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Prairie Island Nuclear Generating Plant
Operated by Nuclear Management Company, LLC

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Washington, DC 20555-0001

Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
License Nos. DPR-42 and DPR-60

Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Prairie Island Nuclear Generating Plant (PINGP)

References: 1) Nuclear Management Company, LLC (NMC) letter to US Nuclear Regulatory Commission (NRC), "Application for Renewed Operating Licenses," dated April 11, 2008, Accession No. ML081130673.

2) NMC letter to NRC, "Decommissioning Funding Status Reports," dated March 30, 2007, Accession No. ML070890622.

The enclosed Irradiated Fuel Management Plan (Enclosure 1) and Preliminary Decommissioning Cost Estimate (Enclosure 2) are submitted in accordance with Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Section 50.54(bb) "Conditions of Licenses," and 10 CFR 50.75(f)(3), "Reporting and Recordkeeping for Decommissioning Planning," respectively, for PINGP. As holder of the plant operating license, NMC is submitting these reports on behalf of the plant owner, Xcel Energy. The financial information provided in the enclosures reflects information provided to NMC by Xcel Energy.

Pursuant to 10 CFR 50.54(bb), a licensee shall "submit written notification to the Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor following permanent cessation of operation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository." Accordingly, the Irradiated Fuel Management Plan (Enclosure 1) is provided for NRC review and preliminary approval.

Additionally, 10 CFR 50.75(f)(3), "Reporting and Recordkeeping for Decommissioning Planning" states, "each power reactor licensee shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate which includes an up-to-date assessment of the major factors that could affect the cost to

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decommission." Accordingly, the Preliminary Decommissioning Cost Estimate (Enclosure 2) is provided for NRC review and approval.

NMC submitted a sufficient application for renewal of the PINGP operating licenses (Reference 1) and therefore, in accordance with 10 CFR 2.109, "Effect of Timely Renewal Application," "the existing license will not be deemed to have expired until the application has been finally determined." Although NMC is seeking license renewal, the Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimate are submitted based on the current operating license expiration date of August 9, 2013 for PINGP Unit 1. If PINGP's licenses are renewed, the current Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimate would no longer be applicable, and a new plan and cost estimate will be submitted in accordance with 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3), respectively.

If there are any questions or if additional information is needed, please contact Mr. Dale Vincent, P.E., at 651-388-1121.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

Scott Northard for

Michael D. Wadley
Site Vice President, Prairie Island Nuclear Generating Plant, Units 1 and 2
Nuclear Management Company, LLC

Enclosures: (2)

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC

Enclosure 1

Irradiated Fuel Management Plan
For Prairie Island Nuclear Generating Plant

I. Background

The Preliminary Decommissioning Cost Estimate (Enclosure 2) in accordance with 10 CFR 50.75(f)(3) for Prairie Island Nuclear Generating Plant (PINGP) Unit 1 and Unit 2 evaluates the DECON strategy with operating licenses expiration of August 9, 2013 for Unit 1 and October 29, 2014 for Unit 2. The Irradiated Fuel Management Plan is also based on the DECON analysis and current operating license expiration dates. There is one independent spent fuel storage installation (ISFSI) on the PINGP site operating under a Site Specific Nuclear Regulatory Commission (NRC) license. Xcel Energy reserves the right to choose the ultimate decommissioning option in accordance with its business needs, recognizing the need to ensure the chosen option meets NRC requirements for decommissioning funding. Inclusion of costs in this submittal is not intended to acknowledge that these costs will ultimately be borne by Xcel Energy or Nuclear Management Company, LLC (NMC), as some (or all) are expected to be the responsibility of the U.S. Department of Energy as a result of the breach of the Standard Contract of Disposal of Spent Nuclear Fuel and/or High–Level Radioactive Waste.

II. Spent Fuel Management Strategy

The NRC requires (10 CFR 50.54(bb)) that licensees 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 U. S. Department of Energy (DOE). Interim storage of the irradiated fuel will be either in the spent fuel storage pool or the ISFSI located on the PINGP site until the DOE has completed the transfer to a repository. The ISFSI operates under an independent site specific license from the Nuclear Regulatory Commission. The design of the ISFSI provides room for expansion that will accommodate the inventory of spent fuel residing in PINGP's storage pool at the conclusion of the required cooling period. The ISFSI if expanded would store all spent nuclear fuel on-site.

The spent fuel pool will remain operational for a minimum of 15 years following the cessation of operations. This period provides the necessary cooling for the final irradiated fuel removed from the reactor core to meet dry storage canister requirements for decay heat. The spent fuel pool will be isolated and a spent fuel island created. Over the fifteen year cool-down period, the irradiated fuel would be packaged into TN-40 casks for transfer to DOE from the ISFSI. Transfer of irradiated fuel from the spent fuel pool to dry storage in the ISFSI allows for early decontamination and dismantlement of plant structures. The ISFSI will remain operational and provide interim storage of spent fuel until such time that the DOE

completes fuel acceptance. Consequently, costs are included within the estimate below for the long-term caretaking of the irradiated fuel at PINGP through the year 2053.

The shipping of spent nuclear fuel assemblies to DOE during decommissioning is based upon several assumptions. First DOE would begin accepting irradiated fuel from PINGP in 2028. Second, based on DOE generator allocation/receipt schedules, the oldest irradiated fuel receives the highest acceptance priority. Third, the maximum rate at which irradiated fuel is removed from commercial sites like PINGP is based upon 3,000 metric tons of uranium (MTU) national acceptance rate. However, any delay in the startup of the repository or decrease in the rate of acceptance will correspondingly prolong the transfer process and result in the fuel remaining at the site longer. In the DECON scenario, the ISFSI will continue to operate until such time that the transfer of irradiated fuel to the DOE is complete. Finally, assuming that the DOE commences repository operation in 2025, irradiated fuel is projected to be removed from the PINGP site by the end of 2053. Consequently, costs are included within this analysis for the continued operation of the storage pool and ISFSI, as required, and for the long-term caretaking of the spent fuel until the year 2053. At the conclusion of the spent fuel transfer process the ISFSI will be decommissioned.

Operation and maintenance costs for the storage facilities (ISFSI and the spent fuel pool) are included within the estimate below and address the cost for staffing the facilities, maintenance of necessary operational requirements as well as security, insurance, and licensing fees. The estimate includes the costs to purchase, load, and transfer the fuel storage canisters to an ISFSI. A cost-estimate for irradiated fuel management at PINGP under the DECON scenario may be found in Table 1.

In the event that PINGP ceases operation in 2013 and 2014 for Unit 1 and Unit 2 respectively, PINGP will continue to comply with existing NRC licensing requirements, including the operation and maintenance of the systems and structures needed to support continued operation of the spent fuel pool and each ISFSI, as necessary, under the decommissioning scenario ultimately selected. In addition, PINGP will also comply with applicable license termination requirements in accordance with 10 CFR 50.82 with respect to plant shutdown and post-shutdown activities including seeking such NRC approvals and on such schedules as necessary to satisfy these requirements consistent with the continued safe storage of irradiated fuel.

III. Funding for Spent Fuel Management Based on the DECON Decommissioning Option

The NRC minimum decommissioning financial assurance requirement as reported in Reference 2 and set forth in 10 CFR 50.75(c) for PINGP is approximately $324.9 million for Unit1 and $324.9 million for Unit 2.

As of December 31, 2007, the PINGP decommissioning trust funds balance were $402.4 million for Unit 1 and $430.2 for Unit 2. These funds are being supplemented with annual total Company contributions of approximately $15 million for Unit 1 and $19 million for Unit 2 based on a prescribed schedule per Minnesota Public Utility Commission direction. Adjustments to the annual contribution require approval of multiple state public utilities commissions. The trust fund monies will be used for radiological decommissioning and to pay for irradiated fuel management. However, inclusion of irradiated fuel costs in this submittal is not intended to acknowledge that these costs will ultimately be borne by Xcel Energy or NMC, as some (or all) are expected to be the responsibility of the U.S. Department of Energy as a result of the breach of the Standard Contract of Disposal of Spent Nuclear Fuel and/or High–Level Radioactive Waste.

IV. Cost Estimate For Spent Fuel Management Based on the DECON Decommissioning Option

The "Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant," included cost estimates of $404 million for spent fuel management, $1,026 million for decommissioning and $83.7 million for site restoration using a DECON scenario (Table 1). The following items are key costs estimates:

(1) The estimated cost to isolate the spent fuel pool and fuel handling systems is $11.8 million. This cost is based on spent fuel pool isolation costs at other decommissioned facilities and engineering judgment. This cost is part of the activities necessary to maintain the spent fuel in a safe and controlled state both during the initial decommissioning activities and during the irradiated fuel cool-down period to meet dry storage canister requirement for decay heat.

(2) The estimated annual cost for the dry storage ISFSI at PINGP is approximately $6.6 million. This cost is based on actual costs at decommissioned facilities, estimated costs for facilities similar to PINGP and engineering judgment. These are annual costs incurred during the storage period, beginning in 2031 and continuing through removal of all fuel and "Greater Than Class C" radioactive material in 2053.

3) The estimated cost for preparation, packaging, and shipping of irradiated fuel to the Department of Energy (DOE) is $220 million. This cost includes the unit cost of approximately $4.1 million for each TN-40 cask. This cost is based on

actual costs at decommissioned facilities, estimated costs for facilities similar to PINGP, and engineering judgment.

(4) An average cost of $100,000 is used for labor and equipment to load each TN-40 onto a DOE- provided railcar for transport of the irradiated fuel to a DOE repository.

(5) The estimated ISFSI Decontamination & Dismantling cost is $12.9 million. This cost includes disposal of the TN-40 casks.

The decommissioning schedule includes the following program period and durations for a DECON with dry storage scenario:

Period # [a]	Activity	Unit 1 & 2 Irradiated Fuel (thousands, 2008 dollars)	Duration (Months)
1	Transition and Preparation	37,582	20
2	Decommissioning	196,051	194
3b	Site Restoration	20,288	28
3c & 3d	ISFSI Operations	135,682	244
3e & 3f	ISFSI Decommissioning Dismantlement & Restoration	14,452	7
	TOTALS[b]	404,056	493

[a] Figure 4.2, Decommissioning Timeline, TLG Services, Inc. Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant. August 2008.

[b] Columns may not add due to rounding.

Enclosure 2

Prairie Island Nuclear Generating Plant
Preliminary Decommissioning Cost Estimate

I. Introduction

This report presents a summary of the preliminary decommissioning cost estimate to decommission Prairie Island Nuclear Generating Plant (PINGP) Unit 1 and Unit 2, as required by 10CFR50.75(f)(3). This cost estimate is based on the "Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant" and premised on the assumption that PINGP Unit 1 and Unit 2 permanently cease to operate in August 2013 and October 2014, respectively. The estimate assumes the eventual removal of all contaminated and activated plant components and structural materials, such that the PINGP operating licenses may be terminated to permit unrestricted use of the site. Although Nuclear Management Company, LLC (NMC) is currently seeking license renewal for PINGP, this cost estimate is based on the current operating licenses expiration dates for PINGP. If license renewal for PINGP is granted, this Preliminary Decommissioning Cost Estimate would no longer be applicable and a new estimate will be submitted in accordance with 10CFR50.75(f)(3).

II. Comparison of the Preliminary Cost Estimate to the Minimum Required Decommissioning Fund

The minimum decommissioning financial assurance requirement for PINGP, as reported in Reference 2 and set forth in 10CFR50.75(c), is approximately $324.9 million for each unit. The total preliminary decommissioning cost estimate based on the "Decommissioning Cost Analysis" is approximately $1,513.7 million. This estimate includes approximately $1,026 million for decommissioning costs, $404 million for spent fuel management and $83.7 million for site restoration (Table 1).

III. Assessment of Major Factors That Could Affect Preliminary Cost Estimate

A. Decommissioning Option/Method

This Preliminary Decommissioning Cost Estimate assumes a DECON decommissioning option with dry storage of spent nuclear fuel. This estimate assumes cessation of operation for Unit 1 in August 2013 and Unit 2 in October 2014 and a Department of Energy (DOE) spent fuel repository open in 2025 with the first irradiated fuel leaving the plant in 2028. Interim safe storage of the irradiated fuel will be in the spent nuclear fuel storage pool and/or the ISFSI located on the PINGP site until the DOE assumes title to the spent fuel. The

ISFSI which operates under an independent Site Specific NRC license, will accommodate the inventory of spent fuel residing in the spent nuclear fuel storage pool at the conclusion of the required irradiated fuel cooling period. This cost estimate scenario includes the decontamination and dismantlement of the facility, irradiated fuel management, and restoration of the site.

B. Potential for Known or Suspected Contamination

The Preliminary Decommissioning Cost 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.

C. LLW Disposition Plan

Low Level (Radioactive) Waste (LLW) disposal costs include processing, packaging, shipping, and burial/vendor costs. This Preliminary Decommissioning Cost Estimate assumes that additional disposal capacity will be available to support reactor decommissioning, particularly for the isolation of the more highly radioactive material. Therefore, for estimating purposes, Class B and C waste disposal costs were generated using the last available published pricing schedule for Barnwell in South Carolina for non-Atlantic members. Costs related to Class A waste uses the Energy Solutions rates for their open facility in Utah. Due to the high cost per cubic foot of LLW disposal, decontamination, recycling, conditioning and metal processing were incorporated into the decommissioning cost calculations in order to reduce the overall LLW disposal costs.

D. Preliminary Schedule of Decommissioning Activities

A schedule of the decommissioning scenario is illustrated in Table 3. Activity and period-dependent costs are estimated for each of the 5 decommissioning time periods, post-decommissioning ISFSI operation, and ISFSI decontamination and decommissioning. These time periods are briefly described in Section IV, below.

E. Other Factors That Could Significantly Affect the Cost to Decommission

NMC is currently unaware of any major site-specific factors that could have a significant effect on the cost of decommissioning. In order to anticipate unknown or unplanned occurrences during decommissioning, e.g., tool breakage, accidents, illnesses, weather delays, and labor stoppages, contingencies are applied to the cost estimates. Contingencies are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook" 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 amount of contingency depends on the status of design, procurement and construction; and the complexity and uncertainties within the defined project scope. The "Decommissioning Cost Analysis for PINGP" conducted by TLG Services, Inc, examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. The composite contingency value calculated for the PINGP DECON alternative is 17.07%.for Unit 1 and 17.23% for Unit 2. Individual activity contingencies range from 10% to 75% depending on the degree of difficulty judged to be appropriate from actual decommissioning experience. Examples include: 15% for staffing and engineering; 25% for low level waste disposal; 50% for decontamination and 75% for reactor segmentation. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

IV. Preliminary Cost Estimate Considerations

The Preliminary Decommissioning Cost Estimate is based on costs associated with the entire decommissioning work scope, including those activities related to the following periods of the decommissioning project: (1) Transition and Preparations, (2) Decommissioning (3) Site Restoration (4) ISFSI Operations and (5) ISFSI Decommissioning and Site Restoration. The cost estimate also includes ISFSI operating and decommissioning costs. The scope of each of those activities is described below. Disposition of LLW is also accounted for in the Preliminary Decommissioning Cost Estimate, as described in Section III.C, above.

A summary of activities and time duration for each DECON period follows (see Table 2 for summary of cost elements and Table 3 for cost estimates for each period):

(1) Transition and Preparations: Includes preliminary engineering and planning to permanently de-fuel the reactor, revision of Technical Specifications applicable to operating conditions and requirements, a characterization of the facility and major components, and the development of the Post-Shutdown Decommissioning Activities Report (PSDAR). This period includes activities including, but not limited to, transfer of the spent fuel to the ISFSI, draining and de-energizing of non-contaminated systems, disposal of contaminated filter elements and resin beds, decontamination of the reactor coolant system, draining of the reactor vessel, preparing lighting, alarm, and security systems, and performing radiation surveys. Period duration is estimated at 20 months.

(2) Decommissioning: Includes continuation of spent fuel transfer from spent fuel pool to the ISFSI, commencement of shipments of irradiated fuel from the ISFSI to the DOE, removal of reactor internals and vessel, non-essential systems removal, structure decontamination, removal of spent fuel racks, and final site survey of reactor plant. Also included are physical decommissioning activities associated with the removal and disposal of contaminated components and structures. This period also includes surveys leading to the successful termination of the 10CFR50 operating license. Period duration estimated at 194 months.

(3b) Site Restoration: Includes activities required to remove contaminated materials and verify that residual radionuclide concentrations are below NRC limits. This will include prompt removal of site structures, removal of foundations and exterior walls to a nominal depth of three feet below grade, and fill and grading of the site. Period duration estimated at 28 months.

(3c/3d) ISFSI Operations: Includes continued on-site dry storage of spent fuel, completion of spent fuel shipment from pool to ISFSI. Period duration estimated at 244 months.

(3e/3f) ISFSI D&D: Includes completion of irradiated fuel shipments from dry storage to DOE, and a final survey of ISFSI and removal. Period duration estimated at 7 months.

