. Highly activated components, requiring additional isolation from the environment, are packaged for geologic disposal. The cost of geologic disposal is based upon a cost equivalent for spent fuel.

A significant portion of the metallic waste is designated for additional processing and treatment at an off-site facility. Processing reduces the volume of material requiring controlled disposal through such techniques and processes as survey and sorting, decontamination and volume reduction. The material that cannot be unconditionally released will be packaged for controlled disposal at one of the currently operating facilities. The costs identified for processing are all-inclusive, incorporating the ultimate disposition of the material.

Removal costs reflect the labor-intensive nature of the decommissioning process and the management controls required to ensure a safe and successful program. Decontamination and packaging costs also have a large labor component that is based upon prevailing union wages. Non-radiological demolition is a natural extension of the decommissioning process. The methods employed in decontamination and dismantling are generally destructive and indiscriminate in inflicting collateral damage. With a work force mobilized to support decommissioning operations, non-radiological demolition can be an integrated activity and a logical expansion of the work being performed in the process of terminating the operating license. Prompt demolition reduces future liabilities and could be more cost-effective than deferral, due to the ultimate deterioration of facilities (and therefore the working conditions).

The reported cost for transport includes the tariffs and surcharges associated with moving large components and/or overweight shielded casks overland, as well as the general expense, e.g., labor and fuel, of transporting material to the destinations identified in this report. For purposes of this estimate, material will be primarily moved overland by truck.

Decontamination will be used to reduce the plant's radiation fields and minimize worker exposure. Slightly contaminated material or material located within a contaminated area will be sent to an off-site processing center, i.e., this estimate does not assume that contaminated plant components and equipment could be economically decontaminated for uncontrolled release in-situ. Centralized processing centers have proven to be a more efficient means of handling the large volumes of material produced in the dismantling of a nuclear unit.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling, isotopic analysis and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also need to be confirmed and will add to the expense of surveying the facilities alone.

The remaining costs include allocations for heavy equipment and temporary services, and other expenses such as regulatory fees and the premiums for nuclear insurance. While site operating costs are greatly reduced following the final cessation of plant operations, certain administrative functions do need to be maintained either at a basic functional or regulatory level.

TABLE 6.1

SUMMARY OF DECOMMISSIONING COST ELEMENTS
UNIT 1

Work Category	Cost 2002$ (thousands)	Percent of Total Costs
Decontamination	13,462.7	2.4
Removal	79,587.2	14.3
Packaging	11,726.5	2.1
Transportation	11,632.0	2.1
Waste Disposal	80,910.9	14.6
Off-site Waste Processing	16,802.4	3.0
Program Management (including Engineering and Security)	233,535.0	42.0
Spent Fuel Pool Isolation	9,060.3	1.6
ISFSI Related (including capital)	67,206.7	12.1
Insurance and Regulatory Fees	11,463.9	2.1
Energy	8,045.7	1.4
Characterization and Licensing Surveys	6,439.9	1.2
Misc. Equipment and Site Services	6,025.8	1.1
Total	555,898.9	100.0

Note: Columns may not add due to rounding

TABLE 6.2

SUMMARY OF DECOMMISSIONING COST ELEMENTS
UNIT 2

Work Category	Cost 2002$ (thousands)	Percent of Total Costs
Decontamination	13,577	2.3
Removal	100,874	16.8
Packaging	11,746	2.0
Transportation	11,734	2.0
Waste Disposal	82,039	13.7
Off-site Waste Processing	17,175	2.9
Program Management (including Engineering and Security)	272,325	45.5
Spent Fuel Pool Isolation	6,040	1.0
ISFSI Related (including capital)	53,776	9.0
Insurance and Regulatory Fees	9,209	1.5
Energy	7,344	1.2
Characterization and Licensing Surveys	6,440	1.1
Misc. Equipment and Site Services	6,423	1.1
Total	598,702	100.0

Note: Columns may not add due to rounding

7. REFERENCES

1. U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72, "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988.

2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," August 1990.

3. U.S. Code of Federal Regulations, Title 10, Parts 2, 50 and 51, "Decommissioning of Nuclear Power Reactors," Nuclear Regulatory Commission, Federal Register Volume 61 (p 39278 et seq.), July 29, 1996.

4. "Nuclear Waste Policy Act of 1982 and Amendments," U.S. Department of Energy's Office of Civilian Radioactive Management, 1982.

5. Maine Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company, and Yankee Atomic Power Company v. United States, U.S. Court of Appeals for the Federal Circuit decision, Docket No. 99-5138, -5139, -5140, August 31, 2000.

6. U.S. Code of Federal Regulations, Title 10, Part 50 – Domestic Licensing of Production and Utilization Facilities, Subpart 54 (bb), "Conditions of Licenses," January 2001 Edition.

7. "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, January 15, 1986.

8. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Radiological Criteria for License Termination," Federal Register, Volume 62, Number 139 (p 39058 et seq.), July 21, 1997.

9. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG/CR-1575, EPA 402-R-97-016, December 1997.

10. "Decommissioning Cost Estimate for the Salem Generating Station," Document No. P07-1180-005, TLG Services, Inc., September 1996.

11. T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

7. REFERENCES
(continued)

12. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980.

13. "Building Construction Cost Data 2002," Robert Snow Means Company, Inc., Kingston, Massachusetts.

14. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984.

15. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995.

16. U.S. Department of Transportation, Section 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178, 1996.

17. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-109397 and Supplements, 2000.

18. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. August 1984.

19. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1978.

20. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1980.

21. "Microsoft Project 2000," Microsoft Corporation, Redmond, WA, 1997.

22. "Atomic Energy Act of 1954," (68 Stat. 919).

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

APPENDIX A
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 waste processing area.

2. CALCULATIONS

Act ID	Activity Description	Activity Duration	Critical Duration
a	Remove insulation	60	(b)
b	Mount pipe cutters	60	60
c	Install contamination controls	20	(b)
d	Disconnect inlet and outlet lines	60	60
e	Cap openings	20	(d)
f	Rig for removal	30	30
g	Unbolt from mounts	30	30
h	Remove contamination controls	15	15
i	Remove, wrap in plastic, send to the waste processing area	60	60
	Totals (Activity/Critical)	355	255

Duration adjustment(s):	
+ Respiratory protection adjustment (50% of critical duration)	128
+ Radiation/ALARA adjustment (37.08% of critical duration)	95
Adjusted work duration	478
+ Protective clothing adjustment (30% of adjusted duration)	143
Productive work duration	621
+ Work break adjustment (8.33 % of productive duration)	52
Total work duration min	673 min

***** Total duration = 11.217 hr *****

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate ($/hr)	Cost
Laborers	3.00	11.217	40.61	1,366.57
Craftsmen	2.00	11.217	56.29	1,262.81
Foreman	1.00	11.217	60.17	674.93
General Foreman	0.25	11.217	67.66	189.74
Fire Watch	0.05	11.217	40.61	22.78
Health Physics Technician	1.00	11.217	45.90	514.86
Total labor cost				$4,031.69

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Gas torch consumables 1 @ $4.57/hr x 1 hr {1}	$4.57
-Blotting paper 50 @ $0.47 sq ft {2}	$23.50
-Plastic sheets/bags 50 @ $0.12/sq ft {3}	$6.00
Subtotal cost of equipment and materials	$34.07
Overhead & sales tax on equipment and materials @ 16.00 %	$5.45
Total costs, equipment & material	$39.52

TOTAL COST:

Removal of contaminated heat exchanger <3000 pounds: $4,071.21

Total labor cost:	$4,031.69
Total equipment/material costs:	$39.52
Total craft labor man-hours required per unit:	81.884

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the AIF (now NEI) program to standardize nuclear decommissioning cost estimates 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 (2002) Division 01590, Section 400-6360 pg 24
    2. McMaster-Carr Ed. 106 pg 1778
    3. R.S. Means (2002) Division 01540, Section 800-0200 pg 17

- Material and consumable costs were adjusted using the regional indices for Wilmington, Delaware.

APPENDIX B

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

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean instrument and sampling tubing, $/linear foot	0.46
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	4.80
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	6.93
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	13.70
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	26.29
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	34.03
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	50.10
Removal of clean pipe >36 inches diameter, $/linear foot	59.60
Removal of clean valves >2 to 4 inches	91.18
Removal of clean valves >4 to 8 inches	136.96
Removal of clean valves >8 to 14 inches	262.88
Removal of clean valves >14 to 20 inches	340.30
Removal of clean valves >20 to 36 inches	501.04
Removal of clean valves >36 inches	595.95
Removal of clean pipe fittings >2 to 4 in	101.25
Removal of clean pipe fittings >4 to 8 in	160.64
Removal of clean pipe fittings >8 to 14 in	262.88
Removal of clean pipe fittings >14 to 20	340.30
Removal of clean pipe fittings > 20 to 36	501.04
Removal of clean pipe hangers for small bore piping	28.12
Removal of clean pipe hangers for large bore piping	103.45
Removal of clean pumps, <300 pound	227.86
Removal of clean pumps, 300-1000 pound	640.33
Removal of clean pumps, 1000-10,000 pound	2,542.96
Removal of clean pumps, >10,000 pound	4,906.95

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean pump motors, 300-1000 pound	271.14
Removal of clean pump motors, 1000-10,000 pound	1,061.82
Removal of clean pump motors, >10,000 pound	2,389.10
Removal of clean turbine-driven pumps > 10,000 pounds	6,577.50
Removal of clean heat exchanger <3000 pound	1,363.81
Removal of clean heat exchanger >3000 pound	3,417.62
Removal of clean feedwater heater/deaerator	9,646.37
Removal of clean moisture separator/reheater	19,849.31
Removal of clean tanks, <300 gallons	293.47
Removal of clean tanks, 300-3000 gallons	931.33
Removal of clean tanks, >3000 gallons, $/square foot surface area	7.81
Removal of clean electrical equipment, <300 pound	126.22
Removal of clean electrical equipment, 300-1000 pound	441.45
Removal of clean electrical equipment, 1000-10,000 pound	882.90
Removal of clean electrical equipment, >10,000 pound	2,112.91
Removal of clean electrical transformers < 30 tons	1,467.39
Removal of clean electrical transformers > 30 tons	4,225.80
Removal of clean standby diesel-generator, <100 kW	1,498.81
Removal of clean standby diesel-generator, 100 kW to 1 MW	3,345.43
Removal of clean standby diesel-generator, >1 MW	6,925.72
Removal of clean electrical cable tray, $/linear foot	11.66
Removal of clean electrical conduit, $/linear foot	5.08
Removal of clean mechanical equipment, <300 pound	126.22
Removal of clean mechanical equipment, 300-1000 pound	441.45
Removal of clean mechanical equipment, 1000-10,000 pound	882.90
Removal of clean mechanical equipment, >10,000 pound	2,112.91
Removal of clean HVAC equipment, <300 pound	126.22

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean HVAC equipment, 300-1000 pound	441.45
Removal of clean HVAC equipment, 1000-10,000 pound	882.90
Removal of clean HVAC equipment, >10,000 pound	2,112.91
Removal of clean HVAC ductwork, $/pound	0.48
Removal of contaminated instrument and sampling tubing, $/linear foot	1.42
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	18.49
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	32.88
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	52.70
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	103.92
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	125.17
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	174.16
Removal of contaminated pipe >36 inches diameter, $/linear foot	206.34
Removal of contaminated valves >2 to 4 inches	409.23
Removal of contaminated valves >4 to 8 inches	491.64
Removal of contaminated valves >8 to 14 inches	1,004.93
Removal of contaminated valves >14 to 20 inches	1,279.12
Removal of contaminated valves >20 to 36 inches	1,707.42
Removal of contaminated valves >36 inches	2,029.16
Removal of contaminated pipe fittings >2 to 4 inches	222.48
Removal of contaminated pipe fittings > 4 to 8 inches	562.42
Removal of contaminated pipe fittings > 8 to 14 inches	1,004.93
Removal of contaminated pipe fittings > 14 to 20 inches	1,279.12
Removal of contaminated pipe fittings >20 to 36 inches	1,707.42
Removal of contaminated pipe hangers for small bore piping	96.90
Removal of contaminated pipe hangers for large bore piping	317.71
Removal of contaminated pumps, <300 pound	872.56
Removal of contaminated pumps, 300-1000 pound	2,038.66
Removal of contaminated pumps, 1000-10,000 pound	6,721.04

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated pumps, >10,000 pound	16,369.44
Removal of contaminated pump motors, 300-1000 pound	856.70
Removal of contaminated pump motors, 1000-10,000 pound	2,726.06
Removal of contaminated pump motors, >10,000 pound	6,120.23
Removal of contaminated turbine-driven pumps < 10,000 pounds	18,918.88
Removal of contaminated heat exchanger <3000 pound	4,071.21
Removal of contaminated heat exchanger >3000 pound	11,752.21
Removal of contaminated feedwater heater / deaerator	28,760.26
Removal of contaminated moisture separator / reheater	63,002.71
Removal of contaminated tanks, <300 gallons	1,448.59
Removal of contaminated tanks, >300 gallons, $/square foot	28.80
Removal of contaminated electrical equipment, <300 pound	684.21
Removal of contaminated electrical equipment, 300-1000 pound	1,664.73
Removal of contaminated electrical equipment, 1000-10,000 pound	3,204.54
Removal of contaminated electrical equipment, >10,000 pound	6,299.81
Removal of electrical transformers < 30 tons	5,079.02
Removal of electrical transformers > 30 tons	12,470.88
Removal of standby diesel-generator, < 100 kW	4,387.47
Removal of standby diesel-generator, 100 kW to 1 MW	9,471.87
Removal of standby diesel-generator, >1 MW	20,474.76
Removal of contaminated electrical cable tray, $/linear foot	32.93
Removal of contaminated electrical conduit, $/linear foot	14.92
Removal of contaminated mechanical equipment, <300 pound	761.89
Removal of contaminated mechanical equipment, 300-1000 pound	1,841.14
Removal of contaminated mechanical equipment, 1000-10,000 pound	3,538.42

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated mechanical equipment, >10,000 pound	6,299.81
Removal of contaminated HVAC equipment, <300 pound	761.89
Removal of contaminated HVAC equipment, 300-1000 pound	1,841.14
Removal of contaminated HVAC equipment, 1000-10,000 pound	3,538.42
Removal of contaminated HVAC equipment, >10,000 pound	6,299.81
Removal of contaminated HVAC ductwork, $/pound	3.03
Removal of clean standard reinforced concrete, $/cubic yard	72.07
Removal of grade slab concrete, $/cubic yard	204.33
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	211.46
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	267.46
Removal of below-grade suspended floors, $/cubic yard	316.55
Removal of clean monolithic concrete structures, $/cubic yard	1,897.58
Removal of clean foundation concrete, $/cubic yard	626.97
Removal of clean hollow masonry block wall, $/cubic yard	75.24
Removal of clean solid masonry block wall, $/cubic yard	75.24
Placement of concrete for below-grade voids, $/cubic yard	99.90
Removal of subterranean tunnels/voids, $/ linear foot	141.76
Backfill of below grade voids, $/cubic yard	17.31
Excavation of clean material, $cubic yard	3.05
Removal of clean building metal siding, $/square foot	1.34
Removal of standard asphalt roofing, $/square foot	2.15
Removal of Galbestos panels, $/square foot	2.19
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	12.54
Scabbling contaminated concrete floors, $/square foot	7.42
Scabbling contaminated concrete walls, $/square foot	8.15
Scabbling contaminated ceilings, $/square foot	73.38
Removal of clean overhead cranes/monorails < 10 ton capacity, each	623.14
Removal of contaminated overhead cranes/monorails < 10 ton capacity, ea.	1,734.71

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean overhead cranes/monorails >10-50 ton capacity, each	1,495.51
Removal of contaminated overhead cranes/monorails >10-50 ton capacity, each	4,162.61
Removal of polar cranes > 50 ton capacity, each	6,286.50
Removal of gantry cranes > 50 ton capacity, each	26,411.28
Removal of clean structural steel, $/pound	0.35
Removal of clean steel floor grating, $/square foot	3.19
Removal of contaminated steel floor grating, $/square foot	9.69
Removal of clean free-standing steel liner, $/square foot	33.75
Removal of clean concrete-anchored steel liner, $/square foot	5.85
Removal of contaminated concrete-anchored steel liner, $/square foot	39.31
Placement of scaffolding in clean areas, $/square foot	13.73
Placement of scaffolding in contaminated areas, $/square foot	22.10
Removal of chain link fencing, $/linear foot	2.10
Removal of asphalt pavement, $/square foot	1.05
Core drilling 2 to 4 inch diameter, linear foot	354.68

APPENDIX C

DETAILED COST ANALYSES

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	95	14	109	109	-	-	-	-	-	-	-	-	-	1,300
1a.1.2	Notification of Cessation of Operations									a											
1a.1.3	Remove fuel & source material									n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	146	22	168	168	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	336	50	386	386	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	95	14	109	109	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	547	82	629	629	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	226	34	260	260	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	365	55	420	420	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	299	45	344	344	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	359	54	418	372	-	41	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	304	46	350	316	-	35	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	30	5	42	42	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	618	78	696	598	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	474	71	545	545	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Biological shield	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Steam generators	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	3,120
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	117	18	134	67	-	67	-	-	-	-	-	-	-	1,600
1a.1.17.9	Turbine & condenser	-	-	-	-	-	-	58	9	67	-	-	67	-	-	-	-	-	-	-	800
1a.1.17.10	Plant structures & buildings	-	-	-	-	-	-	228	34	262	131	-	131	-	-	-	-	-	-	-	3,120
1a.1.17.11	Waste management	-	-	-	-	-	-	336	50	386	386	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.12	Facility & site closeout	-	-	-	-	-	-	66	10	76	38	-	38	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	2,760	414	3,174	2,795	-	379	-	-	-	-	-	-	-	37,827
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	175	26	201	201	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,304	346	2,650	2,650	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	102	15	117	117	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	1,950	293	2,243	2,243	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	90	13	103	103	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	9,635	1,445	11,080	10,701	-	379	-	-	-	-	-	-	-	78,753
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	760	76	836	836	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	318	-	-	-	-	-	79	397	397	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	346	-	-	-	-	-	52	398	398	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	10	3	-	36	-	10	59	59	-	-	-	615	-	-	-	10,315	126	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	942	141	1,083	1,083	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	300	30	330	330	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	33	3	37	-	37	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	943	141	1,084	-	1,084	-	-	-	-	-	-	-	-	-

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 1a Period-Dependent Costs (continued)																				
1a.4.10	ISRA Compliance Staff	-	-	-	-	-	-	807	121	928	928	-	-	-	-	-	-	-	-	-	-
1a.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	1,137	171	1,308	1,308	-	-	-	-	-	-	-	-	-	58,599
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	28,971	4,346	33,317	33,317	-	-	-	-	-	-	-	-	-	437,674
1a.4	Subtotal Period 1a Period-Dependent Costs	-	664	10	3	-	36	33,916	5,174	39,603	38,655	1,147	-	-	515	-	-	-	10,315	126	496,273
1a.0	TOTAL PERIOD 1a COST	-	664	10	3	-	36	43,551	6,620	50,883	49,857	1,147	379	-	515	-	-	-	10,315	126	570,026
	PERIOD 1b - Decommissioning Preparations																				
	Period 1b Direct Decommissioning Activities																				
	Detailed Work Procedures																				
1b.1.1.1	Plant systems	-	-	-	-	-	-	345	52	397	357	-	40	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	182	27	210	210	-	-	-	-	-	-	-	-	-	2,500
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	98	15	113	28	-	85	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	265	40	305	305	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	88	13	101	50	-	50	-	-	-	-	-	-	-	1,200
1b.1.1.10	Missile shields	-	-	-	-	-	-	33	5	38	38	-	-	-	-	-	-	-	-	-	450
1b.1.1.11	Biological shield	-	-	-	-	-	-	88	13	101	101	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.12	Steam generators	-	-	-	-	-	-	336	50	386	386	-	-	-	-	-	-	-	-	-	4,600
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	73	11	84	42	-	42	-	-	-	-	-	-	-	1,000
1b.1.1.14	Turbine & condensers	-	-	-	-	-	-	228	34	262	-	-	262	-	-	-	-	-	-	-	3,120
1b.1.1.15	Auxiliary building	-	-	-	-	-	-	199	30	229	206	-	23	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	199	30	229	206	-	23	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	2,425	364	2,789	2,265	-	525	-	-	-	-	-	-	-	33,243
1b.1.2	Decon primary loop	1,134	-	-	-	-	-	-	567	1,701	1,701	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	1,134	-	-	-	-	-	2,425	931	4,490	3,965	-	525	-	-	-	-	-	-	1,067	33,243
	Period 1b Additional Costs																				
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	7,879	1,182	9,060	9,060	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	696	104	800	800	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	8,574	1,286	9,860	9,860	-	-	-	-	-	-	-	-	-	-
	Period 1b Collateral Costs																				
1b.3.1	Decon equipment	710	-	-	-	-	-	-	107	817	817	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process liquid waste	57	-	503	496	-	4,796	-	1,352	7,204	7,204	-	-	-	-	5,919	-	-	981,389	210	-
1b.3.3	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
1b.3.4	Pipe cutting equipment	-	911	-	-	-	-	-	137	1,048	1,048	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	767	912	503	496	-	4,796	-	1,596	9,070	9,070	-	-	-	-	5,919	-	-	981,389	210	-
	Period 1b Period-Dependent Costs																				
1b.4.1	Decon supplies	22	-	-	-	-	-	-	6	28	28	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	393	39	433	433	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	169	-	-	-	-	-	42	211	211	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	179	-	-	-	-	-	27	206	206	-	-	-	-	-	-	-	-	-	-

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 1b Period-Dependent Costs (continued)																				
1b.4.6	Disposal of DAW generated	-	-	5	1	-	20	-	6	32	32	-	-	-	283	-	-	-	5,674	70	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	975	146	1,122	1,122	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	185	19	204	204	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	17	2	19	-	19	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	488	73	562	-	562	-	-	-	-	-	-	-	-	-
1b.4.11	ISRA Compliance Staff	-	-	-	-	-	-	418	63	481	481	-	-	-	-	-	-	-	-	-	-
1b.4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	589	88	677	677	-	-	-	-	-	-	-	-	-	30,349
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	15,004	2,251	17,255	17,255	-	-	-	-	-	-	-	-	-	226,674
1b.4	Subtotal Period 1b Period-Dependent Costs	22	348	5	1	-	20	18,083	2,763	21,243	20,649	594	-	-	283	-	-	-	5,674	70	257,023
1b.0	TOTAL PERIOD 1b COST	1,923	1,260	508	498	-	4,816	29,083	6,575	44,663	43,545	594	525	-	283	5,919	-	-	987,083	1,346	290,266
	PERIOD 1 TOTALS	1,929	1,924	518	501	-	4,852	72,634	13,195	95,546	92,901	1,742	904	-	798	5,919	-	-	997,378	1,473	860,291
	PERIOD 2a - Large Component Removal																				
	Period 2a Direct Decommissioning Activities																				
	Nuclear Steam Supply System Removal																				
2a.1.1.1	Reactor Coolant Piping	280	255	30	20	-	906	-	436	1,928	1,928	-	-	-	2,038	-	-	-	185,321	10,107	-
2a.1.1.2	Pressurizer Relief Tank	30	28	6	3	-	179	-	67	310	310	-	-	-	329	-	-	-	36,553	527	-
2a.1.1.3	Reactor Coolant Pumps & Motors	81	90	43	1,843	107	3,376	-	1,204	6,744	6,744	-	-	248	8,192	-	-	-	690,870	3,580	-
2a.1.1.4	Pressurizer	44	56	371	460	-	1,487	-	514	2,933	2,933	-	-	-	2,589	-	-	-	804,295	2,845	-
2a.1.1.5	Steam Generators	373	2,186	870	5,391	-	16,902	100	5,842	31,613	31,613	-	-	-	31,467	-	-	-	3,458,553	13,321	-
2a.1.1.6	CRDMs/ICIs/Service Structure Removal	162	97	124	17	-	420	-	220	1,031	1,031	-	-	-	3,881	-	-	-	86,025	4,564	-
2a.1.1.7	Reactor Vessel Internals	118	1,971	4,979	537	-	4,722	214	5,310	17,851	17,851	-	-	-	1,877	903	459	-	326,029	31,608	1,396
2a.1.1.8	Reactor Vessel	90	3,433	1,604	365	-	5,666	214	5,952	17,224	17,224	-	-	-	6,611	2,254	-	-	948,723	31,608	1,896
2a.1.1	Totals	1,168	8,064	7,926	8,636	107	33,658	528	19,645	79,633	79,633	-	-	248	51,384	3,156	459	-	6,036,370	98,161	2,793
	Removal of Major Equipment																				
2a.1.2	Main Turbine/Generator	-	474	55	11	715	-	-	233	1,488	1,488	-	-	3,573	-	-	-	-	-	9,244	-
2a.1.3	Main Condensers	-	1,607	53	11	689	-	-	512	2,872	2,872	-	-	3,446	-	-	-	-	-	31,571	-
	Disposal of Plant Systems																				
2a.1.4.1	Auxiliary Feedwater	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	892	-
2a.1.4.2	Auxiliary Feedwater (RCA)	-	281	2	4	293	-	-	115	697	697	-	-	1,466	-	-	-	-	-	5,333	-
2a.1.4.3	Bleed Steam & Heater Drains	-	140	-	-	-	-	-	21	162	-	-	162	-	-	-	-	-	-	2,984	-
2a.1.4.4	Circulating Water	-	229	-	-	-	-	-	34	264	-	-	264	-	-	-	-	-	-	4,757	-
2a.1.4.5	Condensate Polishing	-	904	6	12	761	-	-	343	2,025	2,025	-	-	3,806	-	-	-	-	-	17,777	-
2a.1.4.6	Condenser Air Removal & Priming	-	125	-	-	-	-	-	19	144	-	-	144	-	-	-	-	-	-	2,693	-
2a.1.4.7	Containment Spray	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	104	-
2a.1.4.8	Containment Spray (RCA)	-	105	4	7	481	-	-	100	699	699	-	-	2,403	-	-	-	-	-	2,075	-
2a.1.4.9	Equipment Vents & Drains - Contaminated	-	6	0	0	5	4	-	3	18	18	-	-	26	8	-	-	-	717	115	-
2a.1.4.10	Generator Stator Cooling Water	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	568	-
2a.1.4.11	Heater Vents & Miscellaneous Drains	-	33	0	0	26	-	-	12	72	72	-	-	128	-	-	-	-	-	660	-
2a.1.4.12	Main & Reheat & Turbine By-Pass Steam	-	460	24	46	3,028	-	-	579	4,138	4,138	-	-	15,141	-	-	-	-	-	9,343	-
2a.1.4.13	Main Turbine Lubricating Oil	-	101	-	-	-	-	-	15	116	-	-	116	-	-	-	-	-	-	2,099	-
2a.1.4.14	Miscellaneous Condensate	-	50	-	-	-	-	-	7	57	-	-	57	-	-	-	-	-	-	1,051	-
2a.1.4.15	Moisture Separator Rehtrs Steam & Drains	-	437	3	5	326	-	-	159	931	931	-	-	1,638	-	-	-	-	-	8,614	-
2a.1.4.16	Steam Gen Drains & Blowdown	-	182	1	2	102	-	-	61	348	348	-	-	512	-	-	-	-	-	3,566	-
2a.1.4.17	Steam Gen Drains & Blowdown (RCA)	-	36	0	0	18	-	-	12	66	60	-	-	90	-	-	-	-	-	694	-
2a.1.4.18	Steam Gen Feed Pump & Turbine Lube Oil	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	611	-

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Disposal of Plant Systems (continued)																				
2a.1.4.19	Steam Generator Feed & Condensate	-	344	-	-	-	-	-	52	396	-	-	396	-	-	-	-	-	-	7,121	-
2a.1.4.20	Turbine Auxiliaries Cooling	-	168	-	-	-	-	-	25	193	-	-	193	-	-	-	-	-	-	3,594	-
2a.1.4.21	Turbine Drains	-	36	0	1	35	-	-	15	88	88	-	-	182	-	-	-	-	-	724	-
2a.1.4.22	Turbine Electro-Hydraulic Control	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	73	-
2a.1.4.23	Turbine Gland Sealing Steam & Leak-Off	-	75	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	1,654	-
2a.1.4.24	Waste Disposal - Gas	-	90	5	8	128	99	-	67	392	392	-	-	640	233	-	-	-	20,293	1,805	-
2a.1.4	Totals	-	8,913	46	81	6,206	103	-	1,667	11,016	9,473	-	1,543	26,032	241	-	-	-	21,010	78,907	-
2a.1.5	Scaffolding in support of decommissioning	-	770	4	1	49	11	-	203	1,038	1,038	-	-	247	34	-	-	-	3,069	17,307	-
2a.1	Subtotal Period 2a Activity Costs	1,168	14,829	8,065	8,740	6,767	33,772	528	22,160	96,048	94,605	-	1,543	33,547	51,659	3,156	459	-	6,060,448	235,191	2,793
	Period 2a Additional Costs																				
2a.2.1	Curie Surcharge (Excluding RPV)	-	-	-	-	-	1,374	-	344	1,718	1,718	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	1,374	-	344	1,718	1,718	-	-	-	-	-	-	-	-	-	-
	Period 2a Collateral Costs																				
2a.3.1	Process liquid waste	73	-	28	65	-	314	-	127	606	606	-	-	-	-	510	-	-	64,228	100	-
2a.3.2	Small tool allowance	-	217	-	-	-	-	-	33	249	225	-	25	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	73	217	28	65	-	314	-	160	856	831	-	25	-	-	510	-	-	64,228	100	-
	Period 2a Period-Dependent Costs																				
2a.4.1	Decon supplies	72	-	-	-	-	-	-	18	90	90	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,262	126	1,388	1,388	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.4.4	*Health physics supplies*	-	1,333	-	-	-	-	-	333	1,666	1,666	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,113	-	-	-	-	-	467	3,579	3,579	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	85	24	-	321	-	92	522	522	-	-	-	4,586	-	-	-	91,909	1,126	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	1,486	223	1,709	1,709	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	619	52	671	671	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	56	6	61	-	61	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,566	235	1,801	-	1,801	-	-	-	-	-	-	-	-	-
2a.4.11	ISRA Compliance Staff	-	-	-	-	-	-	1,341	201	1,542	1,542	-	-	-	-	-	-	-	-	-	-
2a.4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	38	6	44	-	44	-	-	-	-	-	-	-	-	-
2a.4.13	Security Staff Cost	-	-	-	-	-	-	2,357	354	2,710	2,710	-	-	-	-	-	-	-	-	-	121,461
2a.4.14	Utility Staff Cost	-	-	-	-	-	-	44,233	6,635	50,868	50,868	-	-	-	-	-	-	-	-	-	665,023
2a.4	Subtotal Period 2a Period-Dependent Costs	72	4,446	85	24	-	821	52,858	8,747	66,652	64,646	1,906	-	-	4,586	-	-	-	91,909	1,126	786,484
2a.0	TOTAL PERIOD 2a COST	1,312	19,491	8,198	8,828	6,767	35,780	53,388	31,411	165,174	161,699	1,906	1,568	33,547	56,246	3,666	459	-	6,216,586	236,417	789,277
	PERIOD 2b - Site Decontamination																				
	Period 2b Direct Decommissioning Activities																				
	Disposal of Plant Systems																				
2b.1.1.1	Building & Equipment Drains-Conventional	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	850	-
2b.1.1.2	Chem & Vol Ctrl - Boric Acid Recovery	519	507	41	9	218	845	-	636	2,774	2,774	-	-	1,088	2,376	-	-	-	172,868	19,343	-
2b.1.1.3	Chem & Vol Ctrl - Primary Water Recovery	353	347	28	6	158	565	-	432	1,890	1,890	-	-	788	1,630	-	-	-	115,643	18,399	-
2b.1.1.4	Chem & Vol Ctrl Operation	455	532	34	6	71	700	-	550	2,349	2,349	-	-	354	1,685	-	-	-	143,288	19,071	-
2b.1.1.5	Component Cooling	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	346	-
2b.1.1.6	*Component Cooling (RCA)*	-	355	8	15	986	-	-	240	1,603	1,603	-	-	4,928	-	-	-	-	-	6,833	-
2b.1.1.7	Compressed Air	-	109	-	-	-	-	-	16	126	-	-	126	-	-	-	-	-	-	2,328	-
2b.1.1.8	Compressed Air (RCA)	-	78	0	1	35	-	-	25	139	139	-	-	174	-	-	-	-	-	1,554	-

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2b.1.1.9	Control Air - Auxiliary Building	-	131	1	2	128	-	-	52	315	315	-	-	640	-	-	-	-	-	2,678	-
2b.1.1.10	Control Air - Containment Building	-	42	0	1	40	-	-	17	99	99	-	-	200	-	-	-	-	-	860	-
2b.1.1.11	Control Air - Penetration Area	-	32	-	-	-	-	-	6	37	-	-	37	-	-	-	-	-	-	672	-
2b.1.1.12	Control Air - Turbine Generator Area	-	46	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	965	-
2b.1.1.13	Demineralized Water - Restricted Areas	-	41	0	0	28	-	-	15	85	85	-	-	141	-	-	-	-	-	774	-
2b.1.1.14	Electrical	-	3,329	-	-	-	-	-	499	3,828	-	-	3,828	-	-	-	-	-	-	67,956	-
2b.1.1.15	Electrical (RCA - Clean)	-	676	4	7	448	-	-	213	1,247	1,247	-	-	2,298	-	-	-	-	-	11,903	-
2b.1.1.16	Electrical (RCA)	-	180	1	3	164	-	-	70	418	418	-	-	820	-	-	-	-	-	3,613	-
2b.1.1.17	Fire Protection	-	97	-	-	-	-	-	15	112	-	-	112	-	-	-	-	-	-	2,115	-
2b.1.1.18	Fire Protection (CO2)	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	305	-
2b.1.1.19	Fire Protection (RCA)	-	162	1	1	98	-	-	55	317	317	-	-	488	-	-	-	-	-	3,033	-
2b.1.1.20	Floor Drains - Contaminated	-	165	8	1	16	163	-	85	439	439	-	-	81	372	-	-	-	33,319	3,228	-
2b.1.1.21	HVAC - Auxiliary Building	-	265	2	3	188	27	-	102	587	587	-	-	941	62	-	-	-	5,534	4,912	-
2b.1.1.22	HVAC - Control Area	-	26	-	-	-	-	-	4	29	-	-	29	-	-	-	-	-	-	532	-
2b.1.1.23	HVAC - Diesel Generator Area	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	126	-
2b.1.1.24	HVAC - Fuel Handling Area	-	122	1	1	91	13	-	48	277	277	-	-	455	30	-	-	-	2,676	2,266	-
2b.1.1.25	HVAC - Reactor Containment	-	678	6	8	488	74	-	263	1,518	1,518	-	-	2,441	168	-	-	-	15,104	12,513	-
2b.1.1.26	Heating Water	-	34	-	-	-	-	-	5	39	-	-	39	-	-	-	-	-	-	731	-
2b.1.1.27	Heating Water (RCA)	-	45	0	0	27	-	-	16	87	87	-	-	138	-	-	-	-	-	830	-
2b.1.1.28	Miscellaneous Reactor Coolant	-	58	1	0	11	9	-	19	98	98	-	-	56	20	-	-	-	1,814	1,247	-
2b.1.1.29	Residual Heat Removal	140	157	50	10	129	1,126	-	417	2,028	2,028	-	-	643	2,570	-	-	-	230,393	3,803	-
2b.1.1.30	Safety Injection	526	664	49	10	225	997	-	694	3,068	3,068	-	-	1,125	2,713	-	-	-	204,105	20,512	-
2b.1.1.31	Sampling	-	122	3	1	53	72	-	57	310	310	-	-	267	164	-	-	-	14,718	2,623	-
2b.1.1.32	Service Water - Nuclear Area	-	856	21	39	2,621	-	-	600	4,037	4,037	-	-	12,604	-	-	-	-	-	16,744	-
2b.1.1.33	Service Water - Turbine Area	-	61	-	-	-	-	-	9	71	-	-	71	-	-	-	-	-	-	1,336	-
2b.1.1	Totals	1,995	9,793	263	125	6,121	4,591	-	5,176	28,065	23,683	-	4,381	30,606	11,790	-	-	-	939,462	229,400	-
2b.1.2	Scaffolding in support of decommissioning	-	962	5	1	62	13	-	254	1,298	1,298	-	-	309	43	-	-	-	3,836	21,634	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Containment	1,205	757	124	88	115	1,295	-	1,158	4,743	4,743	-	-	576	7,941	-	-	-	738,859	37,887	-
2b.1.3.2	Auxiliary Building	400	199	32	25	26	71	-	279	1,033	1,033	-	-	131	2,095	-	-	-	201,228	11,426	-
2b.1.3.3	Steam Generator Removal	12	2	0	0	5	0	-	7	27	27	-	-	24	2	-	-	-	142	288	-
2b.1.3	Totals	1,617	959	157	112	146	1,367	-	1,444	5,802	5,802	-	-	731	10,038	-	-	-	940,280	49,600	-
2b.1	Subtotal Period 2b Activity Costs	3,611	11,714	425	239	6,329	5,972	-	6,874	35,165	30,784	-	4,381	31,647	21,870	-	-	-	1,883,627	300,634	-
Period 2b Collateral Costs																					
2b.3.1	Process liquid waste	200	-	182	279	-	1,872	-	628	3,160	3,160	-	-	-	-	2,634	-	-	382,959	311	-
2b.3.2	Small tool allowance	-	269	-	-	-	-	-	40	310	310	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	200	269	182	279	-	1,872	-	668	3,470	3,470	-	-	-	-	2,634	-	-	382,859	311	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	621	-	-	-	-	-	-	155	776	776	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	586	59	644	644	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	1,778	-	-	-	-	-	444	2,222	2,222	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,595	-	-	-	-	-	689	5,285	5,285	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	63	23	-	311	-	90	506	506	-	-	-	4,447	-	-	-	89,115	1,092	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	1,662	249	1,911	1,911	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	684	68	752	752	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	79	8	87	-	87	-	-	-	-	-	-	-	-	-
2b.4.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	47,426	7,114	54,540	-	54,540	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	2,218	333	2,551	-	2,551	-	-	-	-	-	-	-	-	-