V. Plans for Adjusting Levels of Funding

NMC submitted a sufficient application for renewal of an operating license (Reference 1) and therefore, in accordance with 10 CFR 2.109, "Effect of Timely Renewal Application," "the existing license will not be deemed to have expired until the application has been finally determined." Although NMC is seeking license renewal, the Preliminary Decommissioning Cost Estimate is submitted based on the current operating license expiration dates of August 9, 2013 for PINGP Unit 1 and October 29, 2014 for Unit 2. If license renewal for PINGP is granted, the Preliminary Decommissioning Cost Estimate would no longer be applicable and a new plan and cost estimate will be submitted in accordance with 10 CFR 50.75(f)(3).

The cost to decommission PINGP is estimated to be $1,513.7 million in 2008 dollars. The "Decommissioning Cost Analysis for PINGP" included cost estimates of approximately $1,026 million for decommissioning costs, $404 million for spent fuel management and $83.7 million for site restoration using a DECON scenario. The total estimated decommissioning costs by period and decommissioning activity are provided in Tables 1 and 2.

The NRC minimum decommissioning financial assurance requirement for PINGP as reported in Reference 2 and set forth in10CFR50.75(c) is approximately $324.9 million for each unit at PINGP. As of December 31, 2007, the PINGP decommissioning trust fund balance was $402.4 million for Unit 1 and $430.2 million for Unit 2.

Xcel Energy applies reasonable earnings rates to the decommissioning funds throughout the decommissioning periods described above. In addition, the Preliminary Decommissioning Cost Estimate includes reasonable escalation factors for the decommissioning activities. Based on a cash flow analysis for the decommissioning activities to be performed for the periods described above, Xcel Energy believes that there is reasonable assurance that adequate decommissioning funds will be available to decommission PINGP Unit 1 and Unit 2 as described herein (assuming an August 2013 and October 2014 cessation of operations dates for each respective unit). Xcel Energy plans to review the decommissioning fund status on a regular basis as described above.

Table 1
Summary of Annual D&D, Irradiated Fuel, and Site Restoration Costs
(thousands, 2008 dollars)

Year	Site D&D	IFM	Site Restore	Total
2013	22,964	4,639	224	27,827
2014	82,929	14,691	997	98,617
2015	163,925	25,478	1,882	191,285
2016	169,706	23,604	2,785	196,095
2017	139,661	18,776	2,752	161,189
2018	88,448	13,724	1,524	103,696
2019	53,248	12,696	696	66,640
2020	19,457	12,098	0	31,555
2021	19,404	12,065	0	31,469
2022	19,404	12,065	0	31,469
2023	19,404	12,065	0	31,469
2024	19,457	12,098	0	31,555
2025	19,404	12,065	0	31,469
2026	19,404	12,065	0	31,469
2027	19,404	12,065	0	31,469
2028	19,457	12,098	0	31,555
2029	29,444	10,122	0	39,566
2030	65,192	979	0	66,171
2031	14,444	6,627	22,918	43,989
2032	120	8,788	31,533	40,441
2033	70	7,880	18,352	26,302
2034	0	6,644	0	6,644
2035	0	6,644	0	6,644
2036	0	6,662	0	6,662
2037	0	6,644	0	6,644
2038	0	6,644	0	6,644
2039	0	6,644	0	6,644
2040	0	6,662	0	6,662
2041	0	6,644	0	6,644
2042	0	6,644	0	6,644
2043	0	6,644	0	6,644
2044	0	6,662	0	6,662
2045	0	6,644	0	6,644
2046	0	6,644	0	6,644
2047	0	6,644	0	6,644
2048	0	6,662	0	6,662
2049	0	6,644	0	6,644
2050	0	6,644	0	6,644
2051	0	6,644	0	6,644
2052	0	6,662	0	6,662
2053	21,028	6,710	0	27,738
2054		14,346	0	14,346
Total	1,025,971	404,056	83,662	1,513,689

(a) Section 3, TLG Services, Inc. Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant. August 2008.
(b) Columns may not add due to rounding.

Table 2 [a]
Unit 1 & 2 Cost Summary of Decommissioning Cost Elements
(thousands, 2008 dollars)

Cost Element		Unit 1	Unit 2	Total	Percentage
Decontamination		8,873	14,101	22,974	1.5%
Removal		71,116	91,943	163,059	10.8%
Packaging		18,148	18,447	36,595	2.4%
Transportation		6,828	7,411	14,239	0.9%
Waste Disposal		48,983	50,257	99,240	6.6%
Off-site Waste Processing		13,211	15,534	28,745	1.9%
Program Management (1)		334,149	381,084	715,233	47.3%
Spent Fuel Pool Isolation		5,911	5,911	11,822	0.8%
Spent Fuel Management (direct costs) (2)		128,061	127,342	255,403	16.9%
Insurance and Regulatory Fees		24,638	22,277	46,915	3.1%
Energy		24,306	23,721	48,027	3.2%
Characterization and Licensing Surveys		8,276	9,713	17,989	1.2%
Property Taxes		21,069	19,904	40,973	2.7%
Miscellaneous Equipment		6,228	6,250	12,478	0.8%
Total (3)		**719,795**	**793,894**	**1,513,689**	**100.0%**

(1) Includes engineering and security costs
(2) Excludes program management costs (staffing) but includes capital expenditures for ISFSI construction, costs for spent fuel loading/packaging costs/spent fuel pool O&M and EP fees
(3) Column may not add due to rounding
[a] Section 3, TLG Services, Inc. Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant. August 2008.

Table 3 [a]
PINGP Unit 1 & Unit 2 Summary of DECON Cost Estimate by Period Cost and Activity Cost
(thousands, 2008 dollars)

Unit 1	Total Contingency	Total Costs	NRC License Term Costs	Irradiated Fuel Management Costs	Site Restoration Costs
Period 1: Transition & Preparations	17,282	127,053	106,917	18,791	1,345
Period 2: Decontamination	72,434	472,934	370,363	98,385	4187
Period 3b: Site Restoration	4,398	34,228	195	7,851	26181
Period 3c: Fuel Storage Operation/Shipping	8,231	67,570	0	67,570	0
Period 3d: GTCC Shipping	1,396	10,785	10,514	271	0
Period 3e: ISFSI Decon	1,108	6,474	0	6,474	0
Period 3f: ISFSI Site Restoration	98	752	0	752	0
[b]	**104,947**	**719,795**	**487,988**	**200,095**	**31,712**

Unit 2	Total Contingency	Total Costs	NRC License Term Costs	Irradiated Fuel Management Costs	Site Restoration Costs
Period 1: Transition & Preparations	15,188	112,796	93,430	18,791	576
Period 2: Decontamination	82,997	536,375	433,957	97,666	4753
Period 3b: Site Restoration	7,647	59,142	83	12,437	46621
Period 3c: Fuel Storage Operation/Shipping	8,231	67,570	0	67,570	0
Period 3d: GTCC Shipping	1,396	10,785	10,514	271	0
Period 3e: ISFSI Decon	1,108	6,474	0	6,474	0
Period 3f: ISFSI Site Restoration	98	752	0	752	0
[b]	**116,665**	**793,894**	**537,983**	**203,961**	**51,950**

[a] Section 3, TLG Services, Inc. Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant. August 2008.
[b] Columns may not add due to rounding.

Attachment 1
to
Enclosures 1 and 2

Decommissioning Cost Analysis
for
Prairie Island Nuclear Generating Plant
August 2008
by
TLG Services, Inc.

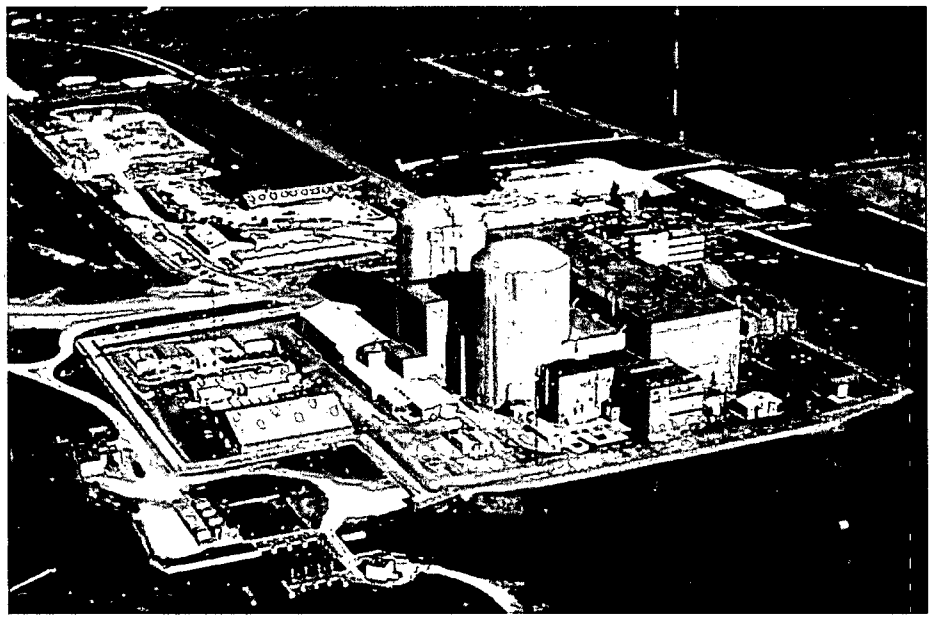
109 pages follow

DECOMMISSIONING COST ANALYSIS

for the

PRAIRIE ISLAND

NUCLEAR GENERATING PLANT



prepared for

Xcel Energy Services, Inc.

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

August 2008

APPROVALS

Project Manager	Francis W. Seymore	8/5/08 Date
Project Engineer	Benjamin J. Stochmal	8/5/08 Date
Technical Manager	William A. Cloutier, Jr.	08/05/08 Date
Quality Assurance Manager (acting)	Joseph J. Adler	8/5/08 Date

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REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
0		08-05-08		Original Issue

EXECUTIVE SUMMARY

This report presents an estimate of the cost to promptly decommission the Prairie Island Nuclear Generating Plant (Prairie Island) following the scheduled cessation of plant operations. The prompt decommissioning, or DECON method, as described below, was selected as it is the most cost-effective of the alternatives (in current dollars) to achieve the objectives of decommissioning. The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2005,[1] updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The current estimate is designed to provide the plant's owners, with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear units.

The primary goal of decommissioning is the removal and disposal of the contaminated systems and structures so that the plant's operating licenses can be terminated. This analysis recognizes that spent fuel will be stored at the site in the plant's storage pool and/or in an independent spent fuel storage installation (ISFSI) until such time that it can be transferred to a U.S. Department of Energy (DOE) facility. Consequently, the estimate also includes those costs to manage and subsequently decommission these storage facilities.

The Prairie Island site currently consists of two operating pressurized water reactors, and Units 1 and 2 are each nominally rated to produce approximately 529 megawatts of electricity (MW). The currently projected cost to decommission the station is estimated at $1,514 million, as reported in 2008 dollars. 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 minimum cooling period for the spent fuel that resides in the storage pool when operations cease. Any residual fuel remaining in the pool after the cooling period is relocated to the ISFSI to await transfer to a DOE facility. The estimate also includes the dismantling of site structures and non-essential facilities and the limited restoration of the site.

An ISFSI is currently operating on the Prairie Island site. The facility will contain 29 Transnuclear dry storage casks after 40 years of operation. The casks are single-purpose and the stored assemblies will be relicensed to meet transport regulations in support of final transfer to a DOE repository. An additional 39 Transnuclear casks will be purchased to accommodate all residual fuel remaining in the pool after final shutdown. Transfer of all spent fuel post-shutdown will require 15 years to allow for radioactive decay to decrease heat loading. Spent fuel is expected to be completely removed from the site by 2053.

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1 "Decommissioning Cost Analysis for the Prairie Island Nuclear Generating Plant," Document No. X01-1526-002, TLG Services, Inc., October 2005.

Alternatives and Regulations

The ultimate objective of the decommissioning process is to reduce the inventory of contaminated and activated material so that the license(s) can be terminated. The Nuclear Regulatory Commission (NRC or Commission) provided initial decommissioning requirements in its rule adopted on June 27, 1988.[2] In this rule, the NRC set forth financial criteria for decommissioning licensed nuclear power 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."[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."[4] 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."[5] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years.
>
> The 60-year restriction has limited the practicality for the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. In 1997, the Commission directed its staff to re-evaluate this alternative and identify the technical requirements and regulatory actions that would be necessary for entombment to become a viable option. The resulting evaluation provided several recommendations; however, rulemaking has been deferred pending the completion of additional research studies, for example, on engineered barriers.

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2 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

3 Ibid. Page FR24022, Column 3

4 Ibid.

5 Ibid. Page FR24023, Column 2

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.[6] 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 described the methods and procedures acceptable to the NRC staff for implementing the requirements of the 1996 revised rule relating to the initial activities and major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and processes described in the amended regulations. The format and content of the estimate is also consistent with the recommendations of Regulatory Guide 1.202, issued in February 2005.[7]

Methodology

The methodology used to develop the estimate described within this document follows the basic approach originally presented in the cost estimating guidelines[8] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference 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, completed in 1989, and 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, 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.

Contingency

Consistent with cost estimating 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

6 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

7 "Standard Format and Content of Decommissioning Cost Estimates of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, U.S. Nuclear Regulatory Commission, February 2005

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

costs has shown that unforeseeable events which will increase costs are likely to occur."[9] The cost elements in this estimate 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 analysis, does not account for price escalation and inflation in the cost of decommissioning over the projected operating life of the station.

Contingency funds are expected to be fully expended throughout the program. As such, inclusion of contingency is necessary to provide assurance that sufficient funding will be available to accomplish the intended tasks.

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 Policy Act" in 1980,[10] the states became 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 for implementation. After little progress, the "Low-Level Radioactive Waste Policy Amendments Act of 1985,"[11] extended the implementation schedule, with specific milestones and stiff sanctions for non-compliance. Subsequent court rulings have substantially diluted those sanctions and, to date, no new compact facilities have been successfully sited, licensed and constructed.

In the interim, and as a proxy, the EnergySolutions' disposal facility in Clive, Utah is used as the destination for the lowest level, Class A,[12] radioactive waste. EnergySolutions does not have a license to dispose of the more highly radioactive waste (Class B and C) generated in the dismantling of the reactor. The rates are comparable with those offered by the Barnwell facility in South Carolina which currently does accept Class B and C material, but which in the future would not be available to Xcel Energy under current South Carolina law. Despite the closing of one of the two currently accessible commercial disposal sites, it is reasonable to assume that additional disposal capacity will be available to support reactor decommissioning, particularly for the isolation of the more highly radioactive material that is not suitable for disposal elsewhere. For estimating purposes, and as a

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

10 "Low-Level Radioactive Waste Policy Act of 1980," Public Law 96-573, 1980

11 "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986

12 U.S. Code of Federal Regulations, Title 10, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste"

proxy for future disposal facilities, waste disposal costs are estimated using available pricing schedules for the currently operating facilities, i.e., Barnwell and EnergySolutions.

A significant portion of the waste material generated during decommissioning may only be potentially contaminated by radioactive materials. This waste can be analyzed on site or shipped off site to licensed facilities for further analysis, for processing and/or for conditioning/recovery. Reduction in the volume of low-level radioactive waste requiring disposal in a licensed low-level radioactive waste disposal facility can be accomplished through a variety of methods, including analyses and surveys or decontamination to eliminate the portion of waste that does not require disposal as radioactive waste, compaction, incineration or metal melt. The estimate for Prairie Island reflects the savings from waste recovery/volume reduction.

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[13] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The NWPA provided that DOE would enter into contracts with utilities in which DOE would promise to take the utilities' spent fuel and high-level radioactive waste and utilities would pay the cost of the disposition services for that material. NWPA, along with the individual contracts with the 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. By January 1998, the DOE had failed to accept any spent fuel or high level waste, as required by the NWPA and utility contracts. Delays continue and, as a result, generators have initiated legal action against the DOE in an attempt to obtain compensation for DOE's breach of contract.

Operation of DOE's yet-to-be constructed repository is contingent upon the review and approval of the facility's license application by the NRC and the successful resolution of pending litigation. The DOE submitted its license application in June 2008. Assuming a timely review, DOE expects that receipt of fuel could begin as early as 2017,[14] although 2020 may be more likely according to the director of the DOE's waste program.[15]

It is generally necessary that spent fuel be actively cooled and stored for a minimum period at the generating site prior to transfer. As such, the NRC requires that licensees 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, pursuant to 10 CFR Part 50.54(bb).[16] This funding

13 "Nuclear Waste Policy Act of 1982 and Amendments," DOE's Office of Civilian Radioactive Management, 1982.
14 "DOE Announces Yucca Mountain License Application Schedule", U.S. Department of Energy's Office of Public Affairs, Press Release July 19, 2006.
15 Remarks of OCRWM Director Ward Sproat to the National Academy of Science, November 2006.
16 U.S. Code of Federal Regulations, Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," Subpart 54 (bb), "Conditions of Licenses."

requirement is fulfilled through inclusion of certain cost elements in the decommissioning estimate, for example, associated with the isolation and continued operation of the spent fuel pool and ISFSI.