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2b Period-Dependent Costs (continued)																					
2b.4.12	Radwaste Processing Equipment/Services	-	-	-	-	-	-	421	63	484	484	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISRA Compliance Staff	-	-	-	-	-	-	1,899	285	2,184	2,184	-	-	-	-	-	-	-	-	-	-
2b.4.14	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	54	8	62	-	62	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	2,477	372	2,849	2,849	-	-	-	-	-	-	-	-	-	127,661
2b.4.16	Utility Staff Cost	-	-	-	-	-	-	59,077	8,862	67,938	67,938	-	-	-	-	-	-	-	-	-	894,699
2b.4	Subtotal Period 2b Period-Dependent Costs	621	6,373	83	23	-	311	116,582	18,798	142,791	85,551	57,240	-	-	4,447	-	-	-	89,115	1,092	1,022,360
2b.0	TOTAL PERIOD 2b COST	4,432	18,356	690	641	6,329	8,154	116,582	26,340	181,425	119,804	57,240	4,381	31,647	26,317	2,694	-	-	2,355,601	302,037	1,022,360
PERIOD 2c - Decontamination Following Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Remove spent fuel racks	505	52	132	11	416	144	-	379	1,638	1,638	-	-	2,081	467	-	-	-	41,012	1,189	-
Disposal of Plant Systems																					
2c.1.2.1	Spent Fuel Cooling	-	186	38	9	197	851	-	294	1,575	1,575	-	-	986	1,941	-	-	-	174,052	3,764	-
2c.1.2.2	Waste Disposal - Liquid	352	851	45	9	180	934	-	530	2,402	2,402	-	-	901	2,407	-	-	-	191,109	12,951	-
2c.1.2	Totals	352	637	83	18	377	1,785	-	824	3,977	3,977	-	-	1,886	4,348	-	-	-	365,161	16,716	-
Decontamination of Site Buildings																					
2c.1.3.1	Fuel Handling Building	557	615	9	7	169	26	-	466	1,848	1,848	-	-	843	468	-	-	-	45,684	22,423	-
2c.1.3	Totals	557	615	9	7	169	26	-	466	1,848	1,848	-	-	843	468	-	-	-	45,684	22,423	-
2c.1.4	Scaffolding in support of decommissioning	-	192	1	0	12	3	-	51	260	260	-	-	62	9	-	-	-	767	4,327	-
2c.1	Subtotal Period 2c Activity Costs	1,414	1,397	225	36	974	1,957	-	1,719	7,722	7,722	-	-	4,872	5,282	-	-	-	452,625	44,655	-
Period 2c Collateral Costs																					
2c.3.1	Process liquid waste	98	-	58	108	-	618	-	226	1,107	1,107	-	-	-	-	930	-	-	126,516	145	-
2c.3.2	Small tool allowance	-	50	-	-	-	-	-	8	58	58	-	-	-	-	-	-	-	-	-	-
2c.3.3	Decommissioning Equipment Disposition	-	-	48	13	540	117	-	117	835	835	-	-	2,700	373	-	-	-	33,507	739	-
2c.3	Subtotal Period 2c Collateral Costs	98	50	106	121	540	736	-	350	2,000	2,000	-	-	2,700	373	930	-	-	160,023	883	-
Period 2c Period-Dependent Costs																					
2c.4.1	Decon supplies	96	-	-	-	-	-	-	24	120	120	-	-	-	-	-	-	-	-	-	-
2c.4.2	Insurance	-	-	-	-	-	-	127	13	140	140	-	-	-	-	-	-	-	-	-	-
2c.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2c.4.4	Health physics supplies	-	363	-	-	-	-	-	91	454	454	-	-	-	-	-	-	-	-	-	-
2c.4.5	Heavy equipment rental	-	1,275	-	-	-	-	-	191	1,467	1,467	-	-	-	-	-	-	-	-	-	-
2c.4.6	Disposal of DAW generated	-	-	25	7	-	92	-	27	150	150	-	-	-	1,821	-	-	-	26,474	324	-
2c.4.7	Plant energy budget	-	-	-	-	-	-	246	37	283	283	-	-	-	-	-	-	-	-	-	-
2c.4.8	NRC Fees	-	-	-	-	-	-	280	28	308	308	-	-	-	-	-	-	-	-	-	-
2c.4.9	Emergency Planning Fees	-	-	-	-	-	-	22	2	24	-	24	-	-	-	-	-	-	-	-	-
2c.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	234	35	269	269	-	-	-	-	-	-	-	-	-	-
2c.4.11	ISRA Compliance Staff	-	-	-	-	-	-	527	79	606	606	-	-	-	-	-	-	-	-	-	-
2c.4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	15	2	17	-	17	-	-	-	-	-	-	-	-	-
2c.4.13	Security Staff Cost	-	-	-	-	-	-	335	50	385	385	-	-	-	-	-	-	-	-	-	17,267
2c.4.14	Utility Staff Cost	-	-	-	-	-	-	10,214	1,532	11,746	11,746	-	-	-	-	-	-	-	-	-	163,869
2c.4	Subtotal Period 2c Period-Dependent Costs	96	1,639	25	7	-	92	12,000	2,111	15,970	15,929	41	-	-	1,321	-	-	-	26,474	324	181,136
2c.0	TOTAL PERIOD 2c COST	1,609	3,086	355	163	1,514	2,785	12,000	4,181	25,692	25,651	41	-	7,572	6,976	930	-	-	639,122	45,864	181,136

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2d - Delay before License Termination																					
Period 2d Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 2d Period-Dependent Costs																					
2d.4.1	Insurance	-	-	-	-	-	-	723	72	795	795	-	-	-	-	-	-	-	-	-	-
2d.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2d.4.3	Health physics supplies	-	295	-	-	-	-	-	74	369	369	-	-	-	-	-	-	-	-	-	-
2d.4.4	Disposal of DAW generated	-	-	9	2	-	33	-	10	54	54	-	-	-	478	-	-	-	9,576	117	-
2d.4.5	Plant energy budget	-	-	-	-	-	-	699	105	804	804	-	-	-	-	-	-	-	-	-	-
2d.4.6	NRC Fees	-	-	-	-	-	-	1,007	101	1,108	1,108	-	-	-	-	-	-	-	-	-	-
2d.4.7	Emergency Planning Fees	-	-	-	-	-	-	124	12	137	-	137	-	-	-	-	-	-	-	-	-
2d.4.8	ISRA Compliance Staff	-	-	-	-	-	-	2,998	450	3,448	3,448	-	-	-	-	-	-	-	-	-	-
2d.4.9	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	85	13	98	-	98	-	-	-	-	-	-	-	-	-
2d.4.10	Security Staff Cost	-	-	-	-	-	-	1,345	202	1,547	1,547	-	-	-	-	-	-	-	-	-	69,326
2d.4.11	Utility Staff Cost	-	-	-	-	-	-	7,760	1,164	8,924	8,924	-	-	-	-	-	-	-	-	-	109,766
2d.4	Subtotal Period 2d Period-Dependent Costs	-	295	9	2	-	33	14,741	2,202	17,283	17,049	234	-	-	478	-	-	-	9,576	117	179,091
2d.0	TOTAL PERIOD 2d COST	-	295	9	2	-	33	14,741	2,202	17,283	17,049	234	-	-	478	-	-	-	9,576	117	179,091
PERIOD 2e - License Termination																					
Period 2e Direct Decommissioning Activities																					
2e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	122	37	158	158	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	122	37	158	158	-	-	-	-	-	-	-	-	-	-
Period 2e Additional Costs																					
2e.2.1	Final Site Survey	-	-	-	-	-	-	4,767	715	5,482	5,482	-	-	-	-	-	-	-	-	95,192	-
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	4,767	715	5,482	5,482	-	-	-	-	-	-	-	-	95,192	-
Period 2e Period-Dependent Costs																					
2e.4.1	Insurance	-	-	-	-	-	-	134	13	147	147	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	544	-	-	-	-	-	136	680	680	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	7	2	-	25	-	7	40	40	-	-	-	353	-	-	-	7,076	87	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	223	33	257	257	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	288	28	317	317	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	23	2	25	-	25	-	-	-	-	-	-	-	-	-
2e.4.8	ISRA Compliance Staff	-	-	-	-	-	-	554	83	637	637	-	-	-	-	-	-	-	-	-	-
2e.4.9	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	16	2	18	-	18	-	-	-	-	-	-	-	-	-
2e.4.10	Security Staff Cost	-	-	-	-	-	-	248	37	286	286	-	-	-	-	-	-	-	-	-	12,806
2e.4.11	Utility Staff Cost	-	-	-	-	-	-	7,914	1,187	9,102	9,102	-	-	-	-	-	-	-	-	-	119,520
2e.4	Subtotal Period 2e Period-Dependent Costs	-	544	7	2	-	25	9,400	1,631	11,508	11,464	43	-	-	353	-	-	-	7,076	87	132,326
2e.0	TOTAL PERIOD 2e COST	-	544	7	2	-	25	14,288	2,282	17,147	17,104	43	-	-	353	-	-	-	7,076	95,279	132,326
PERIOD 2 TOTALS		7,353	41,772	9,259	9,536	14,611	46,778	210,997	66,416	406,722	341,308	59,464	5,949	72,765	80,370	7,230	459	-	9,227,960	679,714	2,804,190

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Containment	-	5,755	-	-	-	-	-	863	6,618	993	-	5,626	-	-	-	-	-	-	72.497	-
3b.1.1.2	Auxiliary Building	-	1,735	-	-	-	-	-	260	1,995	200	-	1,796	-	-	-	-	-	-	25,022	-
3b.1.1.3	Auxiliary Building Control Area	-	329	-	-	-	-	-	49	378	-	-	378	-	-	-	-	-	-	4.752	-
3b.1.1.4	Auxiliary Building Diesel Generator Area	-	108	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	1,810	-
3b.1.1.5	Circulating Water Intake Structure	-	1,035	-	-	-	-	-	155	1,190	-	-	1,190	-	-	-	-	-	-	6,259	-
3b.1.1.6	Condensate Polishing Building	-	85	-	-	-	-	-	13	98	-	-	98	-	-	-	-	-	-	1,214	-
3b.1.1.7	Main Steam Isolation Structure	-	222	-	-	-	-	-	33	255	-	-	255	-	-	-	-	-	-	3,160	-
3b.1.1.8	Penetration Area	-	286	-	-	-	-	-	43	329	-	-	329	-	-	-	-	-	-	3,526	-
3b.1.1.9	Service Water Intake Structure	-	578	-	-	-	-	-	87	664	-	-	664	-	-	-	-	-	-	8,761	-
3b.1.1.10	Steam Generator Removal	-	203	-	-	-	-	-	30	233	233	-	-	-	-	-	-	-	-	2,367	-
3b.1.1.11	Trash and Fish Removal Building	-	18	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	269	-
3b.1.1.12	Turbine Building	-	3,387	-	-	-	-	-	508	3,895	-	-	3,895	-	-	-	-	-	-	58,128	-
3b.1.1.13	Turbine Pedestal	-	644	-	-	-	-	-	97	741	-	-	741	-	-	-	-	-	-	7.237	-
3b.1.1.14	Fuel Handling Building	-	2,238	-	-	-	-	-	336	2,574	257	-	2,317	-	-	-	-	-	-	28.638	-
3b.1.1	Totals	-	16,623	-	-	-	-	-	2,493	19,116	1,683	-	17,433	-	-	-	-	-	-	216.659	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	590	-	-	-	-	-	89	679	-	-	679	-	-	-	-	-	-	1,938	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,660
3b.1	Subtotal Period 3b Activity Costs	-	17,213	-	-	-	-	114	2,599	19,926	1,814	-	18,112	-	-	-	-	-	-	220,598	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	-	-	-	-	-	331	50	381	-	-	381	-	-	-	-	-	-	1,963	-
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	331	50	381	-	-	381	-	-	-	-	-	-	1,963	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	205	-	-	-	-	-	31	236	-	-	236	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	205	-	-	-	-	-	31	236	-	-	236	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	246	25	271	0	244	27	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	3,344	-	-	-	-	-	502	3,845	-	-	3,845	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	206	31	237	-	118	118	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	100	10	110	-	110	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	42	4	47	-	47	-	-	-	-	-	-	-	-	-
3b.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	29	4	33	-	33	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	458	69	527	-	353	174	-	-	-	-	-	-	-	23,606
3b.4.9	Utility Staff Cost	-	-	-	-	-	-	4,061	609	4,670	-	2,335	2,335	-	-	-	-	-	-	-	58,359
3b.4	Subtotal Period 3b Period-Dependent Costs	-	3,344	-	-	-	-	5,142	1,253	9,739	0	3,240	6,499	-	-	-	-	-	-	-	81,964
3b.0	TOTAL PERIOD 3b COST	-	20,761	-	-	-	-	5,687	3,933	30,281	1,814	3,240	25,228	-	-	-	-	-	-	222.561	83,524

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	2,922	292	3,214	-	3,214	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	469	70	539	-	539	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	1,368	137	1,505	-	1,505	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	578	58	636	-	636	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	2,608	391	2,999	-	2,999	-	-	-	-	-	-	-	-	-
3c.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	395	59	454	-	454	-	-	-	-	-	-	-	-	-
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	8,340	1,008	9,348	-	9,348	-	-	-	-	-	-	-	-	-
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	8,340	1,008	9,348	-	9,348	-	-	-	-	-	-	-	-	-
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	-	-	-	11,980	-	1,797	13,777	13,777	-	-	-	-	-	-	613	-	-	-
3d.1.1	Totals	-	-	-	-	-	11,980	-	1,797	13,777	13,777	-	-	-	-	-	-	613	-	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	-	-	-	11,980	-	1,797	13,777	13,777	-	-	-	-	-	-	613	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	7	1	8	-	8	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	1	0	1	-	1	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	3	0	4	-	4	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	1	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	183	27	210	-	210	-	-	-	-	-	-	-	-	-
3d.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	1	0	1	-	1	-	-	-	-	-	-	-	-	-
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	197	29	226	-	226	-	-	-	-	-	-	-	-	-
3d.0	TOTAL PERIOD 3d COST	-	-	-	-	-	11,980	197	1,826	14,002	13,777	226	-	-	-	-	-	613	-	-	-
PERIOD 3 TOTALS		-	20,761	-	-	-	11,960	14,123	6,766	53,631	15,591	12,813	25,228	-	-	-	-	618	-	222,561	83,524
TOTAL COST TO DECOMMISSION		9,276	64,458	9,776	10,036	14,611	63,609	297,754	86,876	555,899	449,800	74,018	82,081	72,765	91,168	13,149	459	613	10,225,340	903,748	3,248,005

TABLE C-1
SALEM GENERATING STATION - UNIT 1
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours

TOTAL COST TO DECOMMISSION WITH 18.4% CONTINGENCY:	$555,899	thousands of 2002 dollars
TOTAL NRC LICENSE TERMINATION COST IS 80.91% OR	$449,800	thousands of 2002 dollars
SPENT FUEL MANAGEMENT COST IS 13.32% OR:	$74,018	thousands of 2002 dollars
NON-NUCLEAR DEMOLITION COST IS 5.77% OR:	$32,081	thousands of 2002 dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	81,371	cubic feet
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	23,405	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	613	cubic feet
TOTAL SCRAP METAL REMOVED:	48,199	tons
TOTAL CRAFT LABOR REQUIREMENTS:	903,746	man-hours

End Notes:
n/a - indicates that this activity not charged as decommissioning expense.
a - indicates that this activity performed by decommissioning staff.
0 - indicates that this value is less than 0.5 but is non-zero.
a cell containing " - " indicates a zero value

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	1,300
1a.1.2	Notification of Cessation of Operations									a											
1a.1.3	Remove fuel & source material									n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	62	9	72	72	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	144	22	165	165	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	234	35	269	269	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	97	15	111	111	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	156	23	179	179	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	128	19	147	147	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	154	23	177	159	-	18	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	130	20	150	135	-	15	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	16	2	18	18	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	222	33	255	255	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	203	30	233	233	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Biological shield	-	-	-	-	-	-	16	2	18	18	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Steam generators	-	-	-	-	-	-	97	15	112	112	-	-	-	-	-	-	-	-	-	3,120
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	50	7	57	29	-	29	-	-	-	-	-	-	-	1,600
1a.1.17.9	Turbine & condenser	-	-	-	-	-	-	25	4	29	-	-	29	-	-	-	-	-	-	-	800
1a.1.17.10	Plant structures & buildings	-	-	-	-	-	-	97	15	112	56	-	56	-	-	-	-	-	-	-	3,120
1a.1.17.11	Waste management	-	-	-	-	-	-	144	22	165	165	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.12	Facility & site closeout	-	-	-	-	-	-	28	4	32	16	-	16	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	1,180	177	1,357	1,195	-	162	-	-	-	-	-	-	-	37,827
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	75	11	86	86	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,304	346	2,650	2,650	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	44	7	50	50	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	1,950	293	2,243	2,243	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	38	6	44	44	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	6,565	983	7,539	7,376	-	162	-	-	-	-	-	-	-	73,753
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	731	73	804	804	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	331	-	-	-	-	-	83	413	413	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	349	-	-	-	-	-	52	401	401	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	10	3	-	37	-	11	61	61	-	-	-	535	-	-	-	10,725	131	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	949	142	1,092	1,092	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	302	30	332	332	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	34	3	37	-	37	-	-	-	-	-	-	-	-	-

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1a Period-Dependent Costs (continued)																					
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	951	143	1,093	-	1,093	-	-	-	-	-	-	-	-	-
1a.4.10	ISRA Compliance Staff	-	-	-	-	-	-	814	122	936	936	-	-	-	-	-	-	-	-	-	-
1a.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	528	79	607	607	-	-	-	-	-	-	-	-	-	27,189
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	18,980	2,847	21,827	21,827	-	-	-	-	-	-	-	-	-	296,983
1a.4	Subtotal Period 1a Period-Dependent Costs	-	680	10	8	-	37	23,311	3,589	27,630	26,473	1,157	-	-	535	-	-	-	10,725	131	324,171
1a.0	TOTAL PERIOD 1a COST	-	680	10	8	-	37	29,866	4,572	35,168	33,849	1,157	162	-	535	-	-	-	10,725	131	397,924
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	148	22	170	153	-	17	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	78	12	90	90	-	-	-	-	-	-	-	-	-	2,500
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	42	6	48	12	-	36	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	113	17	130	130	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	37	6	43	22	-	22	-	-	-	-	-	-	-	1,200
1b.1.1.10	Missile shields	-	-	-	-	-	-	14	2	16	16	-	-	-	-	-	-	-	-	-	450
1b.1.1.11	Biological shield	-	-	-	-	-	-	37	6	43	43	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.12	Steam generators	-	-	-	-	-	-	144	22	165	165	-	-	-	-	-	-	-	-	-	4,600
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	31	5	36	18	-	18	-	-	-	-	-	-	-	1,000
1b.1.1.14	Turbine & condensers	-	-	-	-	-	-	97	15	112	-	-	112	-	-	-	-	-	-	-	3,120
1b.1.1.15	Auxiliary building	-	-	-	-	-	-	85	13	98	88	-	10	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	85	13	98	88	-	10	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	1,037	156	1,193	968	-	224	-	-	-	-	-	-	-	33,243
1b.1.2	Decon primary loop	1,134	-	-	-	-	-	-	567	1,701	1,701	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	1,134	-	-	-	-	-	1,037	722	2,893	2,669	-	224	-	-	-	-	-	-	1,067	33,243
Period 1b Additional Costs																					
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	5,252	788	6,040	6,040	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	696	104	800	800	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	5,948	892	6,840	6,840	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	710	-	-	-	-	-	-	107	817	817	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process liquid waste	57	-	503	496	-	4,796	-	1,352	7,205	7,205	-	-	-	-	5,919	-	-	981,415	210	-
1b.3.3	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
1b.3.4	Pipe cutting equipment	-	911	-	-	-	-	-	137	1,048	1,048	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	767	912	503	496	-	4,796	-	1,596	9,070	9,070	-	-	-	-	5,919	-	-	981,415	210	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	22	-	-	-	-	-	-	5	27	27	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	365	37	402	402	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1b Period-Dependant Costs (continued)																					
1b.4.4	Health physics supplies	-	170	-	-	-	-	-	42	212	212	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	174	-	-	-	-	-	26	201	201	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	5	1	-	20	-	6	32	32	-	-	-	284	-	-	-	5,694	70	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	949	142	1,092	1,092	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	182	18	200	200	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	17	2	19	-	19	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	475	71	547	-	547	-	-	-	-	-	-	-	-	-
1b.4.11	ISRA Compliance Staff	-	-	-	-	-	-	407	61	468	468	-	-	-	-	-	-	-	-	-	-
1b.4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	12	2	13	-	13	-	-	-	-	-	-	-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	264	40	303	303	-	-	-	-	-	-	-	-	-	13,594
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	9,490	1,423	10,913	10,913	-	-	-	-	-	-	-	-	-	148,491
1b.4	Subtotal Period 1b Period-Dependent Costs	22	344	5	1	-	20	12,161	1,876	14,430	13,851	578	-	-	284	-	-	-	5,694	70	162,086
1b.0	TOTAL PERIOD 1b COST	1,923	1,256	508	498	-	4,816	19,147	5,086	33,233	32,431	578	224	-	284	5,919	-	-	987,109	1,347	195,329
PERIOD 1 TOTALS		1,923	1,936	518	501	-	4,854	49,018	9,658	68,402	66,280	1,735	386	-	819	5,919	-	-	997,834	1,478	693,253
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Reactor Coolant Piping	280	255	30	20	-	906	-	436	1,928	1,928	-	-	-	2,038	-	-	-	185,321	10,107	-
2a.1.1.2	Pressurizer Relief Tank	30	26	5	3	-	179	-	67	310	310	-	-	-	329	-	-	-	36,553	527	-
2a.1.1.3	Reactor Coolant Pumps & Motors	81	90	43	1,843	107	3,376	-	1,204	6,744	6,744	-	-	248	3,192	-	-	-	690,870	3,580	-
2a.1.1.4	Pressurizer	44	56	371	460	-	1,487	-	514	2,933	2,933	-	-	-	2,589	-	-	-	304,295	2,845	-
2a.1.1.5	Steam Generators	373	2,136	870	5,391	-	16,902	100	5,842	31,618	31,618	-	-	-	31,467	-	-	-	3,458,553	13,321	-
2a.1.1.6	CRDMs/ICIs/Service Structure Removal	152	97	124	17	-	420	-	220	1,031	1,031	-	-	-	3,881	-	-	-	86,025	4,564	-
2a.1.1.7	Reactor Vessel Internals	118	1,971	4,979	537	-	4,726	214	5,312	17,857	17,857	-	-	-	1,377	903	459	-	326,029	31,608	1,398
2a.1.1.8	Reactor Vessel	90	3,433	1,504	365	-	6,672	214	5,956	17,233	17,233	-	-	-	6,511	2,254	-	-	948,723	31,608	1,396
2a.1.1	Totals	1,168	8,064	7,926	8,636	107	33,668	528	19,550	79,648	79,648	-	-	248	51,384	3,166	459	-	6,036,370	98,161	2,793
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	474	55	11	715	-	-	233	1,488	1,488	-	-	3,573	-	-	-	-	-	9,244	-
2a.1.3	Main Condensers	-	1,607	53	11	689	-	-	512	2,872	2,872	-	-	3,446	-	-	-	-	-	31,571	-
Disposal of Plant Systems																					
2a.1.4.1	Auxiliary Feedwater	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	892	-
2a.1.4.2	Auxiliary Feedwater (RCA)	-	281	2	4	293	-	-	115	697	697	-	-	1,466	-	-	-	-	-	5,333	-
2a.1.4.3	Bleed Steam & Heater Drains	-	140	-	-	-	-	-	21	162	-	-	162	-	-	-	-	-	-	2,884	-
2a.1.4.4	Circulating Water	-	229	-	-	-	-	-	34	264	-	-	264	-	-	-	-	-	-	4,757	-
2a.1.4.5	Circulating Water Sampling	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	104	-
2a.1.4.6	Condensate Polishing	-	904	6	12	761	-	-	343	2,025	2,025	-	-	3,806	-	-	-	-	-	17,777	-
2a.1.4.7	Condenser Air Removal & Priming	-	125	-	-	-	-	-	19	144	-	-	144	-	-	-	-	-	-	2,693	-
2a.1.4.8	Containment Spray	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	104	-
2a.1.4.9	Containment Spray (RCA)	-	106	4	7	481	-	-	100	699	699	-	-	2,403	-	-	-	-	-	2,075	-
2a.1.4.10	Equipment Vents & Drains - Contaminated	-	6	0	0	5	4	-	3	18	18	-	-	26	8	-	-	-	717	115	-
2a.1.4.11	Feedwater Chemical Treatment	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	182	-
2a.1.4.12	Generator Stator Cooling Water	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	568	-
2a.1.4.13	Heater Vents & Miscellaneous Drains	-	33	0	0	26	-	-	12	72	72	-	-	128	-	-	-	-	-	660	-
2a.1.4.14	Hydrogen & Carbon Dioxide	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	235	-
2a.1.4.15	Main & Reheat & Turbine By-Pass Steam	-	460	24	46	3,028	-	-	579	4,138	4,138	-	-	15,141	-	-	-	-	-	9,343	-

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2a.1.4.16	Main Turbine Lubricating Oil	-	101	-	-	-	-	-	15	116	-	-	116	-	-	-	-	-	-	2,099	-
2a.1.4.17	Miscellaneous Condensate	-	50	-	-	-	-	-	7	57	-	-	57	-	-	-	-	-	-	1,051	-
2a.1.4.18	Moisture Separator Rehtrs Steam & Drains	-	437	3	5	328	-	-	159	931	931	-	-	1,638	-	-	-	-	-	8,614	-
2a.1.4.19	Oil Water Separator	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	907	-
2a.1.4.20	Steam Gen Drains & Blowdown	-	182	1	2	102	-	-	61	348	348	-	-	512	-	-	-	-	-	3,566	-
2a.1.4.21	Steam Gen Drains & Blowdown (RCA)	-	36	0	0	18	-	-	12	66	66	-	-	90	-	-	-	-	-	694	-
2a.1.4.22	Steam Gen Feed Pump & Turbine Lube Oil	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	611	-
2a.1.4.23	Steam Generator Feed & Condensate	-	343	-	-	-	-	-	51	394	-	-	394	-	-	-	-	-	-	7,097	-
2a.1.4.24	Turbine Auxiliaries Cooling	-	168	-	-	-	-	-	25	193	-	-	193	-	-	-	-	-	-	3,594	-
2a.1.4.25	Turbine Drains	-	36	0	1	36	-	-	15	88	88	-	-	182	-	-	-	-	-	724	-
2a.1.4.26	Turbine Electro-Hydraulic Control	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	73	-
2a.1.4.27	Turbine Gland Sealing Steam & Leak-Off	-	75	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	1,654	-
2a.1.4.28	Waste Disposal - Gas	-	90	5	3	128	89	-	67	392	392	-	-	640	233	-	-	-	20,293	1,605	-
2a.1.4	Totals	-	8,981	46	81	5,206	103	-	1,678	11,095	9,473	-	1,622	26,032	241	-	-	-	21,010	80,312	-
2a.1.5	Scaffolding in support of decommissioning	-	821	4	1	49	11	-	216	1,103	1,103	-	-	247	34	-	-	-	3,069	18,470	-
2a.1	Subtotal Period 2a Activity Costs	1,168	14,948	8,085	8,740	6,767	33,781	528	22,188	96,206	94,584	-	1,622	33,547	51,659	3,156	459	-	6,060,448	237,759	2,793
Period 2a Additional Costs																					
2a.2.1	Curie Surcharge (Excluding RPV)	-	-	-	-	-	1,374	-	344	1,718	1,718	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	1,374	-	344	1,718	1,718	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Process liquid waste	73	-	28	65	-	314	-	127	606	606	-	-	-	-	510	-	-	64,257	100	-
2a.3.2	Small tool allowance	-	219	-	-	-	-	-	83	252	227	-	25	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	73	219	28	65	-	314	-	160	858	833	-	25	-	-	510	-	-	64,257	100	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	72	-	-	-	-	-	-	18	90	90	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,216	122	1,338	1,338	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,364	-	-	-	-	-	341	1,705	1,705	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,144	-	-	-	-	-	472	3,615	3,615	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	86	24	-	324	-	93	526	526	-	-	-	4,622	-	-	-	92,621	1,185	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	1,501	225	1,726	1,726	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	523	52	576	576	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	56	6	62	-	62	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	1,464	220	1,684	-	1,684	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,582	237	1,819	-	1,819	-	-	-	-	-	-	-	-	-
2a.4.12	ISRA Compliance Staff	-	-	-	-	-	-	1,354	203	1,558	1,558	-	-	-	-	-	-	-	-	-	-
2a.4.13	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	38	6	44	-	44	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	2,380	357	2,737	2,737	-	-	-	-	-	-	-	-	-	122,670
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	44,673	6,701	51,374	51,374	-	-	-	-	-	-	-	-	-	671,640
2a.4	Subtotal Period 2a Period-Dependent Costs	72	4,507	86	24	-	324	54,788	9,052	68,853	65,245	3,609	-	-	4,622	-	-	-	92,621	1,185	794,310
2a.0	TOTAL PERIOD 2a COST	1,313	19,675	8,199	8,828	6,767	35,793	55,316	31,744	167,635	162,379	3,609	1,647	33,547	56,281	3,666	459	-	6,217,926	238,994	797,103

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	Building & Equipment Drains-Conventional	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	850	-
2b.1.1.2	Chem & Vol Ctrl - Boric Acid Recovery	519	507	41	9	218	845	-	636	2,774	2,774	-	-	1,088	2,376	-	-	-	172,868	19,343	-
2b.1.1.3	Chem & Vol Ctrl - Primary Water Recovery	353	347	28	6	158	566	-	432	1,890	1,890	-	-	788	1,630	-	-	-	115,643	13,399	-
2b.1.1.4	Chem & Vol Ctrl Operation	455	532	34	6	71	700	-	550	2,349	2,349	-	-	354	1,685	-	-	-	143,288	19,071	-
2b.1.1.5	Chilled Water	-	185	-	-	-	-	-	28	213	-	-	213	-	-	-	-	-	-	4,017	-
2b.1.1.6	Chilled Water (RCA)	-	197	1	2	138	-	-	70	408	408	-	-	689	-	-	-	-	-	3,683	-
2b.1.1.7	Component Cooling	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	345	-
2b.1.1.8	Component Cooling (RCA)	-	355	8	15	986	-	-	240	1,603	1,603	-	-	4,928	-	-	-	-	-	6,638	-
2b.1.1.9	Compressed Air	-	111	-	-	-	-	-	17	128	-	-	128	-	-	-	-	-	-	2,369	-
2b.1.1.10	Compressed Air (RCA)	-	78	0	1	35	-	-	25	139	139	-	-	174	-	-	-	-	-	1,654	-
2b.1.1.11	Control Air - Auxiliary Building	-	131	1	2	128	-	-	52	315	315	-	-	640	-	-	-	-	-	2,673	-
2b.1.1.12	Control Air - Containment Building	-	42	0	1	40	-	-	17	99	99	-	-	200	-	-	-	-	-	860	-
2b.1.1.13	Control Air - Penetration Area	-	32	-	-	-	-	-	5	37	-	-	37	-	-	-	-	-	-	672	-
2b.1.1.14	Control Air - Turbine Generator Area	-	46	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	965	-
2b.1.1.15	Demineralized Water - Restricted Areas	-	59	0	1	46	-	-	22	129	129	-	-	232	-	-	-	-	-	1,123	-
2b.1.1.16	Demineralized Water Make-up	-	437	-	-	-	-	-	66	503	-	-	503	-	-	-	-	-	-	9,096	-
2b.1.1.17	Diesel Engine Auxiliaries	-	128	-	-	-	-	-	19	148	-	-	148	-	-	-	-	-	-	2,602	-
2b.1.1.18	Electrical	-	3,421	-	-	-	-	-	513	3,934	-	-	3,934	-	-	-	-	-	-	69,784	-
2b.1.1.19	Electrical (RCA - Clean)	-	576	4	7	448	-	-	213	1,247	1,247	-	-	2,238	-	-	-	-	-	11,303	-
2b.1.1.20	Electrical (RCA)	-	190	1	3	176	-	-	74	444	444	-	-	880	-	-	-	-	-	3,808	-
2b.1.1.21	Fire Protection	-	256	-	-	-	-	-	38	294	-	-	294	-	-	-	-	-	-	5,488	-
2b.1.1.22	Fire Protection (CO2)	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	305	-
2b.1.1.23	Fire Protection (RCA)	-	178	1	2	109	-	-	61	351	351	-	-	544	-	-	-	-	-	3,349	-
2b.1.1.24	Floor Drains - Contaminated	-	165	8	1	16	163	-	85	439	439	-	-	81	372	-	-	-	33,319	3,228	-
2b.1.1.25	Fresh Water	-	284	-	-	-	-	-	43	327	-	-	327	-	-	-	-	-	-	5,906	-
2b.1.1.26	Fuel Oil	-	220	-	-	-	-	-	33	253	-	-	253	-	-	-	-	-	-	4,452	-
2b.1.1.27	HVAC - Auxiliary Building	-	265	2	3	188	27	-	102	587	587	-	-	941	62	-	-	-	5,534	4,912	-
2b.1.1.28	HVAC - Control Area	-	26	-	-	-	-	-	4	29	-	-	29	-	-	-	-	-	-	532	-
2b.1.1.29	HVAC - Diesel Generator Area	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	126	-
2b.1.1.30	HVAC - Fuel Handling Area	-	122	1	1	91	18	-	48	277	277	-	-	455	30	-	-	-	2,676	2,268	-
2b.1.1.31	HVAC - Miscellaneous	-	178	-	-	-	-	-	27	205	-	-	205	-	-	-	-	-	-	3,948	-
2b.1.1.32	HVAC - Reactor Containment	-	678	6	8	488	74	-	263	1,518	1,518	-	-	2,441	168	-	-	-	15,104	12,513	-
2b.1.1.33	Heating Steam & Cond Return	-	159	-	-	-	-	-	24	183	-	-	183	-	-	-	-	-	-	3,462	-
2b.1.1.34	Heating Steam & Cond Return (RCA)	-	128	1	1	86	-	-	45	261	261	-	-	432	-	-	-	-	-	2,398	-
2b.1.1.35	Heating Water	-	112	-	-	-	-	-	17	128	-	-	128	-	-	-	-	-	-	2,326	-
2b.1.1.36	Heating Water (RCA)	-	64	0	1	39	-	-	22	126	126	-	-	193	-	-	-	-	-	1,198	-
2b.1.1.37	Htng Boiler Air/Gas Flow & Ignition Gas	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	80	-
2b.1.1.38	Miscellaneous Reactor Coolant	-	58	1	0	11	9	-	19	98	98	-	-	56	20	-	-	-	1,814	1,247	-
2b.1.1.39	Non-Radioactive Liquid Waste Disposal	-	321	-	-	-	-	-	48	369	-	-	369	-	-	-	-	-	-	6,636	-
2b.1.1.40	Plumbing - Hot and Cold Water	-	45	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	988	-
2b.1.1.41	Plumbing - Sanitary	-	30	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	622	-
2b.1.1.42	Residual Heat Removal	140	157	50	10	129	1,126	-	417	2,028	2,028	-	-	643	2,570	-	-	-	230,393	3,803	-
2b.1.1.43	Safety Injection	528	564	49	10	225	997	-	694	3,068	3,068	-	-	1,125	2,713	-	-	-	204,105	20,512	-
2b.1.1.44	Sampling	-	122	3	1	53	72	-	57	310	310	-	-	267	164	-	-	-	14,718	2,629	-
2b.1.1.45	Service Water - Nuclear Area	-	856	21	39	2,521	-	-	600	4,037	4,037	-	-	12,604	-	-	-	-	-	16,744	-
2b.1.1.46	Service Water - Turbine Area	-	61	-	-	-	-	-	9	71	-	-	71	-	-	-	-	-	-	1,336	-
2b.1.1	Totals	1,995	12,505	265	130	6,393	4,591	-	5,664	31,549	24,496	-	7,053	31,993	11,780	-	-	-	939,462	285,358	-

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
2b.1.2	Scaffolding in support of decommissioning	-	1,027	5	1	62	13	-	270	1,379	1,379	-	-	309	43	-	-	-	3,836	23,088	-
	Decontamination of Site Buildings																				
2b.1.3.1	Reactor Containment	1,205	757	124	88	115	1,295	-	1,158	4,743	4,743	-	-	576	7,941	-	-	-	738,859	37,887	-
2b.1.3.2	Auxiliary Building	400	199	32	25	26	71	-	279	1,033	1,033	-	-	131	2,095	-	-	-	201,223	11,426	-
2b.1.3.3	Controlled Facilities Building	55	23	4	3	2	5	-	36	128	128	-	-	8	265	-	-	-	26,374	1,474	-
2b.1.3.4	Steam Generator Removal	12	2	0	0	5	0	-	7	27	27	-	-	24	2	-	-	-	142	288	-
2b.1.3	Totals	1,672	982	161	116	148	1,378	-	1,480	5,930	5,930	-	-	739	10,302	-	-	-	966,604	51,074	-
2b.1	Subtotal Period 2b Activity Costs	3,666	14,513	431	247	6,608	5,977	-	7,414	38,857	31,804	-	7,053	33,042	22,135	-	-	-	1,909,902	359,520	-
	Period 2b Collateral Costs																				
2b.3.1	Process liquid waste	202	-	183	281	-	1,883	-	632	3,181	3,181	-	-	-	-	2,652	-	-	385,235	315	-
2b.3.2	Small tool allowance	-	321	-	-	-	-	-	48	369	369	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	202	321	183	281	-	1,883	-	680	3,550	3,550	-	-	-	-	2,652	-	-	385,235	315	-
	Period 2b Period-Dependent Costs																				
2b.4.1	Decon supplies	642	-	-	-	-	-	-	161	803	803	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	687	69	756	756	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	1,997	-	-	-	-	-	499	2,496	2,496	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,563	-	-	-	-	-	684	5,247	5,247	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	86	24	-	329	-	93	525	525	-	-	-	4,612	-	-	-	92,423	1,132	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	1,650	247	1,897	1,897	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	680	68	748	748	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	78	8	86	-	86	-	-	-	-	-	-	-	-	-
2b.4.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	33,955	5,093	39,048	-	39,048	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	2,203	330	2,533	-	2,533	-	-	-	-	-	-	-	-	-
2b.4.12	Radwaste Processing Equipment/Services	-	-	-	-	-	-	418	63	481	481	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISRA Compliance Staff	-	-	-	-	-	-	1,886	283	2,169	2,169	-	-	-	-	-	-	-	-	-	-
2b.4.14	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	53	8	61	-	61	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	2,656	398	3,055	3,055	-	-	-	-	-	-	-	-	-	136,891
2b.4.16	Utility Staff Cost	-	-	-	-	-	-	60,723	9,108	69,832	69,832	-	-	-	-	-	-	-	-	-	915,840
2b.4	Subtotal Period 2b Period-Dependent Costs	642	6,560	86	24	-	329	104,989	17,113	129,736	88,008	41,728	-	-	4,612	-	-	-	92,423	1,132	1,052,731
2b.0	TOTAL PERIOD 2b COST	4,511	21,394	700	551	6,608	8,183	104,989	25,207	172,144	123,363	41,728	7,053	33,042	26,747	2,652	-	-	2,387,559	360,967	1,052,731
	PERIOD 2c - Decontamination Following Wet Fuel Storage																				
	Period 2c Direct Decommissioning Activities																				
2c.1.1	Remove spent fuel racks	505	52	132	11	416	144	-	379	1,638	1,638	-	-	2,081	457	-	-	-	41,012	1,189	-
	Disposal of Plant Systems																				
2c.1.2.1	Spent Fuel Cooling	-	186	38	9	197	851	-	294	1,575	1,575	-	-	986	1,941	-	-	-	174,053	3,764	-
2c.1.2.2	Waste Disposal - Liquid	352	351	45	9	180	934	-	530	2,402	2,402	-	-	901	2,407	-	-	-	191,109	12,951	-
2c.1.2.3	Waste Disposal - Solid	-	61	5	1	45	107	-	49	267	267	-	-	223	253	-	-	-	21,858	1,209	-
2c.1.2	Totals	352	598	88	19	422	1,891	-	874	4,244	4,244	-	-	2,110	4,601	-	-	-	387,019	17,925	-
	Decontamination of Site Buildings																				
2c.1.3.1	Fuel Handling Building	557	615	9	7	169	26	-	466	1,848	1,848	-	-	843	468	-	-	-	45,684	22,423	-
2c.1.3	Totals	557	615	9	7	169	26	-	466	1,848	1,848	-	-	843	468	-	-	-	45,684	22,423	-
2c.1.4	Scaffolding in support of decommissioning	-	205	1	0	12	3	-	54	276	276	-	-	62	9	-	-	-	767	4,618	-

93

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
2c.1	Subtotal Period 2c Activity Costs	1,414	1,470	230	37	1,019	2,063	-	1,772	8,006	8,006	-	-	5,096	5,535	-	-	-	474,483	46,155	-
	Period 2c Collateral Costs																				
2c.3.1	Process liquid waste	98	-	58	108	-	618	-	225	1,107	1,107	-	-	-	-	930	-	-	126,466	146	-
2c.3.2	Small tool allowance	-	52	-	-	-	-	-	8	59	59	-	-	-	-	-	-	-	-	-	-
2c.3.3	Decommissioning Equipment Disposition	-	-	48	13	540	117	-	117	835	835	-	-	2,700	373	-	-	-	33,507	739	-
2c.3	Subtotal Period 2c Collateral Costs	98	52	106	121	540	735	-	350	2,001	2,001	-	-	2,700	373	930	-	-	159,973	885	-
	Period 2c Period-Dependent Costs																				
2c.4.1	Decon supplies	97	-	-	-	-	-	-	24	121	121	-	-	-	-	-	-	-	-	-	-
2c.4.2	Insurance	-	-	-	-	-	-	111	11	122	122	-	-	-	-	-	-	-	-	-	-
2c.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2c.4.4	Health physics supplies	-	380	-	-	-	-	-	95	476	476	-	-	-	-	-	-	-	-	-	-
2c.4.5	Heavy equipment rental	-	1,308	-	-	-	-	-	196	1,504	1,504	-	-	-	-	-	-	-	-	-	-
2c.4.6	Disposal of DAW generated	-	-	25	7	-	95	-	27	155	155	-	-	-	1,859	-	-	-	27,233	334	-
2c.4.7	Plant energy budget	-	-	-	-	-	-	252	38	290	290	-	-	-	-	-	-	-	-	-	-
2c.4.8	NRC Fees	-	-	-	-	-	-	284	28	312	312	-	-	-	-	-	-	-	-	-	-
2c.4.9	Emergency Planning Fees	-	-	-	-	-	-	22	2	25	-	25	-	-	-	-	-	-	-	-	-
2c.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	240	36	275	275	-	-	-	-	-	-	-	-	-	-
2c.4.11	ISRA Compliance Staff	-	-	-	-	-	-	540	81	622	622	-	-	-	-	-	-	-	-	-	-
2c.4.12	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	15	2	18	-	18	-	-	-	-	-	-	-	-	-
2c.4.13	Security Staff Cost	-	-	-	-	-	-	761	114	875	875	-	-	-	-	-	-	-	-	-	39,227
2c.4.14	Utility Staff Cost	-	-	-	-	-	-	14,860	2,229	17,089	17,089	-	-	-	-	-	-	-	-	-	226,337
2c.4	Subtotal Period 2c Period-Dependent Costs	97	1,688	25	7	-	95	17,085	2,885	21,882	21,840	42	-	-	1,859	-	-	-	27,233	334	265,564
2c.0	TOTAL PERIOD 2c COST	1,609	3,210	361	165	1,559	2,894	17,085	5,007	31,889	31,847	42	-	7,796	7,267	930	-	-	661,688	47,373	265,564
	PERIOD 2e - License Termination																				
	Period 2e Direct Decommissioning Activities																				
2e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	122	37	158	158	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	122	37	158	158	-	-	-	-	-	-	-	-	-	-
	Period 2e Additional Costs																				
2e.2.1	Final Site Survey	-	-	-	-	-	-	4,767	715	5,482	5,482	-	-	-	-	-	-	-	-	95,192	-
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	4,767	715	5,482	5,482	-	-	-	-	-	-	-	-	95,192	-
	Period 2e Period-Dependent Costs																				
2e.4.1	Insurance	-	-	-	-	-	-	113	11	125	125	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	551	-	-	-	-	-	138	688	688	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	7	2	-	25	-	7	41	41	-	-	-	364	-	-	-	7,297	89	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	223	83	257	257	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	288	29	317	317	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	23	2	25	-	25	-	-	-	-	-	-	-	-	-
2e.4.8	ISRA Compliance Staff	-	-	-	-	-	-	554	83	637	637	-	-	-	-	-	-	-	-	-	-
2e.4.9	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	16	2	18	-	18	-	-	-	-	-	-	-	-	-
2e.4.10	Security Staff Cost	-	-	-	-	-	-	428	64	492	492	-	-	-	-	-	-	-	-	-	22,054
2e.4.11	Utility Staff Cost	-	-	-	-	-	-	10,411	1,562	11,972	11,972	-	-	-	-	-	-	-	-	-	150,823
2e.4	Subtotal Period 2e Period-Dependent Costs	-	551	7	2	-	25	12,056	1,932	14,572	14,529	43	-	-	364	-	-	-	7,297	89	172,877

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
2a.0	TOTAL PERIOD 2a COST	-	551	7	2	-	25	16,944	2,684	20,212	20,169	43	-	-	364	-	-	-	7,297	95,281	172,877
PERIOD 2 TOTALS		7,433	44,830	9,267	9,546	14,934	46,895	194,834	64,642	391,880	337,758	45,422	8,700	74,384	90,659	7,248	469	-	9,273,870	742,616	2,288,275
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Containment	-	5,755	-	-	-	-	-	863	6,618	993	-	5,626	-	-	-	-	-	-	72,497	-
3b.1.1.2	Administration Building	-	660	-	-	-	-	-	99	759	-	-	759	-	-	-	-	-	-	10,176	-
3b.1.1.3	Auxiliary Building	-	1,735	-	-	-	-	-	260	1,995	200	-	1,796	-	-	-	-	-	-	25,022	-
3b.1.1.4	Auxiliary Building Control Area	-	329	-	-	-	-	-	49	378	-	-	378	-	-	-	-	-	-	4,752	-
3b.1.1.5	Auxiliary Building Diesel Generator Area	-	108	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	1,810	-
3b.1.1.6	Barge Slip	-	961	-	-	-	-	-	144	1,105	-	-	1,105	-	-	-	-	-	-	7,269	-
3b.1.1.7	Chromate Demineralizer Enclosure	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	92	-
3b.1.1.8	Circulating Water Intake Structure	-	1,038	-	-	-	-	-	156	1,194	-	-	1,194	-	-	-	-	-	-	6,310	-
3b.1.1.9	Circulating Water Piping	-	1,873	-	-	-	-	-	281	2,154	-	-	2,154	-	-	-	-	-	-	36,524	-
3b.1.1.10	Clean Facilities Building	-	358	-	-	-	-	-	54	412	-	-	412	-	-	-	-	-	-	5,692	-
3b.1.1.11	Condensate Polishing Building	-	70	-	-	-	-	-	11	81	-	-	81	-	-	-	-	-	-	1,107	-
3b.1.1.12	Controlled Facilities Building	-	252	-	-	-	-	-	38	290	-	-	290	-	-	-	-	-	-	3,785	-
3b.1.1.13	Fire Pump House	-	57	-	-	-	-	-	9	65	-	-	65	-	-	-	-	-	-	874	-
3b.1.1.14	Guard House and Extension	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,401	-
3b.1.1.15	Heating Boiler Plant	-	83	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	1,138	-
3b.1.1.16	Main Steam Isolation Structure	-	184	-	-	-	-	-	28	211	-	-	211	-	-	-	-	-	-	2,551	-
3b.1.1.17	Miscellaneous Structures	-	1,884	-	-	-	-	-	283	2,167	-	-	2,167	-	-	-	-	-	-	24,441	-
3b.1.1.18	Non-Rad Liquid Waste Chem Treatment Bldg	-	81	-	-	-	-	-	12	94	-	-	94	-	-	-	-	-	-	1,193	-
3b.1.1.19	Non-Rad Liquid Waste Disposal Basin	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	239	-
3b.1.1.20	Non-Rad Liquid Waste Transfer House	-	6	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	84	-
3b.1.1.21	Penetration Area	-	286	-	-	-	-	-	43	329	-	-	329	-	-	-	-	-	-	3,526	-
3b.1.1.22	Service Building	-	520	-	-	-	-	-	78	598	-	-	598	-	-	-	-	-	-	8,811	-
3b.1.1.23	Service Water Intake Structure	-	578	-	-	-	-	-	87	664	-	-	664	-	-	-	-	-	-	3,761	-
3b.1.1.24	Sewage Treatment Facilities	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	89	-
3b.1.1.25	Steam Generator Removal	-	203	-	-	-	-	-	30	233	233	-	-	-	-	-	-	-	-	2,867	-
3b.1.1.26	Trash and Fish Removal Building	-	18	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	269	-
3b.1.1.27	Turbine Building	-	3,387	-	-	-	-	-	508	3,895	-	-	3,895	-	-	-	-	-	-	68,128	-
3b.1.1.28	Turbine Pedestal	-	644	-	-	-	-	-	97	741	-	-	741	-	-	-	-	-	-	7,237	-
3b.1.1.29	Water Pre-Treatment Building	-	122	-	-	-	-	-	18	140	-	-	140	-	-	-	-	-	-	1,629	-
3b.1.1.30	Fuel Handling Building	-	2,238	-	-	-	-	-	336	2,574	257	-	2,317	-	-	-	-	-	-	28,638	-
3b.1.1	Totals	-	23,544	-	-	-	-	-	3,532	27,076	1,683	-	25,393	-	-	-	-	-	-	321,415	-
Site Closeout Activities																					
3b.1.2	Remove Rubble	-	5,970	-	-	-	-	-	895	6,865	-	-	6,865	-	-	-	-	-	-	10,276	-
3b.1.3	Grade & landscape site	-	590	-	-	-	-	-	89	679	-	-	679	-	-	-	-	-	-	1,938	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	49	7	56	56	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	30,104	-	-	-	-	49	4,523	34,676	1,739	-	32,937	-	-	-	-	-	-	333,629	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	-	-	-	-	-	673	101	774	-	-	774	-	-	-	-	-	-	4,018	-
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	673	101	774	-	-	774	-	-	-	-	-	-	4,018	-

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	305	-	-	-	-	-	46	351	-	-	351	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	305	-	-	-	-	-	46	351	-	-	351	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	209	21	230	0	207	23	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	3,344	-	-	-	-	-	502	3,846	-	-	3,846	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	206	31	237	-	118	118	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	100	10	110	-	110	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	42	4	47	-	47	-	-	-	-	-	-	-	-	-
3b.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	29	4	33	-	33	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	789	118	907	(0)	608	299	-	-	-	-	-	-	-	40,654
3b.4.9	Utility Staff Cost	-	-	-	-	-	-	10,926	1,639	12,565	-	6,283	6,283	-	-	-	-	-	-	-	156,716
3b.4	Subtotal Period 3b Period-Dependent Costs	-	3,344	-	-	-	-	12,802	2,329	17,976	(0)	7,406	10,569	-	-	-	-	-	-	-	197,370
3b.0	TOTAL PERIOD 3b COST	-	33,753	-	-	-	-	13,024	6,999	53,775	1,789	7,406	44,631	-	-	-	-	-	-	337,647	198,930
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	2,604	260	2,864	-	2,864	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	488	73	561	-	561	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	1,448	145	1,593	-	1,593	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	612	61	673	-	673	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	1,967	296	2,262	-	2,262	-	-	-	-	-	-	-	-	-
3c.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	410	62	472	-	472	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	7,594	1,139	8,733	-	8,733	-	-	-	-	-	-	-	-	391,380
3c.4.9	Utility Staff Cost	-	-	-	-	-	-	40,670	6,100	46,770	-	46,770	-	-	-	-	-	-	-	-	596,389
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	55,793	8,136	63,929	-	63,929	-	-	-	-	-	-	-	-	987,769
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	55,793	8,136	63,929	-	63,929	-	-	-	-	-	-	-	-	987,769
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	-	-	-	12,491	-	1,874	14,364	14,364	-	-	-	-	-	-	613	-	-	-
3d.1.1	Totals	-	-	-	-	-	12,491	-	1,874	14,364	14,364	-	-	-	-	-	-	613	-	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	-	-	-	12,491	-	1,874	14,364	14,364	-	-	-	-	-	-	613	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	6	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	1	0	1	-	1	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	5	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	183	27	210	-	210	-	-	-	-	-	-	-	-	-
3d.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	1	0	1	-	1	-	-	-	-	-	-	-	-	-

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3d Period-Dependent Costs (continued)																					
3d.4.8	Security Staff Cost	-	-	-	-	-	-	17	3	20	-	20	-	-	-	-	-	-	-	-	900
3d.4.9	Utility Staff Cost	-	-	-	-	-	-	94	14	108	-	108	-	-	-	-	-	-	-	-	1,371
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	309	46	355	-	355	-	-	-	-	-	-	-	-	2,271
3d.0	TOTAL PERIOD 3d COST	-	-	-	-	-	12,491	309	1,919	14,719	14,364	355	-	-	-	-	-	613	-	-	2,271
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3e Additional Costs																					
3e.2.1	ISFSI License Termination	-	1,011	10	78	-	312	956	487	2,855	-	2,855	-	-	6,997	-	-	-	799,883	16,537	1,696
3e.2	Subtotal Period 3e Additional Costs	-	1,011	10	78	-	312	956	487	2,855	-	2,855	-	-	6,997	-	-	-	799,883	16,537	1,696
Period 3e Collateral Costs																					
3e.3.1	Small tool allowance	-	13	-	-	-	-	-	2	15	-	15	-	-	-	-	-	-	-	-	-
3e.3	Subtotal Period 3e Collateral Costs	-	13	-	-	-	-	-	2	15	-	15	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	45	5	50	-	50	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.3	Heavy equipment rental	-	82	-	-	-	-	-	12	94	-	94	-	-	-	-	-	-	-	-	-
3e.4.4	Plant energy budget	-	-	-	-	-	-	52	8	59	-	59	-	-	-	-	-	-	-	-	-
3e.4.5	NRC ISFSI Fees	-	-	-	-	-	-	76	8	83	-	83	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	67	10	77	-	77	-	-	-	-	-	-	-	-	3,450
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	858	129	987	-	987	-	-	-	-	-	-	-	-	12,486
3e.4	Subtotal Period 3e Period-Dependent Costs	-	82	-	-	-	-	1,097	171	1,350	-	1,350	-	-	-	-	-	-	-	-	16,936
3e.0	TOTAL PERIOD 3e COST	-	1,106	10	78	-	312	2,053	660	4,220	-	4,220	-	-	6,997	-	-	-	799,883	16,537	17,632
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3f Additional Costs																					
3f.2.1	ISFSI Site Restoration	-	1,075	-	-	-	-	23	272	1,370	-	1,370	-	-	-	-	-	-	-	4,904	106
3f.2	Subtotal Period 3f Additional Costs	-	1,075	-	-	-	-	23	272	1,370	-	1,370	-	-	-	-	-	-	-	4,904	106
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	4	-	-	-	-	-	1	5	-	5	-	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	4	-	-	-	-	-	1	5	-	5	-	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	25	2	27	-	27	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	32	-	-	-	-	-	5	36	-	36	-	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	28	4	32	-	32	-	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	37	6	42	-	42	-	-	-	-	-	-	-	-	1,690
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	229	34	264	-	264	-	-	-	-	-	-	-	-	3,330
3f.4	Subtotal Period 3f Period-Dependent Costs	-	32	-	-	-	-	319	51	402	-	402	-	-	-	-	-	-	-	-	5,220
3f.0	TOTAL PERIOD 3f COST	-	1,110	-	-	-	-	342	324	1,777	-	1,777	-	-	-	-	-	-	-	4,904	5,326
PERIOD 3 TOTALS		-	35,969	10	78	-	12,803	71,521	18,038	138,420	16,103	77,686	44,631	-	6,997	-	-	613	799,883	359,088	1,211,928

TABLE C-2
SALEM GENERATING STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	TOTAL COST TO DECOMMISSION	9,356	82,735	9,795	10,125	14,934	64,551	314,868	92,838	598,702	420,141	124.844	53.717	74,384	98,475	13,167	459	613	11,071,590	1,103,182	4,093,456

TOTAL COST TO DECOMMISSION WITH 18.24% CONTINGENCY:	$598,702	thousands of 2002 dollars
TOTAL NRC LICENSE TERMINATION COST IS 70.18% OR	$420,141	thousands of 2002 dollars
SPENT FUEL MANAGEMENT COST IS 20.85% OR:	$124,844	thousands of 2002 dollars
NON-NUCLEAR DEMOLITION COST IS 8.97% OR:	$53,717	thousands of 2002 dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	81,642	cubic feet
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	30,460	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	613	cubic feet
TOTAL SCRAP METAL REMOVED:	54,443	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,103,182	man-hours

End Notes:
n/a - indicates that this activity not charged as decommissioning expense.
a - indicates that this activity performed by decommissioning staff.
0 - indicates that this value is less than 0.5 but is non-zero.
a cell containing " - " indicates a zero value

Attachment 3

PSEG Nuclear LLC

Forty-Year Safstor
Decommissioning Cost Analysis

for

Peach Bottom Atomic Power Stations, Unit 2 and 3

September 15, 2011

Attachment 3

Table of Contents

Attachment 3

I. Summary

This report presents estimates of the cost to decommission the Peach Bottom Atomic Power Stations Units 2 and 3 (together, "Peach Bottom") following the end of their current licensed operating period ending on August 8, 2033 and July 2, 2034, respectively.[1]

This report relies in part on a December 2002 report by TLG Services entitled *Decommissioning Cost Analysis for the Peach Bottom Atomic Power Station, Unit 2 and 3* ("TLG Report"), with updates to account for the time value of money and a change in decommissioning method from DECON to a forty-year SAFSTOR. The TLG Report is included in its entirety in Appendix B to this report.

This report is based on two fundamental assumptions: (1) spent nuclear fuel ("SNF") management costs will be borne by the United States Government; and (2) Peach Bottom Units 2 and 3 will be placed in a forty-year period of safe storage following end of license in 2033 and 2034, respectively.

While spent fuels management costs are discussed in this report and its appendices, those costs are contractually the responsibility of the Government of the United States[2], and are therefore not considered a liability that must be funded by the Peach Bottom Decommissioning Trust Fund. The Peach Bottom site has an Independent Spent Fuel Storage Installation ("ISFSI").

PSEG Nuclear considered the following three decommissioning options for Peach Bottom:

- DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license after cessation of operations. Until 2008, this was the strategy that was to be used to decommission Peach Bottom.
- SAFSTOR: The facility is placed in a safe stable condition and maintained in that state until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the levels of radioactivity in and on the material and potentially the quantity of material that must be disposed of during

[1] The Peach Bottom facility also had a Unit 1 reactor. This reactor was not owned or operated by PSEG Nuclear; therefore, PSEG Nuclear has no reporting requirement for this reactor.

[2] *See* US Department of Energy Contract No. DE-CR01-83NE44405, Peach Bottom Atomic Power Station Nos. 2 and 3 Units Contract for Disposal of Spent Fuel and/or High-Level Radioactive Waste (Jun. 13, 1983), as amended.

decontamination and dismantlement. This is the method PSEG will use to evaluate decommission Peach Bottom.

- ENTOMB: involves encasing radioactive structures, systems, and components in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license. Because most power reactors will have radionuclides in concentrations exceeding the limits for unrestricted use even after 100 years, this option will generally not be feasible and was not deemed to be viable for Peach Bottom.

This report assumes a forty-year period of safe storage for each Peach Bottom unit after end of its current licensed operating period[3]. PSEG Nuclear LLC, the non-operating owner of Peach Bottom, has chosen a forty year SAFSTOR evaluation period (approximately 7.6 half-lives of the radioactive isotope Cobalt 60) as a prudent measure to reduce overall radiation exposure to workers during the decommissioning period. An added benefit of the SAFSTOR method is that worker efficiency will be greater due to fewer radiological restrictions during performance of the work. However, economic benefits from gains in efficiency will be partially off-set by maintenance and security costs during the SAFSTOR period, and these costs have been explicitly addressed in this report.

II. Methodology

The TLG Report provided in Appendix B to this report provided the primary source of information related to costs associated with decommissioning Peach Bottom. PSEG personnel used the information in that report to develop the estimate applicable to SAFSTOR described in this report.

Because costs were reported in the TLG Report in 2002 dollars, the first step in the process was to escalate the 2002 costs to 2010 dollars. This re-evaluation produced an increase adjustment of 21.3% for 2010 Labor & Equipment Costs over the 2002 TLG Report. The Pennsylvania labor rates from 2003 through 2010 as well as Construction Equipment Costs over the same time frame were used to develop the overall adjustment. The SAFSTOR Decommissioning value was arrived at by taking the 2010 immediate decommissioning cost and adjusting it to reflect significant reduction in residual radioactivity thereby reducing/eliminating the radiation hazards during the dismantling and demolition. This expected improvement will lead to a reduction in overall decommissioning cost, and that improvement is reflected in this study. Details of the adjustment factors used are provided in Table 2.

Aside from the conversion from 2002 to 2010 dollars, two other significant changes were made to update the 2002 TLG Report to address the current forty-year SAFSTOR strategy for Peach Bottom. The first change involved shifting the initial costs for

[3] The forty-year SAFSTOR period will begin after a three-year period during which systems are drained, fuel is removed, and the plants are readied for safe storage.

preparing the plant for decommissioning from the start of the seven-year decommissioning and dismantlement period assumed in the DECON scenario to prior to the start of the SAFSTOR period. These up-front costs are incurred in three years immediately following termination of operations. The second major change was adding a forty-year period of safe storage prior to final decommissioning. A timeline of these activities is shown in Appendix A to this report. Detailed information showing cash flows, major events, and assumptions is contained in a one-page summary in Table 5 of this report.

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

Attachment 3

III. Tables

Attachment 3

Table 1A: Summary of Decommissioning Cost Elements- Peach Bottom 2

Work Category [4]	Cost 2002$ (thousands)	Cost 2010$ (thousands)	Percent of Total Costs
Decontamination	14,484	17,578	2.5%
Removal	69,674	84,557	11.8%
Packaging	14,487	17,581	2.5%
Transportation	4,741	5,754	0.8%
Waste Disposal	116,518	141,407	19.8%
Off-Site Waste Processing	36,916	44,801	6.3%
Program Management (incl. Eng. and Security)	188,969	229,333	32.1%
Spent Fuel Pool Isolation	9,060	10,995	1.5%
ISFSI Related (including capital)	80,074	97,178	14.6%
Insurance and Regulatory Fees	8,773	10,647	1.5%
Energy	18,617	22,594	3.2%
Characterization and Licensing Surveys	5,676	6,888	1.0%
Misc. Equipment and Site Services	21,000	25,486	3.6%
Total	588,990	714,799	100.0%
License termination (10 CFR § 50.75 decommissioning activities) [5]	565,501	686,294	
Site Restoration (non- 50.75 activities)	23,489	28,506	

[4] Includes contingencies.

[5] This total includes spent fuel management.

Table 1B: Summary of Decommissioning Cost Elements- Peach Bottom 3

Work Category [6]	Cost 2002$ (thousands)	Cost 2010$ (thousands)	Percent of Total Costs
Decontamination	17,010	20,643	2.4%
Removal	102,950	124,940	14.6%
Packaging	14,934	18,124	2.1%
Transportation	5,247	6,338	0.7%
Waste Disposal	123,946	150,421	17.6%
Off-Site Waste Processing	41,441	50,293	5.9%
Program Management (incl. Eng. and Security)	257,180	312,115	36.5%
Spent Fuel Pool Isolation	6,040	7,330	0.9%
ISFSI Related (including capital)	81,571	98,995	11.6%
Insurance and Regulatory Fees	8,348	10,131	1.2%
Energy	18,470	22,415	2.6%
Characterization and Licensing Surveys	6,363	7,722	0.9%
Misc. Equipment and Site Services	21,579	26,188	3.1%
Total	705,080	855,686	100.0%
License termination (10 CFR § 50.75 decommissioning activities) [7]	653,300	792,847	
Site Restoration (non- 50.75 activities)	51,780	62,840	

[6] Includes contingencies.

[7] This total includes spent fuel management.

Table 2A: Summary of Cost Efficiency Adjustments- Peach Bottom 2

	Factors	TLG 2002$ (thousands)	TLG 2010$ (thousands)	SAFSTOR Adjustment Factors: Cost Efficiency Factor	Cost Reduction Adjustment Contam. To Decontam.	SAFSTOR 2010$ (thousands)
Decommissioning						
Non Contaminated	71%	$ 252,345	$ 306,247	90%	0%	$ 276,929
Contaminated	29%	$ 103,071	$ 125,087	0%	25%	$ 94,260
Spent Fuel Mgmt	100%	$ 93,469	$ 113,972	100%	0%	$ 113,972
Other Fixed	100%	$ 44,732	$ 54,544	100%	0%	$ 54,544
Sub-Total		$ 493,617	$ 599,850			$ 539,706
Contingency		$ 95,373	$ 115,745			$ 104,278
Total Peach Bottom 2[8]		**$ 588,990**	**$ 715,595**			**$ 643,984**

8 Individual line items are rounded so totals may vary slightly due to round-off error.

Table 2B: Summary of Cost Efficiency Adjustments- Peach Bottom 3

				SAFSTOR Adjustment Factors		
				Cost Efficiency Factor	Cost Reduction Adjustment Contam. To Decontam.	
	Factors	**TLG 2002$ (thousands)**	**TLG 2010$ (thousands)**			**SAFSTOR 2010$ (thousands)**
Decommissioning						
Non Contaminated	71%	$ 293,867	$ 356,638	90%	0%	$ 322,496
Contaminated	29%	$ 120,030	$ 145,669	0%	25%	$ 109,770
Spent Fuel Mgmt	100%	$ 142,431	$ 173,674	100%	0%	$ 173,674
Other Fixed	100%	$ 36,656	$ 44,697	100%	0%	$ 44,697
Sub-Total		$ 592,984	$ 720,679			$ 650,637
Contingency		$ 112,096	$ 136,040			$ 122,995
Total Peach Bottom 3[9]		**$ 705,080**	**$ 856,718**			**$ 773,631**

[9] Individual line items are rounded so totals may vary slightly due to round-off error.

Attachment 3

Location: Peach Bottom Generating Station Unit 2 and 3
Project: Decommissioning of Nuclear Plants After Safe Storage

Decommissioning Cost For Peach Bottom Nuclear Power Plant After Forty Years of Safe Storage

Analysis:

Bases of Cost - TLG Cost 2002

Plant Prep & Temp Service
Rigging Construction Control & Tooling
Security Staff (except Spent Fuel Mgt.)
Utility Staff (except Spent Fuel Mgt.)
Final Site Survey

Based on the cost of items to be decontaminated (from TLG estimate), determined that Contaminated Factors represent approx. 29% of the total cost to decommission a Nuclear Plant. Therefore, Non - contaminated factors represent approx. 71% of the total cost.

Cost Efficiency Factors:

The 2002 TLG Estimate was based on single unit demolition basis for Peach Bottom, and in our review we acknowledge an economy scale should be applied since Peach Bottom Unit 2 and 3 will be done in tandem. We will reference EPRI study ESC-4685 SIA 83-420 a Nuclear Power Construction study prepared by United & Construction Inc. that supports multi unit construction has efficiency reduction (summarized below).

Station	Reactor Type	Multi Unit Efficiency Direct Craft Labor 1-2	1-3	
Peach Bottom	BWR	11%-22%	28%-36%	Data Source EPRI p. 3-79 & 3-80

Cost Assumptions:

Peach Bottom -
In consideration of the EPRI study, efficiency reduced the variable costs. Fixed cost elements (see base cost allocation above) remain constant on a per unit basis. The TLG cost was reduced by 10% since this will be a mass demolition (non contaminated) vs. controlled demolition (contaminated)

The Spent Fuel will follow the same fact pattern and cash flow pattern as in the 2002 TLG Study for Peach Bottom.