At shutdown, the spent fuel pool is expected to contain freshly discharged assemblies (from the most recent refueling cycles) as well as the final reactor core. Over the following fifteen years the assemblies are packaged into casks and transferred to dry storage at the ISFSI. It is assumed that this period provides the necessary cooling for the final core to meet the storage canister requirements for decay heat.

DOE's contracts with utilities generally order the acceptance of spent fuel from utilities based upon the oldest fuel receiving the highest priority. For purposes of this analysis, acceptance of commercial spent fuel by the DOE is expected to begin in 2025. The first assemblies removed from the Prairie Island site are assumed to be in 2028. With an estimated rate of transfer of 3,000 metric tons of uranium (MTU)/year, completion of the removal of fuel from the site is projected to be in the year 2053.

The existing ISFSI, which operates under the Station's general license, is expanded to support decommissioning. As such, the facility will be modified to accommodate the additional dry storage casks needed to off-load the wet storage pool so that dismantling activities can proceed.

Xcel Energy's position is that the DOE has a contractual obligation to accept Prairie Island' fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim. However, at this time, including the cost of storing spent fuel in this study is the most reasonable approach because it insures the availability of sufficient decommissioning funds at the end of the station's life if, contrary to its contractual obligation, the DOE has not performed earlier.

Site Restoration

Prompt dismantling of site structures (once the facilities are decontaminated) 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 the demolition work force. Consequently, this study assumes that site structures are removed to a nominal depth of three feet below the local grade level wherever possible. The site is then to be graded and stabilized.

Summary

The cost to promptly decommission the Prairie Island units assumes the removal of all contaminated and activated plant components and structural materials such that the owner(s) may then have unrestricted use of the site with no further requirements for an operating license. Low-level

radioactive waste, other than GTCC waste, is sent to a commercial processor for treatment/conditioning or a controlled disposal facility.

Decommissioning is accomplished within the 60-year period required by current NRC regulations. In the interim, the spent fuel remains in storage at the site until such time that the transfer to a DOE facility is complete. Once emptied, the storage facilities are also decommissioned.

The decommissioning scenario 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. The major cost components are also identified in the cost summary provided at the end of this section.

The cost elements in this estimate are assigned to one of three subcategories: NRC License Termination, Spent Fuel Management, and Site Restoration. The subcategory "NRC License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR Part 50.75). In situations where the long-term management of spent fuel is not an issue, the cost reported for this subcategory is generally sufficient to terminate the unit's operating license.

The "Spent Fuel Management" subcategory contains costs associated with the construction of an ISFSI, the containerization and transfer of spent fuel to the ISFSI that is not transferred directly to the DOE over the five and one-half years of post-shutdown pool operations, and the management of the ISFSI until such time that the transfer of all fuel from this facility to an off-site location (e.g., geologic repository) is complete. The estimate also includes spent fuel management expenses incurred prior to the cessation of plant operations.

"Site Restoration" is used to capture costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination. This includes structures never exposed to radioactive materials, as well as those facilities that have been decontaminated to appropriate levels. Structures are removed to a depth of three feet and backfilled to conform to local grade.

It should be noted that the costs assigned to these subcategories are allocations. Delegation of cost elements is for the purposes of comparison (e.g., with NRC financial guidelines) or to permit specific financial treatment (e.g., ARO determinations). In reality, there can be considerable interaction between the activities in the three subcategories. For example, an owner may decide to remove non-contaminated structures early in the project to improve access to highly contaminated facilities or plant components. In these instances, the non-contaminated removal costs could be reassigned from Site Restoration to an NRC License Termination support activity. However, in general, the allocations represent a reasonable accounting of those costs that can be expected to be incurred for the specific subcomponents of the total estimated program cost, if executed as described.

The estimate presented in this document reflects the total cost (100%) to decontaminate the nuclear units, manage the spent fuel until the DOE is able to complete the transfer to a federal facility, dismantle the plant and restore the site for alternative use.

As noted within this document, the estimate was developed and costs are presented in 2008 dollars. As such, the estimate does not reflect the escalation of costs (due to inflationary and market forces) over the remaining operating life of the reactors or during the decommissioning period.

COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2008 dollars)

Cost Element	Unit 1	Unit 2
Decontamination	8,873	14,101
Removal	71,116	91,943
Packaging	18,148	18,447
Transportation	6,828	7,411
Radioactive Waste Disposal	48,983	50,257
Off-site Waste Processing	13,211	15,534
Program Management [1]	334,149	381,084
Spent Fuel Pool Isolation	5,911	5,911
Spent Fuel Management (direct costs) [2]	128,061	127,342
Insurance and Regulatory Fees	24,638	22,277
Energy	24,306	23,721
Characterization and Licensing Surveys	8,276	9,713
Property Taxes	21,069	19,904
Miscellaneous Equipment	6,228	6,250
Total [3]	719,795	793,894

Cost Element	Unit 1	Unit 2
License Termination	487,988	537,983
Spent Fuel Management	200,095	203,961
Site Restoration	31,713	51,950
Total [3]	719,795	793,894

[1] Includes engineering and security costs
[2] Excludes program management costs (staffing) but includes capital expenditures for ISFSI construction, costs for spent fuel loading/packaging/spent fuel pool O&M and EP fees
[3] Columns may not add due to rounding

1. INTRODUCTION

This report presents an estimate of the cost to promptly decommission the Prairie Island Nuclear Generating Plant (Prairie Island) following the scheduled cessation of plant operations. The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2005,[1] updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The current estimate is designed to provide the plant's owners, with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear units. It is not a detailed engineering document, but a financial analysis prepared in advance of the detailed engineering that will be required to carry out the decommissioning.

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare a comprehensive estimate of the cost to decommission the Prairie Island nuclear units, to provide a sequence or schedule for the associated activities, and to develop waste stream projections from the decontamination and dismantling activities.

For the purposes of this study, final shutdown dates (license expiration) for Unit 1 and Unit 2 are August 2013 and October 2014, respectively. Assuming a scheduled cessation of operations, these dates approximate a forty-year operating life.

1.2 SITE DESCRIPTION

Prairie Island is located on the west bank of the Mississippi River, approximately 26 miles southeast of the Twin City Metropolitan Area and within the city limits of Red Wing. The site is in Goodhue County, Minnesota.

The Nuclear Steam Supply System (NSSS) consists of a pressurized water reactor and a two-loop reactor coolant system. The system is comprised of the reactor vessel and two closed reactor coolant loops connected in parallel to the reactor vessel, each containing a reactor coolant pump and a steam generator. An electrically heated pressurizer is connected to one of the loops. The components were supplied by the Westinghouse Electric Corporation, with the reactor rated at a net core power output of 1650 MW(t). The steam and power conversion equipment, including the turbine-generator, has the capability to generate a gross unit output is 592 MW(e).

The system is housed within the reactor containment vessel, a free-standing cylindrical steel shell with a hemispherical dome and ellipsoidal bottom designed to withstand the internal pressure accompanying a loss-of-coolant accident. The reactor containment vessel

is surrounded by a cylindrical shield building constructed of reinforced concrete, which serves as a radiation shielding for normal operations and for the loss-of-coolant condition.

Heat produced in the reactor is converted to electrical energy by the plant's power conversion system. A turbine-generator converts the thermal energy of steam produced in the steam generators into mechanical shaft power and then into electrical energy. The turbine-generator consists of one high-pressure, double-flow and two low-pressure, double-flow elements driving a direct-coupled generator at 1800 rpm. The turbines are operated in a closed feedwater cycle in which the steam is condensed and returned to the steam generators by the feedwater system.

Heat rejected in the main condensers is removed by the circulating water system, which provides the heat sink for the removal of the waste heat in the power plant's thermal cycle. The majority of the heat is removed through dilution with river water in the discharge canal. Forced draft cooling towers provided supplemental heat removal.

1.3 REGULATORY GUIDANCE

The Nuclear Regulatory Commission (NRC or Commission) provided initial decommissioning requirements in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988.[2] This rule set forth financial criteria for decommissioning licensed nuclear power 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,"[3] which provided additional 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.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB. The DECON alternative assumes that any contaminated or activated portion of the plant's systems, structures and facilities are removed or decontaminated to levels that permit the site to be released for unrestricted use shortly after the cessation of plant operations. The rule 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 can 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 this deferred option is 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 unrestricted release limits for 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. With rulemaking permitting the controlled release of a site,[4] 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 considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments.[5] At this time, however, the NRC's staff has recommended that rulemaking be deferred, based upon several factors including that no licensee has committed to pursuing the entombment option, the unresolved issues associated with the disposition of greater-than-Class C material (GTCC), and the NRC's current priorities, at least until after the additional research studies are complete. The Commission concurred with the staff's recommendation.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants.[6] When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the facility's operating licensed life. Since that time, several licensees permanently and prematurely ceased operations. Exemptions from certain operating requirements were required once the reactor was defueled to facilitate the decommissioning. 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 amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees will submit written certification to the NRC within 30 days after the decision to cease operations. Certification will also be required once the fuel is permanently removed from the reactor vessel. Submittal of these notices will 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 is 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 is required to submit an application to the NRC to terminate the license, which will include a license termination plan (LTP).

1.3.1 Nuclear Waste Policy Act

Congress passed the "Nuclear Waste Policy Act"[7] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The NWPA provided that DOE would enter into contracts with utilities in which DOE would promise to take the utilities' spent fuel and high level waste, and utilities would pay the cost of the disposition services for that material. NWPA, along with the individual disposal contracts with the 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. By January 1998, the DOE had failed to accept spent nuclear fuel and high level waste, as required by the NWPA and utility contracts. Delays continue and, as a result, generators have initiated legal action against the DOE in an attempt to obtain compensation for DOE's breach of contract.

Operation of DOE's yet-to-be constructed repository is contingent upon the review and approval of the facility's license application by the NRC and the successful resolution of pending litigation. The DOE filed the license application in June 2008. Assuming a timely review, DOE expects that receipt of fuel could begin as early as 2017,[8] although 2020 may be more likely according to the director of the DOE's waste program.[9]

It is generally necessary that spent fuel be actively cooled and stored for a minimum period at the generating site prior to transfer. As such, the NRC requires that licensees 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, pursuant to 10 CFR Part 50.54(bb).[10] This funding requirement is fulfilled through inclusion of certain cost elements in the decommissioning estimate, for example, associated with the isolation and continued operation of the spent fuel pool and ISFSI.

At shutdown, the spent fuel pool is expected to contain freshly discharged assemblies (from the most recent refueling cycles) as well as the final reactor core. Over the next fifteen years the assemblies are packaged into multipurpose canisters for transfer to DOE from the ISFSI. It is assumed that this period provides the necessary cooling for the final core to meet storage canister requirements for decay heat.

DOE's contracts with utilities generally order the acceptance of spent fuel from utilities based upon the oldest fuel receiving the highest priority. The contracts also provide for exchanges of acceptance allocations among utilities, priority acceptance of spent fuel from permanently shutdown reactors and emergency acceptance of spent

fuel. In addition, DOE has discussed the development of new contracts that would address acceptance of spent fuel from new plants. For purposes of this analysis, the acceptance of commercial spent fuel by the DOE is expected to begin in 2025. The first assemblies removed from the Prairie Island site are assumed to be in 2028. With an estimated rate of transfer of 3,000 metric tons of uranium (MTU)/year, completion of the removal of fuel from the site is projected to be in the year 2053.

An ISFSI, which Xcel Energy operates under a site-specific license, is currently in operation to support plant operations and decommissioning. As such, the facility will be modified to accommodate the dry storage casks needed to off-load the wet storage pool so that dismantling activities can proceed.

Xcel Energy's position is that the DOE has a contractual obligation to accept Prairie Island' fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim. However, at this time, including the cost of storing spent fuel in this study is the most reasonable approach because it insures the availability of sufficient decommissioning funds if, contrary to its contractual obligations, the DOE has not performed.

1.3.2 Low-Level Radioactive Waste Acts

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 Policy Act" in 1980,[11] the states became 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 for implementation. After little progress, the "Low-Level Radioactive Waste Policy Amendments Act of 1985,"[12] extended the implementation schedule, with specific milestones and stiff sanctions for non-compliance. Subsequent court rulings have substantially diluted those sanctions and, to date, no new compact facilities have been successfully sited, licensed and constructed.

In June 2000, South Carolina formally joined with Connecticut and New Jersey to form the Atlantic Compact. The legislation allowed South Carolina to gradually limit access to the Barnwell facility, with only Atlantic Compact members having access to the facility after mid-year 2008. Therefore, Prairie Island is no longer able to access the disposal facility in Barnwell, South Carolina. Prairie Island still has access to the EnergySolutions facility in Clive Utah (for 10 CFR 61 Class A waste only). It is

reasonable to assume that additional disposal capacity will be developed to support reactor decommissioning, particularly for the isolation of the more highly radioactive material that is not suitable for disposal elsewhere.

In the interim, and as a proxy, the EnergySolutions' disposal facility in Clive, Utah is used as the destination for the lowest level, Class A,[13] radioactive waste. EnergySolutions does not have a license to dispose of the more highly radioactive waste (Class B and C) generated in the dismantling of the reactor. As such, the disposal costs for this material are based upon the last published rate schedule for non-compact waste for the Barnwell facility.

A significant portion of the waste material generated during decommissioning may only be potentially contaminated by radioactive materials. This waste can be analyzed on site or shipped off site to licensed facilities for further analysis, for processing and/or for conditioning/recovery. Reduction in the volume of low-level radioactive waste requiring disposal in a licensed low-level radioactive waste disposal facility can be accomplished through a variety of methods, including analyses and surveys or decontamination to eliminate the portion of waste that does not require disposal as radioactive waste, compaction, incineration or metal melt. The estimate for the Prairie Island units reflects the savings from waste recovery/volume reduction.

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination,"[14] amending 10 CFR Part 20. This subpart provides radiological criteria for releasing a facility for unrestricted use. The regulation states that the site can 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 that residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimate for the Prairie Island site assumed that it 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).[15] An additional and separate limit of 4 millirem per year, as defined in 40 CFR Part 141.16, is applied to drinking water.[16]

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)[17] 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 the 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 the EPA. However, if there are other hazardous materials on the site, the EPA may be involved in the cleanup. As such, the possibility of dual regulation remains for certain licensees. The present study does not include any costs for this occurrence.

2. DECOMMISSIONING ALTERNATIVE DESCRIPTION

A detailed cost estimate was developed to promptly decommission the Prairie Island nuclear units, (i.e., the DECON decommissioning alternative). The DECON alternative, as defined by the NRC, is "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."

The following sections describe the basic activities associated with the DECON 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 provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee is then 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 estimate developed for Prairie Island is 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 rate of expenditure.

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 Part 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 GTCC, as defined by 10 CFR Part 61. Major components are further defined as comprising the reactor vessel and internals, steam generators, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the Part 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 is not allowed to proceed if the consequences of a particular decommissioning activity are greater than that bounded by previously evaluated environmental assessments or impact statements. In this instance, the licensee must submit a license amendment for the specific activity and update the environmental report.

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

- Characterize the site and surrounding environs. This includes radiation surveys and sampling of the work areas, major components (including the reactor vessel and its internals), internal piping, and biological shield.
- Isolate the spent fuel storage pool and fuel handling systems, such that decommissioning operations can commence on the balance of the plant. Decommissioning operations are scheduled around the fuel handling area to optimize the overall project schedule. The fuel is transferred from the pool once it decays to the point that it meets the heat load criteria of the storage/transport containers. Consequently, it is assumed that the fuel pool will remain operational for approximately fifteen years following the cessation of plant operations while the residual inventory is transferred to the ISFSI.
- Specify of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Develop 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

This period includes the physical decommissioning activities associated with the removal and disposal of contaminated and activated components and structures, including the successful termination of the 10 CFR Part 50 operating license. Significant decommissioning activities in this phase include:

- Construct 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.
- Reconfigure and modify 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. Modifications may be required to the containment structure to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the building to support the segmentation of the reactor vessel internals and component extraction.
- Design and fabricate temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procure (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontaminate components and piping systems as required to control (minimize) worker exposure.

- Remove piping and components no longer essential to support decommissioning operations.
- Remove control rod drive housings and the head service structure from reactor vessel head. Segment the vessel closure head.
- Remove and segment 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.
- Disassemble and segment the remaining reactor internals, including the core former and lower core support assembly. Some material is expected to exceed Class C disposal requirements. That material will be packaged in a modified spent fuel storage canister for geologic disposal.
- Segment the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in air using remotely operated equipment within a contamination control envelope. The water level is 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.
- Remove 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.
- Remove the steam generators and pressurizer for controlled disposal. The steam domes are removed for off-site processing. The lower shell is sealed and the nozzles and other openings welded closed. These components can serve as their own burial containers provided that all penetrations are properly sealed and the internal contaminants are stabilized. Steel shielding is added, as necessary, to those external areas of the steam generators to meet transportation limits and regulations.
- Transfer any remaining spent fuel from the storage pool to the ISFSI.