Since decommissioning after 40 yrs would be equivalent to normal demolition work in a Fossil Plant an additional allowance of 15% savings has been made to contaminated portion of the work only. (Working in a contaminated area can account for a loss of productivity of an additional 25% or 2 Man Hrs/Day). The breakdown of unproductive time is listed below, is based on field observations made at the nuclear sites.

Security:	0.5 MH	6.25%
Suit Up requirements (two times/day)	1 MH	12.5%
Clean up at the end of day	0.5 MH	6.3%
Total	2 MH	25.0%

The other factors affecting productivity in a contaminated area physical restrictions congestion, height adjustment in work space (crawl space or 40ft. In the air), outage schedule (comprised time line) and

Attachment 3

ALARA (level of allowance radiation) & proximity of other on going projects. The cost assumptions correspond to present circumstances and to the present status & availability of technology.

Attachment 3

Table 3A: Peach Bottom Unit 2 SAFSTOR vs. Non-SAFSTOR Summary of Costs

2010$

(millions)

Description	Non SAFSTOR TLG 2002	Non SAFSTOR TLG (esc.) 2010	SAFSTOR PSEG 2010
Site Specific Cost			
Lic. Termination	468.6	569.4	497.8
Spent Fuel Mgmt.	96.9	117.6	117.6
Site Restoration	23.5	28.6	28.6
Total (100% Share)	**589.0**	**715.6**	**644.0**
PSEG Share (w/Spent Fuel)[10]	**294.5**	**357.8**	**322.0**
Spent Fuel Costs	(48.5)	(58.8)	(58.8)
PS share (w/o Spent Fuel)	**246.0**	**299.0**	**263.2**
Site Restoration (PSEG Share)	(11.8)	(14.2)	(14.3)
PS share (w/o Site Restoration & Spent Fuel)	**234.2**	**284.8**	**248.9**

[10] The spent fuel management cost include an allocation from the contingency shown on table 2.

Table 3B: Unit 3 SAFSTOR vs. Non-SAFSTOR Summary of Costs
2010$
(millions)

Description	Non SAFSTOR TLG 2002	Non SAFSTOR TLG (esc.) 2010	SAFSTOR PSEG 2010
Site Specific Cost			
Lic. Termination	492.8	599.1	515.9
Spent Fuel Mgmt.	160.5	194.8	194.8
Site Restoration	51.8	62.9	62.9
Total (100% Share)	**705.1**	**856.7**	**773.6**
PSEG Share (w/Spent Fuel)[11]	**352.6**	**427.9**	**386.8**
Spent Fuel Costs	(80.3)	(97.4)	(97.4)
PS share (w/o Spent Fuel)	**272.3**	**330.5**	**289.4**
Site Restoration (PSEG Share)	(25.9)	(31.4)	(31.4)
PS share (w/o Site Restoration & Spent Fuel)	**246.4**	**299.1**	**258.0**

[11] The spent fuel management cost include an allocation from the contingency shown on table 2.

Attachment 3

TABLE 4A: SCHEDULE OF ANNUAL EXPENDITURES
Peach Bottom Unit 2 - SAFSTOR
(millions, 2010 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total	O&M Security During SAFSTOR
2033	5.6	0.1	0.2	0.0	0.4	6.4	
2034	28.7	3.3	0.9	0.7	3.1	36.8	
2035	8.4	1.5	0.8	0.9	4.1	15.6	
2036							2.6
2037							2.6
2038							2.6
2039							2.6
2040							2.6
2041							2.6
2042							2.6
2043							2.6
2044							2.6
2045							2.6
2046							2.6
2047							2.6
2048							2.6
2049							2.6
2050							2.6
2051							2.6
2052							2.6
2053							2.6
2054							2.6
2055							2.6
2056							2.6
2057							2.6
2058							2.6
2059							2.6
2060							2.6
2061							2.6
2062							2.6
2063							2.6
2064							2.6
2065							2.6
2066							2.6
2067							2.6
2068							2.6
2069							2.6
2070							2.6
2071							2.6
2072							2.6
2073							2.6
2074							2.6
2075							2.6
2076	11.7	0.6	0.3	0.0	0.5	13.2	
2077	11.6	3.8	0.3	7.4	3.1	26.3	
2078	17.4	5.2	0.4	11.9	4.6	39.5	
2079	42.8	5.7	1.0	12.2	4.1	65.8	
2080	33.9	4.2	1.1	8.9	4.5	52.6	

Attachment 3

2081	33.0	4.7	0.3	0.0	1.5	39.5	
2082	17.6	7.5	0.2	0.0	1.1	26.3	
Total	210.7	36.7	5.5	42.1	27.0	322.0	130.0

Attachment 3

TABLE 4B: SCHEDULE OF ANNUAL EXPENDITURES
Peach Bottom Unit 3 - SAFSTOR
(millions, 2010 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total	O&M Security During SAFSTOR
2034	9.3	0.2	0.3	0.1	0.7	10.5	
2035	47.6	5.5	1.5	1.2	5.2	61.0	
2036	13.9	2.5	1.3	1.4	6.9	25.9	
2037							2.6
2038							2.6
2039							2.6
2040							2.6
2041							2.6
2042							2.6
2043							2.6
2044							2.6
2045							2.6
2046							2.6
2047							2.6
2048							2.6
2049							2.6
2050							2.6
2051							2.6
2052							2.6
2053							2.6
2054							2.6
2055							2.6
2056							2.6
2057							2.6
2058							2.6
2059							2.6
2060							2.6
2061							2.6
2062							2.6
2063							2.6
2064							2.6
2065							2.6
2066							2.6
2067							2.6
2068							2.6
2069							2.6
2070							2.6
2071							2.6
2072							2.6
2073							2.6
2074							2.6
2075							2.6
2076							2.6
2077	12.8	0.7	0.3	0.0	0.6	14.5	
2078	12.8	4.2	0.3	8.2	3.4	28.9	
2079	19.1	5.7	0.5	13.1	5.1	43.4	
2080	47.1	6.2	1.1	13.5	4.5	72.4	
2081	37.3	4.7	1.2	9.8	4.9	57.9	

2082	36.3	5.1	0.3	0.0	1.6	43.4	
2083	19.4	8.2	0.2	0.0	1.2	28.9	
Total	255.5	43.0	7.1	47.2	34.0	386.8	130.0

Attachment 3

Table 5A Peach Bottom 2 Cash Flows

Year	Annual Expenditures thousands 2010	DTF Fund Balance 2% Real Rate of Return dollars less expenditures	SAFSTOR Year	Notes
		216,330		Balance as of 12/31/2010
2011		220,657		
2012		225,070		
2013		229,571		Fund balances escalates at 2% per annum during remaining period of operation
2014		234,162		
2015		238,846		
2016		243,623		
2017		248,495		
2018		253,465		
2019		258,534		
2020		263,705		
2021		268,979		
2022		274,359		
2023		279,846		
2024		285,443		
2025		291,151		
2026		296,975		
2027		302,914		
2028		308,972		
2029		315,152		
2030		321,455		
2031		327,884		
2032		334,442		
2033	6,400	334,731		Expenses to put plant in SAFSTOR Condition, includes security and O&M
2034	36,800	304,625		
2035	15,600	295,118		
2036		298,420	1	Annual Security and O&M cost during SAFSTOR is $2.6MM (PSEG Share)
2037		301,788	2	
2038		305,224	3	
2039		308,729	4	
2040		312,304	5	
2041		315,950	6	
2042		319,669	7	
2043		323,462	8	
2044		327,331	9	
2045		331,278	10	
2046		335,303	11	
2047		339,409	12	
2048		343,598	13	
2049		347,870	14	
2050		352,227	15	
2051		356,672	16	
2052		361,205	17	
2053		365,829	18	
2054		370,545	19	
2055		375,357	20	
2056		380,364	21	
2057		385,269	22	
2058		390,374	23	
2059		395,582	24	
2060		400,894	25	
2061		406,311	26	
2062		411,838	27	
2063		417,474	28	
2064		423,224	29	
2065		429,088	30	
2066		435,070	31	

Attachment 3

2067		441,171	32	
2068		447,395	33	
2069		453.743	34	
2070		460,218	35	
2071		466,822	36	
2072		473,558	37	
2073		480,430	38	
2074		487,438	39	
2075		494,587	40	
2076	13,200	491,279		Costs during 7-year decommissioning period includes security and O&M
2077	26,300	474,804		
2078	39,500	444,800		
2079	65,800	387,896		
2080	52,600	343,054		
2081	39,500	310,415		
2082	26,300	290,324		

Attachment 3

Table 5B Peach Bottom 3 Cash Flows

Year	Annual Expenditures thousands 2010	DTF Fund Balance 2% Real Rate of Return dollars less expenditures	SAFSTOR Year	Notes
		219,251		Balance as of 12/31/2010
2011		223,636		
2012		228,109		
2013		232,671		Fund balances escalates at 2% per annum during remaining period of operation
2014		237,327		
2015		242,324		
2016		246,912		
2017		251,850		
2018		256,887		
2019		262,025		
2020		267,266		
2021		272,611		
2022		278,063		
2023		283,625		
2024		289,297		
2025		295,083		
2026		300,985		
2027		307,004		
2028		313,144		
2029		319,407		
2030		325,795		
2031		332,312		
2032		338,958		
2033		345,737		
2034	10,500	342,152		Expenses to put plant in SAFSTOR Condition, includes security and O&M
2035	61,000	287,995		
2036	25,900	267,855		
2037		270,612	1	Annual Security and O&M cost during SAFSTOR is $2.6MM (PSEG Share)
2038		273,424	2	
2039		276,293	3	
2040		279,219	4	
2041		282,203	5	
2042		285,247	6	
2043		288,352	7	
2044		291,519	8	
2045		294,749	9	
2046		298,044	10	
2047		301,405	11	
2048		304,833	12	
2049		308,330	13	
2050		311,897	14	
2051		315,535	15	
2052		319,245	16	
2053		323,030	17	
2054		326,891	18	
2055		330,829	19	
2056		334,845	20	
2057		338,942	21	
2058		343,121	22	
2059		347,383	23	
2060		351,731	24	
2061		356,166	25	
2062		360,689	26	
2063		365,166	27	
2064		370,009	28	
2065		374,809	29	
2066		379,705	30	
2067		384,699	31	

Attachment 3

2068		389,793	32	
2069		394,989	33	
2070		400,288	34	
2071		405,695	35	
2072		411,209	36	
2073		416,833	37	
2074		422,569	38	
2075		428,421	39	
2076		434,389	40	
2077	14,500	428,577		Costs during 7-year decommissioning period includes security and O&M
2078	28,900	408,248		
2079	43,400	373,013		
2080	72,400	308,074		
2081	57,900	256,335		
2082	43,400	218,062		
2083	28,900	193,523		

Attachment 3

Table 6: Decommissioning Waste Summary
Please see Table 5.1, Decommissioning Waste Summary, in the TLG Report, attached as Appendix B to this report.

Attachment 3

Table 7: Detailed Cost Analysis
Please see Appendix C in the TLG Report, attached as Appendix B to this report.

Attachment 3

IV. Appendices
A. Time Line
B. December 2002 TLG Decommissioning Cost Analysis

Attachment 3

Appendix A: Time Line

Peach Bottom 2

Activity	2033	2034	2035	2036 - 2075	2076	2077	2078	2079	2080	2081	2082
Shutdown through Transition	x	x	x								
Safe storage period				x							
Decommissioning and Site Restoration					x	x	x	x	x	x	x

Peach Bottom 3

Activity	2034	2035	2036	2037 - 2076	2077	2078	2079	2080	2081	2082	2083
Shutdown through Transition	x	x	x								
Safe Storage period				x							
Decommissioning and Site Restoration					x	x	x	x	x	x	x

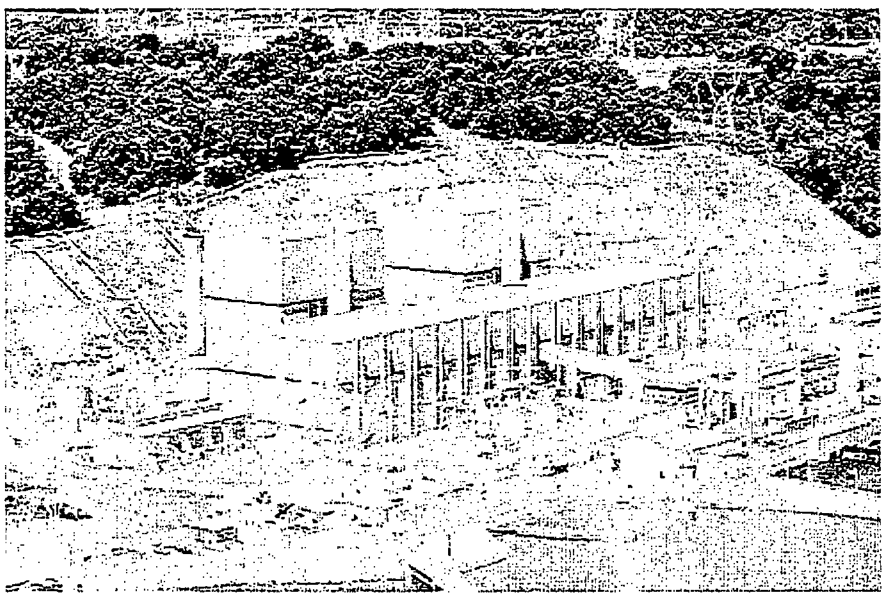
Attachment 3

Appendix B: December 2002 TLG Decommissioning Cost Analysis

DECOMMISSIONING COST ANALYSIS

for the

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3



prepared for

PSEG NUCLEAR, LLC

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

December 2002

APPROVALS

Project Manager	William A. Cloutier, Jr.	12/4/02 Date
Project Engineer	Albert A. Koehl	12/4/02 Date
Technical Manager	Geoffrey M. Griffiths	12/4/02 Date
Quality Assurance Manager	Carolyn A. Palmer	12/05/02 Date

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLES

FIGURES

APPENDICES

REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
0		12-05-02		Original Issue

EXECUTIVE SUMMARY

This report presents the costs to promptly decommission (decontaminate and dismantle) the Peach Bottom Atomic Power Station, Units 2 and 3 (Peach Bottom) following a scheduled cessation of plant operations. The analysis relies upon the site-specific, technical information developed for a previous evaluation prepared in 1995-96, updated to reflect current plant conditions and operating assumptions. The estimates are designed to provide PSEG Power with sufficient information to assess its financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimates are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The estimates incorporate a cooling period of approximately five years for the spent fuel that resides in the plant's storage pools when operations cease. Any residual fuel remaining in the pools after the five-year period will be relocated to an on-site, interim storage facility to await the transfer to a DOE facility. The estimates also include the dismantling of non-essential structures and limited restoration of the site.

Alternatives and Regulations

The Nuclear Regulatory Commission (NRC) provided general decommissioning guidance in the rule adopted on June 27, 1988.[1] In this rule the NRC set forth technical and financial criteria for decommissioning licensed nuclear facilities. The regulations addressed planning needs, timing, funding methods, and environmental review requirements for decommissioning. The rule also defined three decommissioning alternatives as being acceptable to the NRC - DECON, SAFSTOR, and ENTOMB.

> DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."[2]

---

1 U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72 "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988.

2 Ibid. Page FR24022, Column 3.

> SAFSTOR is defined as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use."[3] Decommissioning is to be completed within 60 years, although longer time periods will be considered when necessary to protect public health and safety.

> ENTOMB is defined as "the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactive material decays to a level permitting unrestricted release of the property."[4] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years.

The 60-year restriction has limited the practicality of the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. As such, the NRC is currently re-evaluating this option and the technical requirements and regulatory actions that would be necessary for entombment to become a viable option.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning. Regulatory Guide 1.184, issued in July 2000, further describes the methods and procedures that are acceptable to the NRC staff for implementing the requirements of the 1996 revised rule that relate to the initial activities and the major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and process described in the amended regulations.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines[5] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference

---

3 Ibid.
4 Ibid. Page FR24023, Column 2.
5 T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

describes a unit factor method for determining decommissioning activity costs. The unit factors used in this analysis incorporate site-specific costs and the latest available information on worker productivity in decommissioning.

The estimates also reflect lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee and San Onofre-1 nuclear units have provided additional insight into the process, the regulatory aspects, and technical challenges of decommissioning commercial nuclear units.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

Contingency

Consistent with industry practice, contingencies are applied to the decontamination and dismantling costs developed as "specific provision for unforeseeable elements of cost within the defined project scope, particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."[6] The cost elements in the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a safety factor issue. Safety factors provide additional security and address situations that may never occur. Contingency funds, by contrast, are expected to be fully expended throughout the program. Inclusion of contingency is necessary to provide assurance that sufficient funding will be available to accomplish the intended tasks.

6 Project and Cost Engineers' Handbook, Second Edition, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, p. 239.

Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Disposal Act" in 1980, and its Amendments of 1985,[7] the states became ultimately responsible for the disposition of radioactive waste generated within their own borders.

Pennsylvania is a member of the four-state Appalachian States Low-Level Radioactive Waste Compact, formed in response to the waste legislation. Since Pennsylvania generators produced approximately 75% of the waste in the Compact, the state was selected as the initial host state. The Pennsylvania Low-Level Radioactive Waste Disposal Act (1988) granted the Department of Environmental Resources the responsibility for governing the development, operation, maintenance, and eventual closure of the disposal facility. The siting process was suspended in 1998 following a significant decrease in the waste volume produced by Pennsylvania generators and the continued availability of disposal capacity at two out-of-state facilities.

While the generators in the four states are currently able to access the disposal facility in Barnwell, South Carolina, the situation is expected to be much different in the future. A state law passed in July 2000 limits the annual volume of waste that can be accepted at the Barnwell site through mid-year 2008. After that date, the site can only accept waste generated within the Atlantic Compact region. Therefore, it is reasonable to assume that additional disposal capacity will be required to support reactor decommissioning, particularly for the isolation of the more highly radioactive material that is not suitable for disposal elsewhere.

This analysis presumes that new disposal facilities will be available by the time the station ceases operation. However, for estimating purposes, rate schedules for the currently operating Barnwell and Envirocare facilities were used to generate disposal costs.

7 "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1/15/86.

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[8] in 1982, assigning the responsibility for disposal of spent nuclear fuel created by the commercial nuclear generating plants to the DOE. This legislation also created a Nuclear Waste Fund to cover the cost of the program, which is funded by the sale of electricity from nuclear reactors since 1993, and an estimated equivalent value for assemblies irradiated prior to 1983. The Nuclear Waste Policy Act, along with the individual disposal contracts with utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. Operation of DOE's yet-to-be constructed geologic repository is currently scheduled for the year 2010, assuming that the licensing could be completed expeditiously and a national transportation system established. The agency has no plans for receiving spent fuel from commercial nuclear plant sites prior to this date and startup operations may be phased in, creating additional delays.

The NRC requires licensees to establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE. For estimating purposes, Exelon Generation has assumed that the high-level waste repository, or some interim storage facility, will be fully operational by 2015. Interim storage of the fuel, until the DOE has completed the transfer, will be in an independent facility located on the Peach Bottom site. This will allow the licensee to proceed with decommissioning and terminate its operating licenses in the shortest time possible.

The spent fuel storage facility, which is independently licensed and operated, will be sized to accommodate the inventory of spent fuel residing in the plant's storage pools at the cessation of operations, in addition to any operational inventory already in residence. When emptied, the station could be dismantled without maintaining the wet storage pools. Based upon this scenario, and an anticipated rate of transfer, spent fuel is projected to remain on site for approximately 26 years following the cessation of Unit 2 operations.

Site Restoration

The efficient removal of the contaminated materials at the site may result in damage to many of the site structures. Blasting, coring, drilling, and the other decontamination activities will substantially damage power block structures, potentially weakening the footings and structural supports. Prompt demolition once

8 "Nuclear Waste Policy Act of 1982 and Amendments," U.S. Department of Energy's Office of Civilian Radioactive Management, 1982.

the license is terminated is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized is more efficient and less costly than if the process were deferred. Experience at shutdown generating stations has shown that plant facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and the demolition work force. Consequently, this study assumes that site structures will be removed to a nominal depth of three feet below the local grade level wherever possible. The site will then be graded and stabilized.

Summary

The DECON decommissioning alternative involves the prompt removal of the contaminated and activated plant components, including structural materials, from the site following permanent shutdown. The facility operator may then have unrestricted use of the site with no further requirement for a license. This study assumes that the remainder of the non-essential plant systems and structures, not previously removed in support of license termination, are dismantled and the site restored.

The scenario analyzed for the purpose of generating the estimates is described in Section 2. The assumptions are presented in Section 3, along with schedules of annual expenditures. The major cost contributors are identified in Section 6, with detailed activity costs, waste volumes, and associated manpower requirements delineated in Appendix C. A cost summary is provided at the end of this section for the major cost components.

COST SUMMARY
(Thousands of 2002 Dollars)

Activity	Unit 2	Unit 3	Station
Decontamination	14,484	17,010	31,495
Removal	69,674	102,950	172,624
Packaging	14,487	14,934	29,422
Transportation	4,741	5,247	9,988
Waste Disposal	116,518	123,946	240,463
Off-site Waste Processing	36,916	41,441	78,358
Program Management (including Engineering and Security)	188,969	257,180	446,149
Spent Fuel Pool Isolation	9,060	6,040	15,101
ISFSI Related (including capital)	80,074	81,571	161,645
Insurance and Regulatory Fees	8,773	8,348	17,121
Energy	18,617	18,470	37,087
Characterization and Licensing Surveys	5,676	6,363	12,039
Misc. Equipment and Site Services	21,000	21,579	42,579
Total [1]	588,990	705,080	1,294,070
License Termination [2]	565,501	653,300	1,218,801
Site Restoration	23,489	51,780	75,269

[1] Columns may not add due to rounding.
[2] Includes spent fuel management expenditures.

1. INTRODUCTION

This decommissioning analysis is designed to provide PSEG Power with sufficient information to prepare the financial planning documents for decommissioning, as required by the Nuclear Regulatory Commission (NRC or Commission). It is not a detailed assessment, but a financial analysis prepared in advance of the engineering and planning that will be required to carry out the decommissioning of the Peach Bottom Atomic Power Station, Units 2 and 3 (Peach Bottom).

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the costs to decommission Peach Bottom for the scenario outlined in Section 2, to define a sequence of events, and project the volume of waste produced from the decontamination and dismantling activities.

Peach Bottom is jointly owned by PSEG Power, LLC (50%) and Exelon Generation Corporation (50%). However, for purposes of this study, only the undivided decommissioning costs (100%) are presented, since the division of ownership has no effect on the total expenditures required. PSEG Nuclear oversees PSEG Power's ownership interest in Peach Bottom, while Exelon Nuclear operates the station.

Operating licenses were issued on August 8, 1973, for Unit 2 and July 2, 1974, for Unit 3. For the purposes of this study, the shutdown dates were taken as August 8, 2013, for Unit 2 and July 2, 2014, for Unit 3. This time frame, which reflects 40 years of operating life for each unit, was used as an input for scheduling the decommissioning activities.

1.2 SITE DESCRIPTION

Peach Bottom is located about 38 miles north-northeast of Baltimore, Maryland, and 63 miles west-southwest of Philadelphia, Pennsylvania. Units 2 and 3 are two essentially identical boiling water reactors with supporting facilities. Unit 1 was a 40-megawatt experimental, high-temperature, helium-cooled and graphite-moderated reactor. It was shutdown in 1974 and its disposition is not addressed in this analysis.

The Nuclear Steam Supply Systems (NSSS) for Units 2 and 3 consist of a boiling water reactor and a two-loop recirculation system. A generating unit has a rated core thermal power of 3,293 Megawatts thermal (MWt). The corresponding net electrical output is approximately 1,126 Megawatts electric (MWe).

The two-loop reactor recirculation system contains two, vertical centrifugal pumps and is located within the "primary containment structure." This structure consists of the drywell, the suppression system, and interconnecting vent system. The drywell is a steel pressure vessel in the shape of a light bulb. The pressure suppression chamber is a torus-shaped steel pressure vessel located below and encircling the drywell.

This chamber is connected to the drywell by equally spaced vent pipes. These vent pipes are connected to a common header within the suppression chamber. Downcomers, connected to the header, terminate below the water level of the suppression pool. As a system, the drywell, suppression chamber, and interconnecting piping, acts to reduce the pressure increase in the event of a local process system piping failure.

Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of steam produced in the reactor vessel into mechanical shaft power and then into electrical energy. The turbine consists of a high-pressure, double-flow turbine element, and three, double-flow, low-pressure turbine elements aligned in tandem. The generator is driven at 1,800 rpm and rated at 1,280 MVA. The exhaust steam from the turbine is condensed and deaerated in the main condenser. The heat rejected to the main condenser is removed by the circulating water system.

The circulating water system provides the heat sink required for removal of waste heat in the power plant's thermal cycle. The system has the principal function of removing heat by absorbing this energy in the main condenser. Water is withdrawn from the Susquehanna River via the intake tunnels by the circulating water pumps. After passing through the plant condensers, the discharge is routed back through five mechanical draft cooling towers, then back to the river.

1.3 REGULATORY GUIDANCE

The NRC provided initial decommissioning guidance in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988.[1]* This rule set forth technical and financial criteria for decommissioning licensed nuclear facilities. The regulation addressed

* Annotated references for citations in Sections 1-6 are provided in Section 7.

decommissioning planning needs, timing, funding methods, and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors,"[2] which provided guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the content and form of the financial assurance mechanisms indicated in the rule amendments.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB. It also placed limits on the time allowed to complete the decommissioning process. For SAFSTOR, the process is restricted in overall duration to 60 years unless it could be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the definition of unrestricted release and license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some if not most reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC is considering rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. Pending completion of such rulemaking, entombment requests will be handled on a case-by-case basis.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants.[3] When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the operating license life. Since that time, several licensees permanently and prematurely ceased operations without having submitted a decommissioning plan. In addition, these licensees requested exemptions from certain operating requirements as being unnecessary once the reactor is defueled. Each case was handled individually without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The new amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees would submit written certification to the NRC within 30 days after the decision to cease operations. Certification would also be required once the fuel was permanently removed from the reactor vessel. Submittal of these notices would entitle the licensee to a fee reduction and eliminate the obligation to follow certain requirements needed only during operation of the reactor. Within two years of submitting notice of permanent cessation of operations, the licensee would be required to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC. The PSDAR describes the planned decommissioning activities, the associated sequence and schedule, and an estimate of expected costs. Prior to completing decommissioning, the licensee would be required to submit an application to the NRC to terminate the license, along with a license termination plan (LTP).

1.3.1 Nuclear Waste Policy Act

Congress passed the Nuclear Waste Policy Act[4] in 1982, assigning the responsibility for disposal of spent nuclear fuel from the commercial nuclear generating plants to the Department of Energy (DOE). Two permanent disposal facilities were envisioned, as well as an interim facility. To recover the cost of permanent spent fuel disposal, this legislation created a Nuclear Waste Fund through which money was to be collected from the consumers of the electricity generated by commercial nuclear power plants. The Nuclear Waste Policy Act, along with the individual disposal contracts with utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

After pursuing a national site selection process, the Act was amended in 1987 to designate Yucca Mountain, Nevada, as the only site to be evaluated for geologic disposal of high-level waste. Also in 1987, the DOE announced a five-year delay in the opening date for the repository, from 1998 to 2003. Two years later, in 1989, an additional

7-year delay was announced, primarily due to problems in obtaining the required permits from the state of Nevada to perform the required characterization of the site.

Generators have responded to this impasse by initiating legal action and constructing supplemental storage as a means of maintaining necessary operating margins. In a recent decision, the U.S. Court of Appeals for the Federal Circuit reaffirmed the utility position that DOE had breached its contractual obligation. However, even with the August 2000 ruling,[5] DOE's position has remained unchanged. The agency continues to maintain that its delayed performance is unavoidable because it does not have an operational repository and does not have authority to provide storage in the interim. Consequently, DOE has no plans to receive spent fuel from commercial U.S. reactors before the year 2010.

The NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy in 10 CFR 50.54 (bb).[6] This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimates, as described below.

For estimating purposes, it has been assumed that the high-level waste repository, or some interim storage facility, will be fully operational by 2015. Interim storage of the fuel, until the DOE has completed the transfer, will be in an independent facility located on the Peach Bottom site. This will allow Exelon Generation to proceed with decommissioning and terminate its operating licenses in the shortest time possible.

An Independent Spent Fuel Storage Installation (ISFSI) has been constructed at the site so as to maintain full core off-load capability for the operating units. This analysis assumes that the ISFSI will also be available to support decommissioning and will be able to accommodate the inventory of spent fuel residing in the plant's storage pools at the cessation of operations. When emptied, the station could be dismantled without maintaining the wet storage pools. Based upon this scenario, and an anticipated rate of transfer, spent fuel is projected to remain on site for approximately 26 years following the cessation of Unit 2 operations.

Expenditures are included in the analysis for the isolation and continued operation of the spent fuel pools throughout the first five years of decommissioning. Expenses are also included for loading the spent fuel assemblies remaining in the storage pools after the cessation of plant operations into multi-purpose canisters, for canister costs and overpacks, and for the operation of the ISFSI through the year 2039, when all the fuel is expected to be transferred to the DOE.

1.3.2 Low-Level Radioactive Waste Policy Amendments Act

Congress passed the "Low-Level Radioactive Waste Disposal Act" in 1980, declaring the states as being ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. The federal law encouraged the formation of regional groups or compacts to implement this objective safely, efficiently and economically, and set a target date of 1986. With little progress, the "Amendments Act" of 1985[7] extended the target, with specific milestones and stiff sanctions for non-compliance.

Pennsylvania is a member of the four-state Appalachian States Low-Level Radioactive Waste Compact, formed in response to the waste legislation. Since Pennsylvania generators produced approximately 75% of the waste in the Compact, the state was selected as the initial host state. The Pennsylvania Low-Level Radioactive Waste Disposal Act (1988) granted the Department of Environmental Resources the responsibility for governing the development, operation, maintenance, and eventual closure of the disposal facility. The siting process was suspended in 1998 following a significant decrease in the waste volume produced by Pennsylvania generators and the continued availability of disposal capacity at two out-of-state facilities.

While the generators in the four states are currently able to access the disposal facility in Barnwell, South Carolina, the situation is expected to be much different in the future. A state law passed in July 2000 limits the annual volume of waste that can be accepted at the Barnwell site through mid-year 2008. After that date, the site can only accept waste generated within the Atlantic Compact region. Therefore, it is reasonable to assume that additional disposal capacity will be required to support reactor decommissioning, particularly for the isolation of the more highly radioactive material that is not suitable for disposal elsewhere.

This analysis presumes that new disposal facilities will be available by the time the station ceases operation. However, for estimating purposes, rate schedules for the currently operating Barnwell and Envirocare facilities were used to generate disposal costs.

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination,"[8] amending Part 20 of Title 10 of the Code of Federal Regulations (10 CFR §20). This subpart provided radiological criteria for releasing a facility for unrestricted use. The regulation provides that the site could be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimate for Peach Bottom assumes that the site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). An additional limit of 4 millirem per year, as defined in 40 CFR Part 141.16, is applied to drinking water.

On October 9, 2002, the NRC signed an agreement with the EPA on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding (MOU) provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC authority. The MOU also includes provisions for NRC and EPA consultation for certain sites when, at the time of license termination, (1) groundwater contamination exceeds EPA-permitted levels; (2) NRC contemplates restricted release of the site; and/or (3) residual radioactive soil concentrations exceed levels defined in the MOU.

The MOU does not impose any new requirements on NRC licensees and should reduce the involvement of EPA with NRC licensees who are decommissioning. Most sites are expected to meet the NRC criteria for unrestricted use, and the NRC believes that only a few sites will have groundwater or soil contamination in excess of the levels specified in the MOU that trigger consultation with EPA. However, if there are other hazardous materials on the site, EPA may be involved in the cleanup. As such, the possibility of dual regulation remains for certain licensees.

2. DECOMMISSIONING ALTERNATIVE

The following section describes the basic activities associated with the DECON decommissioning alternative. Although detailed procedures for each activity identified are not provided, and the actual sequence of work may vary, the activity descriptions provide a basis not only for estimating, but also for the expected scope of work, i.e., engineering and planning at the time of decommissioning.

The conceptual approach that the NRC has described in its regulations divides decommissioning into three phases. The initial phase commences with the effective date of permanent cessation of operations and involves the transition of both plant and licensee from reactor operations, i.e., power production, to facility de-activation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

The second phase encompasses activities during the storage period or during major decommissioning activities, or a combination of the two. The third phase pertains to the activities involved in license termination. The decommissioning estimates developed for Peach Bottom are also divided into phases or periods; however, demarcation of the phases is based upon major milestones within the project or significant changes in the projected expenditures.

2.1 PERIOD 1 – PREPARATIONS

In anticipation of the cessation of plant operations, detailed preparations are undertaken to provide a smooth transition from plant operations to site decommissioning. Through implementation of a staffing transition plan, the organization required to manage the intended decommissioning activities is assembled from available plant staff and outside resources. Preparations include the planning for permanent defueling of the reactor, revision of technical specifications applicable to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

2.1.1 Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a

local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure, i.e., without specific NRC approval. Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing Greater-than-Class C waste (GTCC), as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

- foreclose release of the site for possible unrestricted use,
- significantly increase decommissioning costs,
- cause any significant environmental impact, or
- violate the terms of the licensee's existing license.

Existing operational technical specifications are reviewed and modified to reflect plant conditions and the safety concerns associated with permanent cessation of operations. The environmental impact associated with the planned decommissioning activities is also considered. Typically, a licensee will not be allowed to proceed if the consequences of a particular decommissioning activity are greater than bounded by previously evaluated environmental assessments or impact statements. In this instance, the licensee would have to submit a license amendment for the specific activity and update the environmental report.

The decommissioning program outlined in the PSDAR will be designed to accomplish the required tasks within the ALARA guidelines (as defined in 10 CFR §20) for protection of personnel from exposure to radiation hazards. It will also address the continued protection of the health and safety of the public and the environment during the dismantling activity. Consequently, in conjunction with the development of the PSDAR, activity specifications, cost-benefit and safety analyses, work packages and procedures must be assembled in support of the proposed decontamination and dismantling activities.

2.1.2 Site Preparations

Following final plant shutdown, and in preparation for actual decommissioning activities, the following activities are initiated:

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), sampling of internal piping contamination levels, and primary shield cores.

- Isolation of the spent fuel storage pool and fuel handling systems, such that decommissioning operations could commence on the balance of the plant. Decommissioning operations are scheduled around the fuel handling area to the greatest extent possible such that the overall project schedule is optimized. The fuel will be transferred to the DOE as it decays to the point that it meets the heat load criteria of the containers and, as such, it is assumed that the fuel pool will remain operational for a minimum of five years following the cessation of plant operations.

- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.

- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.2 PERIOD 2 – DECOMMISSIONING OPERATIONS

Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.

- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Building

modifications may be required to the Reactor Building to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the Reactor Building to support the segmentation of the reactor vessel internals and component extraction.

- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Disconnection of the control blades from the drives on the vessel lower head. Blades are transferred to the spent fuel pool for packaging.
- Transfer of the steam separator and dryer assemblies to the dryer-separator pool for segmentation. Segmentation will maximize the loading of the shielded transport casks, i.e., by weight and activity. The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly, segmentation and packaging of the core shroud and in-core guide tubes. Some of the material is expected to exceed Class C disposal requirements. As such, those segments will be packaged in a modified fuel canister for geologic disposal. Interim storage can be in the pool, as space permits, or in the ISFSI.
- Removal and segmentation of the remaining internals including the jet pump assemblies, fuel support castings and core plate assembly.
- Draining and decontamination of the reactor well and permanently sealing of the spent fuel transfer gate. Install shielded platform for segmentation of reactor vessel. Cutting operations are performed in-air using remotely operated equipment within a contamination control envelope, with the water level maintained just below the cut to minimize the working area dose rates.