At least two years prior to the anticipated date of license termination, a LTP is required. Submitted as a supplement to the 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:

- Remove 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).
- Remove steel liners from refueling canal, disposing of the activated and contaminated sections as radioactive waste. Remove any remaining activated/ contaminated concrete.
- Survey decontaminated areas of the containment structure.
- Remediate and remove the contaminated equipment and material from the mechanical and electrical auxiliary and fuel handling buildings and any other contaminated facility. Radiation and contamination controls are utilized until residual levels indicate that the structures and equipment can 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 facilitates surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.
- Remove the remaining components, equipment, and plant services in support of the area release survey(s).
- Route material removed in the decontamination and dismantling to a central processing area. Material certified to be free of contamination is 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 the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)."[18] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies 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(s) 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 will 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, safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade power block structures including the reactor, fuel handling and mechanical and electrical auxiliary 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 is 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 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 were deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public as well as to future workers. Abandonment creates a breeding ground for vermin infestation as well as other biological hazards.

This cost study presumes that non-essential structures and site facilities are 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, as well as 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 to an off-site area for disposal as construction debris.

2.4 ISFSI OPERATIONS AND DECOMMISSIONING

The ISFSI will continue to operate under a site-specific license as authorized by 10 CFR Part 72. Assuming the DOE begins to remove fuel from the Prairie Island site in 2028, the process is not expected to be completed until 2053. 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, can result

in a longer on-site residence time for the fuel discharge from the reactors, as well as additional caretaking expenses.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the license when 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.

The assumed design for the ISFSI is based upon the use of the TN-40 cask from Transnuclear. The Prairie Island ISFSI already contains twenty-four TN-40 casks, and Xcel Energy has indicated that the remainder of the Prairie Island spent fuel will be loaded into TN-40 casks as well. Therefore the TN-40 is used as a basis for this cost analysis. For purposes of this cost analysis, it is assumed that the spent fuel is shipped to DOE within the TN-40 casks. The concrete storage pad will then be removed, and the area graded and landscaped to conform to the surrounding environment. Once the spent fuel has been removed from the casks by DOE at the geologic repository, the TN-40 casks will be disposed of as low-level waste.

3. COST ESTIMATE

The cost estimate prepared for decommissioning the Prairie Island units considers the unique features of the plant, including the nuclear steam supply system, power generation systems, support services, plant structures, and ancillary facilities. The basis of the estimate, including the sources of information relied upon, the estimating methodology employed, site-specific considerations, and other pertinent assumptions, is described in this section.

3.1 BASIS OF COST ESTIMATE

The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2005,[1] updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. This information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluations 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 the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[19] and the DOE "Decommissioning Handbook."[20] 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) are developed using local labor rates. The activity-dependent costs are 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 rely upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means. [21]

The unit factor method provides a demonstrable basis for establishing a reliable cost estimate. 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.

This analysis 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 the technical challenges of decommissioning commercial nuclear units.

Work Difficulty Factors

The estimate 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.

Work difficulty adjustment factors (WDFs) account for the inefficiencies in working in a power plant environment. The factors are assigned to each unique set of unit cost 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 — 0% to 30%
- Work Break Factor — 8.33%

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 radiological 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 is based 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 result.

3.3 IMPACT OF DECOMMISSIONING MULTIPLE REACTOR UNITS

In estimating the near simultaneous decommissioning of two co-located reactor units there can be opportunities to achieve economies of scale, by sharing costs between units, and coordinating the sequence of work activities. There will also be schedule constraints, particularly where there are requirements for specialty equipment and staff, or practical limitations on when final status surveys can take place. For purposes of the estimate, Units 1 and 2 are assumed to be essentially identical. Common facilities have been assigned to Unit 2. A summary of the principal impacts are listed below.

- The sequence of work generally follows the principal that the work is done at Unit 1 first, followed by similar work at Unit 2. This permits the experience gained at Unit 1 to be applied by the workforce at the second unit. It should be noted however, that the estimate does not consider productivity improvements at the second unit, since there is little documented experience with decommissioning two units simultaneously. The work associated with developing activity specifications and procedures can be considered essentially identical between the two units, therefore the second unit costs are assumed to be a fraction of the first unit (~ 40%).
- Segmenting the reactor vessel and internals will require the use of special equipment. The cost of procuring that equipment is assumed to be shared on an equal basis between the two units. In addition, the decommissioning project will be scheduled such that Unit 2's reactor internals and vessel are segmented immediately after the activities at Unit 1 have been completed.
- Some program management and support costs, particularly costs associated with the more senior positions, can be avoided with two reactors undergoing decommissioning simultaneously. As a result, the estimate is based on a "lead" unit that includes these senior positions, and a "second" unit that excludes these positions. The designation as lead is based on the unit undertaking the most complex tasks (for instance vessel segmentation) or performing tasks for the first time.
- The final radiological survey schedule is also affected by a two-unit decommissioning schedule. It would be considered impractical to try to complete the final status survey of Unit 1, while Unit 2 still has ongoing radiological remediation work and waste handling in process. As a result, Unit 1 is assumed to enter a delay period after completion of radiological remediation, such that the final status survey can be completed for the station. During this delay, program management costs are reduced accordingly.

- The final demolition of buildings at Units 1 and 2 are considered to take place concurrently. This is considered a reasonable assumption since access to the buildings is considered good at the station.
- Unit 1, as the first unit to enter decommissioning, incurs the majority of site characterization costs.
- Shared systems and structures are generally assigned to Unit 2.
- Station costs such as ISFSI operations, emergency response fees, regulatory agency fees, and insurance are generally allocated on an equal basis between the two units.

3.4 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 (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 the 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.

3.4.1 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"[22] 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 analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, contingency is included. 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 analysis, does not account for price escalation and inflation in the cost of decommissioning over the anticipated operating life of the station.

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 ranged 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 consistent with those developed in the AIF/NESP-036 study and 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%
- Nuclear Steam Supply System Component Removal 25%
- Reactor Waste Packaging 25%

- Reactor Waste Transport 25%
- Reactor Vessel Component Disposal 50%
- Greater-than-Class C 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%
- Property Taxes 0%
- Fees 10%
- Insurance 10%
- Staffing 15%

The contingency values are applied to the appropriate components of the estimate on a line item basis. A composite value is then reported at the end of each detailed estimate as provided in Appendix C.

3.4.2 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:

- 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 plant drawings.
- Regulatory changes, for example, 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, for example, the start and rate of acceptance of spent fuel by the DOE.
- Pricing changes for basic inputs such as labor, energy, materials, and disposal. Items subject to widespread price competition (such as materials) may not show significant variation; however, others such as waste disposal could exhibit large pricing uncertainties, particularly in markets where limited access to services is available.

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 higher probability. This is mostly due to the pricing uncertainty for low-level radioactive waste disposal, 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, the areas of uncertainty or risk should be revisited periodically and addressed through repeated revisions or updates of the base estimate.

3.5 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.

3.5.1 Spent Fuel Management

The cost to dispose the spent fuel generated from plant operations is not reflected within the estimate to decommission the Prairie Island units. 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 (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 below.

Operation of the DOE's yet-to-be constructed geologic repository is contingent upon the review and approval of the facility's license application by the NRC, the successful resolution of pending litigation, and the development of a national transportation system. The timetable issued by the DOE in 2006 is based upon submittal of the license application in mid-2008 (The application was submitted to the NRC in June 2008). Assuming a timely review (the application for the Private Fuel Storage's facility on the Goshute reservation took 8½ years), the DOE expects that receipt of fuel could begin as early as 2017. However, for purposes of this estimate, full scale operations at the repository are not expected to commence before 2025.

Spent Fuel Management Model

Completion of the decommissioning process is highly dependent upon the DOE's ability to remove spent fuel from the site. The timing for removal of spent fuel from the site is based upon the DOE's most recently published annual acceptance rates of 400 MTU/year for year 1, 3,800 MTU total for years 2 through 4 and 3,000 MTU/year for year 5 and beyond.[23] The DOE contracts provide mechanisms for altering the oldest fuel first allocation scheme, including emergency deliveries, exchanges of allocations amongst utilities and the option of providing priority acceptance from permanently shutdown nuclear reactors. Because it is unclear how these mechanisms may operate once DOE begins accepting spent fuel from commercial reactors, this study assumes that DOE will accept spent fuel in an oldest fuel first order.

ISFSI

This analysis assumes that the existing ISFSI is modified at the cessation of plant operations to facilitate the decommissioning of the two nuclear units. The storage facility is sized to accommodate the fuel present in the storage pool at shutdown that cannot be transferred directly to the DOE.

Construction, operation and maintenance costs for the ISFSI are included within the estimate and address the costs for staffing the facility, as well as security, insurance, and licensing fees. The estimate also includes the costs to purchase, load, and transfer the Transnuclear TN-40 metal cask storage system spent fuel storage canisters from the pool to the ISFSI. Costs are also provided for the final disposition of the facilities once the transfer is complete.

Storage Canister Design

The design and capacity of the ISFSI is based upon the TN-40 dry cask storage system. A capacity of 40 fuel assemblies is used, at a unit cost of approximately $4,095,000 per cask.

Canister Loading and Transfer

A cost of $100,000 is used for the labor and equipment to load each TN-40 onto a DOE-provided railcar for transport of the spent fuel to the DOE.

Operations and Maintenance

An annual cost (excluding labor) of approximately $746,000 and $87,000 are used for operation and maintenance of the spent fuel pool and the ISFSI, respectively.

At shutdown, the spent fuel pool is expected to contain freshly discharged assemblies (from the most recent refueling cycles). Over the next fifteen years the assemblies are packaged into TN-40s for transfer to the ISFSI for transfer to the DOE. It is assumed that the fifteen years also provides the necessary cooling period for the final core to meet transport system requirements for decay heat and/or the dry cask storage vendor's system. Once the pool is emptied, the spent fuel storage and handling facilities are available for decommissioning.

ISFSI Design Considerations

The TN-40 is an ultra-high capacity vertical storage system with self-contained steel and borated resin shielding. Borated aluminum plates and stainless steel tubes form the basket assembly. The Prairie Island ISFSI already contains twenty-four TN-40 casks, and Xcel Energy has indicated that the remainder of the Prairie Island

spent fuel will be loaded into TN-40 casks as well. Therefore the TN-40 is used as a basis for this cost analysis. While it is expected that surface contamination within the TN-40 casks could be removed to levels that meet the site release criteria, it is also expected that the casks will 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). The cost of the disposal of this material, as well as the demolition of the ISFSI, is reflected within the estimate.

GTCC

The dismantling of the reactor internals generates radioactive waste considered unsuitable for shallow land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the Federal Government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. Although there are strong arguments that GTCC waste is covered by the spent fuel contact with DOE and the fees being paid pursuant to that contract, DOE has taken the position that GTCC waste is not covered by that contract or its fees and that utilities, including Xcel Energy, will have to pay an additional fee for the disposal of their GTCC waste. However, to date, the Federal Government has not identified a cost for disposing of GTCC or a schedule for acceptance. As such, the estimate to decommission the Prairie Island units includes an allowance for the disposition of GTCC material.

For purposes of this study, GTCC is packaged in the same canisters used to store spent fuel. It is not anticipated that the DOE would accept this waste prior to completing the transfer of spent fuel. Therefore, until such time the DOE is ready to accept GTCC waste, it is reasonable to assume that this material remains in storage with the spent fuel at the ISFSI.

3.5.2 Reactor Vessel and Internal Components

The reactor vessel internal components are segmented for disposal in shielded, reusable transportation casks. Segmentation is performed underwater when practical where a remote cutter is installed. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology. The control elements are disposed of along with the spent fuel and, there is no additional cost provided for their disposal.

As stated previously, the dismantling of 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 by the NRC, DOE at one time

indicated it would accept title to this waste for disposal at the future high-level waste repository.[24] However, the current DOE position is unclear, and 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 radioactive waste has been packaged and disposed of as high-level waste, at a cost equivalent to that envisioned for the spent fuel.

Intact disposal of reactor vessel shells has been successfully demonstrated at several of the sites recently decommissioned. Access to navigable waterways has allowed these large packages to be transported to the Barnwell disposal site with minimal overland travel. Intact disposal of the reactor vessel and internal components can 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 (including the internals). However, its location 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 Prairie Island units cease 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. As such, the estimate assumes segmentation of the reactor vessel, as a bounding condition. With lower levels of activation, the vessel shell can be packaged more efficiently than the curie-limited internal components. This will allow the use of more conventional waste packages rather than shielded casks for transport.

3.5.3 Primary System Large Components

The reactor coolant system components are assumed to be decontaminated using chemical agents prior to the start of cutting operations. This type of decontamination can be expected to have a significant ALARA impact in the DECON scenario, since in this scenario the removal work is done within the first few years of shutdown. It should be noted that if the decommissioning work is significantly delayed, chemical decontamination might not be necessary. A decontamination factor (average reduction) of 10 is assumed for the process. Disposal of the decontamination solution effluent is included within the estimate as a "process liquid waste" charge.

The following discussion deals with the removal and disposition of the steam generators, but the techniques involved are also applicable to other large radioactively-contaminated components, such as heat exchangers and the pressurizer. The steam generators' size and weight, their location within the reactor building, as well as the disposal facility waste acceptance criteria, and access to transportation will ultimately determine the removal, transportation, and disposal strategy.

A crane is set up for the removal of the generators. It can also 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. Interferences within the work area, such as grating, piping, and other components are removed to create sufficient lay-down space for processing these large components.

The generators are rigged for removal, disconnected from the surrounding piping and supports, and maneuvered into the open area where they are lowered onto a down-ending cradle. Each generator is rotated into the horizontal position for extraction from the containment and placed onto a multi-wheeled vehicle for transport to an on-site preparation area.

Disposal costs are based upon the displaced volume and weight of the primary side portions of the steam generators. Each component is then loaded onto a rail car for transport to the disposal facility. The secondary side is assumed to be sent to an off-site waste processor.

Reactor coolant piping is cut from the reactor once the water level (used for personnel shielding during dismantling and cutting operations in and around the reactor) is dropped below the elevation of associated nozzle(s). The piping is boxed and transported by shielded van. The reactor coolant pumps and motors are lifted out intact, packaged, and transported for disposal.

3.5.4 Main Turbine and Condenser

The main turbine and condenser are assumed to have only minor levels of contamination. As such, the components are dismantled using conventional maintenance procedures. The turbine rotors and shafts are removed to a laydown area. The lower turbine casings are removed from their anchors by controlled demolition. The main condensers are also disassembled and moved to a laydown area. Material is then surveyed and designated for either decontamination or volume reduction, conventional disposal, or controlled disposal. Components are packaged and readied for transport in accordance with the intended disposition. This estimate assumes that the components can meet free-release limits and ultimately dispositioned as scrap metal.

3.5.5 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.[25] The contaminated material will be packaged in Industrial Packages (IP-1, IP-2, or IP-3, as defined in subpart 173.411) 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 Part 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.

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., ^{137}Cs, ^{90}Sr, or transuranics) has been prevented from reaching levels exceeding those that permit the major reactor components to be shipped under current transportation regulations and disposal requirements.

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 is 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, rail, and/or multi-wheeled transporter.

Transportation costs for Classes A, B and C material requiring controlled disposal are based upon the mileage to the EnergySolutions facility in Clive, Utah. The existing Barnwell facility rate schedule for non-Atlantic Compact members is used as the cost estimating basis for disposal of the Class B and C material. Transportation costs for off-site waste processing are based upon the mileage to Memphis, Tennessee. Truck transport costs are estimated using published tariffs from Tri-State Motor Transit.[26]

3.5.6 Low-Level Radioactive Waste Disposal

To the greatest extent practical, metallic material generated in the decontamination and dismantling processes is processed to reduce the total cost of controlled disposal. Material meeting the regulatory and/or site release criterion, is released as scrap, requiring no further cost consideration. Conditioning (preparing the material to meet the waste acceptance criteria of the disposal site) and recovery of the waste stream is performed off site at a licensed processing center. Any material leaving the site is subject to a survey and release charge, at a minimum. Based on TLG's experience, rates were assumed for off-site processing as well as survey and release.

The mass of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in the detailed Appendix C, and summarized in Table 5.1. The quantified waste summaries shown in these tables are consistent with 10 CFR Part 61 classifications. 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 are calculated based on the exterior package dimensions for containerized material or a specific calculation for components serving as their own waste containers.

The more highly activated reactor components will be shipped in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume, as well as 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.

Disposal fees are based upon estimated charges, with surcharges added for the highly activated components, for example, generated in the segmentation of the reactor vessel. The cost to dispose of the majority of the material generated from

the decontamination and dismantling activities is based upon Xcel Energy's current cost for disposal at EnergySolutions facility in Clive, Utah. Disposal costs for the higher activity waste (Class B and C) were estimated using the last available Barnwell rate structure for non-Atlantic Compact members.