Sections are transferred to the dryer-separator pool for packaging and interim storage.

- Disconnection of the control rod drives and instrumentation tubes from reactor vessel lower head. The lower reactor head and vessel supporting structure will then be segmented.

- Removal of the reactor recirculation pumps. Exterior surfaces are decontaminated and openings covered. Components can serve as their own burial containers provided that all penetrations are properly sealed.

- Demolition of the sacrificial shield activated concrete by controlled demolition.

At least two years prior to the anticipated date of license termination, a LTP is required. Submitted as a supplement to the Final Safety Analysis Report (FSAR), or equivalent, the plan must include: a site characterization, description of the remaining dismantling activities, plans for site remediation, procedures for the final radiation survey, designation of the end use of the site, an updated cost estimate to complete the decommissioning, and any associated environmental concerns. The NRC will notice the receipt of the plan, make the plan available for public comment, and schedule a local hearing. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).

- Removal of the steel liners from the drywell, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/ contaminated concrete.

- Removal of the steel liners from the steam separator and dryer pool, reactor well, and spent fuel storage pool.

- Surveys of the decontaminated areas of the containment structure.

- Removal of the contaminated equipment and material from the Turbine and Radwaste Buildings and any other contaminated facility. Use radiation and contamination control techniques until radiation surveys indicate that the structures could be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and components (both clean and contaminated) located within these buildings. This activity will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).

- Routing of material removed in the decontamination and dismantling to a central processing area. Material certified to be free of contamination would be released for unrestricted disposition, e.g., as scrap, recycle, or general disposal. Contaminated material is characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in NUREG/CR-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM).[9] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies state-of-the-art, commercially available, instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate the operating license if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release.

2.3 PERIOD 3 – SITE RESTORATION

Following completion of decommissioning operations, site restoration activities may begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits may result in substantial damage to many of the structures. Although performed in a controlled and safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade power block structures, including the Reactor, Radwaste, and Turbine Buildings. Verifying that subsurface radionuclide concentrations meet NRC site release requirements may require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process is deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and future workers. Abandonment creates a breeding ground for vermin infestation and other biological hazards.

This cost study presumes that non-essential structures and site facilities will be dismantled as a continuation of the decommissioning activity. Foundations and exterior walls are removed to a nominal depth of three feet below grade. The three-foot depth allows for the placement of gravel for drainage, and topsoil so that vegetation can be established for erosion control. Site areas affected by the dismantling activities are restored and the plant area graded as required to prevent ponding and inhibit the refloating of subsurface materials.

Concrete rubble produced by demolition activities is processed to remove rebar and miscellaneous embedments. The processed material is then used on-site to backfill voids. Excess materials are trucked off-site for disposal as construction debris.

2.4 POST PERIOD 3 – ISFSI OPERATIONS

The ISFSI will continue to operate under a separate and independent license (10 CFR §72) following the relocation of the spent fuel from the plant's storage pools. Transfer of spent fuel to a DOE or interim facility will be exclusively from the ISFSI once the fuel pools have been emptied and the structures released for decommissioning. Assuming initiation of the federal Waste Management System in 2015, transfer of spent fuel from Peach Bottom is anticipated to continue through the year 2039. Any delay in the transfer process, for example, due to a delay in the scheduled opening of the geologic repository, a slower acceptance rate, or a combination of a delayed start date and lower transfer rate, will result in a longer on-site residence time for the fuel discharge from the reactor, and therefore additional caretaking expenses.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the §72 license if it determines that the remediation of the ISFSI has been performed in accordance with an ISFSI license termination plan and that the final radiation survey and associated documentation demonstrate that the facility is suitable for release. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

The currently proposed design for the ISFSI is based upon the use of concrete overpacks for pad storage. For purposes of this cost analysis, it is assumed that once the inner canisters containing the spent fuel assemblies have been removed and the license for the facility terminated, the modules can be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad is then removed, and the area graded and landscaped to conform to the surrounding environment.

3. COST ESTIMATE

The cost estimates prepared for decommissioning Peach Bottom consider the unique features of the site, including the nuclear steam supply system, power generation systems, support services, site buildings, and ancillary facilities. The bases of the estimates, including the sources of information relied upon, the estimating methodology employed, site-specific considerations and other pertinent assumptions are described in this section.

3.1 BASIS OF ESTIMATE

The current estimates were developed using the basic design information originally generated for the decommissioning analysis prepared in 1995-96.[10] The information was reviewed for the current estimates and updated, as deemed necessary. The site-specific considerations and assumptions used in the previous estimates were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

The methodology used to develop this cost estimate follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[11] and the US DOE "Decommissioning Handbook."[12] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.[13]

This estimate reflects lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells and associated facilities, completed in 1997. In addition, the planning and engineering for the Pathfinder, Shoreham, Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, and San Onofre-1 nuclear units has provided additional insight into the process, the

regulatory aspects, and technical challenges of decommissioning commercial nuclear units.

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, ensures that essential elements have not been omitted. Appendix A presents the detailed development of a typical unit factor. Appendix B provides the values contained within one set of factors developed for this analysis.

Work Difficulty Factors

TLG has historically applied work difficulty adjustment factors (WDFs) to account for the inefficiencies in working in a power plant environment. WDFs were assigned to each unique set of unit factors, commensurate with the inefficiencies associated with working in confined, hazardous environments. The ranges used for the WDFs are as follows:

• Access Factor	10% to 20%
• Respiratory Protection Factor	10% to 50%
• Radiation/ALARA Factor	10% to 37%
• Protective Clothing Factor	10% to 30%
• Work Break Factor	8.33%
• Productivity	adjustable

The factors and their associated range of values were developed in conjunction with the AIF/NESP-036 study. The application of the factors is discussed in more detail in that publication.

Scheduling Program Durations

The unit factors, adjusted by the WDFs as described above, are applied against the inventory of materials to be removed in the radiologically controlled areas. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities relied upon productivity information available from the "Building Construction Cost Data" publication.

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field

engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

3.3 FINANCIAL COMPONENTS OF THE COST MODEL

TLG's proprietary decommissioning cost model, DECCER, produces a number of distinct cost elements. These direct expenditures, however, do not comprise the total cost to accomplish the project goal, i.e., license termination and site restoration.

Inherent in any cost estimate that does not rely on historical data is the inability to specify the precise source of costs imposed by factors such as tool breakage, accidents, illnesses, weather delays, and labor stoppages. In TLG's DECCER cost model, contingency fulfills this role. Contingency is added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude; therefore, this cost analysis includes funds to cover these types of expenses.

3.3.1 Contingency

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook"[14] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this estimate are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a "safety factor issue." Safety factors provide additional security and address situations that may never occur. Contingency funds are

expected to be fully expended throughout the program. They also provide assurance that sufficient funding is available to accomplish the intended tasks. An estimate without contingency, or from which contingency has been removed, could disrupt the orderly progression of events and jeopardize a successful conclusion to the decommissioning process.

For example, the most technologically challenging task in decommissioning a commercial nuclear station will be the disposition of the reactor vessel and internal components, which have become highly radioactive after a lifetime of exposure to radiation produced in the core. The disposition of these highly radioactive components forms the basis for the critical path (schedule) for decommissioning operations. Cost and schedule are inter-dependent and any deviation in schedule has a significant impact on cost for performing a specific activity.

Disposition of the reactor vessel internals involves the underwater cutting of complex components that are highly radioactive. Costs are based upon optimum segmentation, handling, and packaging scenarios. The schedule is primarily dependent upon the turnaround time for the heavily shielded shipping casks, including preparation, loading, and decontamination of the containers for transport. The number of casks required is a function of the pieces generated in the segmentation activity, a value calculated on optimum performance of the tooling employed in cutting the various subassemblies. The risk and uncertainties associated with this task are that the expected optimization may not be achieved, resulting in delays and additional program costs. For this reason, contingency must be included to mitigate the consequences of the expected inefficiencies inherent in this complex activity, along with related concerns associated with the operation of highly specialized tooling, field conditions, and water clarity.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies can range from 0% to 75%, depending on the degree of difficulty judged to be appropriate

from TLG's actual decommissioning experience. The contingency values used in this study are as follows:

Decontamination	50%
Contaminated Component Removal	25%
Contaminated Component Packaging	10%
Contaminated Component Transport	15%
Low-Level Radioactive Waste Disposal	25%
Reactor Segmentation	75%
NSSS Component Removal	25%
Reactor Waste Packaging	25%
Reactor Waste Transport	25%
Reactor Vessel Component Disposal	50%
GTCC Disposal	15%
Non-Radioactive Component Removal	15%
Heavy Equipment and Tooling	15%
Supplies	25%
Engineering	15%
Energy	15%
Characterization and Termination Surveys	30%
Construction	15%
Taxes and Fees	10%
Insurance	10%
Staffing	15%

The overall contingency, when applied to the appropriate components of the estimates on a line item basis, results in an average value of 19.1%.

3.3.2 Financial Risk

In addition to the routine uncertainties addressed by contingency, another cost element that is sometimes necessary to consider when bounding decommissioning costs relates to uncertainty, or risk. Examples can include changes in work scope, pricing, job performance, and other variations that could conceivably, but not necessarily, occur. Consideration is sometimes necessary to generate a level of confidence in the estimate, within a range of probabilities. TLG considers these types of costs under the broad term "financial risk." Included within the category of financial risk are:

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.

- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.

- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.

- Regulatory changes, e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal.

- Policy decisions altering national commitments, e.g., in the ability to accommodate certain waste forms for disposition, or in the timetable for such.

- Pricing changes for basic inputs, such as labor, energy, materials, and burial. Some of these inputs may vary slightly, e.g. -10% to +20%; burial could vary from -50% to +200% or more.

It has been TLG's experience that the results of a risk analysis, when compared with the base case estimate for decommissioning, indicate that the chances of the base decommissioning estimate's being too high is a low probability, and the chances that the estimate is too low is a much higher probability. This is mostly due to the pricing uncertainty for low-level radioactive waste burial, and to a lesser extent due to schedule increases from changes in plant conditions and to pricing variations in the cost of labor (both craft and staff). This cost study, however, does not add any additional costs to the estimate for financial risk since there is insufficient historical data from which to project future liabilities. Consequently, it is recommended that the areas of

uncertainty or risk be revisited periodically and addressed through repeated revisions or updates of the base estimate.

3.4 SITE-SPECIFIC CONSIDERATIONS

There are a number of site-specific considerations that affect the method for dismantling and removal of equipment from the site and the degree of restoration required. The cost impact of the considerations identified below is included in this cost study.

3.4.1 Spent Fuel

The cost to dispose of the spent fuel generated from plant operations is not reflected within the estimate to decommission Peach Bottom. Ultimate disposition of the spent fuel is within the province of the DOE's Waste Management System, as defined by the Nuclear Waste Policy Act. As such, the disposal cost is financed by a 1 mill/kWhr surcharge paid into the DOE's waste fund during operations. However, the NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy. This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimate, as described herein.

The total inventory of assemblies that will need to be handled during decommissioning is based upon several assumptions. The pickup of commercial fuel is assumed to begin in the year 2015 and will proceed on an oldest fuel first basis. The rate at which the fuel is removed from the commercial sites is based upon an annual capacity at the geologic repository of 3,000 metric tons. A delay in the startup of the repository, or a decrease in the rate of acceptance rate, will correspondingly prolong the transfer process and extend the duration that the fuel remains at the site.

For estimating purposes, spent fuel will be removed from the Peach Bottom site during, and following decommissioning, with the transfer complete by the end of year 2039. Built to support continuing plant operations, an ISFSI will be available to support decommissioning, i.e., the fuel residing in the pool following the cessation of plant operations could be relocated to the ISFSI so that decommissioning can proceed on the Reactor Building. The assemblies will be relocated to the ISFSI during the first five years following final shutdown. Costs are included for the purchase of the 112 canisters and overpacks required to empty the pool (an additional eight will be used to package the GTCC).

Operation and maintenance costs for the ISFSI are included within the estimates and address the cost for staffing the facility, security, insurance, and licensing fees. Costs are also provided for the final disposition of the facility once the transfer is complete.

ISFSI Design Considerations

A multi-purpose (storage and transport) dry shielded storage canister with a vertical, reinforced concrete storage silo is used as a basis for the cost analyses. Approximately 50% of the silos are assumed to have some level of neutron-induced activation as a result of the long-term storage of the fuel, i.e., to levels exceeding free-release limits. Approximately 10% of the concrete and steel is assumed to be removed from the overpacks for controlled disposal. The cost of the disposition of this material, as well as the demolition of the ISFSI facility, is included in the estimate.

3.4.2 Reactor Vessel and Internal Components

The NSSS (reactor vessel and reactor recirculation system components) will be decontaminated using chemical agents prior to the start of cutting operations. A decontamination factor (average reduction) of 10 is presumed.

The reactor pressure vessel and internal components are segmented for disposal in shielded, reusable transportation casks. Segmentation will be performed in the dryer-separator pool, where a turntable and remote cutter will be installed. The vessel will be segmented in place, using a mast-mounted cutter supported off the lower head and directed from a shielded work platform installed overhead in the reactor well. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology.

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal, i.e., GTCC. Although the material is not classified as high-level waste, DOE has indicated it will accept title to this waste for disposal at the future high-level waste repository.[15] However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has

been packaged and disposed of as high-level waste, at a cost equivalent to that envisioned for the spent fuel. It is not anticipated that DOE would accept this waste prior to completing the transfer of spent fuel. Therefore, until such time as the DOE is ready to accept GTCC waste, it is reasonable to assume that this material would remain in storage at Peach Bottom.

Intact disposal of the reactor vessel and internal components could provide savings in cost and worker exposure by eliminating the complex segmentation requirements, isolation of the GTCC material, and transport/storage of the resulting waste packages. Portland General Electric (PGE) was able to dispose of the Trojan reactor as an intact package. However, the location of the Trojan Nuclear Plant on the Columbia River simplified the transportation analysis since:

- the reactor package could be secured to the transport vehicle for the entire journey, i.e., the package was not lifted during transport,
- there were no man-made or natural terrain features between the plant site and the disposal location that could produce a large drop, and
- transport speeds were very low, limited by the overland transport vehicle and the river barge.

As a member of the Northwest Compact, PGE had a site available for disposal of the package, the US Ecology facility in Washington State. The characteristics of this arid site proved favorable in demonstrating compliance with land disposal regulations.

It is not known whether this option will be available when Peach Bottom ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, as a bounding condition, the study assumes the reactor vessel will have to be segmented.

3.4.3 Primary System Components

Reactor recirculation piping is cut from the reactor vessel once the water level in the vessel (used for personnel shielding during dismantling and cutting operations in and around the vessel) is dropped below the nozzle zone. The piping is boxed and shipped by shielded van. The reactor recirculation pumps and motors are lifted out intact, packaged, and transported for processing or disposal.

3.4.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condenser will also be disassembled and moved to a laydown area. Material will then be prepared for transportation to an off-site recycling facility where it will be surveyed and designated for decontamination, volume reduction, or conventional disposal or controlled disposal. Components will be packaged and readied for transport in accordance with the intended disposition.

3.4.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessel and internal components will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49 of the Code of Federal Regulations.[16] The contaminated material will be packaged in Industrial Packages (IP I, II, or III) for transport unless demonstrated to qualify as their own shipping containers. The reactor vessel and internal components are expected to be transported in accordance with §71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Transport of the highly activated metal, produced in the segmentation of the reactor vessel and internal components, will be by shielded truck cask. Cask shipments may exceed 95,000 pounds, including vessel segment(s), supplementary shielding, cask tie-downs, and tractor-trailer. The maximum level of activity per shipment assumed permissible was based upon the license limits of the available shielded transport casks.

The segmentation scheme for the vessel and internal segments are designed to meet these limits.

The transport of large intact components, e.g., large heat exchangers and other oversized components, will be by a combination of truck, barge, and/or multi-wheeled transporter.

The low-level radioactive waste requiring controlled disposal will be sent to one of two currently available burial facilities. Transportation costs are based upon the mileage to either the Envirocare facility in Clive, Utah, or the Barnwell facility in South Carolina. Memphis, Tennessee will be used as the destination for off-site processing. Transportation costs are estimated using published tariffs from Tri-State Motor Transit.[17]

3.4.6 Low-Level Radioactive Waste Disposal

To the greatest extent practical, metallic material generated in the decontamination and dismantling processes will be treated to reduce the total volume requiring controlled disposal. The treated material, meeting the regulatory and/or site release criterion, will be released as scrap, requiring no further cost consideration. Conditioning and recovery of the waste stream will be performed off site at a licensed processing center.

Material requiring controlled disposal will be packaged and transported to one of two currently available burial facilities. Very low-level radioactive material, e.g., structural steel and contaminated concrete, will be sent to Envirocare. More highly contaminated and activated material will be sent to Barnwell. Disposal fees are based upon current charges for operating waste with surcharges added for the highly activated components, e.g., generated in the segmentation of the reactor vessel.

3.4.7 Site Conditions Following Decommissioning

The NRC will terminate (or amend) the site licenses if it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the next step in the decommissioning process, as well as Exelon Generation's own future plans for the site, e.g., the electrical switchyard will remain in support of the electrical transmission and distribution system.

The large underground tunnels between the cooling water intake, Turbine Building, and cooling tower will be isolated, sealed, and abandoned in place. Site utility and service piping are abandoned in place. Electrical manholes are backfilled with suitable earthen material and abandoned. Asphalt surfaces in the immediate vicinity of site buildings are broken up and the material used for backfill on site, if needed. The site access road will remain.

The estimate does not assume the remediation of any significant volume of contaminated soil. This assumption may be affected by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

Structures will be removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities will be processed and made available as clean fill. The site will be graded following the removal of non-essential structures to conform to the adjacent landscape, and vegetation will be established to inhibit erosion.

3.5 ASSUMPTIONS

The following are the major assumptions made in the development of the estimate for decommissioning the site. Decommissioning activities will be performed in accordance with the current regulations that are assumed to be in place at the time of decommissioning.

3.5.1 Estimating Basis

The study follows the principles of ALARA through the use of work duration adjustment factors. These factors address the impact of activities such as radiological protection instruction, mock-up training, and the use of respiratory protection and protective clothing. The factors lengthen a task's duration, increasing costs and lengthening the overall schedule. ALARA planning is considered in the costs for engineering and planning, and in the development of activity specifications and detailed procedures. Changes to worker exposure limits may impact the decommissioning cost and project schedule.

3.5.2 Labor Costs

The craft labor required to decontaminate and dismantle the nuclear units will be acquired through standard site contracting practices. The current cost of labor at the site is used as an estimating basis. Costs for site administration, operations, construction, and maintenance personnel are based upon average salary information provided by Exelon Nuclear.

Exelon Generation, as the licensee, will oversee the decommissioning operations and provide site security, radiological controls, and overall site administration. Exelon Nuclear will provide contract management of the decommissioning labor force and subcontractors. Engineering services for preparing the activity specifications, work procedures, activation, and structural analyses, are provided by Exelon Nuclear personnel.

The costs associated for the transition of the operating organization to decommissioning, e.g., separation packages, retraining, severance, and incentives are not included in this estimate and are considered to be ongoing operating expenses.

3.5.3 Design Conditions

Any fuel cladding failure that occurred during the lifetime of the plant is assumed to have released fission products at sufficiently low levels that the buildup of quantities of long-lived isotopes (e.g., cesium-137, strontium-90, or transuranics) has been prevented from reaching levels exceeding those that permit the major NSSS components to be shipped under current transportation regulations and disposal requirements.

The curie contents of the vessel and internals at final shutdown are derived from those listed in NUREG/CR-3474.[18] Actual estimates are derived from the curie/gram values in NUREG/CR-3474 and adjusted for the different mass of Peach Bottom components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from NUREG/CR-0130[19] and NUREG/CR-0672[20] and benchmarked to the long-lived values from NUREG/CR-3474.

The disposal cost for the control blades removed from the vessel with the final core load is included within the estimate. Disposition of any blades stored in the pools from operations is considered an operating expense and therefore not accounted for in the estimates.

Activation of the Reactor Building structure is confined to the sacrificial shield in this estimate. More extensive activation (at very low levels) of the interior structures within containment has been detected at several reactors and the owners have elected to dispose of the affected material at a controlled facility rather than reuse the material as fill on site or send it to a landfill. The ultimate disposition of the material removed from the Reactor Building will depend upon the site release criteria selected and the designated end use for the site.

3.5.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by Exelon Nuclear and its subcontractors. The warehouses may be dismantled as they become surplus to the decommissioning program. The plant's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Excess acid, caustic, and all chemicals listed will be removed.

Scrap and Salvage

The existing plant equipment is considered obsolete and suitable for scrap as deadweight quantities only. Exelon Nuclear will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG for equipment in this estimate are not consistent with removal techniques required for salvage (resale) of equipment. Experience has indicated that some buyers wanted equipment stripped down to very specific requirements before they would consider purchase. This required expensive rework after the equipment had been removed from its installed location. Since placing a salvage value on this machinery and equipment would be speculative, and the value would be small in comparison to the overall decommissioning expenses, this estimate does not attempt to quantify the value that Exelon Nuclear may realize based upon those efforts.

It is assumed, for purposes of this estimate, that any value received from the sale of scrap generated in the dismantling process would be more than offset by the on-site processing costs. The dismantling techniques assumed in the decommissioning estimate do not include the additional cost for size reduction and preparation to meet "furnace ready" conditions. For example, the recovery of copper from electrical cabling from a facility currently being decommissioned has required the removal and disposition of the PCB-contaminated insulation, an added expense. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. This assumption is an implicit recognition of scrap value in the disposal of clean metallic waste at no additional cost to the project.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other such items of personal property owned by Exelon Nuclear will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other generating facilities. Spare parts will also be made available for alternative use.

Energy

For estimating purposes, the plant is assumed to be de-energized, with the exception of those facilities associated with spent fuel storage. Replacement power costs are used for the cost of energy consumption during decommissioning for tooling, lighting, ventilation, and essential services.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance and the limits for coverage defined in the NRC's proposed rulemaking "Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors." The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

Property Taxes

Property tax payments are assume to continue after the shutdown of the generating station and are based upon land value only.

Site Modifications

The perimeter fence and in-plant security barriers will be moved, as appropriate, to conform to the Site Security Plan in force during the various stages of the project.

3.6 COST ESTIMATE SUMMARY

The costs projected for the decommissioning of Peach Bottom are provided in Tables 3.1 and 3.2. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2002 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure.

The annual expenditures are based upon the detailed activity costs reported in Appendix C, along with the schedule discussed in Section 4.

TABLE 3.1
SCHEDULE OF ANNUAL EXPENDITURES BY PERIOD, UNIT 2
(Thousands, 2002 Dollars)

Year	Period 1 Preparations	Period 2 Decommissioning Operations	Period 3 Site Restoration	Period 4 Dry Fuel Storage	Period 5 ISFSI Decommissioning	Totals
2013	20,225					20,225
2014	61,845					61,845
2015	8,416	102,029				110,446
2016		100,653				100,653
2017		78,520				78,520
2018		78,520				78,520
2019		52,569				52,569
2020		11,077				11,077
2021		11,946	6,134			18,080
2022			14,082			14,082
2023			8,796	467		9,264
2024				1,248		1,248
2025				1,245		1,245
2026				1,245		1,245
2027				1,245		1,245
2028				1,248		1,248
2029				1,245		1,245
2030				1,245		1,245
2031				1,245		1,245
2032				1,248		1,248
2033				1,245		1,245
2034				1,245		1,245
2035				1,245		1,245
2036				1,248		1,248
2037				1,245		1,245
2038				1,245		1,245
2039				15,027		15,027
	90,486	435,314	29,013	34,177	[Unit 3]	588,990

TABLE 3.2
SCHEDULE OF ANNUAL EXPENDITURES BY PERIOD, UNIT 3
(Thousands, 2002 Dollars)

Year	Period 1 Preparations	Period 2 Decommissioning Operations	Period 3 Site Restoration	Period 4 Dry Fuel Storage	Period 5 ISFSI Decommissioning	Totals
2014	17,759					17,759
2015	46,994					46,994
2016	808	95,409				96,218
2017		96,466				96,466
2018		103,883				103,883
2019		104,382				104,382
2020		70,794				70,794
2021		14,847	13,164			28,011
2022			30,219			30,219
2023			18,877	1,579		20,456
2024				4,218		4,218
2025				4,207		4,207
2026				4,207		4,207
2027				4,207		4,207
2028				4,218		4,218
2029				4,207		4,207
2030				4,207		4,207
2031				4,207		4,207
2032				4,218		4,218
2033				4,207		4,207
2034				4,207		4,207
2035				4,207		4,207
2036				4,218		4,218
2037				4,207		4,207
2038				4,207		4,207
2039				18,045	96	18,141
2040					8,608	8,608
	65,562	485,782	62,260	82,773	8,704	705,080

4. SCHEDULE ESTIMATE

The schedule for the decommissioning scenarios considered in this study follows the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints. In addition, the scheduling has been revised to reflect the required cooling period for the spent fuel.

A schedule or sequence of activities is presented in Figure 4.1. The schedule reflects the prompt decommissioning alternative and the start date consistent with a scheduled shutdown in 2013 for Unit 2 and 2014 for Unit 3. The sequence assumes that fuel will be removed from the spent fuel pool within the first five years. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the Appendix C cost table, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2000" computer software.[21]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

The schedule was generated using a precedence network and associated software. Activity durations are based upon the actual man-hour estimates calculated for each area. The schedule was assembled by sequencing the work areas, considering work crew availability and material access/egress. The following assumptions were made in the development of the decommissioning schedule:

- The Reactor Building will continue to serve as the spent fuel storage/ transfer facility until such time that all spent fuel has been removed from site. The Reactor Building is expected to operate for approximately five years after the cessation of operations.

- All work (except vessel and internals removal activities) will be performed during an 8-hour workday, 5 days per week, with no overtime. There are eleven paid holidays per year.

- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.

- Multiple crews work parallel activities to the maximum extent possible, consistent with: optimum efficiency; adequate access for cutting, removal

and laydown space; and the stringent safety measures necessary during demolition of heavy components and structures.

- For plant systems removal, the systems with the longest removal durations in areas on the critical path are considered to determine the duration of the activity.

4.2 PROJECT SCHEDULE

The period-dependent costs presented in Appendix C are based upon the durations developed in the schedule for the decommissioning of Peach Bottom. Durations are established between several milestones in each project period; these durations are used to establish a critical path for the entire project. In turn, the critical path duration for each period is used as the basis for determining the period-dependent costs.

Project timelines are shown in this section as Figure 4.2. Milestone dates are based on a 40-year plant operating life from the issuance of the operating license, a five-year wet storage period for the last core discharge, and continued operation of the ISFSI until DOE can complete the transfer.

FIGURE 4.1

DECOMMISSIONING ACTIVITY SCHEDULE

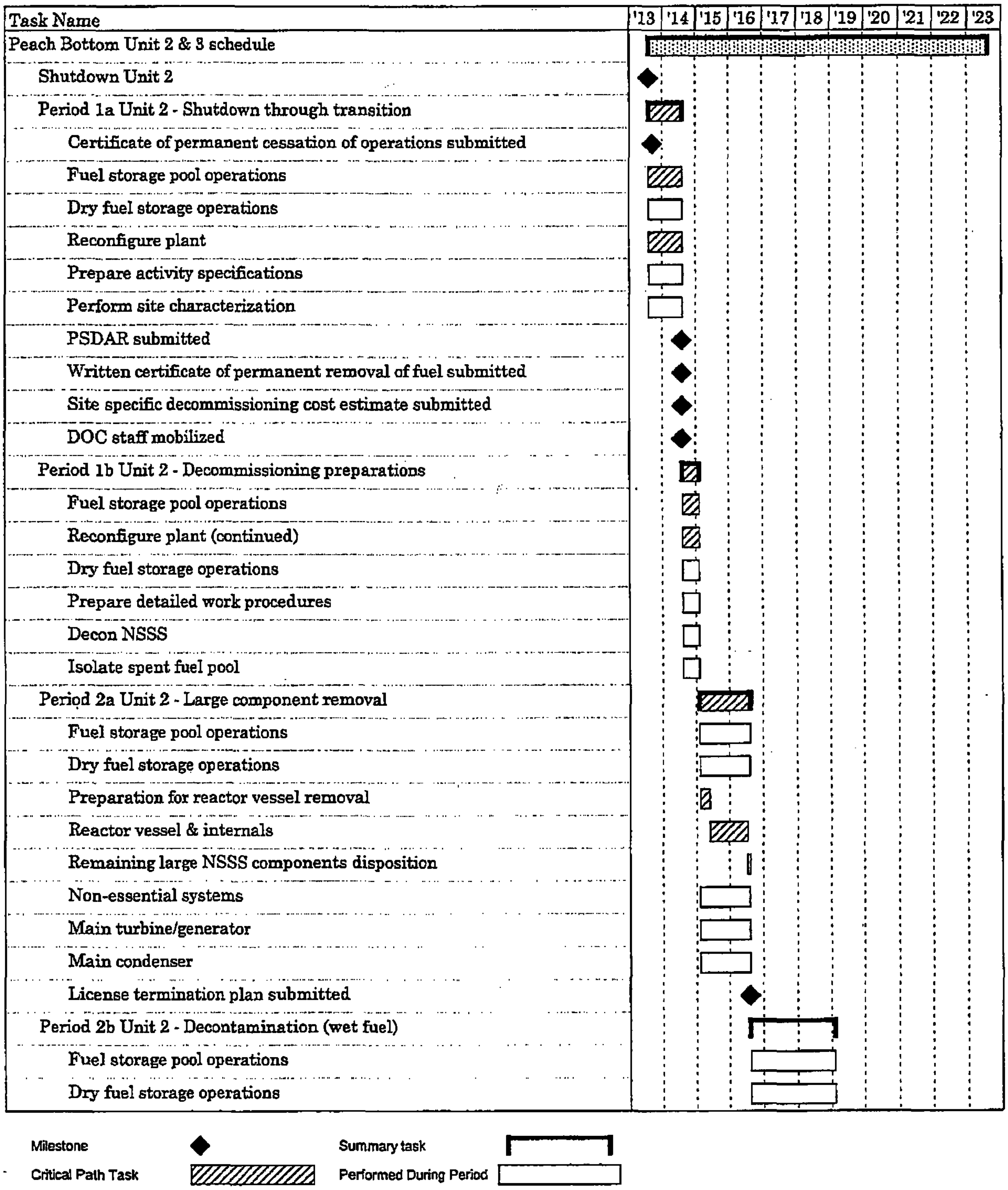


FIGURE 4.1

(continued)

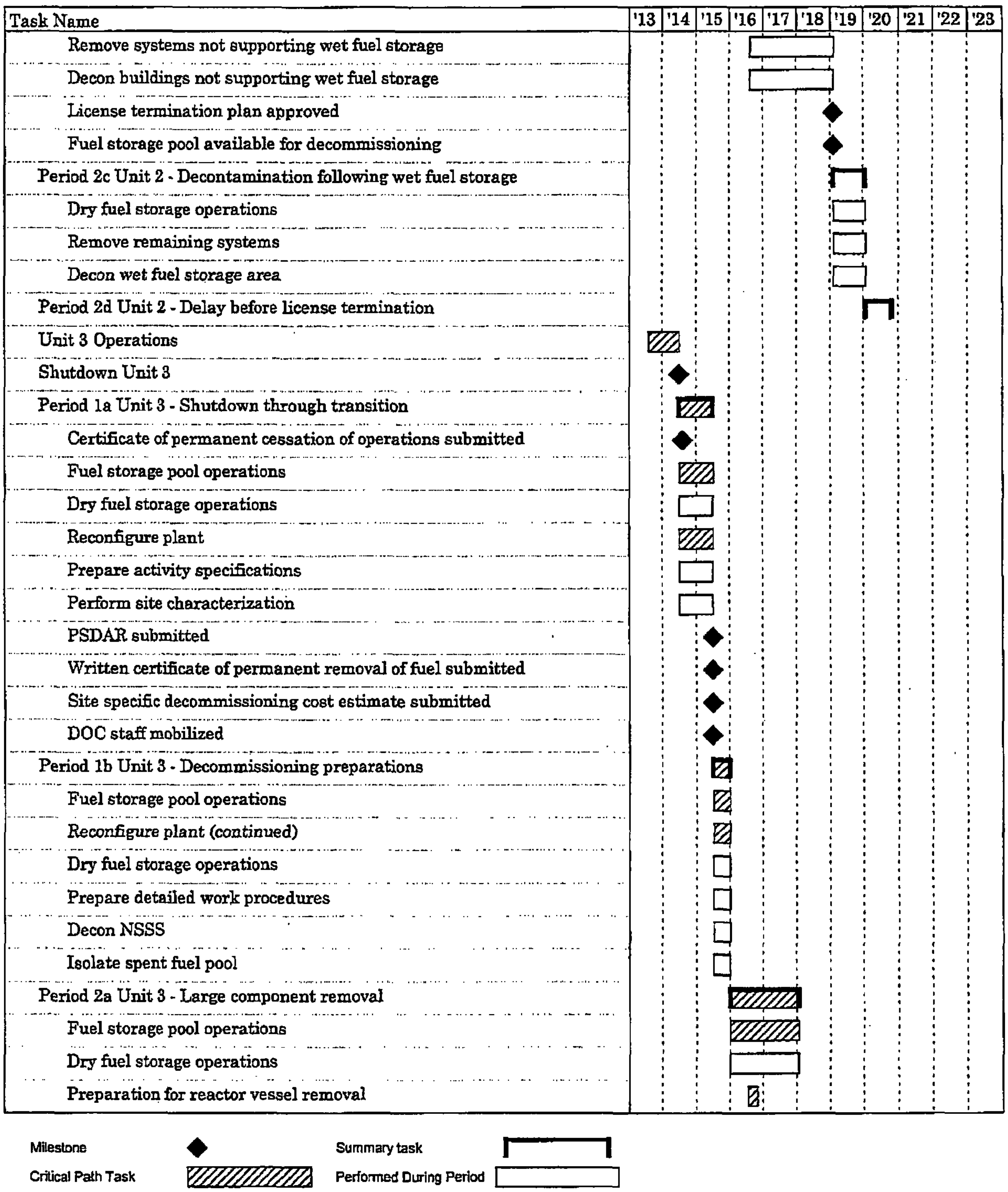


FIGURE 4.1

(continued)