3.5.7 Site Conditions Following Decommissioning

The NRC will terminate (or amend) the site license(s) 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 typically ends at this point. Building codes and state environmental regulations dictate the next step in the decommissioning process, as well as the owner's future plans for the site.

There are varying degrees to which the Prairie Island site can be restored following the decommissioning of the two nuclear units. The estimate presented herein includes the dismantling of the major structures to just below ground level, backfilling and the collapsing of below grade voids, and general terra-forming such that the site upon which the power block and supplemental structures are located is transformed into a "grassy plain." Certain facilities, which have continued use or value (e.g., the switchyard) are left intact.

3.6 ASSUMPTIONS

The following are the major assumptions made in the development of the estimate for decommissioning Prairie Island.

3.6.1 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.

3.6.2 Labor Costs

The craft labor required to decontaminate and dismantle the Prairie Island units will be acquired through standard site contracting practices. Craft labor costs were based upon information from Xcel Energy. Craft labor costs include applicable overheads and profit.

Xcel Energy, as the operator, will continue to provide site operations support, including decommissioning program management, licensing, radiological protection, and site security. A Decommissioning Operations Contractor (DOC) will provide the supervisory staff needed to oversee the labor subcontractors, consultants, and specialty contractors needed to perform the work required for the decontamination and dismantling effort. The DOC will also provide the engineering services needed to develop activity specifications, detailed procedures, detailed activation analyses, and support field activities such as structural modifications.

Utility labor costs were provided by Xcel Energy. Average costs were provided by department or work group and included payroll overheads. Decommissioning Operations Contractor (DOC) labor costs were based on utility labor costs with modified markups to account for employee benefits, DOC overhead and profit. Severance costs were included as a separate expenditure within the estimate.

Based upon site overhead costs provided by Xcel Energy, an administrative and general cost (A&G) is included. This cost is based on the average annual A&G per person applied to each of the utility staffing positions (number of utility personnel assigned to the project). The A&G cost includes: site overhead costs directly required to support the site decommissioning staff.

Security, while reduced from operating levels, is maintained throughout the decommissioning for access control, material control, and to safeguard the spent fuel.

3.6.3 Design Conditions

Activation levels in the vessel and internal components are modeled using NUREG/CR-3474.[27] Estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the Prairie Island components, projected operating life(s), and different periods of decay. Additional short-lived isotopes were derived from CR-0130 [28] and CR-0672 [29] and benchmarked to the long-lived values from CR-3474.

The control elements are disposed of along with the spent fuel (i.e., there is no additional cost provided for their disposal). Disposition of any control elements

stored in the pool from operations is considered an operating expense and therefore not accounted for in the decommissioning estimate.

Activation of the reactor building is confined to the area around the biological shield. 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 sending it to a landfill. The ultimate disposition of the material removed from the reactor building will depend upon the site release criteria applied, as well as the designated end use for the site.

3.6.4 General

Transition Activities

Existing warehouses are cleared of non-essential material and remain for use by the plant operator and its subcontractors. The plant's operating staff performs 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.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale.
- Process operating waste inventories. This estimate does not address the disposition of any legacy wastes and the disposal of operating wastes during this initial period is not considered a decommissioning expense.

Scrap and Salvage

The existing plant equipment is considered obsolete and suitable for scrap as deadweight quantities only. Xcel Energy will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed for equipment in this analysis 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 analysis does not attempt to quantify the value that an owner may realize based upon those efforts.

It is assumed, for purposes of this analysis, 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. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. An allowance has been included for the survey and release of all metallic material released from the site.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other property is removed at no cost or credit to the decommissioning project. Disposition may include relocation to other facilities. Spare parts are also made available for alternative use.

The concrete debris resulting from building demolition activities is crushed on site to reduce the size of the debris. The resulting crushed concrete is used to backfill below grade voids, with the excess assumed to be removed from the site as recycled material at no cost or credit to the decommissioning program. The rebar removed from the concrete crushing process is disposed of as scrap steel in a similar fashion as other scrap metal as discussed previously.

Energy

For estimating purposes, the plant is assumed to be de-energized, with the exception of those facilities associated with spent fuel storage (temporary power is run throughout the plant, as needed). Replacement power costs are used to calculate the cost of energy consumed 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."[30] The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

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.

3.7 COST ESTIMATE SUMMARY

Schedules of expenditures are provided in Tables 3.1 and 3.2. The tables delineate the cost contributors by year of expenditures as well as cost contributor (e.g., labor, materials, and waste disposal).

The cost elements are also assigned to one of three subcategories: "License Termination," "Spent Fuel Management," and "Site Restoration." The subcategory "License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). In situations where the long-term management of spent fuel is not an issue, the cost reported for this subcategory is generally sufficient to terminate the unit's operating license.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel to the ISFSI, and the management of the ISFSI until such time that the transfer of all fuel from this facility to an off-site location (e.g., geologic repository) is complete. It also includes spent fuel management expenses incurred prior to the cessation of plant operations.

"Site Restoration" is used to capture costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination. This includes structures never exposed to radioactive materials, as well as those facilities that have been decontaminated to appropriate levels. Structures are removed to a depth of three feet and backfilled to conform to local grade.

As discussed in Section 3.5.1, it is not anticipated that the DOE will accept the GTCC waste prior to completing the transfer of spent fuel. Therefore, the cost of GTCC disposal is shown in the final year of ISFSI operation. While designated for disposal at the geologic repository along with the spent fuel, GTCC waste is still classified as low-level radioactive waste and, as such, included as a "License Termination" expense.

Decommissioning costs are reported in 2008 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure (or projected lifetime of the plant). The schedules are based upon the detailed activity costs reported in Appendix C, along with the timeline presented in Section 4.

TABLE 3.1
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2013	18,730	3,838	1,168	21	4,071	27,827
2014	54,479	13,925	4,108	3,012	11,618	87,143
2015	57,610	29,919	3,123	22,490	7,706	120,848
2016	42,606	18,193	2,433	12,694	4,973	80,899
2017	33,917	10,326	2,205	5,624	3,731	55,802
2018	15,258	5,605	1,009	1,472	2,584	25,928
2019	8,692	3,944	588	11	2,181	15,416
2020	8,716	3,955	590	11	2,187	15,459
2021	8,692	3,944	588	11	2,181	15,416
2022	8,692	3,944	588	11	2,181	15,416
2023	8,692	3,944	588	11	2,181	15,416
2024	8,716	3,955	590	11	2,187	15,459
2025	8,692	3,944	588	11	2,181	15,416
2026	8,692	3,944	588	11	2,181	15,416
2027	8,692	3,944	588	11	2,181	15,416
2028	8,716	3,955	590	11	2,187	15,459
2029	10,302	3,968	692	607	2,377	17,947
2030	13,819	2,577	893	1,775	5,234	24,299
2031	9,409	3,420	374	10	2,566	15,779
2032	9,393	4,359	295	0	778	14,825
2033	6,451	2,577	208	0	776	10,011
2034	2,363	96	88	0	775	3,322
2035	2,363	96	88	0	775	3,322
2036	2,369	96	88	0	777	3,331
2037	2,363	96	88	0	775	3,322
2038	2,363	96	88	0	775	3,322
2039	2,363	96	88	0	775	3,322
2040	2,369	96	88	0	777	3,331

Note: Columns may not add due to rounding

TABLE 3.1
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	2,363	96	88	0	775	3,322
2042	2,363	96	88	0	775	3,322
2043	2,363	96	88	0	775	3,322
2044	2,369	96	88	0	777	3,331
2045	2,363	96	88	0	775	3,322
2046	2,363	96	88	0	775	3,322
2047	2,363	96	88	0	775	3,322
2048	2,369	96	88	0	777	3,331
2049	2,363	96	88	0	775	3,322
2050	2,363	96	88	0	775	3,322
2051	2,363	96	88	0	775	3,322
2052	2,369	96	88	0	777	3,331
2053	2,356	313	89	34	11,078	13,869
2054	527	1,070	146	4,054	1,375	7,173
	406,770	141,387	24,306	51,900	95,432	719,795

Note: Columns may not add due to rounding

TABLE 3.1a
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF LICENSE TERMINATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2013	17,424	591	1,168	21	3,760	22,964
2014	50,558	5,028	4,108	3,012	10,838	73,544
2015	53,047	20,321	3,123	22,490	6,926	105,907
2016	39,046	11,179	2,433	12,694	4,310	69,663
2017	30,956	4,878	2,205	5,624	3,142	46,805
2018	13,540	1,348	1,009	1,472	1,996	19,365
2019	7,413	106	588	11	1,592	9,710
2020	7,433	106	590	11	1,597	9,736
2021	7,413	106	588	11	1,592	9,710
2022	7,413	106	588	11	1,592	9,710
2023	7,413	106	588	11	1,592	9,710
2024	7,433	106	590	11	1,597	9,736
2025	7,413	106	588	11	1,592	9,710
2026	7,413	106	588	11	1,592	9,710
2027	7,413	106	588	11	1,592	9,710
2028	7,433	106	590	11	1,597	9,736
2029	9,234	763	692	607	1,865	13,162
2030	13,737	2,330	893	1,775	5,074	23,810
2031	2,625	195	159	10	1,957	4,945
2032	84	0	0	0	0	84
2033	49	0	0	0	0	49
2034	0	0	0	0	0	0
2035	0	0	0	0	0	0
2036	0	0	0	0	0	0
2037	0	0	0	0	0	0
2038	0	0	0	0	0	0
2039	0	0	0	0	0	0
2040	0	0	0	0	0	0

Note: Columns may not add due to rounding

TABLE 3.1a
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF LICENSE TERMINATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	0	0	0	0	0	0
2042	0	0	0	0	0	0
2043	0	0	0	0	0	0
2044	0	0	0	0	0	0
2045	0	0	0	0	0	0
2046	0	0	0	0	0	0
2047	0	0	0	0	0	0
2048	0	0	0	0	0	0
2049	0	0	0	0	0	0
2050	0	0	0	0	0	0
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	220	0	0	10,294	10,514
2054	0	0	0	0	0	0
	304,487	47,913	21,677	47,812	66,098	487,988

Note: Columns may not add due to rounding

TABLE 3.1b
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2013	1,082	3,246	0	0	310	4,639
2014	2,966	8,897	0	0	781	12,644
2015	3,191	9,574	0	0	609	13,374
2016	2,332	6,995	0	0	590	9,917
2017	1,811	5,434	0	0	589	7,834
2018	1,418	4,254	0	0	589	6,260
2019	1,279	3,838	0	0	589	5,707
2020	1,283	3,849	0	0	590	5,722
2021	1,279	3,838	0	0	589	5,707
2022	1,279	3,838	0	0	589	5,707
2023	1,279	3,838	0	0	589	5,707
2024	1,283	3,849	0	0	590	5,722
2025	1,279	3,838	0	0	589	5,707
2026	1,279	3,838	0	0	589	5,707
2027	1,279	3,838	0	0	589	5,707
2028	1,283	3,849	0	0	590	5,722
2029	1,068	3,205	0	0	512	4,785
2030	82	247	0	0	160	489
2031	1,754	165	64	0	608	2,592
2032	2,387	148	88	0	777	3,401
2033	2,373	126	88	0	775	3,362
2034	2,363	96	88	0	775	3,322
2035	2,363	96	88	0	775	3,322
2036	2,369	96	88	0	777	3,331
2037	2,363	96	88	0	775	3,322
2038	2,363	96	88	0	775	3,322
2039	2,363	96	88	0	775	3,322
2040	2,369	96	88	0	777	3,331

Note: Columns may not add due to rounding

TABLE 3.1b
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	2,363	96	88	0	775	3,322
2042	2,363	96	88	0	775	3,322
2043	2,363	96	88	0	775	3,322
2044	2,369	96	88	0	777	3,331
2045	2,363	96	88	0	775	3,322
2046	2,363	96	88	0	775	3,322
2047	2,363	96	88	0	775	3,322
2048	2,369	96	88	0	777	3,331
2049	2,363	96	88	0	775	3,322
2050	2,363	96	88	0	775	3,322
2051	2,363	96	88	0	775	3,322
2052	2,369	96	88	0	777	3,331
2053	2,356	93	89	34	784	3,355
2054	527	1,070	146	4,054	1,375	7,173
	81,073	83,694	2,152	4,088	29,087	200,094

Note: Columns may not add due to rounding

TABLE 3.1c
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF SITE RESTORATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2013	224	0	0	0	0	224
2014	955	0	0	0	0	955
2015	1,371	24	0	0	171	1,567
2016	1,229	18	0	0	73	1,320
2017	1,150	13	0	0	0	1,163
2018	299	3	0	0	0	303
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0
2030	0	0	0	0	0	0
2031	5,031	3,060	150	0	1	8,242
2032	6,922	4,210	206	0	1	11,340
2033	4,028	2,450	120	0	1	6,600
2034	0	0	0	0	0	0
2035	0	0	0	0	0	0
2036	0	0	0	0	0	0
2037	0	0	0	0	0	0
2038	0	0	0	0	0	0
2039	0	0	0	0	0	0
2040	0	0	0	0	0	0

Note: Columns may not add due to rounding

TABLE 3.1c
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1
SCHEDULE OF SITE RESTORATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	0	0	0	0	0	0
2042	0	0	0	0	0	0
2043	0	0	0	0	0	0
2044	0	0	0	0	0	0
2045	0	0	0	0	0	0
2046	0	0	0	0	0	0
2047	0	0	0	0	0	0
2048	0	0	0	0	0	0
2049	0	0	0	0	0	0
2050	0	0	0	0	0	0
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	0	0	0	0	0
2054	0	0	0	0	0	0
	21,210	9,780	476	0	247	31,713

Note: Columns may not add due to rounding

TABLE 3.2
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	7,510	1,689	516	8	1,751	11,474
2015	44,360	11,510	3,456	1,370	9,742	70,437
2016	56,365	28,466	3,816	19,135	7,414	115,195
2017	56,382	23,703	2,548	17,218	5,536	105,387
2018	53,429	11,639	2,205	6,749	3,746	77,769
2019	34,256	8,540	1,509	3,851	3,067	51,222
2020	8,877	4,445	590	11	2,173	16,096
2021	8,853	4,433	588	11	2,168	16,052
2022	8,853	4,433	588	11	2,168	16,052
2023	8,853	4,433	588	11	2,168	16,052
2024	8,877	4,445	590	11	2,173	16,096
2025	8,853	4,433	588	11	2,168	16,052
2026	8,853	4,433	588	11	2,168	16,052
2027	8,853	4,433	588	11	2,168	16,052
2028	8,877	4,445	590	11	2,173	16,096
2029	13,330	4,526	691	747	2,325	21,619
2030	28,047	3,233	896	2,223	7,473	41,872
2031	19,269	4,650	374	11	3,906	28,210
2032	18,641	5,901	295	0	779	25,617
2033	11,832	3,474	208	0	776	16,291
2034	2,363	96	88	0	775	3,322
2035	2,363	96	88	0	775	3,322
2036	2,369	96	88	0	777	3,331
2037	2,363	96	88	0	775	3,322
2038	2,363	96	88	0	775	3,322
2039	2,363	96	88	0	775	3,322
2040	2,369	96	88	0	777	3,331

Note: Columns may not add due to rounding

TABLE 3.2
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	2,363	96	88	0	775	3,322
2042	2,363	96	88	0	775	3,322
2043	2,363	96	88	0	775	3,322
2044	2,369	96	88	0	777	3,331
2045	2,363	96	88	0	775	3,322
2046	2,363	96	88	0	775	3,322
2047	2,363	96	88	0	775	3,322
2048	2,369	96	88	0	777	3,331
2049	2,363	96	88	0	775	3,322
2050	2,363	96	88	0	775	3,322
2051	2,363	96	88	0	775	3,322
2052	2,369	96	88	0	777	3,331
2053	2,356	313	89	34	11,078	13,869
2054	527	1,070	146	4,054	1,375	7,173
	470,976	150,471	23,721	55,497	93,229	793,894

Note: Columns may not add due to rounding

TABLE 3.2a
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF LICENSE TERMINATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	6,990	256	516	8	1,614	9,385
2015	41,214	3,018	3,456	1,370	8,961	58,018
2016	51,793	18,669	3,816	19,135	6,631	100,043
2017	52,342	15,913	2,548	17,218	4,835	92,856
2018	50,503	6,469	2,205	6,749	3,157	69,083
2019	31,967	3,732	1,509	3,851	2,478	43,538
2020	7,431	106	590	11	1,583	9,721
2021	7,411	106	588	11	1,579	9,694
2022	7,411	106	588	11	1,579	9,694
2023	7,411	106	588	11	1,579	9,694
2024	7,431	106	590	11	1,583	9,721
2025	7,411	106	588	11	1,579	9,694
2026	7,411	106	588	11	1,579	9,694
2027	7,411	106	588	11	1,579	9,694
2028	7,431	106	590	11	1,583	9,721
2029	12,124	908	691	747	1,811	16,282
2030	27,964	2,986	896	2,223	7,313	41,382
2031	5,728	304	159	11	3,296	9,499
2032	36	0	0	0	0	36
2033	21	0	0	0	0	21
2034	0	0	0	0	0	0
2035	0	0	0	0	0	0
2036	0	0	0	0	0	0
2037	0	0	0	0	0	0
2038	0	0	0	0	0	0
2039	0	0	0	0	0	0
2040	0	0	0	0	0	0