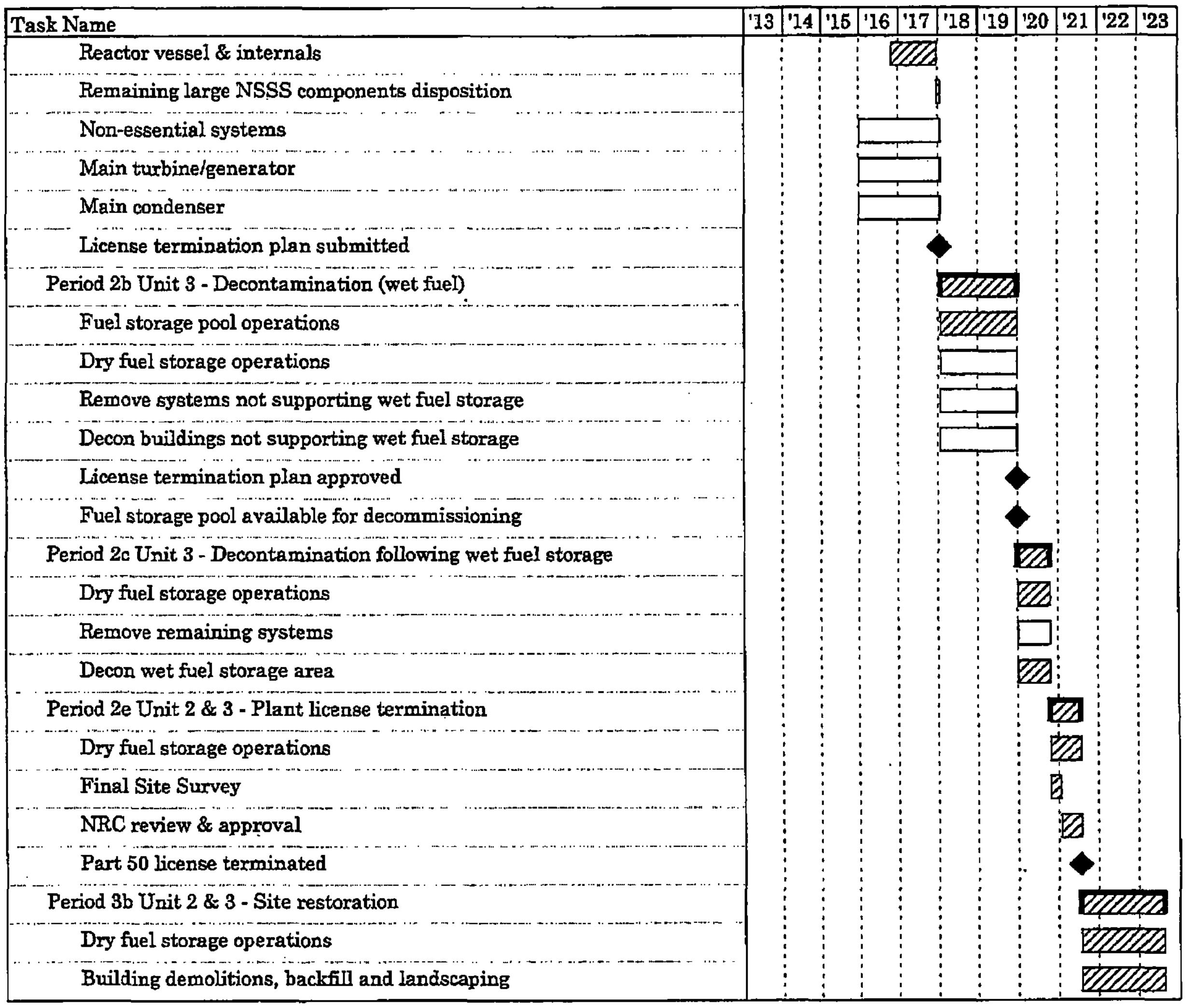
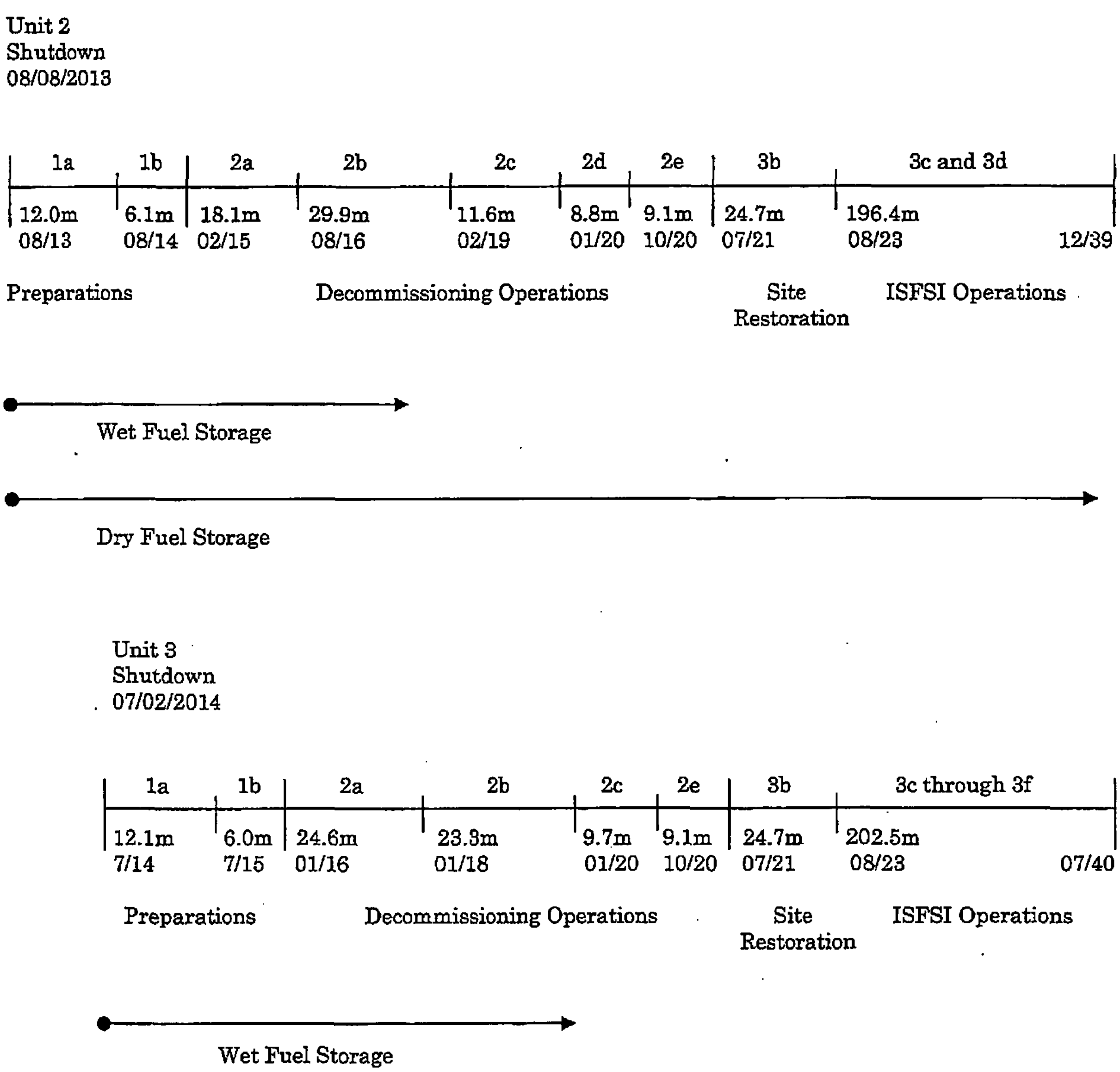


FIGURE 4.2

DECOMMISSIONING TIMELINE
(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,[22] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations delineates the production, utilization, and disposal of radioactive materials and processes. In particular, 10 CFR §71 defines radioactive material and 10 CFR §61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR §173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3). For this study, commercially available steel containers are presumed to be used for the disposal of piping, small components, and concrete. Larger components can serve as their own containers, with proper closure of all openings, access ways, and penetrations.

The volumes of radioactive waste generated during the various decommissioning activities at the site are shown on a line-item basis in Appendix C and summarized in Table 5.1. The quantified waste volume summary shown in this table is consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material. The volumes are calculated on the displaced volume of components serving as their own waste containers.

The reactor vessel and internals are categorized as large quantity shipments and, accordingly, will be shipped in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume and the special handling requirements of the payload. Packaging efficiencies are lower for the highly activated materials (greater than Type A quantity waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

No process system containing/handling radioactive substances at shutdown is presumed to meet material release criteria by decay alone, i.e., systems radioactive at shutdown will still be radioactive over the time period during which the decommissioning is accomplished, due to the presence of long-lived radionuclides. While the dose rates decrease with time, radionuclides such as ^{137}Cs will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of Peach Bottom will primarily be generated during Period 2. Material considered potentially contaminated when removed from the radiologically controlled area will be sent to processing facilities for conditioning and disposal at a unit cost of $2.00 per pound. Heavily contaminated components and activated materials will be routed for controlled disposal. The disposal volumes reported in the table reflects the savings resulting from reprocessing and recycling.

For purposes of constructing the estimate, the rate schedule for the Barnwell facility was used as a proxy for the higher activity waste. This schedule was used to estimate the disposal fees for the majority of plant components and activated concrete deemed unsuitable for processing or recovery. An average disposal rate of $433 per cubic foot was used, with additional surcharges for activity, dose rate and/or handling added, as appropriate for the particular package.

The remaining volume of contaminated metallic and concrete debris will be disposed of at the Envirocare facility. This includes lower activity material such as miscellaneous steel, metal siding, scaffolding and structural steel. A rate of $298 per cubic foot was used for containerized waste, $70 per cubic foot for disposal of DAW, and approximately $20 per cubic foot for bulk material, e.g., concrete.

TABLE 5.1

DECOMMISSIONING WASTE SUMMARY
UNIT 2

	Waste Class[1]	Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste			
Barnwell, South Carolina (contaminated/activated metallic waste and concrete)			
	A	77,882	6,798,729
	B	17,783	2,763,680
	C	804	50,930
Envirocare, Utah (miscellaneous steel, contaminated/activated concrete)			
Containerized/DAW	A	43,219	3,832,401
Bulk	A	29,345	1,497,241
Geologic Repository (Greater-than Class C)			
	>C	748	155,911
Total [2]		169,779	15,098,892
Processed Waste (Off-Site)		160,500	
Scrap Metal			63,534,000

1 Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55
2 Columns may not add due to rounding.

TABLE 5.2

DECOMMISSIONING WASTE SUMMARY UNIT 3

	Waste Class[1]	Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste			
Barnwell, South Carolina (contaminated/activated metallic waste and concrete)			
	A	87,810	7,568,011
	B	19,103	2,939,360
	C	804	50,930
Envirocare, Utah (miscellaneous steel, contaminated/activated concrete)			
Containerized/DAW	A	55,853	5,246,234
Bulk	A	37,983	2,049,815
Geologic Repository (Greater-than Class C)			
	>C	748	155,911
Total [2]		202,300	18,010,261
Processed Waste (Off-Site)		180,173	
Scrap Metal			93,730,000

1 Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55
2 Columns may not add due to rounding.

6. RESULTS

Costs were developed to decommission Peach Bottom following a scheduled cessation of plant operations. The analysis relied upon the site-specific, technical information developed for a previous analysis prepared in 1995-96, then updated to reflect current plant conditions and operating assumptions. While not an engineering study, the estimate does provide PSEG Power with sufficient information to assess its financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimate described in this report is based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenario assumes continued operation of the plant's spent fuel pool for approximately five years following the cessation of operations for continued cooling of the assemblies. An ISFSI will be used to safeguard the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository. The scenario also includes the costs for the dismantling of non-essential structures and limited restoration of the site.

The cost projected to promptly decommission Peach Bottom is estimated to be $1.294 billion. The majority of this cost (approximately 94.2%) is associated with the physical decontamination and dismantling of the nuclear unit and caretaking of the spent fuel, so that the license could be terminated. The remaining 5.8% is for the demolition of the remaining structures and limited restoration of the site.

The primary cost contributors, identified in Table 6.1, are either labor-related or associated with the management and disposition of the radioactive waste. Program management is the largest single contributor to the overall cost. The magnitude of the expense is a function of both the size of the organization required to manage the decommissioning and the duration of the program. It is assumed, for purposes of this analysis, that Exelon Nuclear will oversee the decommissioning program, managing the decommissioning labor force and the associated subcontractors. The size and composition of the management organization varies with the decommissioning phase and associated site activities. However, once the operating licenses have been terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel.

As described in this report, the spent fuel pool will remain operational for approximately five years following the cessation of plant operation. The pool will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the Reactor Building. Over the five-year period, the spent fuel will be packaged into transportable steel canisters for loading into a DOE-provided transport cask. The canisters will be stored in concrete overpacks at the ISFSI until DOE is able to receive them. Dry storage of the fuel under a separate license provides additional flexibility in the event DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses incurred by Exelon Nuclear.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the lower level material, including concrete and structural steel, will be at the Envirocare facility. The more highly radioactive material will be sent to the Barnwell facility, with the exception of selected reactor vessel components. Highly activated components, requiring additional isolation from the environment, are packaged for geologic disposal. The cost of geologic disposal is based upon a cost equivalent for spent fuel.

A significant portion of the metallic waste is designated for additional processing and treatment at an off-site facility. Processing reduces the volume of material requiring controlled disposal through such techniques and processes as survey and sorting, decontamination and volume reduction. The material that cannot be unconditionally released will be packaged for controlled disposal at one of the currently operating facilities. The costs identified for processing are all-inclusive, incorporating the ultimate disposition of the material.

Removal costs reflect the labor-intensive nature of the decommissioning process and the management controls required to ensure a safe and successful program. Decontamination and packaging costs also have a large labor component that is based upon prevailing union wages. Non-radiological demolition is a natural extension of the decommissioning process. The methods employed in decontamination and dismantling are generally destructive and indiscriminate in inflicting collateral damage. With a work force mobilized to support decommissioning operations, non-radiological demolition can be an integrated activity and a logical expansion of the work being performed in the process of terminating the operating license. Prompt demolition reduces future liabilities and could be more cost-effective than deferral, due to the ultimate deterioration of facilities (and therefore the working conditions).

The reported cost for transport includes the tariffs and surcharges associated with moving large components and/or overweight shielded casks overland, as well as the general expense, e.g., labor and fuel, of transporting material to the destinations identified in this report. For purposes of this estimate, material will be primarily moved overland by truck.

Decontamination will be used to reduce the plant's radiation fields and minimize worker exposure. Slightly contaminated material or material located within a contaminated area will be sent to an off-site processing center, i.e., this estimate does not assume that contaminated plant components and equipment could be economically decontaminated for uncontrolled release in-situ. Centralized processing centers have proven to be a more efficient means of handling the large volumes of material produced in the dismantling of a nuclear unit.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling, isotopic analysis and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also need to be confirmed and will add to the expense of surveying the facilities alone.

The remaining costs include allocations for heavy equipment and temporary services, and other expenses such as regulatory fees and the premiums for nuclear insurance. While site operating costs are greatly reduced following the final cessation of plant operations, certain administrative functions do need to be maintained either at a basic functional or regulatory level.

TABLE 6.1

SUMMARY OF DECOMMISSIONING COST ELEMENTS
UNIT 2

Work Category	Cost 2002$ (thousands)	Percent of Total Costs
Decontamination	14,484.4	2.5
Removal	69,674.0	11.8
Packaging	14,487.4	2.5
Transportation	4,740.9	0.8
Waste Disposal	116,517.7	19.8
Off-site Waste Processing	36,916.5	6.3
Program Management (including Engineering and Security)	188,969.1	32.1
Spent Fuel Pool Isolation	9,060.3	1.5
ISFSI Related (including capital)	80,073.9	13.6
Insurance and Regulatory Fees	8,772.8	1.5
Energy	18,616.6	3.2
Characterization and Licensing Surveys	5,676.0	1.0
Misc. Equipment and Site Services	20,999.9	3.6
Total	583,989.5	100.0

Note: Columns may not add due to rounding

TABLE 6.2

SUMMARY OF DECOMMISSIONING COST ELEMENTS UNIT 3

Work Category	Cost 2002$ (thousands)	Percent of Total Costs
Decontamination	17,010.1	2.4
Removal	102,950.1	14.6
Packaging	14,934.5	2.1
Transportation	5,246.9	0.7
Waste Disposal	123,945.7	17.6
Off-site Waste Processing	41,441.3	5.9
Program Management (including Engineering and Security)	257,180.4	36.5
Spent Fuel Pool Isolation	6,040.2	0.9
ISFSI Related (including capital)	81,571.1	11.6
Insurance and Regulatory Fees	8,348.1	1.2
Energy	18,470.1	2.6
Characterization and Licensing Surveys	6,363.3	0.9
Misc. Equipment and Site Services	21,578.6	3.1
Total	705,080.4	100.0

Note: Columns may not add due to rounding

7. REFERENCES

1. U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72, "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988.

2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," August 1990.

3. U.S. Code of Federal Regulations, Title 10, Parts 2, 50 and 51, "Decommissioning of Nuclear Power Reactors," Nuclear Regulatory Commission, Federal Register Volume 61 (p 39278 et seq.), July 29, 1996.

4. "Nuclear Waste Policy Act of 1982 and Amendments," U.S. Department of Energy's Office of Civilian Radioactive Management, 1982.

5. Maine Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company, and Yankee Atomic Power Company v. United States, U.S. Court of Appeals for the Federal Circuit decision, Docket No. 99-5138, -5139, -5140, August 31, 2000.

6. U.S. Code of Federal Regulations, Title 10, Part 50 – Domestic Licensing of Production and Utilization Facilities, Subpart 54 (bb), "Conditions of Licenses," January 2001 Edition.

7. "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, January 15, 1986.

8. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Radiological Criteria for License Termination," Federal Register, Volume 62, Number 139 (p 39058 et seq.), July 21, 1997.

9. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG/CR-1575, EPA 402-R-97-016, December 1997.

10. "Decommissioning Cost Estimate for the Peach Bottom Atomic Power Station, Units 2 and 3," Document No. P07-1180-003, TLG Services, Inc., September 1996.

7. REFERENCES
(continued)

11. T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

12. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980.

13. "Building Construction Cost Data 2002," Robert Snow Means Company, Inc., Kingston, Massachusetts.

14. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984.

15. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995.

16. U.S. Department of Transportation, Section 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178, 1996.

17. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-109397 and Supplements, 2000.

18. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. August 1984.

19. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1978.

20. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1980.

7. REFERENCES
(continued)

21. "Microsoft Project 2000," Microsoft Corporation, Redmond, WA, 1997.

22. "Atomic Energy Act of 1954," (68 Stat. 919).

APPENDIX A
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 waste processing area.

2. CALCULATIONS

Act ID	Activity Description	Activity Duration	Critical Duration
a	Remove insulation	60	(b)
b	Mount pipe cutters	60	60
c	Install contamination controls	20	(b)
d	Disconnect inlet and outlet lines	60	60
e	Cap openings	20	(d)
f	Rig for removal	30	30
g	Unbolt from mounts	30	30
h	Remove contamination controls	15	15
i	Remove, wrap in plastic, send to the waste processing area	60	60
	Totals (Activity/Critical)	355	255

Duration adjustment(s):	
+ Respiratory protection adjustment (50% of critical duration)	128
+ Radiation/ALARA adjustment (37.08% of critical duration)	95
Adjusted work duration	478
+ Protective clothing adjustment (30% of adjusted duration)	143
Productive work duration	621
+ Work break adjustment (8.33 % of productive duration)	52
Total work duration min	673 min

***** Total duration = 11.217 hr *****

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate ($/hr)	Cost
Laborers	3.00	11.217	22.50	757.15
Craftsmen	2.00	11.217	34.13	765.67
Foreman	1.00	11.217	36.29	407.06
General Foreman	0.25	11.217	43.54	122.10
Fire Watch	0.05	11.217	22.50	12.62
Health Physics Technician	1.00	11.217	40.48	454.06
Total labor cost				$2,518.66

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Gas torch consumables 1 @ $4.23/hr x 1 hr {1}	$4.23
-Blotting paper 50 @ $0.44 sq ft {2}	$22.00
-Plastic sheets/bags 50 @ $0.11/sq ft {3}	$5.50
Subtotal cost of equipment and materials	$31.73
Overhead & sales tax on equipment and materials @ 16.00 %	$5.08
Total costs, equipment & material	$36.81

TOTAL COST:
Removal of contaminated heat exchanger <3000 pounds: $2,555.47

Total labor cost:	$2,518.66
Total equipment/material costs:	$36.81
Total craft labor man-hours required per unit:	81.88

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the AIF (now NEI) program to standardize nuclear decommissioning cost estimates 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 (2002) Division 01590, Section 400-6360 pg 24
    2. McMaster-Carr Ed. 106 pg 1778
    3. R.S. Means (2002) Division 01540, Section 800-0200 pg 17

- Material and consumable costs were adjusted using the regional indices for Lancaster, Pennsylvania.

APPENDIX B

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

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean instrument and sampling tubing, $/linear foot	0.26
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	2.72
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	3.98
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	8.00
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	15.20
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	19.71
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	29.01
Removal of clean pipe >36 inches diameter, $/linear foot	34.49
Removal of clean valves >2 to 4 inches	53.14
Removal of clean valves >4 to 8 inches	79.97
Removal of clean valves >8 to 14 inches	152.02
Removal of clean valves >14 to 20 inches	197.05
Removal of clean valves >20 to 36 inches	290.09
Removal of clean valves >36 inches	344.92
Removal of clean pipe fittings >20 to 36	290.09
Removal of clean pipe hangers for small bore piping	16.57
Removal of clean pipe hangers for large bore piping	59.39
Removal of clean pumps, <300 pound	133.61
Removal of clean pumps, 300-1000 pound	378.15
Removal of clean pumps, 1000-10,000 pound	1,493.10
Removal of clean pumps, >10,000 pound	2,883.03
Removal of clean pump motors, 300 – 1000 pound	159.71
Removal of clean pump motors, 1000 – 10,000 pound	622.86
Removal of clean pump motors, >10,000 pound	1,401.46
Removal of clean turbine-driven pumps >10,000 pounds	3,863.30

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean heat exchanger < 3000 pound	802.43
Removal of clean heat exchanger > 3000 pounds	2,013.56
Removal of clean feedwater heater/deaerator	5,671.40
Removal of clean moisture separator/reheater	11,654.37
Removal of clean tanks, < 300 gallons	172.04
Removal of clean tanks, 300 – 3000 gallons	544.89
Removal of clean tanks, >3000 gallons, $/square foot surface	4.62
Removal of clean electrical equipment, <300 pound	73.65
Removal of clean electrical equipment, 300 – 1000 pound	260.01
Removal of clean electrical equipment, 1000 – 10,000 pound	520.02
Removal of clean electrical equipment, >10,000 pound	1,251.39
Removal of clean electrical transformers < 30 tons	2,502.79
Removal of clean electrical cable tray, $/linear foot	6.83
Removal of clean electrical conduit, $/linear foot	2.98
Removal of clean mechanical equipment, <300 pound	73.65
Removal of clean mechanical equipment, 300-1000 pound	260.01
Removal of clean mechanical equipment, 1000 – 10,000 pound	520.02
Removal of clean mechanical equipment, > 10,000 pound	1,251.39
Removal of clean HVAC equipment, <300 pound	73.65
Removal of clean HVAC equipment, 3000 – 1000 pound	260.01
Removal of clean HVAC equipment, 1000 – 10,000 pound	520.02
Removal of clean HVAC equipment, >10,000 pound	1,251.39
Removal of clean HVAC ductwork, $/pound	0.28
Removal of contaminated instrument and sampling tubing, $/linear foot	0.94
Removal of contaminated pipe 0.25 to 2 inches diameter $/linear foot	12.59

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated pipe >2 to 4 in	21.50
Removal of contaminated pipe >4 to 8 in	35.05
Removal of contaminated pipe >8 to 14 in	67.60
Removal of contaminated >14 to 20	81.02
Removal of contaminated > 20 to 36	111.93
Removal of contaminated pipe > 36 inches diameter $/linear foot	132.21
Removal of contaminated valves >2 to 4 inches	270.37
Removal of contaminated valves > 4 to 8 inches	321.80
Removal of contaminated valves >8 to 14 inches	644.05
Removal of contaminated valves > 14 to 20 inches	817.20
Removal of contaminated valves >20 to 36	1,087.36
Removal of contaminated valves > 36 inches	1,290.22
Removal of contaminated pipe fittings > 20 inches	1,087.36
Removal of clean pipe hangers for small bore piping	64.49
Removal of clean pipe hangers for large bore piping	202.80
Removal of contaminated pumps, <300 pound	572.71
Removal of contaminated pumps, 300-1000 pound	1,319.27
Removal of contaminated pumps, 1000-10,000 pound	4,164.52
Removal of contaminated pumps, >10,000 pound	10,139.82
Removal of contaminated pump motors, 300 – 1000 pound	566.16
Removal of contaminated pump motors, 1000-10,000 pound	1,702.07
Removal of contaminated pump motors, >10,000 pound	3,821.38
Removal of contaminated turbine-driven pumps > 10,000 pounds	11,711.22
Removal of contaminated heat exchanger <3000 pound	2,555.47
Removal of contaminated heat exchanger >3000 pound	7,411.35

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated feedwater heater/deaerator	17,907.11
Removal of contaminated moisture separator/reheater	38,753.69
Removal of contaminated tanks, <300 gallons	953.84
Removal of contaminated tanks, >300 gallons, $/square foot surface	18.44
Removal of contaminated electrical equipment, <300 pound	442.37
Removal of contaminated electrical equipment, 300 - 1 000 pound	1,064.85
Removal of contaminated electrical equipment, 1000 - 10,000 pound	2,050.06
Removal of contaminated electrical equipment, >10,000 pound	4,015.20
Removal of electrical transformers > 30 tons	7,909.43
Removal of contaminated electrical cable tray, $/linear foot	21.28
Removal of contaminated electrical conduit, $/linear foot	9.82
Removal of contaminated mechanical equipment, <300 pound	492.50
Removal of contaminated mechanical equipment, 300 – 1000 pound	1,177.26
Removal of contaminated mechanical equipment, 1000 – 10,000 pound	2,262.87
Removal of contaminated mechanical equipment, > 10,000 pound	4,015.20
Removal of contaminated HVAC equipment, <300 pound	492.50
Removal of contaminated HVAC equipment, 300 – 1000 pound	1,177.26
Removal of contaminated HVAC equipment, 1000 – 10,000 pound	2,262.87
Removal of contaminated HVAC equipment, >10,000 pound	4,015.20
Removal of contaminated HVAC ductwork, $/pound	2.03
Removal of clean standard reinforced concrete, $/cubic yard	46.64
Removal of grade slab concrete, $/cubic yard	144.88
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	154.60
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	195.56
Removal of below-grade suspended floors, $/cubic yard	222.85

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated monolithic concrete structures, $/cubic yard	1,272.46
Removal of wooden structures, $/cubic foot	0.48
Removal of clean hollow masonry block wall, $/cubic yard	51.02
Removal of clean solid masonry block wall, $/cubic yard	51.02
Placement of concrete for below-grade voids, $/cubic yard	87.31
Backfill of below grade voids, $/cubic yard	14.77
Excavation of clean material, $cubic yard	2.45
Removal of building by volume, $/cubic foot	0.19
Removal of clean building metal siding, $/square foot	0.81
Removal of standard asphalt roofing, $/square foot	1.23
Removal of transite panels, $/square foot	1.51
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	9.43
Scabbling contaminated concrete floors, $/square foot	5.21
Scabbling contaminated concrete walls, $/square foot	5.72
Removal of clean overhead cranes/monorails < 10 ton capacity, each	371.63
Removal of contaminated overhead cranes/monorails < 10 ton capacity, ea.	1,130.24
Removal of clean overhead cranes/monorails >10-50 ton capacity, each	891.91
Removal of contaminated overhead cranes/monorails >10-50 ton capacity, each	2,712.12
Removal of gantry cranes > 50 ton capacity, each	15,642.42
Removal of clean structural steel, $/pound	0.23
Removal of clean steel floor grating, $/square foot	1.89
Removal of contaminated steel floor grating, $/square foot	6.31
Removal of contaminated free-standing steel liner, $/square foot	21.52
Removal of clean concrete-anchored steel liner, $/square foot	3.46
Removal of contaminated concrete-anchored steel liner, $/square foot	25.07

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Placement of scaffolding in clean areas, $/square foot	11.46
Placement of scaffolding in contaminated areas, $/square foot	17.05
Removal of chain link fencing, $/linear foot	1.16
Removal of railroad track, $/linear foot	34.40
Removal of asphalt pavement, $/square foot	0.74
Core drilling 2 to 4 inch diameter, linear foot	239.50

APPENDIX C

DETAILED COST ANALYSES

Page

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	94	14	108	108	-	-	-	-	-	-	-	-	-	1,300
1a.1.2	Notification of Cessation of Operations									a											
1a.1.3	Remove fuel & source material									n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	145	22	167	167	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	333	50	383	383	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	94	14	108	108	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	543	82	625	625	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	225	34	258	258	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	363	54	417	417	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	297	45	341	341	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	357	53	410	369	-	41	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	302	45	347	312	-	35	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	514	77	592	592	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	471	71	542	542	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	116	17	133	67	-	67	-	-	-	-	-	-	-	1,600
1a.1.17.9	Turbine & condenser	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	4,167
1a.1.17.10	Pressure suppression structure	-	-	-	-	-	-	145	22	167	167	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.11	Drywell	-	-	-	-	-	-	116	17	133	133	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.12	Plant structures & buildings	-	-	-	-	-	-	226	34	260	130	-	130	-	-	-	-	-	-	-	3,120
1a.1.17.13	Waste management	-	-	-	-	-	-	333	50	383	383	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.14	Facility & site closeout	-	-	-	-	-	-	66	10	75	37	-	37	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	3,092	464	3,556	3,246	-	310	-	-	-	-	-	-	-	42,674
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	174	26	200	200	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,304	346	2,650	2,650	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	101	15	117	117	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	1,950	293	2,243	2,243	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	89	13	102	102	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	9,949	1,492	11,442	11,132	-	310	-	-	-	-	-	-	-	78,580
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,292	129	1,421	1,421	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	510	51	561	561	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	305	-	-	-	-	-	76	382	382	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	322	-	-	-	-	-	48	371	371	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	9	3	-	37	-	11	60	60	-	-	-	534	-	-	-	10,696	191	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,446	367	2,813	2,813	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	301	30	331	331	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	50	5	56	-	56	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	948	142	1,090	-	1,090	-	-	-	-	-	-	-	-	-
1a.4.10	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	34	5	40	-	40	-	-	-	-	-	-	-	-	-

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1a Period-Dependent Costs (continued)																					
1a.4.11	Security Staff Cost	-	-	-	-	-	-	1,494	224	1,718	1,718	-	-	-	-	-	-	-	-	-	68,921
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	26,328	3,949	30,278	30,278	-	-	-	-	-	-	-	-	-	410,086
1a.4	Subtotal Period 1a Period-Dependent Costs	-	628	9	3	-	37	33,405	5,038	39,120	37,935	1,185	-	-	634	-	-	-	10,696	131	499,007
1a.0	TOTAL PERIOD 1a COST	-	628	9	3	-	37	43,356	6,631	50,562	49,067	1,185	310	-	634	-	-	-	10,696	131	577,607
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	343	51	394	355	-	39	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	290	43	333	333	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	98	15	112	28	-	84	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	11	2	12	12	-	-	-	-	-	-	-	-	-	145
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	263	39	302	302	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	87	13	100	50	-	50	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	72	11	83	42	-	42	-	-	-	-	-	-	-	1,000
1b.1.1.12	Turbine & condensers	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	4,167
1b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	145	22	167	167	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.14	Radwaste building	-	-	-	-	-	-	198	30	227	205	-	23	-	-	-	-	-	-	-	2,730
1b.1.1.15	Reactor building	-	-	-	-	-	-	198	30	227	205	-	23	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	2,310	347	2,657	2,396	-	261	-	-	-	-	-	-	-	31,885
1b.1.2	Decon NSSS	492	-	-	-	-	-	-	246	737	737	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	492	-	-	-	-	-	2,310	592	3,394	3,133	-	261	-	-	-	-	-	-	1,067	31,885
Period 1b Additional Costs																					
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	7,879	1,182	9,060	9,060	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	923	138	1,062	1,062	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	8,802	1,320	10,122	10,122	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	658	-	-	-	-	-	-	99	757	757	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process liquid waste	17	-	208	202	-	2,237	-	619	3,283	3,283	-	-	-	-	2,632	-	-	438,813	84	-
1b.3.3	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
1b.3.4	Pipe cutting equipment	-	911	-	-	-	-	-	137	1,048	1,048	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	675	912	208	202	-	2,237	-	854	5,088	5,088	-	-	-	-	2,632	-	-	438,813	84	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	20	-	-	-	-	-	-	5	25	25	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	655	65	720	720	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	259	26	284	284	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	158	-	-	-	-	-	40	198	198	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	163	-	-	-	-	-	25	188	188	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	5	1	-	20	-	6	32	32	-	-	-	287	-	-	-	5,753	70	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,480	372	2,852	2,852	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	183	18	202	202	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	26	3	28	-	28	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	481	72	553	-	553	-	-	-	-	-	-	-	-	-

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1b Period-Dependent Costs (continued)																					
1b.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	17	3	20	-	20	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	757	114	871	871	-	-	-	-	-	-	-	-	-	29,864
1b.4.13	Utility Staff Cost	-	-	-	-	-	-	13,344	2,002	15,346	15,346	-	-	-	-	-	-	-	-	-	223,057
1b.4	Subtotal Period 1b Period-Dependent Costs	20	322	5	1	-	20	18,202	2,749	21,320	20,719	601	-	-	287	-	-	-	5,753	70	252,921
1b.0	TOTAL PERIOD 1b COST	1,187	1,234	212	204	-	2,257	29,314	5,516	39,924	39,062	601	261	-	287	2,632	-	-	444,566	1,221	284,806
PERIOD 1 TOTALS		1,187	1,861	221	207	-	2,294	72,669	12,047	90,486	88,129	1,786	571	-	821	2,682	-	-	465,262	1,352	862,413
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	62	49	16	11	-	572	-	190	900	900	-	-	-	1,227	-	-	-	112,271	3,330	-
2a.1.1.2	Recirculation Pumps & Motors	26	28	12	11	30	766	-	219	1,092	1,092	-	-	146	1,442	-	-	-	150,250	1,763	-
2a.1.1.3	CRDMs & NIs Removal	138	108	297	48	-	705	-	308	1,598	1,598	-	-	-	5,179	-	-	-	138,258	6,971	-
2a.1.1.4	Reactor Vessel Internals	137	1,851	6,083	1,212	-	12,569	212	9,596	31,659	31,659	-	-	-	751	2,526	804	-	453,410	32,665	1,439
2a.1.1.5	Reactor Vessel	61	3,574	1,543	425	-	9,350	212	7,909	23,073	23,073	-	-	-	10,735	2,254	-	-	1,408,631	32,665	1,439
2a.1.1	Totals	424	5,608	7,951	1,702	30	23,962	423	18,222	58,323	58,323	-	-	146	19,334	4,779	804	-	2,262,849	77,394	2,877
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	311	562	198	5,653	3,684	-	1,933	12,348	12,348	-	-	28,275	11,732	-	-	-	1,052,676	9,758	-
2a.1.3	Main Condensers	-	793	477	142	5,598	1,931	-	1,590	10,530	10,530	-	-	27,989	6,148	-	-	-	551,650	25,487	-
Disposal of Plant Systems																					
2a.1.4.1	Air Ejection & Offgas	-	199	10	5	232	250	-	147	834	834	-	-	1,112	548	-	-	-	49,086	6,219	-
2a.1.4.2	Circulating Water	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	673	-
2a.1.4.3	Circulating Water (RCA)	-	52	2	3	202	-	-	44	302	302	-	-	1,008	-	-	-	-	-	1,517	-
2a.1.4.4	Condensate	-	887	82	24	702	2,347	-	801	4,343	4,343	-	-	3,510	6,136	-	-	-	460,603	12,428	-
2a.1.4.5	Condensate Filter Demineralizer	-	505	39	11	309	1,062	-	444	2,370	2,370	-	-	1,545	2,388	-	-	-	208,271	15,656	-
2a.1.4.6	Control Rod Drive Hydraulic	-	600	40	8	190	922	-	414	2,173	2,173	-	-	948	2,018	-	-	-	180,812	17,902	-
2a.1.4.7	Electrohydraulic Control	-	41	1	1	81	-	-	23	147	147	-	-	406	-	-	-	-	-	1,231	-
2a.1.4.8	Emergency & HP Service Water	-	45	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	1,653	-
2a.1.4.9	Emergency & HP Service Water (RCA)	-	258	4	8	520	-	-	144	933	933	-	-	2,600	-	-	-	-	-	7,614	-
2a.1.4.10	Feedwater & Feed Pumps	-	603	76	24	724	2,262	-	836	4,526	4,526	-	-	3,621	4,963	-	-	-	443,851	19,161	-
2a.1.4.11	Feedwater Heater Vents & Drains	-	514	54	20	675	1,682	-	659	3,604	3,604	-	-	3,375	3,679	-	-	-	330,060	16,282	-
2a.1.4.12	Generator Hydrogen & Carbon Dioxide	-	24	0	1	41	-	-	12	78	78	-	-	203	-	-	-	-	-	721	-
2a.1.4.13	Instrument Nitrogen	-	21	0	1	53	-	-	13	88	88	-	-	264	-	-	-	-	-	600	-
2a.1.4.14	Main Steam & Bypass & Crossaround	-	456	36	20	955	977	-	508	2,952	2,952	-	-	4,775	2,136	-	-	-	191,636	14,603	-
2a.1.4.15	Offgas Recombiner	-	136	9	3	116	227	-	110	601	601	-	-	581	498	-	-	-	44,558	4,136	-
2a.1.4.16	Post Accident Sampling	-	11	0	0	2	6	-	5	25	25	-	-	12	14	-	-	-	1,270	353	-
2a.1.4.17	Primary Containment Leak Testing	-	3	0	0	1	1	-	1	7	7	-	-	7	3	-	-	-	248	111	-
2a.1.4.18	Process Sampling	-	300	18	3	65	344	-	173	903	903	-	-	325	753	-	-	-	67,472	8,788	-
2a.1.4.19	Stator Water Cooling	-	9	0	1	35	-	-	8	53	53	-	-	176	-	-	-	-	-	282	-
2a.1.4.20	Traveling Water Screens	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	581	-
2a.1.4.21	Traversing Incore Probe	-	23	2	1	26	71	-	28	151	151	-	-	128	156	-	-	-	14,012	739	-
2a.1.4.22	Turbine & Extraction Steam	-	673	127	51	1,865	3,906	-	1,445	8,066	8,066	-	-	9,324	8,643	-	-	-	766,278	21,651	-
2a.1.4.23	Turbine Lube Oil	-	217	3	5	365	-	-	110	701	701	-	-	1,825	-	-	-	-	-	6,608	-
2a.1.4	Totals	-	5,118	503	188	7,149	14,058	-	5,936	32,951	32,858	-	93	35,745	30,835	-	-	-	2,768,050	169,428	-
2a.1.5	Scaffolding in support of decommissioning	-	711	9	3	118	26	-	203	1,070	1,070	-	-	591	82	-	-	-	7,838	25,052	-
2a.1	Subtotal Period 2a Activity Costs	424	12,539	9,502	2,232	18,550	43,660	423	27,884	115,216	115,123	-	93	92,746	68,131	4,779	804	-	6,632,664	297,124	2,877

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2a Additional Costs																					
2a.2.1	Curie Surcharge (Excluding RPV)	-	-	-	-	-	1,631	-	408	2,038	2,038	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	1,631	-	408	2,038	2,038	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Process liquid waste	31	-	10	26	-	137	-	54	258	258	-	-	-	-	214	-	-	26,932	42	-
2a.3.2	Small tool allowance	-	172	-	-	-	-	-	26	197	178	-	20	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	31	172	10	26	-	137	-	60	456	436	-	20	-	-	214	-	-	26,932	42	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	61	-	-	-	-	-	-	15	76	76	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	451	45	496	496	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	769	77	846	761	-	85	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,402	-	-	-	-	-	351	1,753	1,753	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,630	-	-	-	-	-	395	3,025	3,025	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	104	31	-	436	-	124	695	695	-	-	-	6,232	-	-	-	124,876	1,530	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	3,502	525	4,027	4,027	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	485	48	533	533	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	76	8	84	-	84	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,429	214	1,643	-	1,643	-	-	-	-	-	-	-	-	-
2a.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	52	8	60	-	60	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	2,319	352	2,701	2,701	-	-	-	-	-	-	-	-	-	92,651
2a.4.13	Utility Staff Cost	-	-	-	-	-	-	33,467	5,020	38,487	38,487	-	-	-	-	-	-	-	-	-	560,277
2a.4	Subtotal Period 2a Period-Dependent Costs	61	4,033	104	31	-	436	42,579	7,182	54,425	52,554	1,786	85	-	6,232	-	-	-	124,876	1,530	652,929
2a.0	TOTAL PERIOD 2a COST	515	16,743	9,616	2,289	16,550	45,865	43,002	35,654	172,186	170,162	1,786	197	92,746	74,363	4,993	804	-	6,784,873	288,696	655,806
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	Chilled Water - Drywell	-	262	2	6	344	-	-	118	733	733	-	-	1,722	-	-	-	-	-	7,894	-
2b.1.1.2	Cleanup Filter Demineralizer	121	142	11	2	20	270	-	168	734	734	-	-	99	616	-	-	-	52,951	7,664	-
2b.1.1.3	Condensate & Refueling Wtr Strg & Trnsfr	-	219	18	6	250	439	-	205	1,137	1,137	-	-	1,250	1,092	-	-	-	86,186	6,798	-
2b.1.1.4	Core Spray Cooling	400	376	103	22	837	2,841	-	1,068	5,146	5,146	-	-	1,685	6,215	-	-	-	557,294	14,615	-
2b.1.1.5	High Pressure Coolant Injection	405	306	56	14	225	1,858	-	785	3,650	3,650	-	-	1,126	4,064	-	-	-	364,612	11,559	-
2b.1.1.6	Reactor Core Isolation Cooling	56	81	12	3	37	361	-	146	696	696	-	-	184	790	-	-	-	70,885	3,228	-
2b.1.1.7	Reactor Water Cleanup	70	102	8	1	9	201	-	113	505	505	-	-	45	440	-	-	-	39,443	4,846	-
2b.1.1.8	Recirc Pump M/G Set Lube Oil	-	86	1	3	186	-	-	50	326	326	-	-	928	-	-	-	-	-	2,635	-
2b.1.1.9	Residual Heat Removal	1,036	634	171	40	607	5,170	-	2,083	9,742	9,742	-	-	3,037	11,309	-	-	-	1,014,361	24,663	-
2b.1.1.10	Standby Liquid Control	-	31	0	1	43	-	-	14	89	89	-	-	214	-	-	-	-	-	941	-
2b.1.1	Totals	2,088	2,240	383	97	2,058	11,141	-	4,761	22,758	22,758	-	-	10,291	24,526	-	-	-	2,185,732	84,843	-
2b.1.2	Scaffolding in support of decommissioning	-	889	12	8	148	92	-	254	1,337	1,337	-	-	739	102	-	-	-	9,173	31,327	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	3,339	1,749	489	231	2,992	5,961	-	4,130	18,892	18,892	-	-	14,959	21,740	-	-	-	1,935,619	149,340	-
2b.1.3.2	Turbine Building	692	373	77	66	188	127	-	517	2,041	2,041	-	-	941	5,461	-	-	-	542,911	30,653	-
2b.1.3	Totals	4,032	2,123	566	297	3,180	6,088	-	4,647	20,932	20,932	-	-	15,900	27,201	-	-	-	2,478,530	179,993	-
2b.1	*Subtotal Period 2b Activity Costs*	*6,120*	*5,251*	*961*	*397*	*5,386*	*17,261*	-	*9,652*	*45,028*	*45,028*	-	-	*26,930*	*51,829*	-	-	-	*4,673,434*	*296,163*	-

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2b Collateral Costs																					
2b.3.1	Process liquid waste	59	-	751	732	-	8,092	-	2,238	11,872	11,872	-	-	-	-	9,522	-	-	1,587,683	302	-
2b.3.2	Small tool allowance	-	160	-	-	-	-	-	24	184	184	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	59	160	751	732	-	8,092	-	2,262	12,056	12,056	-	-	-	-	9,522	-	-	1,587,683	302	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	899	-	-	-	-	-	-	225	1,123	1,123	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	746	75	821	821	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	1,272	127	1,399	1,399	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	1,701	-	-	-	-	-	425	2,127	2,127	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,537	-	-	-	-	-	681	5,217	5,217	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	102	31	-	430	-	122	685	685	-	-	-	6,136	-	-	-	122,959	1,507	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	4,574	686	5,261	5,261	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	720	72	792	792	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	126	13	138	-	138	-	-	-	-	-	-	-	-	-
2b.4.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	56,000	8,400	64,400	-	64,400	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	2,364	355	2,718	-	2,718	-	-	-	-	-	-	-	-	-
2b.4.12	Radwaste Processing Equipment/Services	-	-	-	-	-	-	448	67	516	516	-	-	-	-	-	-	-	-	-	-
2b.4.13	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	86	13	99	-	99	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-	-	-	-	-	-	1,681	252	1,933	1,933	-	-	-	-	-	-	-	-	-	66,300
2b.4.15	Utility Staff Cost	-	-	-	-	-	-	44,738	6,711	51,449	51,449	-	-	-	-	-	-	-	-	-	764,400
2b.4	Subtotal Period 2b Period-Dependent Costs	899	6,238	102	31	-	430	112,756	18,223	138,678	71,322	67,355	-	-	6,136	-	-	-	122,959	1,507	880,700
2b.0	TOTAL PERIOD 2b COST	7,078	11,649	1,614	1,160	5,886	25,783	112,756	30,136	195,762	128,406	67,855	-	26,930	57,965	9,522	-	-	6,384,076	297,971	830,700
PERIOD 2c - Decontamination Following Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Remove spent fuel racks	506	45	117	32	1,260	434	-	578	2,972	2,972	-	-	6,298	1,383	-	-	-	124,123	1,647	-
Disposal of Plant Systems																					
2c.1.2.1	Compressed Air	-	361	3	6	412	-	-	153	935	935	-	-	2,059	-	-	-	-	-	10,123	-
2c.1.2.2	Containment Atmosphere Control	-	184	3	6	438	-	-	113	745	745	-	-	2,191	-	-	-	-	-	5,736	-
2c.1.2.3	Cooling Water - Reactor Building	-	87	1	3	182	-	-	49	322	322	-	-	910	-	-	-	-	-	2,524	-
2c.1.2.4	Cooling Water - Turbine Building	-	87	1	2	126	-	-	41	257	257	-	-	632	-	-	-	-	-	2,463	-
2c.1.2.5	Electrical	-	352	-	-	-	-	-	64	417	-	-	417	-	-	-	-	-	-	12,503	-
2c.1.2.6	Electrical (RCA)	-	399	3	5	296	44	-	156	904	904	-	-	1,479	97	-	-	-	8,693	13,165	-
2c.1.2.7	Electrical (RCA-Clean)	-	2,451	21	41	2,802	-	-	1,041	6,356	6,356	-	-	14,010	-	-	-	-	-	72,424	-
2c.1.2.8	Fire Protection (RCA)	-	138	2	3	206	-	-	66	415	415	-	-	1,032	-	-	-	-	-	4,105	-
2c.1.2.9	Fuel Pool Cooling & Cleanup	-	251	22	6	165	592	-	238	1,273	1,273	-	-	823	1,316	-	-	-	116,158	7,788	-
2c.1.2.10	HVAC - Battery & Emergency Swgr Bldg	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	14	-
2c.1.2.11	HVAC - Drywell	-	44	4	5	339	51	-	76	519	519	-	-	1,697	111	-	-	-	9,973	1,345	-
2c.1.2.12	HVAC - Reactor Building	-	146	2	3	164	25	-	68	407	407	-	-	821	54	-	-	-	4,825	4,834	-
2c.1.2.13	HVAC - Turbine Building (Contaminated)	-	179	3	3	220	44	-	90	540	540	-	-	1,099	97	-	-	-	8,707	5,286	-
2c.1.2.14	Liquid Radwaste Collection	104	124	10	1	9	210	-	138	597	597	-	-	46	461	-	-	-	41,268	6,728	-
2c.1.2.15	Plant Heating & Auxiliary Steam (RCA)	-	107	1	2	108	-	-	43	261	261	-	-	541	-	-	-	-	-	3,884	-
2c.1.2.16	Service Water	-	36	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	1,299	-
2c.1.2.17	Service Water (RCA)	-	419	5	10	704	-	-	212	1,351	1,351	-	-	3,520	-	-	-	-	-	12,383	-
2c.1.2.18	Solid Radwaste Process & Disposal	-	153	17	4	77	407	-	154	812	812	-	-	387	1,031	-	-	-	79,937	4,614	-
2c.1.2.19	Ventilation Radiation Monitoring	-	9	0	0	5	9	-	6	29	29	-	-	23	20	-	-	-	1,811	269	-
2c.1.2	Totals	104	5,538	99	100	6,254	1,383	-	2,705	16,183	15,725	-	458	31,271	3,187	-	-	-	271,862	169,005	-
Decontamination of Site Buildings																					
2c.1.3.1	Reactor (post fuel)	399	582	105	82	82	1,322	-	711	3,283	3,283	-	-	408	7,547	-	-	-	710,620	28,309	-
2c.1.3	Totals	399	582	105	82	82	1,322	-	711	3,283	3,283	-	-	408	7,547	-	-	-	710,620	28,309	-

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
2c.1.4	Scaffolding in support of decommissioning	-	178	2	1	30	6	-	51	267	267	-	-	148	20	-	-	-	1,835	6,265	-
2c.1	Subtotal Period 2c Activity Costs	1,009	6,342	826	214	7,625	3,146	-	4,045	22,705	22,247	-	458	38,124	12,138	-	-	-	1,107,940	205,125	-
	Period 2c Collateral Costs																				
2c.3.1	Process liquid waste	81	-	31	74	-	418	-	159	784	764	-	-	-	-	636	-	-	81,917	118	-
2c.3.2	Small tool allowance	-	116	-	-	-	-	-	17	133	133	-	-	-	-	-	-	-	-	-	-
2c.3.3	Decommissioning Equipment Disposition	-	-	43	12	540	117	-	116	829	829	-	-	2,700	373	-	-	-	33,507	739	-
2c.3	Subtotal Period 2c Collateral Costs	81	116	74	87	540	535	-	293	1,726	1,726	-	-	2,700	373	636	-	-	115,424	857	-
	Period 2c Period-Dependent Costs																				
2c.4.1	Decon supplies	124	-	-	-	-	-	-	31	154	154	-	-	-	-	-	-	-	-	-	-
2c.4.2	Insurance	-	-	-	-	-	-	193	19	213	213	-	-	-	-	-	-	-	-	-	-
2c.4.3	Property taxes	-	-	-	-	-	-	495	49	544	544	-	-	-	-	-	-	-	-	-	-
2c.4.4	Health physics supplies	-	949	-	-	-	-	-	237	1,186	1,186	-	-	-	-	-	-	-	-	-	-
2c.4.5	Heavy equipment rental	-	1,765	-	-	-	-	-	265	2,030	2,030	-	-	-	-	-	-	-	-	-	-
2c.4.6	Disposal of DAW generated	-	-	71	21	-	300	-	85	478	478	-	-	-	4,284	-	-	-	85,848	1,052	-
2c.4.7	Plant energy budget	-	-	-	-	-	-	949	142	1,091	1,091	-	-	-	-	-	-	-	-	-	-
2c.4.8	NRC Fees	-	-	-	-	-	-	356	36	392	392	-	-	-	-	-	-	-	-	-	-
2c.4.9	Emergency Planning Fees	-	-	-	-	-	-	49	5	54	-	54	-	-	-	-	-	-	-	-	-
2c.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	349	52	401	401	-	-	-	-	-	-	-	-	-	-
2c.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	33	5	38	-	38	-	-	-	-	-	-	-	-	-
2c.4.12	Security Staff Cost	-	-	-	-	-	-	654	98	752	752	-	-	-	-	-	-	-	-	-	25,791
2c.4.13	Utility Staff Cost	-	-	-	-	-	-	14,169	2,125	16,294	16,294	-	-	-	-	-	-	-	-	-	244,766
2c.4	Subtotal Period 2c Period-Dependent Costs	124	2,714	71	21	-	300	17,247	3,151	23,628	23,536	92	-	-	4,284	-	-	-	85,848	1,052	270,557
2c.0	TOTAL PERIOD 2c COST	1,214	9,172	470	322	8,165	3,980	17,247	7,489	48,060	47,509	92	458	40,824	16,795	636	-	-	1,309,212	207,035	270,557
	PERIOD 2d - Delay before License Termination																				
	Period 2d Direct Decommissioning Activities																				
	No direct activities in this period																				
	Period 2d Period-Dependent Costs																				
2d.4.1	Insurance	-	-	-	-	-	-	73	7	81	81	-	-	-	-	-	-	-	-	-	-
2d.4.2	Property taxes	-	-	-	-	-	-	376	38	414	414	-	-	-	-	-	-	-	-	-	-
2d.4.3	Health physics supplies	-	56	-	-	-	-	-	14	70	70	-	-	-	-	-	-	-	-	-	-
2d.4.4	Disposal of DAW generated	-	-	2	0	-	7	-	2	11	11	-	-	-	98	-	-	-	1,971	24	-
2d.4.5	Plant energy budget	-	-	-	-	-	-	361	54	415	415	-	-	-	-	-	-	-	-	-	-
2d.4.6	NRC Fees	-	-	-	-	-	-	301	30	331	331	-	-	-	-	-	-	-	-	-	-
2d.4.7	Emergency Planning Fees	-	-	-	-	-	-	37	4	41	-	41	-	-	-	-	-	-	-	-	-
2d.4.8	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	25	4	29	-	29	-	-	-	-	-	-	-	-	-
2d.4.9	Security Staff Cost	-	-	-	-	-	-	351	53	403	403	-	-	-	-	-	-	-	-	-	13,834
2d.4.10	Utility Staff Cost	-	-	-	-	-	-	1,355	203	1,558	1,558	-	-	-	-	-	-	-	-	-	21,904
2d.4	Subtotal Period 2d Period-Dependent Costs	-	56	2	0	-	7	2,879	408	3,352	3,282	70	-	-	98	-	-	-	1,971	24	35,739
2d.0	TOTAL PERIOD 2d COST	-	56	2	0	-	7	2,879	408	3,352	3,282	70	-	-	98	-	-	-	1,971	24	35,739
	PERIOD 2e - License Termination																				
	Period 2e Direct Decommissioning Activities																				
2e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	118	36	154	154	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	118	36	154	154	-	-	-	-	-	-	-	-	-	-

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2e Additional Costs																					
2e.2.1	Final Site Survey	-	-	-	-	-	-	3,879	582	4,460	4,460	-	-	-	-	-	-	-	-	110,544	-
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	3,879	582	4,460	4,460	-	-	-	-	-	-	-	-	110,544	-
Period 2e Period-Dependent Costs																					
2e.4.1	Insurance	-	-	-	-	-	-	75	8	83	83	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	386	39	424	424	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	581	-	-	-	-	-	145	727	727	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	7	2	-	28	-	8	45	45	-	-	-	404	-	-	-	8,088	99	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	370	55	425	425	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	305	31	336	336	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	38	4	42	-	42	-	-	-	-	-	-	-	-	-
2e.4.8	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	-
2e.4.9	Security Staff Cost	-	-	-	-	-	-	360	54	414	414	-	-	-	-	-	-	-	-	-	14,194
2e.4.10	Utility Staff Cost	-	-	-	-	-	-	7,709	1,156	8,865	8,865	-	-	-	-	-	-	-	-	-	132,480
2e.4	Subtotal Period 2e Period-Dependent Costs	-	581	7	2	-	28	9,269	1,504	11,391	11,319	72	-	-	404	-	-	-	8,088	99	146,674
2e.0	TOTAL PERIOD 2e COST	-	581	7	2	-	28	13,266	2,121	16,005	15,934	72	-	-	404	-	-	-	8,088	110,643	146,674
PERIOD 2 TOTALS		8,806	38,203	11,909	3,774	32,101	78,663	189,150	75,708	435,314	365,283	69,378	656	160,500	149,625	15,151	804	-	14,487,720	914,869	1,939,476
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	5,903	-	-	-	-	-	885	6,788	1,018	-	5,770	-	-	-	-	-	-	109,307	-
3b.1.1.2	Switchgear Building & Transformer Yard	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	1,263	-
3b.1.1.3	Turbine Building	-	3,582	-	-	-	-	-	537	4,120	412	-	3,708	-	-	-	-	-	-	72,947	-
3b.1.1.4	Turbine Pedestal	-	940	-	-	-	-	-	141	1,081	-	-	1,081	-	-	-	-	-	-	15,197	-
3b.1.1	Totals	-	10,483	-	-	-	-	-	1,572	12,060	1,430	-	10,626	-	-	-	-	-	-	198,714	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	113	17	130	130	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	10,483	-	-	-	-	113	1,589	12,186	1,560	-	10,626	-	-	-	-	-	-	198,714	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	-	-	-	-	-	322	48	370	-	-	370	-	-	-	-	-	-	2,320	-
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	322	48	370	-	-	370	-	-	-	-	-	-	2,320	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	205	21	226	0	203	23	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,051	105	1,156	-	-	1,156	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,076	-	-	-	-	-	761	5,837	-	-	5,837	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	504	76	580	-	290	290	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	246	25	271	-	271	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	104	10	114	-	114	-	-	-	-	-	-	-	-	-
3b.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	71	11	82	-	82	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	981	147	1,128	-	756	372	-	-	-	-	-	-	-	38,674
3b.4.9	Utility Staff Cost	-	-	-	-	-	-	6,043	906	6,950	-	3,475	3,475	-	-	-	-	-	-	-	95,611
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,076	-	-	-	-	9,205	2,062	16,842	0	5,190	11,152	-	-	-	-	-	-	-	134,286

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
3b.0	TOTAL PERIOD 3b COST	-	15,659	-	-	-	-	9,640	3,714	29,013	1,560	5,190	22,263	-	-	-	-	-	-	201,034	135,846
	PERIOD 3c - Fuel Storage Operations/Shipping																				
	Period 3c Direct Decommissioning Activities																				
	No direct activities in this period																				
	Period 3c Period-Dependent Costs																				
3c.4.1	Insurance	-	-	-	-	-	-	1,627	163	1,790	-	1,790	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	8,333	833	9,166	-	9,166	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	999	150	1,149	-	1,149	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	1,951	195	2,146	-	2,146	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	824	82	907	-	907	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	3,935	590	4,525	-	4,525	-	-	-	-	-	-	-	-	-
3c.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	563	84	647	-	647	-	-	-	-	-	-	-	-	-
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4	*Subtotal Period 3c Period-Dependent Costs*	-	-	-	-	-	-	18,231	2,098	20,329	-	20,329	-	-	-	-	-	-	-	-	-
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	18,231	2,098	20,329	-	20,329	-	-	-	-	-	-	-	-	-
	PERIOD 3d - GTCC shipping																				
	Period 3d Direct Decommissioning Activities																				
	Nuclear Steam Supply System Removal																				
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	-	-	-	11,819	-	1,773	13,592	13,592	-	-	-	-	-	-	748	-	-	-
3d.1.1	Totals	-	-	-	-	-	11,819	-	1,773	13,592	13,592	-	-	-	-	-	-	748	-	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	-	-	-	11,819	-	1,773	13,592	13,592	-	-	-	-	-	-	748	-	-	-
	Period 3d Period-Dependent Costs																				
3d.4.1	Insurance	-	-	-	-	-	-	5	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.2	*Property taxes*	-	-	-	-	-	-	24	2	26	-	26	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	3	0	3	-	3	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	6	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	2	0	3	-	3	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	183	27	210	-	210	-	-	-	-	-	-	-	-	-
3d.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	224	32	256	-	256	-	-	-	-	-	-	-	-	-
3d.0	TOTAL PERIOD 3d COST	-	-	-	-	-	11,819	224	1,805	13,847	13,692	256	-	-	-	-	-	748	-	-	-
	PERIOD 3 TOTALS	-	15,659	-	-	-	11,819	28,095	7,617	63,189	15,152	25,775	22,263	-	-	-	-	748	-	201,034	135,846
	TOTAL COST TO DECOMMISSION	9,994	55,723	12,130	3,980	32,101	89,776	289,913	95,372	588,990	468,664	98,937	23,489	160,500	150,445	17,783	804	748	14,942,980	1,116,755	2,937,735

TABLE C-1
PEACH BOTTOM ATOMIC POWER STATION - UNIT 2
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours

TOTAL COST TO DECOMMISSION WITH 18.32% CONTINGENCY:	$588,990	thousands of 2002 dollars
TOTAL NRC LICENSE TERMINATION COST IS 79.58% OR	$466,564	thousands of 2002 dollars
SPENT FUEL MANAGEMENT COST IS 16.46% OR:	$96,937	thousands of 2002 dollars
NON-NUCLEAR DEMOLITION COST IS 3.99% OR:	$23,489	thousands of 2002 dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	96,468	cubic feet
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	72,563	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	748	cubic feet
TOTAL SCRAP METAL REMOVED:	31,767	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,116,755	man-hours

End Notes:
n/a - indicates that this activity not charged as decommissioning expense.
a - indicates that this activity performed by decommissioning staff.
0 - indicates that this value is less than 0.5 but is non-zero.
a cell containing " - " indicates a zero value