Note: Columns may not add due to rounding

TABLE 3.2a
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF LICENSE TERMINATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	0	0	0	0	0	0
2042	0	0	0	0	0	0
2043	0	0	0	0	0	0
2044	0	0	0	0	0	0
2045	0	0	0	0	0	0
2046	0	0	0	0	0	0
2047	0	0	0	0	0	0
2048	0	0	0	0	0	0
2049	0	0	0	0	0	0
2050	0	0	0	0	0	0
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	220	0	0	10,294	10,514
2054	0	0	0	0	0	0
	347,441	53,427	21,092	51,409	64,614	537,983

Note: Columns may not add due to rounding

TABLE 3.2b
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	478	1,433	0	0	137	2,047
2015	2,831	8,492	0	0	781	12,104
2016	3,258	9,775	0	0	653	13,687
2017	2,588	7,765	0	0	589	10,942
2018	1,719	5,157	0	0	589	7,464
2019	1,600	4,800	0	0	589	6,989
2020	1,446	4,339	0	0	590	6,376
2021	1,442	4,327	0	0	589	6,358
2022	1,442	4,327	0	0	589	6,358
2023	1,442	4,327	0	0	589	6,358
2024	1,446	4,339	0	0	590	6,376
2025	1,442	4,327	0	0	589	6,358
2026	1,442	4,327	0	0	589	6,358
2027	1,442	4,327	0	0	589	6,358
2028	1,446	4,339	0	0	590	6,376
2029	1,206	3,618	0	0	513	5,337
2030	83	248	0	0	160	490
2031	3,198	165	64	0	608	4,035
2032	4,373	148	88	0	777	5,387
2033	3,529	126	88	0	775	4,518
2034	2,363	96	88	0	775	3,322
2035	2,363	96	88	0	775	3,322
2036	2,369	96	88	0	777	3,331
2037	2,363	96	88	0	775	3,322
2038	2,363	96	88	0	775	3,322
2039	2,363	96	88	0	775	3,322
2040	2,369	96	88	0	777	3,331

Note: Columns may not add due to rounding

TABLE 3.2b
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	2,363	96	88	0	775	3,322
2042	2,363	96	88	0	775	3,322
2043	2,363	96	88	0	775	3,322
2044	2,369	96	88	0	777	3,331
2045	2,363	96	88	0	775	3,322
2046	2,363	96	88	0	775	3,322
2047	2,363	96	88	0	775	3,322
2048	2,369	96	88	0	777	3,331
2049	2,363	96	88	0	775	3,322
2050	2,363	96	88	0	775	3,322
2051	2,363	96	88	0	775	3,322
2052	2,369	96	88	0	777	3,331
2053	2,356	93	89	34	784	3,355
2054	527	1,070	146	4,054	1,375	7,173
	85,659	83,694	2,152	4,088	28,368	203,961

Note: Columns may not add due to rounding

TABLE 3.2c
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF SITE RESTORATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	42	0	0	0	0	42
2015	315	0	0	0	0	315
2016	1,314	22	0	0	129	1,465
2017	1,452	25	0	0	112	1,589
2018	1,208	14	0	0	0	1,221
2019	688	8	0	0	0	696
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0
2030	0	0	0	0	0	0
2031	10,343	4,181	150	0	2	14,676
2032	14,232	5,753	206	0	2	20,193
2033	8,283	3,348	120	0	1	11,752
2034	0	0	0	0	0	0
2035	0	0	0	0	0	0
2036	0	0	0	0	0	0
2037	0	0	0	0	0	0
2038	0	0	0	0	0	0
2039	0	0	0	0	0	0
2040	0	0	0	0	0	0

Note: Columns may not add due to rounding

TABLE 3.2c
(continued)
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
SCHEDULE OF SITE RESTORATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2041	0	0	0	0	0	0
2042	0	0	0	0	0	0
2043	0	0	0	0	0	0
2044	0	0	0	0	0	0
2045	0	0	0	0	0	0
2046	0	0	0	0	0	0
2047	0	0	0	0	0	0
2048	0	0	0	0	0	0
2049	0	0	0	0	0	0
2050	0	0	0	0	0	0
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	0	0	0	0	0
2054	0	0	0	0	0	0
	37,877	13,350	476	0	247	51,950

Note: Columns may not add due to rounding

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 spent fuel management plan described in Section 3.5.1.

A schedule or sequence of activities for the DECON alternative is presented in Figure 4.1. The scheduling sequence assumes that fuel is removed from the spent fuel pool approximately five and one-half years following the permanent cessation of plant operations. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost table, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project Professional 2003" computer software.[31]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

The schedule reflects the results of a precedence network developed for the site decommissioning activities, i.e., a PERT (Program Evaluation and Review Technique) Software Package. The work activity durations used in the precedence network reflect the actual man-hour estimates from the cost table, adjusted by stretching certain activities over their slack range and shifting the start and end dates of others. The following assumptions were made in the development of the decommissioning schedule:

- The fuel handling area of the Auxiliary Building is isolated until such time that all spent fuel has been discharged from the spent fuel pool to the ISFSI. Decontamination and dismantling of the storage pool is initiated once the transfer of spent fuel is complete.
- All work (except vessel and internals removal) is 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 with 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 schedules for decommissioning. 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. A second critical path is shown for the spent fuel storage period, which determines the release of the auxiliary building for final decontamination. A project timeline is provided in Figure 4.2.

FIGURE 4.1
ACTIVITY SCHEDULE

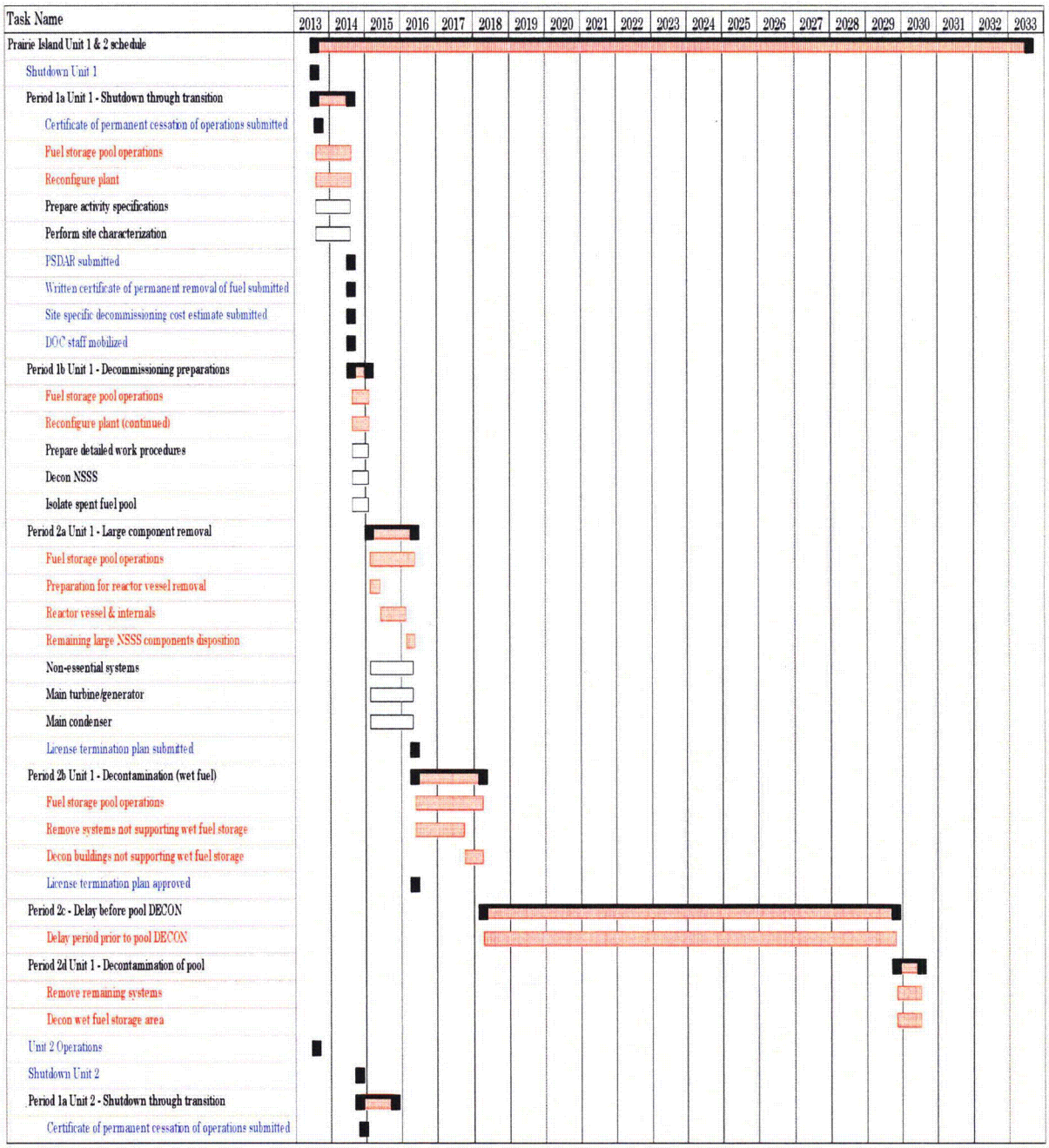


FIGURE 4.1
ACTIVITY SCHEDULE
(continued)

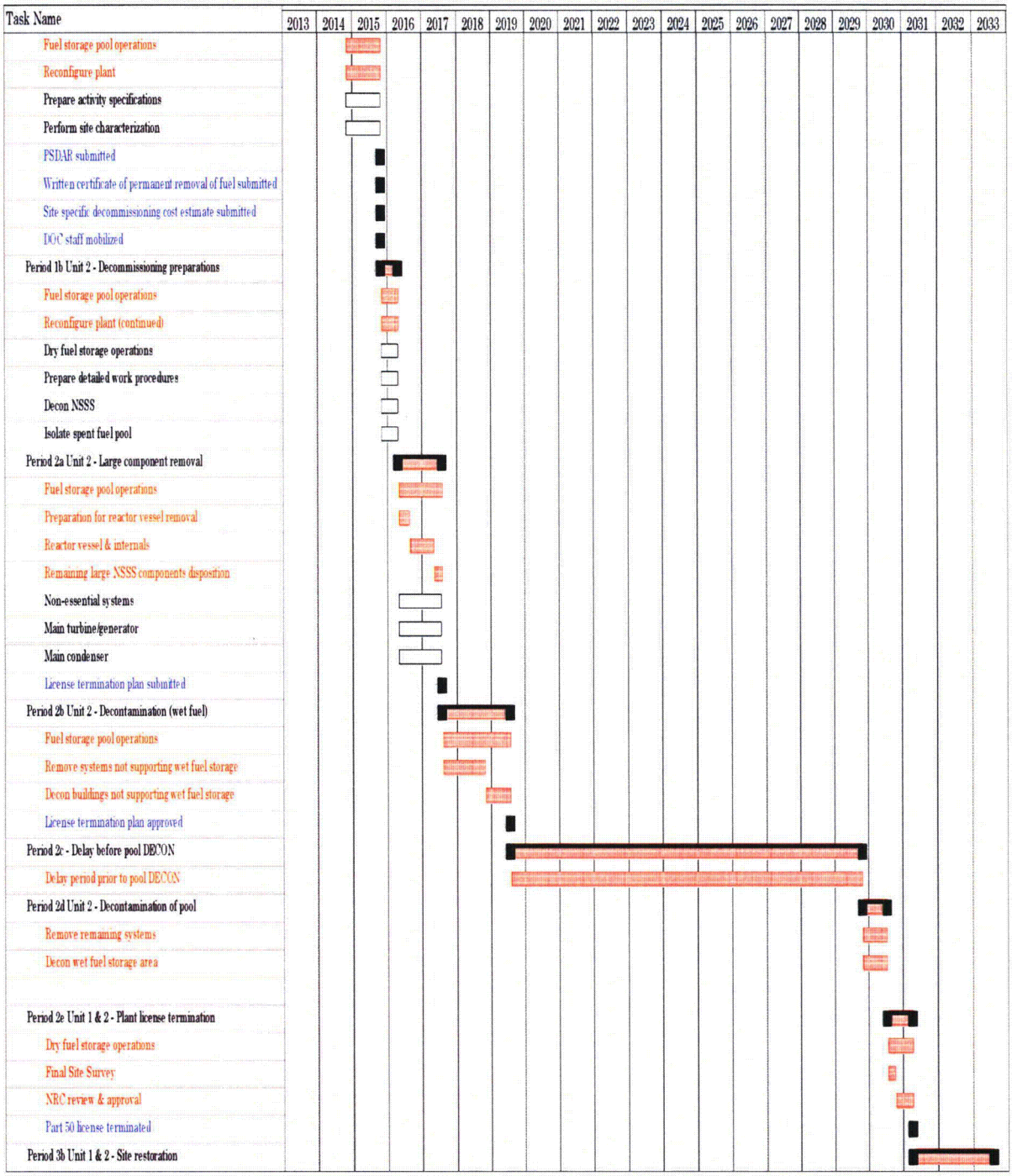
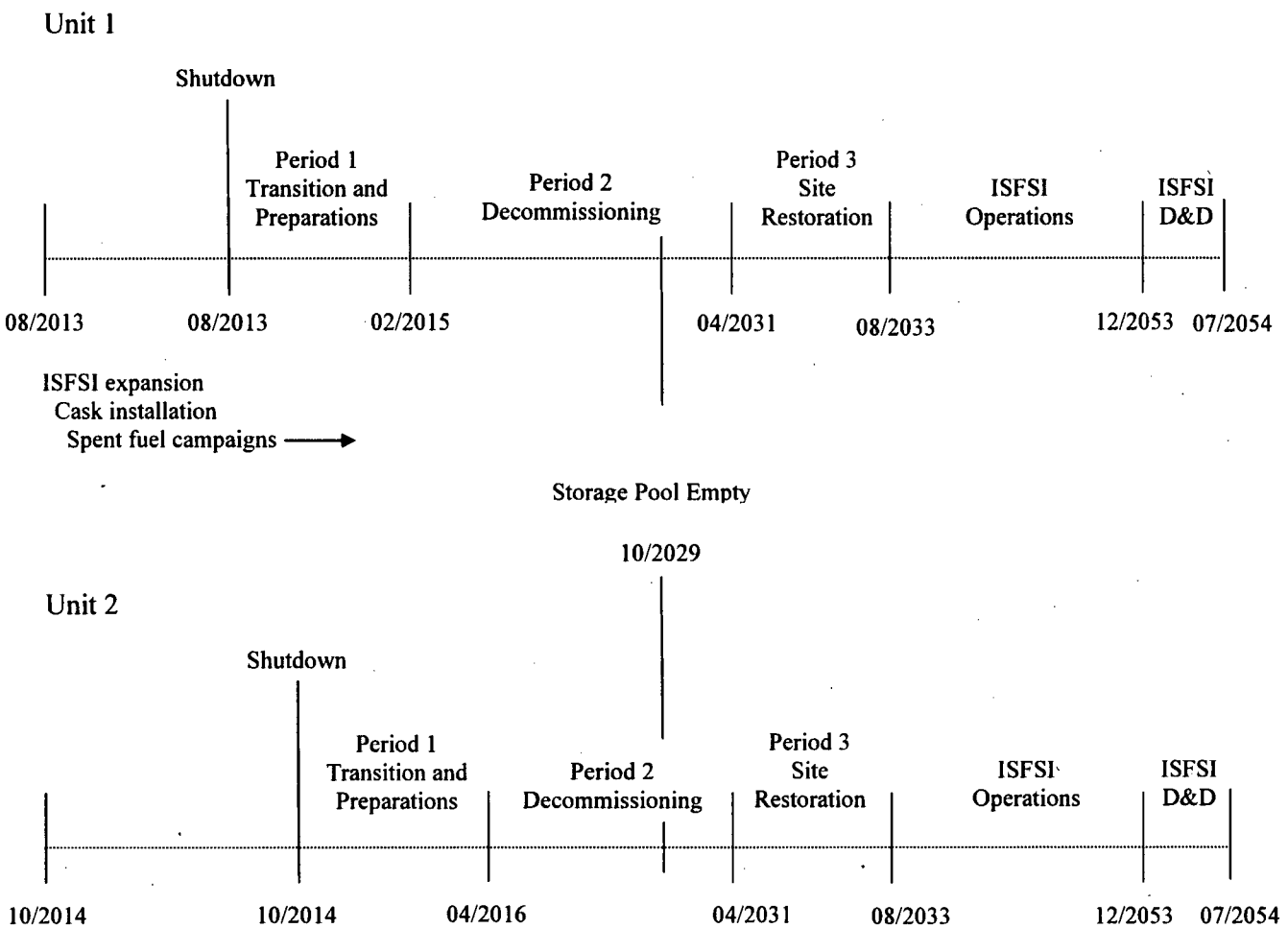


FIGURE 4.2
DECOMMISSIONING TIMELINE
(not to scale)



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. This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,[32] 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, Part 71 defines radioactive material as it pertains to transportation and Part 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 Parts 173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3, as defined in 10 CFR §173.411). 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 summaries shown in these tables are consistent with Part 61 classifications. The volumes are calculated based on the exterior dimensions for containerized material and 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, as well as 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 produced in the decontamination and dismantling of the nuclear units is primarily generated during Period 2. Material that is considered potentially contaminated when removed from the radiological controlled area is sent to processing facilities in Tennessee for conditioning and disposal. Heavily contaminated components and activated materials are 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 cost for disposal at the EnergySolutions facility was used as a proxy for future disposal facilities. Separate rates were used for containerized waste and large components, including the steam generators and reactor coolant pump motors. Demolition debris including miscellaneous steel, scaffolding, and concrete was disposed of at a bulk rate. The decommissioning waste stream also included resins and dry active waste.

Since EnergySolutions is not currently able to receive the more highly radioactive components generated in the decontamination and dismantling of the reactor, disposal costs for the Class B and C material were based upon the last available published disposal rates for Barnwell for non-Atlantic Compact members. Additional surcharges were included for activity, dose rate, and/or handling added as appropriate for the particular package.

TABLE 5.1
DECOMMISSIONING WASTE SUMMARY

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste	EnergySolutions	A	47,143	4,696,459
(near-surface disposal)	EnergySolutions	B	4,938	608,324
	EnergySolutions	C	1,837	224,252
Greater than Class C	Spent Fuel	GTCC	1,024	211,190
(geologic repository)	Equivalent			
Processed/Conditioned	Recycling	A		11,646,327
(off-site recycling center)	Vendors			
Low-Level Radioactive Waste	EnergySolutions	Containerized	104,031	16,103,225
Low-Level Radioactive Waste	EnergySolutions	Bulk/ DAW	61,298	2,000,870
Total [2]			220,271	35,490,647

[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

The cost projected to promptly decommission the two Prairie Island nuclear units is estimated to be $1,514 million. The estimate is based on numerous fundamental assumptions, including regulatory requirements, project contingencies, and low-level radioactive waste disposal practices and high-level waste management considerations.

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, as well as the duration of the program. It is assumed, for purposes of this analysis, that Xcel Energy will oversee the decommissioning program, using a DOC to manage 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.

As described in this report, the spent fuel pool will remain operational for fifteen years following the cessation of operations. The pool will be isolated to allow decommissioning operations to proceed in and around the pool area. Over the fifteen year period, the spent fuel will be packaged for transfer to the ISFSI.

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, disposition of the low-level radioactive material requiring controlled disposal is at the EnergySolutions facility in Clive, Utah. 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 is packaged for controlled disposal at one of the currently operating facilities. The cost identified in the summary table for processing is all-inclusive, incorporating the ultimate disposition of the material.

Removal costs reflect the labor-intensive nature of the decommissioning process, as well as 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 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 can be more cost effective than deferral, due to the deterioration of the facilities (and therefore the working conditions) with time.

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 (labor and fuel) of transporting material to the destinations identified in this report. For purposes of this analysis, material is primarily moved overland by truck.

Decontamination is used to reduce the plant's radiation fields and minimize worker exposure. Slightly contaminated material or material located within a contaminated area is sent to an off-site processing center (i.e., this analysis does not assume that contaminated plant components and equipment can be decontaminated for uncontrolled release in-situ). Centralized processing centers have proven to be a more economical 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 remaining costs include allocations for heavy equipment and temporary services, as well as for 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
COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2008 dollars)

Cost Element	Unit 1	Unit 2	Total	Percentage
Decontamination	8,873	14,101	22,974	1.5
Removal	71,116	91,943	163,059	10.8
Packaging	18,148	18,447	36,595	2.4
Transportation	6,828	7,411	14,238	0.9
Waste Disposal	48,983	50,257	99,240	6.6
Off-site Waste Processing	13,211	15,534	28,745	1.9
Program Management [1]	334,149	381,084	715,233	47.3
Spent Fuel Pool Isolation	5,911	5,911	11,822	0.8
Spent Fuel Management (direct costs) [2]	128,061	127,342	255,402	16.9
Insurance and Regulatory Fees	24,638	22,277	46,914	3.1
Energy	24,306	23,721	48,027	3.2
Characterization and Licensing Surveys	8,276	9,713	17,989	1.2
Property Taxes	21,069	19,904	40,973	2.7
Miscellaneous Equipment	6,228	6,250	12,478	0.8
Total [3]	719,795	793,894	1,513,689	100.0

Cost Element	Unit 1	Unit 2	Total	Percentage
License Termination	487,988	537,983	1,025,971	67.8
Spent Fuel Management	200,095	203,961	404,056	26.7
Site Restoration	31,713	51,950	83,662	5.5
Total [3]	719,795	793,894	1,513,689	100.0

[1] Includes engineering and security costs
[2] Excludes program management costs (staffing) but includes capital expenditures for ISFSI construction, costs for spent fuel loading/packaging costs/spent fuel pool O&M and EP fees
[3] Columns may not add due to rounding

7. REFERENCES

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3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," October 2003

4. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Radiological Criteria for License Termination"

5. U.S. Code of Federal Regulations, Title 10, Parts 20 and 50, "Entombment Options for Power Reactors," Advanced Notice of Proposed Rulemaking, Federal Register Volume 66, Number 200, October 16, 2001

6. 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

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8. "DOE Announces Yucca Mountain License Application Schedule", U.S. Department of Energy's Office of Public Affairs, Press Release July 19, 2006

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11. "Low Level Radioactive Waste Policy Act of 1980," Public Law 96-573, 1980

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

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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 (minutes)	Critical Duration (minutes)
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 (minutes)	673

Total duration = 11.217 hours

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate ($/hr)	Cost
Laborers	3.00	11.217	$42.06	$1415.36
Craftsmen	2.00	11.217	$58.49	$1312.16
Foreman	1.00	11.217	$58.53	$656.53
General Foreman	0.25	11.217	$60.53	$169.74
Fire Watch	0.05	11.217	$42.06	$23.59
Health Physics Technician	1.00	11.217	$46.21	$518.34
Total labor cost				$4095.72

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
Gas torch consumables 1 @ $8.36/hour x 1 hour [1]	$8.36
Blotting paper 50 @ $0.46 square foot [2]	$23.00
Plastic sheets/bags 50 @ $0.14/square foot [3]	$7.00
Subtotal cost of equipment and materials	$38.36
Overhead & sales tax on equipment and materials @ 16.50 %	$6.33
Total costs, equipment & material	$44.69
TOTAL COST: Removal of contaminated heat exchanger <3000 pounds:	$4,140.41
Total labor cost:	$4,095.72
Total equipment/material costs:	$44.69
Total craft labor man-hours required per unit:	81.88

APPENDIX A
(continued)

5. NOTES AND REFERENCES

Work difficulty factors were developed in conjunction with the Atomic Industrial Forum (AIF) (now Nuclear Energy Institute) 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 (2008) Division 01 54 33, Section 40-6360, Reference-10.
2. McMaster-Carr, Item 7193T88, Spill Control.
3. R.S. Means (2008) Division 01 56 13.6-0200, page 20.

Material and consumable costs were adjusted using the regional indices for Minneapolis, Minnesota.

APPENDIX B

UNIT COST FACTOR LISTING

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	4.92
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	7.03
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	13.99
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	26.91
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	34.90
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	51.37
Removal of clean pipe >36 inches diameter, $/linear foot	61.08
Removal of clean valve >2 to 4 inches	91.15
Removal of clean valve >4 to 8 inches	139.89
Removal of clean valve >8 to 14 inches	269.13
Removal of clean valve >14 to 20 inches	349.02
Removal of clean valve >20 to 36 inches	513.72
Removal of clean valve >36 inches	610.77
Removal of clean pipe hanger for small bore piping	29.53
Removal of clean pipe hanger for large bore piping	107.73
Removal of clean pump, <300 pound	234.09
Removal of clean pump, 300-1000 pound	658.66
Removal of clean pump, 1000-10,000 pound	2,603.35
Removal of clean pump, >10,000 pound	5,028.11
Removal of clean pump motor, 300-1000 pound	277.67
Removal of clean pump motor, 1000-10,000 pound	1,085.16
Removal of clean pump motor, >10,000 pound	2,441.63
Removal of clean heat exchanger <3000 pound	1,391.64
Removal of clean heat exchanger >3000 pound	3,493.88
Removal of clean feedwater heater/deaerator	9,893.65
Removal of clean moisture separator/reheater	20,397.87
Removal of clean tank, <300 gallons	301.33
Removal of clean tank, 300-3000 gallon	953.77
Removal of clean tank, >3000 gallons, $/square foot surface area	8.05

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean electrical equipment, <300 pound	128.66
Removal of clean electrical equipment, 300-1000 pound	452.07
Removal of clean electrical equipment, 1000-10,000 pound	904.14
Removal of clean electrical equipment, >10,000 pound	2,143.14
Removal of clean electrical transformer < 30 tons	1,488.39
Removal of clean electrical transformer > 30 tons	4,286.30
Removal of clean standby diesel generator, <100 kW	1,520.27
Removal of clean standby diesel generator, 100 kW to 1 MW	3,393.32
Removal of clean standby diesel generator, >1 MW	7,024.86
Removal of clean electrical cable tray, $/linear foot	11.96
Removal of clean electrical conduit, $/linear foot	5.22
Removal of clean mechanical equipment, <300 pound	128.66
Removal of clean mechanical equipment, 300-1000 pound	452.07
Removal of clean mechanical equipment, 1000-10,000 pound	904.14
Removal of clean mechanical equipment, >10,000 pound	2,143.14
Removal of clean HVAC equipment, <300 pound	128.66
Removal of clean HVAC equipment, 300-1000 pound	452.07
Removal of clean HVAC equipment, 1000-10,000 pound	904.14
Removal of clean HVAC equipment, >10,000 pound	2,143.14
Removal of clean HVAC ductwork, $/pound	0.49
Removal of contaminated instrument and sampling tubing, $/linear foot	1.44
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	18.86
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	33.26
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	53.69
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	106.01
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	127.76
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	177.76
Removal of contaminated pipe >36 inches diameter, $/linear foot	210.56
Removal of contaminated valve >2 to 4 inches	409.55
Removal of contaminated valve >4 to 8 inches	500.28

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated valve >8 to 14 inches	1,025.15
Removal of contaminated valve >14 to 20 inches	1,305.51
Removal of contaminated valve >20 to 36 inches	1,742.61
Removal of contaminated valve >36 inches	2,070.70
Removal of contaminated pipe hanger for small bore piping	99.30
Removal of contaminated pipe hanger for large bore piping	327.77
Removal of contaminated pump, <300 pound	889.22
Removal of contaminated pump, 300-1000 pound	2,084.98
Removal of contaminated pump, 1000-10,000 pound	6,863.28
Removal of contaminated pump, >10,000 pound	16,718.32
Removal of contaminated pump motor, 300-1000 pound	874.87
Removal of contaminated pump motor, 1000-10,000 pound	2,781.86
Removal of contaminated pump motor, >10,000 pound	6,245.52
Removal of contaminated heat exchanger <3000 pound	4,140.41
Removal of contaminated heat exchanger >3000 pound	11,957.46
Removal of contaminated tank, <300 gallons	1,475.45
Removal of contaminated tank, >300 gallons, $/square foot	29.47
Removal of contaminated electrical equipment, <300 pound	696.17
Removal of contaminated electrical equipment, 300-1000 pound	1,702.11
Removal of contaminated electrical equipment, 1000-10,000 pound	3,276.66
Removal of contaminated electrical equipment, >10,000 pound	6,394.12
Removal of contaminated electrical cable tray, $/linear foot	33.58
Removal of contaminated electrical conduit, $/linear foot	15.31
Removal of contaminated mechanical equipment, <300 pound	775.13
Removal of contaminated mechanical equipment, 300-1000 pound	1,882.27
Removal of contaminated mechanical equipment, 1000-10,000 pound	3,617.63
Removal of contaminated mechanical equipment, >10,000 pound	6,394.12
Removal of contaminated HVAC equipment, <300 pound	775.13
Removal of contaminated HVAC equipment, 300-1000 pound	1,882.27
Removal of contaminated HVAC equipment, 1000-10,000 pound	3,617.63

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated HVAC equipment, >10,000 pound	6,394.12
Removal of contaminated HVAC ductwork, $/pound	1.97
Removal/plasma arc cut of contaminated thin metal components, $/linear in.	3.73
Additional decontamination of surface by washing, $/square foot	7.49
Additional decontamination of surfaces by hydrolasing, $/square foot	34.48
Decontamination rig hook up and flush, $/ 250 foot length	6,585.18
Chemical flush of components/systems, $/gallon	13.23
Removal of clean standard reinforced concrete, $/cubic yard	128.23
Removal of grade slab concrete, $/cubic yard	172.13
Removal of clean concrete floors, $/cubic yard	329.05
Removal of sections of clean concrete floors, $/cubic yard	993.82
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	217.92
Removal of contaminated heavily rein concrete w/#9 rebar, $/cubic yard	1,986.01
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	275.54
Removal of contaminated heavily rein concrete w/#18 rebar, $/cubic yard	2,629.56
Removal heavily rein concrete w/#18 rebar & steel embedments, $/cubic yard	428.01
Removal of below-grade suspended floors, $/cubic yard	329.05
Removal of clean monolithic concrete structures, $/cubic yard	845.27
Removal of contaminated monolithic concrete structures, $/cubic yard	1,985.44
Removal of clean foundation concrete, $/cubic yard	662.49
Removal of contaminated foundation concrete, $/cubic yard	1,849.43
Explosive demolition of bulk concrete, $/cubic yard	28.88
Removal of clean hollow masonry block wall, $/cubic yard	90.72
Removal of contaminated hollow masonry block wall, $/cubic yard	301.40
Removal of clean solid masonry block wall, $/cubic yard	90.72
Removal of contaminated solid masonry block wall, $/cubic yard	301.40
Backfill of below-grade voids, $/cubic yard	23.09
Removal of subterranean tunnels/voids, $/linear foot	106.43
Placement of concrete for below-grade voids, $/cubic yard	123.82
Excavation of clean material, $/cubic yard	2.63

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Excavation of contaminated material, $/cubic yard	38.21
Removal of clean concrete rubble (tipping fee included), $/cubic yard	20.56
Removal of contaminated concrete rubble, $/cubic yard	23.37
Removal of building by volume, $/cubic foot	0.28
Removal of clean building metal siding, $/square foot	1.08
Removal of contaminated building metal siding, $/square foot	3.74
Removal of standard asphalt roofing, $/square foot	2.17
Removal of transite panels, $/square foot	2.05
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	12.82
Scabbling contaminated concrete floors, $/square foot	7.48
Scabbling contaminated concrete walls, $/square foot	19.52
Scabbling contaminated ceilings, $/square foot	66.76
Scabbling structural steel, $/square foot	6.32
Removal of clean overhead crane/monorail < 10 ton capacity	636.59
Removal of contaminated overhead crane/monorail < 10 ton capacity	1,767.18
Removal of clean overhead crane/monorail >10-50 ton capacity	1,527.80
Removal of contaminated overhead crane/monorail >10-50 ton capacity	4,240.55
Removal of polar crane > 50 ton capacity	6,352.78
Removal of gantry crane > 50 ton capacity	26,789.34
Removal of structural steel, $/pound	0.20
Removal of clean steel floor grating, $/square foot	4.50
Removal of contaminated steel floor grating, $/square foot	12.90
Removal of clean free standing steel liner, $/square foot	12.07
Removal of contaminated free standing steel liner, $/square foot	34.53
Removal of clean concrete-anchored steel liner, $/square foot	6.04
Removal of contaminated concrete-anchored steel liner, $/square foot	40.23
Placement of scaffolding in clean areas, $/square foot	14.41
Placement of scaffolding in contaminated areas, $/square foot	24.36
Landscaping with topsoil, $/acre	21,043.22
Cost of CPC B-88 LSA box & preparation for use	1,537.33

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Cost of CPC B-25 LSA box & preparation for use	1,356.59
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,328.96
Cost of CPC B-144 LSA box & preparation for use	8,033.36
Cost of LSA drum & preparation for use	134.03
Cost of cask liner for CNSI 14 195 cask	165.72
Cost of cask liner for CNSI 8 120A cask (resins)	6,461.28
Cost of cask liner for CNSI 8 120A cask (filters)	1,078.13
Decontamination of surfaces with vacuuming, $/square foot	0.65