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	39	6	45	45	-	-	-	-	-	-	-	-	-	1,300
1a.1.2	Notification of Cessation of Operations									a											
1a.1.3	Remove fuel & source material									n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	61	9	70	70	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	140	21	161	161	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	30	5	35	35	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	30	5	35	35	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	39	6	45	45	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	7,600
1a.1.13	Perform SER and EA	-	-	-	-	-	-	94	14	108	108	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	152	23	175	175	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	124	19	143	143	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	149	22	172	153	-	17	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	127	19	145	131	-	15	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	15	2	17	17	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	216	32	248	248	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	197	30	227	227	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	15	2	17	17	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	30	5	35	35	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	49	7	56	28	-	28	-	-	-	-	-	-	-	1,600
1a.1.17.9	Turbine & condenser	-	-	-	-	-	-	127	19	145	145	-	-	-	-	-	-	-	-	-	4,167
1a.1.17.10	Pressure suppression structure	-	-	-	-	-	-	61	9	70	70	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.11	Drywell	-	-	-	-	-	-	49	7	56	56	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.12	Plant structures & buildings	-	-	-	-	-	-	95	14	109	54	-	54	-	-	-	-	-	-	-	3,120
1a.1.17.13	Waste management	-	-	-	-	-	-	140	21	161	161	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.14	Facility & site closeout	-	-	-	-	-	-	27	4	31	16	-	16	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	1,296	194	1,490	1,360	-	130	-	-	-	-	-	-	-	42,674
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,304	346	2,650	2,650	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	43	6	49	49	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	1,950	293	2,243	2,243	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	37	6	43	43	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	6,640	996	7,637	7,607	-	130	-	-	-	-	-	-	-	78,600
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,306	131	1,437	1,437	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	515	52	567	567	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	346	-	-	-	-	-	87	433	433	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	326	-	-	-	-	-	49	375	375	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	10	3	-	42	-	13	68	68	-	-	-	605	-	-	-	12,124	149	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,473	371	2,844	2,844	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	304	30	334	334	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	51	5	56	-	56	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	958	144	1,102	-	1,102	-	-	-	-	-	-	-	-	-
1a.4.10	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	35	5	40	-	40	-	-	-	-	-	-	-	-	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1a Period-Dependent Costs (continued)																					
1a.4.11	Security Staff Cost	-	-	-	-	-	-	695	104	799	799	-	-	-	-	-	-	-	-	-	27,411
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	17,493	2,624	20,117	20,117	-	-	-	-	-	-	-	-	-	299,417
1a.4	Subtotal Period 1a Period-Dependent Costs	-	672	10	3	-	42	23,831	3,613	28,173	26,974	1,198	-	-	605	-	-	-	12,124	149	326,829
1a.0	TOTAL PERIOD 1a COST	-	672	10	3	-	42	30,472	4,609	35,809	34,481	1,198	130	-	605	-	-	-	12,124	149	405,426
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	144	22	166	149	-	17	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	30	5	35	35	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	121	18	140	140	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	41	6	47	12	-	35	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	30	5	35	35	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	30	5	35	35	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	2	0	2	2	-	-	-	-	-	-	-	-	-	61
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	110	17	127	127	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	36	5	42	21	-	21	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	36	5	42	42	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	30	5	35	17	-	17	-	-	-	-	-	-	-	1,000
1b.1.1.12	Turbine & condensers	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	4,167
1b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	61	9	70	70	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.14	Radwaste building	-	-	-	-	-	-	83	12	95	86	-	10	-	-	-	-	-	-	-	2,730
1b.1.1.15	Reactor building	-	-	-	-	-	-	83	12	95	86	-	10	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	965	145	1,110	1,001	-	109	-	-	-	-	-	-	-	31,801
1b.1.2	Decon NSSS	492	-	-	-	-	-	-	246	737	737	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	492	-	-	-	-	-	965	391	1,848	1,738	-	109	-	-	-	-	-	-	1,067	31,801
Period 1b Additional Costs																					
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	5,252	788	6,040	6,040	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	923	138	1,062	1,062	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	6,176	926	7,102	7,102	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	658	-	-	-	-	-	-	99	757	757	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process liquid waste	39	-	215	221	-	2,334	-	657	3,465	3,465	-	-	-	-	2,783	-	-	457,832	113	-
1b.3.3	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
1b.3.4	Pipe cutting equipment	-	911	-	-	-	-	-	137	1,048	1,048	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	697	912	215	221	-	2,334	-	893	5,271	5,271	-	-	-	-	2,783	-	-	457,832	113	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	20	-	-	-	-	-	-	5	25	25	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	651	65	717	717	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	257	26	283	283	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	176	-	-	-	-	-	44	220	220	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	163	-	-	-	-	-	24	187	187	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	5	2	-	22	-	6	36	36	-	-	-	318	-	-	-	6,377	78	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,467	370	2,836	2,836	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	183	18	201	201	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	25	3	28	-	28	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	478	72	550	-	550	-	-	-	-	-	-	-	-	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 1b Period-Dependant Costs (continued)																				
1b.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	17	3	20	-	20	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	347	52	399	399	-	-	-	-	-	-	-	-	-	13,669
1b.4.13	Utility Staff Cost	-	-	-	-	-	-	8,723	1,308	10,031	10,031	-	-	-	-	-	-	-	-	-	149,303
1b.4	Subtotal Period 1b Period-Dependent Costs	20	339	5	2	-	22	13,148	1,996	15,533	14,935	598	-	-	318	-	-	-	6,377	78	162,971
1b.0	TOTAL PERIOD 1b COST	1,209	1,251	220	222	-	2,356	20,289	4,206	29,753	29,046	598	109	-	318	2,783	-	-	464,209	1,258	194,772
	PERIOD 1 TOTALS	1,209	1,923	230	225	-	2,898	50,761	8,816	65,662	63,527	1,796	239	-	923	2,783	-	-	476,333	1,407	600,200
	PERIOD 2a - Large Component Removal																				
	Period 2a Direct Decommissioning Activities																				
	Nuclear Steam Supply System Removal																				
2a.1.1.1	Recirculation System Piping & Valves	62	49	16	11	-	572	-	190	900	900	-	-	-	1,227	-	-	-	112,271	3,350	-
2a.1.1.2	Recirculation Pumps & Motors	26	28	12	11	30	765	-	219	1,092	1,092	-	-	146	1,442	-	-	-	150,250	1,763	-
2a.1.1.3	CRDMs & NIs Removal	138	108	297	43	-	705	-	308	1,598	1,598	-	-	-	5,179	-	-	-	138,258	6,971	-
2a.1.1.4	Reactor Vessel Internals	137	1,851	6,083	1,212	-	12,569	212	8,596	31,659	31,659	-	-	-	761	2,526	804	-	453,410	32,665	1,439
2a.1.1.5	Reactor Vessel	61	3,574	1,543	425	-	9,350	212	7,909	23,074	23,074	-	-	-	10,735	2,254	-	-	1,408,631	32,665	1,439
2a.1.1	Totals	424	5,608	7,951	1,702	30	23,962	423	18,222	58,823	58,323	-	-	146	19,331	4,779	804	-	2,262,849	77,394	2,877
	Removal of Major Equipment																				
2a.1.2	Main Turbine/Generator	-	311	562	198	5,655	3,684	-	1,933	12,343	12,343	-	-	28,275	11,732	-	-	-	1,052,676	9,753	-
2a.1.3	Main Condensers	-	793	477	142	5,698	1,931	-	1,590	10,630	10,630	-	-	27,989	6,148	-	-	-	551,650	25,487	-
	Disposal of Plant Systems																				
2a.1.4.1	Air Ejection & Offgas	-	199	10	5	222	250	-	147	834	834	-	-	1,112	548	-	-	-	49,068	6,219	-
2a.1.4.2	Circulating Water	-	20	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	652	-
2a.1.4.3	Circulating Water (RCA)	-	52	2	3	202	-	-	44	302	302	-	-	1,008	-	-	-	-	-	1,517	-
2a.1.4.4	Condensate	-	387	82	24	702	2,347	-	801	4,343	4,343	-	-	3,510	5,136	-	-	-	460,503	12,429	-
2a.1.4.5	Condensate Filter Demineralizer	-	505	29	11	309	1,062	-	444	2,370	2,370	-	-	1,545	2,388	-	-	-	208,271	15,655	-
2a.1.4.6	Control Rod Drive Hydraulic	-	600	40	8	190	922	-	414	2,173	2,173	-	-	948	2,018	-	-	-	180,812	17,902	-
2a.1.4.7	Cooling Towers	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	743	-
2a.1.4.8	Electrohydraulic Control	-	41	1	1	81	-	-	23	147	147	-	-	406	-	-	-	-	-	1,231	-
2a.1.4.9	Emergency & HP Service Water	-	69	-	-	-	-	-	10	79	-	-	79	-	-	-	-	-	-	2,462	-
2a.1.4.10	Emergency & HP Service Water (RCA)	-	242	4	7	476	-	-	133	861	861	-	-	2,379	-	-	-	-	-	7,114	-
2a.1.4.11	Emergency Cooling Water & Tower	-	108	-	-	-	-	-	16	125	-	-	125	-	-	-	-	-	-	4,020	-
2a.1.4.12	Feedwater & Feed Pumps	-	603	76	24	724	2,262	-	836	4,525	4,525	-	-	3,620	4,963	-	-	-	443,828	19,179	-
2a.1.4.13	Feedwater Heater Vents & Drains	-	514	54	20	675	1,682	-	659	3,604	3,604	-	-	3,375	3,679	-	-	-	330,052	16,282	-
2a.1.4.14	Generator Hydrogen & Carbon Dioxide	-	24	0	1	41	-	-	12	78	78	-	-	203	-	-	-	-	-	721	-
2a.1.4.15	Instrument Nitrogen	-	21	0	1	53	-	-	13	88	88	-	-	264	-	-	-	-	-	600	-
2a.1.4.16	Main Steam & Bypass & Crossaround	-	456	36	20	955	977	-	508	2,952	2,952	-	-	4,775	2,136	-	-	-	191,636	14,603	-
2a.1.4.17	Offgas Recombiner	-	152	9	3	127	244	-	119	655	655	-	-	636	535	-	-	-	47,844	4,620	-
2a.1.4.18	Post Accident Sampling	-	14	0	0	2	8	-	6	30	30	-	-	12	17	-	-	-	1,504	447	-
2a.1.4.19	Primary Containment Leak Testing	-	4	0	0	3	2	-	2	11	11	-	-	14	4	-	-	-	337	140	-
2a.1.4.20	Process Sampling	-	313	19	3	71	349	-	178	932	932	-	-	353	764	-	-	-	68,423	9,185	-
2a.1.4.21	Stator Water Cooling	-	9	0	1	35	-	-	8	53	53	-	-	176	-	-	-	-	-	282	-
2a.1.4.22	Traveling Water Screens	-	26	-	-	-	-	-	4	30	-	-	30	-	-	-	-	-	-	935	-
2a.1.4.23	Traversing Incore Probe	-	23	2	1	26	71	-	28	151	151	-	-	128	156	-	-	-	14,012	739	-
2a.1.4.24	Turbine & Extraction Steam	-	673	127	51	1,865	3,906	-	1,445	8,066	8,066	-	-	9,324	8,543	-	-	-	766,273	21,651	-
2a.1.4.25	Turbine Lube Oil	-	223	3	5	369	-	-	112	711	711	-	-	1,843	-	-	-	-	-	6,766	-
2a.1.4	Totals	-	6,801	504	188	7,126	14,031	-	5,969	33,169	32,888	-	281	35,682	30,886	-	-	-	2,762,580	160,052	-
2a.1.5	Scaffolding in support of decommissioning	-	1,011	13	4	169	37	-	289	1,523	1,523	-	-	845	117	-	-	-	10,491	35,612	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
2a.1	Subtotal Period 2a Activity Costs	424	13,024	9,607	2,233	18,579	43,695	423	28,003	115,887	115,606	-	281	92,887	68,217	4,779	804	-	6,640,246	314,298	2,877
	Period 2a Additional Costs																				
2a.2.1	Curie Surcharge (Excluding RPV)	-	-	-	-	-	1,631	-	408	2,038	2,038	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	1,631	-	408	2,038	2,038	-	-	-	-	-	-	-	-	-	-
	Period 2a Collateral Costs																				
2a.3.1	Process liquid waste	64	-	21	54	-	291	-	115	547	547	-	-	-	-	453	-	-	57,160	89	-
2a.3.2	Small tool allowance	-	180	-	-	-	-	-	27	207	186	-	21	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	64	180	21	54	-	291	-	142	754	733	-	21	-	-	453	-	-	57,160	89	-
	Period 2a Period-Dependent Costs																				
2a.4.1	Decon supplies	82	-	-	-	-	-	-	21	103	103	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	614	61	675	675	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	1,047	105	1,152	1,036	-	116	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,699	-	-	-	-	-	425	2,124	2,124	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,582	-	-	-	-	-	537	4,119	4,119	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	118	35	-	495	-	141	789	789	-	-	-	7,075	-	-	-	141,770	1,737	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	4,769	715	5,485	5,485	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	615	61	676	676	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	104	10	114	-	114	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,945	292	2,237	-	2,237	-	-	-	-	-	-	-	-	-
2a.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	71	11	81	-	81	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	3,825	574	4,399	4,399	-	-	-	-	-	-	-	-	-	150,870
2a.4.13	Utility Staff Cost	-	-	-	-	-	-	49,813	7,476	57,320	57,320	-	-	-	-	-	-	-	-	-	826,040
2a.4	Subtotal Period 2a Period-Dependent Costs	82	5,281	118	35	-	495	62,833	10,430	79,275	76,727	2,432	115	-	7,075	-	-	-	141,770	1,737	976,910
2a.0	TOTAL PERIOD 2a COST	571	18,485	9,646	2,323	18,579	46,112	63,256	38,982	197,954	195,105	2,432	417	92,887	75,291	5,233	804	-	6,839,176	316,124	979,787
	PERIOD 2b - Site Decontamination																				
	Period 2b Direct Decommissioning Activities																				
	Disposal of Plant Systems																				
2b.1.1.1	Chilled Water - Drywell	-	262	2	6	344	-	-	118	733	733	-	-	1,722	-	-	-	-	-	7,894	-
2b.1.1.2	Cleanup Filter Demineralizer	121	142	11	2	20	270	-	168	734	734	-	-	99	616	-	-	-	52,951	7,664	-
2b.1.1.3	Condensate & Refueling Wtr Strg & Trnsfr	-	940	74	26	1,207	1,772	-	871	4,893	4,893	-	-	6,036	4,608	-	-	-	347,750	29,457	-
2b.1.1.4	Core Spray Cooling	400	376	103	22	337	2,841	-	1,068	5,146	5,146	-	-	1,635	6,215	-	-	-	557,294	14,615	-
2b.1.1.5	High Pressure Coolant Injection	405	306	56	14	225	1,858	-	785	3,650	3,650	-	-	1,120	4,064	-	-	-	364,612	11,659	-
2b.1.1.6	Reactor Core Isolation Cooling	56	81	12	3	37	361	-	146	696	696	-	-	184	790	-	-	-	70,885	3,228	-
2b.1.1.7	Reactor Water Cleanup	70	102	8	1	9	201	-	113	505	505	-	-	45	440	-	-	-	39,443	4,846	-
2b.1.1.8	Recirc Pump M/G Set Lube Oil	-	86	1	3	186	-	-	50	326	326	-	-	928	-	-	-	-	-	2,635	-
2b.1.1.9	Residual Heat Removal	1,036	634	171	40	607	5,170	-	2,083	9,742	9,742	-	-	3,037	11,309	-	-	-	1,014,361	24,663	-
2b.1.1.10	Standby Liquid Control	-	22	0	1	43	-	-	13	78	78	-	-	214	-	-	-	-	-	645	-
2b.1.1	Totals	2,098	2,953	439	119	3,015	12,474	-	5,415	26,503	26,503	-	-	15,077	28,042	-	-	-	2,447,296	107,207	-
2b.1.2	Scaffolding in support of decommissioning	-	1,263	17	6	211	46	-	361	1,903	1,903	-	-	1,057	146	-	-	-	13,113	44,615	-
	Decontamination of Site Buildings																				
2b.1.3.1	Reactor Building	5,939	1,749	439	231	2,992	5,961	-	4,180	18,892	18,892	-	-	14,959	21,740	-	-	-	1,935,619	149,340	-
2b.1.3.2	Administration Buildings	36	1	0	0	-	0	-	18	56	56	-	-	-	11	-	-	-	1,122	1,160	-
2b.1.3.3	Low Level Radwaste Storage Building	127	76	15	13	47	26	-	100	404	404	-	-	237	1,056	-	-	-	104,363	5,823	-
2b.1.3.4	Offgas Filter Building	4	3	0	0	2	1	-	3	13	13	-	-	8	23	-	-	-	2,224	207	-
2b.1.3.5	Radwaste Building	385	240	41	33	56	146	-	307	1,209	1,209	-	-	279	2,931	-	-	-	279,157	18,140	-
2b.1.3.6	Radwaste Building Extension	89	61	13	10	33	77	-	87	371	371	-	-	167	966	-	-	-	85,822	4,339	-
2b.1.3.7	Recombiner Building	47	24	5	4	8	8	-	34	130	130	-	-	40	366	-	-	-	36,436	2,032	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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: Class A Cu. Feet	Burial Volumes: Class B Cu. Feet	Burial Volumes: Class C Cu. Feet	Burial Volumes: GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Decontamination of Site Buildings (continued)																					
2b.1.3.8	Basin Dewatering Facility	10	6	1	1	4	2	-	8	31	31	-	-	20	78	-	-	-	7,723	446	-
2b.1.3.9	Stack	5	3	1	1	2	1	-	4	16	16	-	-	8	42	-	-	-	4,113	243	-
2b.1.3.10	Turbine Building	692	373	77	66	188	127	-	517	2,041	2,041	-	-	941	5,461	-	-	-	542,911	30,653	-
2b.1.3	Totals	4,735	2,637	643	360	3,332	6,319	-	5,207	23,162	23,162	-	-	16,658	32,674	-	-	-	3,000,490	212,383	-
2b.1	Subtotal Period 2b Activity Costs	6,823	6,753	1,099	483	6,558	18,869	-	10,983	51,569	51,569	-	-	32,791	60,862	-	-	-	5,460,900	364,104	-
Period 2b Collateral Costs																					
2b.3.1	Process liquid waste	97	-	764	765	-	8,268	-	2,307	12,200	12,200	-	-	-	-	9,795	-	-	1,622,091	856	-
2b.3.2	Small tool allowance	-	195	-	-	-	-	-	29	224	224	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	97	195	764	765	-	8,268	-	2,336	12,424	12,424	-	-	-	-	9,795	-	-	1,622,091	856	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,273	-	-	-	-	-	-	318	1,592	1,592	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	581	58	639	639	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	991	99	1,090	1,090	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	1,820	-	-	-	-	-	455	2,276	2,276	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	3,536	-	-	-	-	-	530	4,065	4,065	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	120	36	-	505	-	144	806	806	-	-	-	7,221	-	-	-	144,708	1,773	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	3,664	535	4,099	4,099	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	589	59	648	648	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	98	10	108	-	108	-	-	-	-	-	-	-	-	-
2b.4.10	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	56,000	8,400	64,400	-	64,400	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,842	276	2,118	-	2,118	-	-	-	-	-	-	-	-	-
2b.4.12	Radwaste Processing Equipment/Services	-	-	-	-	-	-	349	52	402	402	-	-	-	-	-	-	-	-	-	-
2b.4.13	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	67	10	77	-	77	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-	-	-	-	-	-	2,902	435	3,337	3,337	-	-	-	-	-	-	-	-	-	114,453
2b.4.16	Utility Staff Cost	-	-	-	-	-	-	46,183	6,927	53,111	53,111	-	-	-	-	-	-	-	-	-	765,720
2b.4	Subtotal Period 2b Period-Dependent Costs	1,273	5,355	120	36	-	505	113,166	18,309	138,766	72,063	66,703	-	-	7,221	-	-	-	144,708	1,773	880,173
2b.0	TOTAL PERIOD 2b COST	8,193	12,303	1,983	1,284	6,558	27,642	113,166	31,628	202,759	136,056	66,703	-	32,791	68,084	9,795	-	-	7,227,698	366,233	880,173
PERIOD 2c - Decontamination Following Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Remove spent fuel racks	606	45	117	32	1,260	434	-	578	2,972	2,972	-	-	6,298	1,363	-	-	-	124,123	1,547	-
Disposal of Plant Systems																					
2c.1.2.1	Auxiliary Boiler Fuel Oil	-	35	-	-	-	-	-	6	40	-	-	40	-	-	-	-	-	-	1,216	-
2c.1.2.2	Auxiliary Steam	-	239	2	4	267	-	-	101	613	613	-	-	1,337	-	-	-	-	-	6,998	-
2c.1.2.3	Breathing Air	-	116	1	1	79	-	-	41	238	238	-	-	896	-	-	-	-	-	3,245	-
2c.1.2.4	Compressed Air	-	426	4	8	517	-	-	185	1,139	1,139	-	-	2,683	-	-	-	-	-	12,066	-
2c.1.2.5	Containment Atmosphere Control	-	237	4	8	522	-	-	139	909	909	-	-	2,608	-	-	-	-	-	7,359	-
2c.1.2.6	Containment Atmosphere Dilution	-	40	0	1	55	-	-	18	114	114	-	-	275	-	-	-	-	-	1,185	-
2c.1.2.7	Control & Admin Cooling & Heating	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	2,505	-
2c.1.2.8	Cooling Water - Reactor Building	-	87	1	3	182	-	-	49	322	322	-	-	910	-	-	-	-	-	2,524	-
2c.1.2.9	Cooling Water - Turbine Building	-	88	1	2	128	-	-	42	260	260	-	-	640	-	-	-	-	-	2,502	-
2c.1.2.10	Diesel Generator & Auxiliaries	-	152	-	-	-	-	-	23	174	-	-	174	-	-	-	-	-	-	5,311	-
2c.1.2.11	Electrical	-	1,188	-	-	-	-	-	178	1,366	-	-	1,366	-	-	-	-	-	-	41,246	-
2c.1.2.12	Electrical (RCA)	-	565	5	6	409	61	-	219	1,265	1,265	-	-	2,044	134	-	-	-	12,018	17,184	-
2c.1.2.13	Electrical (RCA-Clean)	-	3,466	29	57	3,874	-	-	1,459	8,884	8,884	-	-	19,368	-	-	-	-	-	102,099	-
2c.1.2.14	Fire Protection	-	96	-	-	-	-	-	14	111	-	-	111	-	-	-	-	-	-	3,550	-
2c.1.2.15	Fire Protection (RCA)	-	225	2	4	296	-	-	101	628	628	-	-	1,479	-	-	-	-	-	6,510	-
2c.1.2.16	Fuel Pool Cooling & Cleanup	-	268	23	6	170	632	-	254	1,353	1,353	-	-	850	1,404	-	-	-	123,996	8,325	-
2c.1.2.17	Fuel Pool Filter Demineralizer	-	159	12	3	51	304	-	125	654	654	-	-	253	676	-	-	-	59,699	4,794	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2c.1.2.18	HVAC - Administration Facility	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	226	-
2c.1.2.19	HVAC - Auxiliary Boiler Building	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	25	-
2c.1.2.20	HVAC - *Battery & Emergency Swgr Bldg*	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	117	-
2c.1.2.21	HVAC - Diesel Generator Building	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	85	-
2c.1.2.22	HVAC - Drywell	-	44	4	5	339	61	-	76	519	519	-	-	1,697	111	-	-	-	9,973	1,345	-
2c.1.2.23	HVAC - Maintenance Hot Shop	-	12	0	0	12	2	-	6	31	31	-	-	62	4	-	-	-	362	356	-
2c.1.2.24	HVAC - Miscellaneous	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	107	-
2c.1.2.25	HVAC - Pump Structure	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	193	-
2c.1.2.26	HVAC - Radwaste Building	-	103	1	1	95	15	-	44	259	259	-	-	475	32	-	-	-	2,889	8,037	-
2c.1.2.27	HVAC - Radwaste Storage Facility	-	72	1	1	68	10	-	31	182	182	-	-	338	23	-	-	-	1,958	1,988	-
2c.1.2.28	HVAC - Reactor Building	-	157	2	8	174	26	-	72	434	434	-	-	869	57	-	-	-	5,107	4,677	-
2c.1.2.29	HVAC - Recombiner Building	-	30	0	0	25	4	-	12	73	73	-	-	132	9	-	-	-	778	906	-
2c.1.2.30	HVAC - Turbine Building (Clean)	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	459	-
2c.1.2.31	HVAC - Turbine Building (Contaminated)	-	160	3	3	220	44	-	90	541	541	-	-	1,101	97	-	-	-	8,717	5,301	-
2c.1.2.32	Hypochlorite	-	17	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	646	-
2c.1.2.33	Liquid Radwaste Collection	243	269	27	6	135	614	-	366	1,660	1,660	-	-	675	1,016	-	-	-	120,492	15,072	-
2c.1.2.34	Liquid Radwaste Process & Disposal	363	410	36	8	169	921	-	542	2,438	2,438	-	-	794	2,339	-	-	-	160,624	22,404	-
2c.1.2.35	Makeup Demineralizer	-	69	-	-	-	-	-	10	79	-	-	79	-	-	-	-	-	-	2,521	-
2c.1.2.36	Plant Heating & Auxiliary Steam	-	28	-	-	-	-	-	4	32	-	-	32	-	-	-	-	-	-	1,055	-
2c.1.2.37	Plant Heating & Auxiliary Steam (RCA)	-	125	1	2	149	-	-	54	331	331	-	-	746	-	-	-	-	-	3,407	-
2c.1.2.38	Raw Water	-	115	-	-	-	-	-	17	132	-	-	132	-	-	-	-	-	-	4,114	-
2c.1.2.39	Service Water	-	39	-	-	-	-	-	6	45	-	-	45	-	-	-	-	-	-	1,403	-
2c.1.2.40	Service Water (RCA)	-	495	6	12	861	-	-	254	1,619	1,619	-	-	4,256	-	-	-	-	-	14,664	-
2c.1.2.41	Service Water Chemical Injection	-	0	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	15	-
2c.1.2.42	Sewage Treatment	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	702	-
2c.1.2.43	Solid Radwaste Process & Disposal	-	404	47	10	193	1,254	-	450	2,357	2,357	-	-	964	3,025	-	-	-	246,060	12,375	-
2c.1.2.44	Ventilation Radiation Monitoring	-	10	0	0	5	9	-	6	30	30	-	-	24	21	-	-	-	1,817	284	-
2c.1.2	Totals	605	10,082	213	165	8,976	3,948	-	5,016	28,994	26,855	-	2,139	44,878	9,548	-	-	-	774,550	326,089	-
Decontamination of Site Buildings																					
2c.1.3.1	Reactor (post fuel)	399	582	106	82	82	1,322	-	711	3,283	3,283	-	-	408	7,547	-	-	-	710,620	28,309	-
2c.1.3	Totals	399	582	106	82	82	1,322	-	711	3,283	3,283	-	-	408	7,547	-	-	-	710,620	28,309	-
2c.1.4	Scaffolding in support of decommissioning	-	253	8	1	42	9	-	72	381	381	-	-	211	29	-	-	-	2,623	8,903	-
2c.1	Subtotal Period 2c Activity Costs	1,510	10,861	440	270	10,359	5,713	-	6,376	35,629	33,490	-	2,139	51,795	18,508	-	-	-	1,611,917	364,848	-
Period 2c Collateral Costs																					
2c.3.1	Process liquid waste	142	-	70	143	-	887	-	321	1,562	1,562	-	-	-	-	1,293	-	-	173,943	209	-
2c.3.2	Small tool allowance	-	198	-	-	-	-	-	30	228	228	-	-	-	-	-	-	-	-	-	-
2c.3.3	Decommissioning Equipment Disposition	-	-	43	12	510	117	-	116	829	829	-	-	2,700	373	-	-	-	33,507	739	-
2c.3	Subtotal Period 2c Collateral Costs	142	198	112	155	540	1,004	-	467	2,619	2,619	-	-	2,700	373	1,293	-	-	207,449	949	-
Period 2c Period-Dependent Costs																					
2c.4.1	Decon supplies	117	-	-	-	-	-	-	29	146	146	-	-	-	-	-	-	-	-	-	-
2c.4.2	Insurance	-	-	-	-	-	-	160	16	177	177	-	-	-	-	-	-	-	-	-	-
2c.4.3	Property taxes	-	-	-	-	-	-	411	41	452	452	-	-	-	-	-	-	-	-	-	-
2c.4.4	Health physics supplies	-	1,435	-	-	-	-	-	359	1,794	1,794	-	-	-	-	-	-	-	-	-	-
2c.4.5	Heavy equipment rental	-	1,466	-	-	-	-	-	220	1,686	1,686	-	-	-	-	-	-	-	-	-	-
2c.4.6	Disposal of DAW generated	-	-	103	31	-	434	-	123	691	691	-	-	-	6,106	-	-	-	124,160	1,521	-
2c.4.7	Plant energy budget	-	-	-	-	-	-	788	118	906	906	-	-	-	-	-	-	-	-	-	-
2c.4.8	NRC Fees	-	-	-	-	-	-	317	32	349	349	-	-	-	-	-	-	-	-	-	-
2c.4.9	Emergency Planning Fees	-	-	-	-	-	-	41	4	45	-	45	-	-	-	-	-	-	-	-	-
2c.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	290	43	333	333	-	-	-	-	-	-	-	-	-	-
2c.4.11	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	28	4	32	-	32	-	-	-	-	-	-	-	-	-
2c.4.12	Security Staff Cost	-	-	-	-	-	-	1,203	160	1,384	1,384	-	-	-	-	-	-	-	-	-	47,460

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 2c Period-Dependent Costs (continued)																				
2c.4.18	Utility Staff Cost	-	-	-	-	-	-	16,464	2,470	18,934	18,934	-	-	-	-	-	-	-	-	-	275,840
2c.4	Subtotal Period 2c Period-Dependent Costs	117	2,901	103	81	-	434	19,702	3,640	26,928	26,852	77	-	-	6,196	-	-	-	124,160	1,521	321,300
2c.0	TOTAL PERIOD 2c COST	1,769	14,060	656	456	10,899	7,151	19,702	10,483	65,177	62,961	77	2,139	54,495	25,077	1,293	-	-	1,948,525	367,318	321,300
	PERIOD 2e - License Termination																				
	Period 2e Direct Decommissioning Activities																				
2e.1.1	*ORISE confirmatory survey*	-	-	-	-	-	-	118	36	154	154	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	118	36	154	154	-	-	-	-	-	-	-	-	-	-
	Period 2e Additional Costs																				
2e.2.1	Final Site Survey	-	-	-	-	-	-	4,476	671	5,148	5,148	-	-	-	-	-	-	-	-	127,578	-
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	4,476	671	5,148	5,148	-	-	-	-	-	-	-	-	127,578	-
	Period 2e Period-Dependent Costs																				
2e.4.1	Insurance	-	-	-	-	-	-	75	8	83	83	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	386	39	424	424	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	663	-	-	-	-	-	166	829	829	-	-	-	-	-	-	-	-	-	-
2e.4.4	*Disposal of DAW generated*	-	-	8	2	-	32	-	9	50	50	-	-	-	453	-	-	-	9,068	111	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	370	55	425	425	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	305	31	336	336	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	38	4	42	-	42	-	-	-	-	-	-	-	-	-
2e.4.8	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	-
2e.4.9	Security Staff Cost	-	-	-	-	-	-	620	93	713	713	-	-	-	-	-	-	-	-	-	24,446
2e.4.10	Utility Staff Cost	-	-	-	-	-	-	10,137	1,521	11,658	11,658	-	-	-	-	-	-	-	-	-	167,177
2e.4	Subtotal Period 2e Period-Dependent Costs	-	663	8	2	-	32	11,958	1,928	14,591	14,519	72	-	-	453	-	-	-	9,068	111	191,623
2e.0	TOTAL PERIOD 2e COST	-	663	8	2	-	32	16,552	2,635	19,892	19,820	72	-	-	453	-	-	-	9,068	127,689	191,623
	PERIOD 2 TOTALS	10,533	45,512	12,293	4,065	86,036	80,937	212,677	83,729	485,782	413,943	69,284	2,556	180,173	168,905	16,320	804	-	16,019,470	1,177,863	2,372,883
	PERIOD 3b - Site Restoration																				
	Period 3b Direct Decommissioning Activities																				
	Demolition of Remaining Site Buildings																				
3b.1.1.1	Reactor Building	-	5,903	-	-	-	-	-	885	6,788	1,018	-	5,770	-	-	-	-	-	-	109,307	-
3b.1.1.2	Administration Buildings	-	463	-	-	-	-	-	69	532	-	-	532	-	-	-	-	-	-	10,790	-
3b.1.1.3	Auxiliary Boiler Building	-	51	-	-	-	-	-	8	58	-	-	58	-	-	-	-	-	-	1,154	-
3b.1.1.4	Circulating Water Pump Structure	-	1,598	-	-	-	-	-	240	1,838	-	-	1,838	-	-	-	-	-	-	27,214	-
3b.1.1.5	Circulating Water Screenwell Structure	-	1,619	-	-	-	-	-	243	1,861	-	-	1,861	-	-	-	-	-	-	14,843	-
3b.1.1.6	Cooling Towers	-	3,129	-	-	-	-	-	469	3,598	-	-	3,598	-	-	-	-	-	-	87,415	-
3b.1.1.7	Emergency Cooling Tower	-	168	-	-	-	-	-	25	193	-	-	193	-	-	-	-	-	-	3,412	-
3b.1.1.8	Emergency Diesel Generator Building	-	351	-	-	-	-	-	53	404	-	-	404	-	-	-	-	-	-	7,962	-
3b.1.1.9	Guard House	-	69	-	-	-	-	-	10	79	-	-	79	-	-	-	-	-	-	1,595	-
3b.1.1.10	Hazardous Waste Storage Area	-	98	-	-	-	-	-	16	113	-	-	113	-	-	-	-	-	-	1,915	-
3b.1.1.11	Low Level Radwaste Storage Building	-	457	-	-	-	-	-	69	526	26	-	500	-	-	-	-	-	-	10,611	-
3b.1.1.12	Miscellaneous Yard Structures	-	1,287	-	-	-	-	-	193	1,480	-	-	1,480	-	-	-	-	-	-	24,889	-
3b.1.1.13	Mods Building	-	109	-	-	-	-	-	16	125	-	-	125	-	-	-	-	-	-	2,425	-
3b.1.1.14	Offgas Filter Building	-	20	-	-	-	-	-	3	23	1	-	21	-	-	-	-	-	-	341	-
3b.1.1.15	Plant Access Building	-	119	-	-	-	-	-	18	137	-	-	137	-	-	-	-	-	-	2,892	-
3b.1.1.16	Plant Services Building	-	48	-	-	-	-	-	7	55	-	-	55	-	-	-	-	-	-	1,191	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
Demolition of Remaining Site Buildings (continued)																					
3b.1.1.17	Radwaste Building	-	1,320	-	-	-	-	-	198	1,517	152	-	1,366	-	-	-	-	-	-	23,189	-
3b.1.1.18	Radwaste Building Extension	-	144	-	-	-	-	-	22	166	17	-	149	-	-	-	-	-	-	3,293	-
3b.1.1.19	Radwaste Service Enclosure	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	210	-
3b.1.1.20	Recombiner Building	-	508	-	-	-	-	-	76	585	29	-	555	-	-	-	-	-	-	7,753	-
3b.1.1.21	Resin Dewatering Facility	-	22	-	-	-	-	-	3	25	1	-	24	-	-	-	-	-	-	498	-
3b.1.1.22	Secondary Alarm Station	-	17	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	383	-
3b.1.1.23	Site Management Building & Shop	-	239	-	-	-	-	-	36	275	-	-	275	-	-	-	-	-	-	5,839	-
3b.1.1.24	Snubber Rebuild Facility	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	925	-
3b.1.1.25	Stack	-	299	-	-	-	-	-	45	344	-	-	344	-	-	-	-	-	-	7,322	-
3b.1.1.26	Switchgear Building & Transformer Yard	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	1,404	-
3b.1.1.27	Training Center	-	194	-	-	-	-	-	29	223	-	-	223	-	-	-	-	-	-	4,819	-
3b.1.1.28	Turbine Building	-	3,582	-	-	-	-	-	537	4,120	412	-	3,708	-	-	-	-	-	-	72,947	-
3b.1.1.29	Turbine Pedestal	-	940	-	-	-	-	-	141	1,081	-	-	1,081	-	-	-	-	-	-	15,197	-
3b.1.1.30	Warehouse Complex Additions	-	209	-	-	-	-	-	31	240	-	-	240	-	-	-	-	-	-	5,044	-
3b.1.1.31	Water Treatment Facility	-	60	-	-	-	-	-	9	69	-	-	69	-	-	-	-	-	-	1,306	-
3b.1.1	Totals	-	23,138	-	-	-	-	-	3,471	26,609	1,656	-	24,952	-	-	-	-	-	-	458,071	-
Site Closeout Activities																					
3b.1.2	Remove Rubble	-	4,155	-	-	-	-	-	623	4,779	-	-	4,779	-	-	-	-	-	-	7,964	-
3b.1.3	Grade & landscape site	-	585	-	-	-	-	-	88	673	-	-	673	-	-	-	-	-	-	2,209	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	47	7	54	54	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	27,879	-	-	-	-	47	4,169	32,115	1,711	-	30,404	-	-	-	-	-	-	468,244	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	-	-	-	-	-	927	139	1,066	-	-	1,066	-	-	-	-	-	-	6,739	-
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	927	139	1,066	-	-	1,066	-	-	-	-	-	-	6,739	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	231	-	-	-	-	-	35	266	-	-	266	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	231	-	-	-	-	-	35	266	-	-	266	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	205	21	226	0	203	23	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,051	105	1,156	-	-	1,156	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,076	-	-	-	-	-	761	5,837	-	-	5,837	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	504	76	580	-	290	290	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	246	25	271	-	271	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	104	10	114	-	114	-	-	-	-	-	-	-	-	-
3b.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	71	11	82	-	82	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	1,689	253	1,942	(0)	1,301	641	-	-	-	-	-	-	-	66,606
3b.4.9	Utility Staff Cost	-	-	-	-	-	-	16,179	2,427	18,606	-	9,303	9,303	-	-	-	-	-	-	-	256,764
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,076	-	-	-	-	20,049	3,688	28,813	(0)	11,564	17,249	-	-	-	-	-	-	-	323,360
3b.0	TOTAL PERIOD 3b COST	-	33,186	-	-	-	-	21,023	8,051	62,260	1,711	11,564	48,985	-	-	-	-	-	-	474,983	324,920
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	1,627	163	1,790	-	1,790	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	8,333	833	9,166	-	9,166	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	999	150	1,149	-	1,149	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	1,951	195	2,146	-	2,146	-	-	-	-	-	-	-	-	-

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 3c Period-Dependent Costs (continued)																				
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	824	82	907	-	907	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	3,797	570	4,367	-	4,367	-	-	-	-	-	-	-	-	-
3c.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	563	84	647	-	647	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	9,070	1,360	10,430	-	10,430	-	-	-	-	-	-	-	-	357,720
3c.4.9	Utility Staff Cost	-	-	-	-	-	-	33,143	4,971	38,114	-	38,114	-	-	-	-	-	-	-	-	545,097
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	60,306	8,409	68,716	-	68,716	-	-	-	-	-	-	-	-	902,817
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	60,306	8,409	68,716	-	68,716	-	-	-	-	-	-	-	-	902,817
	PERIOD 3d - GTCC shipping																				
	Period 3d Direct Decommissioning Activities																				
	Nuclear Steam Supply System Removal																				
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	-	-	-	11,881	-	1,782	13,663	13,663	-	-	-	-	-	-	748	-	-	-
3d.1.1	Totals	-	-	-	-	-	11,881	-	1,782	13,663	13,663	-	-	-	-	-	-	748	-	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	-	-	-	11,881	-	1,782	13,663	13,663	-	-	-	-	-	-	748	-	-	-
	Period 3d Period-Dependent Costs																				
3d.4.1	Insurance	-	-	-	-	-	-	5	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	24	2	26	-	26	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	3	0	3	-	3	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	6	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	2	0	3	-	3	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Transfer and Capital Costs	-	-	-	-	-	-	183	27	210	-	210	-	-	-	-	-	-	-	-	-
3d.4.7	Dry Fuel Storage O&M Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.8	Security Staff Cost	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	1,020
3d.4.9	Utility Staff Cost	-	-	-	-	-	-	95	14	109	-	109	-	-	-	-	-	-	-	-	1,554
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	344	50	394	-	394	-	-	-	-	-	-	-	-	2,574
3d.0	TOTAL PERIOD 3d COST	-	-	-	-	-	11,881	344	1,832	14,057	13,663	394	-	-	-	-	-	748	-	-	2,574
	PERIOD 3e - ISFSI Decontamination																				
	Period 3e Direct Decommissioning Activities																				
	No direct activities in this period																				
	Period 3e Additional Costs																				
3e.2.1	ISFSI License Termination	-	1,242	14	130	-	508	1,438	674	4,005	-	4,005	-	-	11,818	-	-	-	1,358,549	27,799	2,560
3e.2	Subtotal Period 3e Additional Costs	-	1,242	14	130	-	508	1,438	674	4,005	-	4,005	-	-	11,818	-	-	-	1,358,549	27,799	2,560
	Period 3e Collateral Costs																				
3e.3.1	Small tool allowance	-	12	-	-	-	-	-	2	14	-	14	-	-	-	-	-	-	-	-	-
3e.3	Subtotal Period 3e Collateral Costs	-	12	-	-	-	-	-	2	14	-	14	-	-	-	-	-	-	-	-	-
	Period 3e Period-Dependent Costs																				
3e.4.1	Insurance	-	-	-	-	-	-	34	3	37	-	37	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	344	34	378	-	378	-	-	-	-	-	-	-	-	-
3e.4.3	Heavy equipment rental	-	240	-	-	-	-	-	36	276	-	276	-	-	-	-	-	-	-	-	-
3e.4.4	Plant energy budget	-	-	-	-	-	-	82	12	95	-	95	-	-	-	-	-	-	-	-	-
3e.4.5	NRC ISFSI Fees	-	-	-	-	-	-	40	4	44	-	44	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	94	14	108	-	108	-	-	-	-	-	-	-	-	3,690
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	835	125	960	-	960	-	-	-	-	-	-	-	-	13,354
3e.4	Subtotal Period 3e Period-Dependent Costs	-	240	-	-	-	-	1,428	229	1,898	-	1,898	-	-	-	-	-	-	-	-	17,044
3e.0	TOTAL PERIOD 3e COST	-	1,494	14	130	-	508	2,866	905	5,916	-	5,916	-	-	11,818	-	-	-	1,358,549	27,799	19,604

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
	No direct activities in this period																				
Period 3f Additional Costs																					
3f.2.1	ISFSI Pad Restoration	-	1,757	-	-	-	-	35	269	2,061	-	2,061	-	-	-	-	-	-	-	10,817	160
3f.2.2	ISFSI Bridge Restoration	-	55	-	-	-	-	-	8	63	-	63	-	-	-	-	-	-	-	1,176	-
3f.2.3	ISFSI Equipment Building Restoration	-	1	-	-	-	-	-	0	2	-	2	-	-	-	-	-	-	-	26	-
3f.2.4	ISFSI Pole Barn Restoration	-	12	-	-	-	-	-	2	14	-	14	-	-	-	-	-	-	-	217	-
3f.2	Subtotal Period 3f Additional Costs	-	1,826	-	-	-	-	35	279	2,140	-	2,140	-	-	-	-	-	-	-	12,236	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	6	-	-	-	-	-	1	7	-	7	-	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	6	-	-	-	-	-	1	7	-	7	-	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	17	2	19	-	19	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	173	17	191	-	191	-	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	85	-	-	-	-	-	13	98	-	98	-	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	42	6	48	-	48	-	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	47	7	54	-	54	-	-	-	-	-	-	-	-	1,860
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	202	30	232	-	232	-	-	-	-	-	-	-	-	3,277
3f.4	Subtotal Period 3f Period-Dependent Costs	-	85	-	-	-	-	481	75	642	-	642	-	-	-	-	-	-	-	-	5,137
3f.0	TOTAL PERIOD 3f COST	-	1,917	-	-	-	-	516	355	2,788	-	2,788	-	-	-	-	-	-	-	12,236	5,297
PERIOD 3 TOTALS		-	36,597	14	130	-	12,388	85,055	19,553	153,737	15,374	89,378	48,985	-	11,818	-	-	748	1,358,549	515,018	1,255,213
TOTAL COST TO DECOMMISSION		11,743	84,032	12,537	4,420	36,036	95,723	348,493	112,097	705,080	492,843	160,457	51,780	180,173	181,646	19,103	804	748	17,854,350	1,693,789	4,228,296

TABLE C-2
PEACH BOTTOM ATOMIC POWER STATION - UNIT 3
DETAILED COST ANALYSIS
(Thousands of 2002 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 Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial Weight Lbs.	Craft Manhours	Utility and Contractor Manhours

TOTAL COST TO DECOMMISSION WITH 18.9% CONTINGENCY:	$705,080	thousands of 2002 dollars
TOTAL NRC LICENSE TERMINATION COST IS 69.9% OR	$492,843	thousands of 2002 dollars
SPENT FUEL MANAGEMENT COST IS 22.76% OR:	$160,457	thousands of 2002 dollars
NON-NUCLEAR DEMOLITION COST IS 7.34% OR:	$51,780	thousands of 2002 dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	107,717	cubic feet
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	93,836	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	748	cubic feet
TOTAL SCRAP METAL REMOVED:	46,865	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,693,789	man-hours

End Notes:
n/a - indicates that this activity not charged as decommissioning expense.
a - indicates that this activity performed by decommissioning staff.
0 - indicates that this value is less than 0.5 but is non-zero.
a cell containing " - " indicates a zero value