APPENDIX C

DETAILED COST TABLES

Table | Page

C-1 Unit 1 DECON Decommissioning Cost Estimate 2

C-2 Unit 2 DECON Decommissioning Cost Estimate 11

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	217	33	250	250	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	499	75	574	574	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	814	122	936	936	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	337	50	387	387	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	543	81	624	624	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	445	67	511	511	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	534	80	614	553	-	61	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	452	68	520	468	-	52	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	54	8	62	62	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	771	116	886	886	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	706	106	811	811	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Biological shield	-	-	-	-	-	-	54	8	62	62	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Steam generators	-	-	-	-	-	-	339	51	390	390	-	-	-	-	-	-	-	-	-	3,120
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	174	26	200	100	-	100	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	43	7	50	-	-	50	-	-	-	-	-	-	-	400
1a.1.17.10	Main Condensers	-	-	-	-	-	-	43	7	50	-	-	50	-	-	-	-	-	-	-	400
1a.1.17.11	Plant structures & buildings	-	-	-	-	-	-	339	51	390	195	-	195	-	-	-	-	-	-	-	3,120
1a.1.17.12	Waste management	-	-	-	-	-	-	499	75	574	574	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.13	Facility & site closeout	-	-	-	-	-	-	98	15	112	56	-	56	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,106	616	4,722	4,158	-	564	-	-	-	-	-	-	-	37,827
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,700	405	3,105	3,105	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	152	23	175	175	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,100	315	2,415	2,415	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	134	20	154	154	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	12,807	1,921	14,728	14,163	-	564	-	-	-	-	-	-	-	73,753
Period 1a Additional Costs																					
1a.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	5,140	771	5,911	5,911	-	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	5,140	771	5,911	5,911	-	-	-	-	-	-	-	-	-	-
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	9,475	1,421	10,896	-	10,896	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	9,475	1,421	10,896	-	10,896	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	775	77	852	852	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	1,745	174	1,919	1,919	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	386	-	-	-	-	-	97	483	483	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	387	-	-	-	-	-	58	445	445	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	9	6	-	41	-	12	69	69	-	-	-	610	-	-	-	12,190	22	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,557	383	2,940	2,940	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	706	71	776	776	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	275	27	302	-	302	-	-	-	-	-	-	-	-	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1a Period-Dependent Costs (continued)																					
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	373	56	429	-	429	-	-	-	-	-	-	-	-	-
1a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	44	7	50	-	50	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-	-	-	-	-	2,276	341	2,618	2,618	-	-	-	-	-	-	-	-	-	46,678
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	24,026	3,604	27,630	27,630	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	773	9	6	-	41	32,775	4,908	38,513	37,732	781	-	-	610	-	-	-	12,190	22	470,078
1a.0	TOTAL PERIOD 1a COST	-	773	9	6	-	41	60,196	9,021	70,047	57,806	11,677	564	-	610	-	-	-	12,190	22	543,831
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	514	77	591	532	-	59	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	271	41	312	312	-	-	-	-	-	-	-	-	-	2,500
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	147	22	169	42	-	126	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	394	59	453	453	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	130	20	150	75	-	75	-	-	-	-	-	-	-	1,200
1b.1.1.10	Missile shields	-	-	-	-	-	-	49	7	56	56	-	-	-	-	-	-	-	-	-	450
1b.1.1.11	Biological shield	-	-	-	-	-	-	130	20	150	150	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.12	Steam generators	-	-	-	-	-	-	499	75	574	574	-	-	-	-	-	-	-	-	-	4,600
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	109	16	125	62	-	62	-	-	-	-	-	-	-	1,000
1b.1.1.14	Main Turbine	-	-	-	-	-	-	169	25	195	-	-	195	-	-	-	-	-	-	-	1,560
1b.1.1.15	Main Condensers	-	-	-	-	-	-	169	25	195	-	-	195	-	-	-	-	-	-	-	1,560
1b.1.1.16	Auxiliary building	-	-	-	-	-	-	296	44	341	307	-	34	-	-	-	-	-	-	-	2,730
1b.1.1.17	Reactor building	-	-	-	-	-	-	296	44	341	307	-	34	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,609	541	4,150	3,370	-	780	-	-	-	-	-	-	-	33,243
1b.1.2	Decon primary loop	380	-	-	-	-	-	-	190	570	570	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	380	-	-	-	-	-	3,609	731	4,720	3,940	-	780	-	-	-	-	-	-	1,067	33,243
Period 1b Additional Costs																					
1b.2.1	Site Characterization	-	-	-	-	-	-	3,290	987	4,277	4,277	-	-	-	-	-	-	-	-	-	-
1b.2.2	Mixed Waste	-	-	11	53	946	-	-	151	1,161	1,161	-	-	-	-	-	-	-	-	-	-
1b.2.3	RCRA Waste	-	-	6	4	21	-	-	4	35	35	-	-	-	-	-	-	-	-	-	-
1b.2.4	Asbestos Abatement	-	1,598	1	103	-	88	-	437	2,227	2,227	-	-	-	12,843	-	-	-	166,959	18,667	-
1b.2	Subtotal Period 1b Additional Costs	-	1,598	17	159	968	88	3,290	1,580	7,701	7,701	-	-	-	12,843	-	-	-	166,959	18,667	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	743	-	-	-	-	-	-	111	855	855	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	912	137	1,049	1,049	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process liquid waste	27	-	40	225	-	2,023	-	557	2,872	2,872	-	-	-	174	565	-	-	73,114	144	-
1b.3.4	Small tool allowance	-	21	-	-	-	-	-	3	25	25	-	-	-	-	-	-	-	-	-	-
1b.3.5	Pipe cutting equipment	-	1,000	-	-	-	-	-	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
1b.3.6	Decon rig	1,400	-	-	-	-	-	-	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
1b.3.7	Spent Fuel Capital and Transfer	-	-	-	-	-	-	5,844	877	6,720	-	6,720	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,170	1,021	40	225	-	2,023	6,756	2,045	14,280	7,560	6,720	-	-	174	565	-	-	73,114	144	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	23	-	-	-	-	-	-	6	29	29	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	391	39	430	430	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	880	88	968	968	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	285	-	-	-	-	-	71	356	356	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	195	-	-	-	-	-	29	224	224	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	5	4	-	24	-	7	41	41	-	-	-	360	-	-	-	7,197	13	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,578	387	2,964	2,964	-	-	-	-	-	-	-	-	-	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1b Period-Dependent Costs (continued)																					
1b.4.8	NRC Fees	-	-	-	-	-	-	356	36	391	391	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	139	14	152	-	152	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	188	28	216	-	216	-	-	-	-	-	-	-	-	-
1b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	22	3	25	-	25	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	4,083	612	4,695	4,695	-	-	-	-	-	-	-	-	-	79,383
1b.4.13	DOC Staff Cost	-	-	-	-	-	-	5,055	758	5,813	5,813	-	-	-	-	-	-	-	-	-	64,137
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	12,173	1,826	13,999	13,999	-	-	-	-	-	-	-	-	-	214,491
1b.4	Subtotal Period 1b Period-Dependent Costs	23	480	5	4	-	24	25,863	3,905	30,304	29,910	394	-	-	360	-	-	-	7,197	13	358,011
1b.0	TOTAL PERIOD 1b COST	2,573	3,100	63	388	968	2,136	39,518	8,260	57,005	49,111	7,114	780	-	13,377	565	-	-	247,270	19,891	391,254
PERIOD 1 TOTALS		2,573	3,873	72	394	968	2,177	99,714	17,282	127,053	108,917	18,791	1,345	-	13,986	565	-	-	259,460	19,913	935,085
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Reactor Coolant Piping	41	34	4	7	-	55	-	45	187	187	-	-	-	288	-	-	-	34,807	1,414	-
2a.1.1.2	Pressurizer Relief Tank	18	15	3	5	-	34	-	22	97	97	-	-	-	192	-	-	-	21,288	625	-
2a.1.1.3	Reactor Coolant Pumps & Motors	41	46	20	84	46	999	-	303	1,539	1,539	-	-	132	1,701	-	-	-	325,380	1,785	-
2a.1.1.4	Pressurizer	36	58	492	396	-	671	-	309	1,963	1,963	-	-	-	2,460	-	-	-	202,122	2,282	-
2a.1.1.5	Steam Generators	181	2,513	1,739	1,330	1,149	3,088	-	2,037	12,036	12,036	-	-	18,672	11,316	-	-	-	1,668,341	11,617	2,875
2a.1.1.6	CRDMs/ICIs/Service Structure Removal	126	55	118	34	-	84	-	115	531	531	-	-	-	2,404	-	-	-	53,072	3,225	-
2a.1.1.7	Reactor Vessel Internals	96	1,777	9,977	908	-	9,331	174	8,795	31,061	31,061	-	-	-	501	527	918	-	219,145	21,733	1,001
2a.1.1.8	Reactor Vessel	58	3,450	1,022	459	-	4,410	174	5,217	14,790	14,790	-	-	-	4,319	1,377	-	-	619,525	21,733	1,001
2a.1.1	Totals	599	7,949	13,375	3,223	1,195	18,673	349	16,843	62,205	62,205	-	-	18,804	23,180	1,904	918	-	3,143,680	64,414	4,878
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	245	130	51	357	160	-	176	1,120	1,120	-	-	2,131	1,187	-	-	-	287,637	4,667	-
2a.1.3	Main Condensers	-	2,045	56	35	253	120	-	590	3,099	3,099	-	-	2,851	841	-	-	-	203,723	39,151	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor	-	862	-	-	-	-	-	129	992	992	-	-	-	-	-	-	-	-	11,415	-
2a.1.4	Totals	-	862	-	-	-	-	-	129	992	992	-	-	-	-	-	-	-	-	11,415	-
Disposal of Plant Systems																					
2a.1.5.1	Air Removal	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	452	-
2a.1.5.2	Auxiliary Feedwater	-	31	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	870	-
2a.1.5.3	Auxiliary Feedwater - RCA	-	30	0	1	17	-	-	10	59	59	-	-	215	-	-	-	-	8,722	575	-
2a.1.5.4	Bleed Steam	-	63	-	-	-	-	-	9	73	-	-	73	-	-	-	-	-	-	1,335	-
2a.1.5.5	Caustic Addition - RCA	-	25	0	1	19	-	-	9	55	55	-	-	233	-	-	-	-	9,453	443	-
2a.1.5.6	Chemical Feed	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	304	-
2a.1.5.7	Chemical Feed - RCA	-	1	0	0	0	-	-	0	1	1	-	-	6	-	-	-	-	243	12	-
2a.1.5.8	Circulating Water	-	29	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	619	-
2a.1.5.9	Condensate	-	336	-	-	-	-	-	50	387	-	-	387	-	-	-	-	-	-	6,837	-
2a.1.5.10	Condensate Polishing	-	165	-	-	-	-	-	25	190	-	-	190	-	-	-	-	-	-	3,419	-
2a.1.5.11	Condensate Polishing - RCA	-	125	2	12	166	-	-	58	364	364	-	-	2,078	-	-	-	-	84,395	2,299	-
2a.1.5.12	Electro-hydraulic	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	127	-
2a.1.5.13	Feedwater	-	108	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	2,215	-
2a.1.5.14	Feedwater - RCA	-	133	4	19	257	-	-	75	488	488	-	-	3,208	-	-	-	-	130,294	2,604	-
2a.1.5.15	Gland Seal	-	24	-	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	505	-
2a.1.5.16	Heater Drain	-	282	-	-	-	-	-	42	324	-	-	324	-	-	-	-	-	-	5,881	-
2a.1.5.17	Internal Circ Water & CDSR	-	19	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	389	-
2a.1.5.18	Main Gen/Exciter/Transformer	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	5	-
2a.1.5.19	Main Steam	-	81	-	-	-	-	-	12	93	-	-	93	-	-	-	-	-	-	1,690	-
2a.1.5.20	Main Steam - RCA	-	251	6	30	404	-	-	128	819	819	-	-	5,044	-	-	-	-	204,825	4,871	-
2a.1.5.21	Steam Generator Blowdown	-	314	12	21	162	69	-	124	703	703	-	-	2,031	495	-	-	-	125,865	6,152	-
2a.1.5.22	Steam Generators	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	75	-
2a.1.5.23	Turbine & Moisture Separators	-	275	-	-	-	-	-	41	316	-	-	316	-	-	-	-	-	-	5,609	-
2a.1.5.24	Turbine Oil Purification	-	50	-	-	-	-	-	7	57	-	-	57	-	-	-	-	-	-	1,003	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
2a.1.5	Totals	-	2,388	25	85	1,025	69	-	632	4,225	2,490	-	1,734	12,815	495	-	-	-	563,797	48,090	-
2a.1.6	Scaffolding in support of decommissioning	-	708	2	1	12	1	-	179	904	904	-	-	138	9	-	-	-	6,982	6,073	-
2a.1	Subtotal Period 2a Activity Costs	599	14,197	13,589	3,395	2,842	19,023	349	18,550	72,544	70,809	-	1,734	36,739	25,711	1,904	918	-	4,205,820	173,810	4,878
Period 2a Collateral Costs																					
2a.3.1	Process liquid waste	57	-	21	114	-	108	-	74	374	374	-	-	-	387	-	-	-	23,216	75	-
2a.3.2	Small tool allowance	-	142	-	-	-	-	-	21	164	147	-	16	-	-	-	-	-	-	-	-
2a.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	14,036	2,105	16,141	-	16,141	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	57	142	21	114	-	108	14,036	2,201	16,679	521	16,141	16	-	387	-	-	-	23,216	75	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	58	-	-	-	-	-	-	14	72	72	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	518	52	570	570	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	2,218	222	2,440	2,196	-	244	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,125	-	-	-	-	-	281	1,406	1,406	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,363	-	-	-	-	-	355	2,718	2,718	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	44	29	-	202	-	59	334	334	-	-	-	2,965	-	-	-	59,308	108	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	3,087	463	3,551	3,551	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	837	84	920	920	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	127	13	140	-	140	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	474	71	545	-	545	-	-	-	-	-	-	-	-	-
2a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	55	8	64	-	64	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	8,427	1,264	9,691	9,691	-	-	-	-	-	-	-	-	-	162,294
2a.4.13	DOC Staff Cost	-	-	-	-	-	-	15,540	2,331	17,871	17,871	-	-	-	-	-	-	-	-	-	201,509
2a.4.14	Utility Staff Cost	-	-	-	-	-	-	21,968	3,295	25,263	25,263	-	-	-	-	-	-	-	-	-	374,673
2a.4	Subtotal Period 2a Period-Dependent Costs	58	3,488	44	29	-	202	53,252	8,512	65,585	64,593	748	244	-	2,965	-	-	-	59,308	108	738,476
2a.0	TOTAL PERIOD 2a COST	713	17,827	13,654	3,539	2,842	19,333	67,636	29,263	154,807	135,923	16,889	1,995	36,739	29,064	1,904	918	-	4,288,343	173,993	743,354
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	Aux Bldg Normal Ventilation	-	1	0	0	0	-	-	0	2	2	-	-	3	-	-	-	-	140	22	-
2b.1.1.2	Battery Rm Special Ventilation	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	5	-
2b.1.1.3	Buildings Maintenance	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	65	-
2b.1.1.4	Chemical & Volume Control	832	926	51	65	360	286	-	788	3,307	3,307	-	-	4,498	2,214	-	-	-	362,748	33,361	-
2b.1.1.5	Component Cooling - RCA	-	574	15	74	994	-	-	305	1,962	1,962	-	-	12,427	-	-	-	-	504,675	10,833	-
2b.1.1.6	Containment Cooling	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	1,062	-
2b.1.1.7	Containment Cooling - RCA	-	209	4	20	272	-	-	97	602	602	-	-	3,400	-	-	-	-	138,090	3,941	-
2b.1.1.8	Containment Hydrogen Control - RCA	-	21	0	1	8	-	-	7	36	36	-	-	105	-	-	-	-	4,278	396	-
2b.1.1.9	Containment Spray - RCA	-	63	1	5	69	-	-	27	166	166	-	-	868	-	-	-	-	35,249	1,195	-
2b.1.1.10	Containment Ventilation	-	184	13	39	396	74	-	131	838	838	-	-	4,951	520	-	-	-	247,736	3,661	-
2b.1.1.11	Cooling Water	-	113	-	-	-	-	-	17	130	-	-	130	-	-	-	-	-	-	2,396	-
2b.1.1.12	Cooling Water - RCA	-	442	9	46	618	-	-	211	1,327	1,327	-	-	7,728	-	-	-	-	313,832	8,397	-
2b.1.1.13	D1 Emergency Diesel	-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	730	-
2b.1.1.14	D2 Emergency Diesel	-	26	-	-	-	-	-	4	29	-	-	29	-	-	-	-	-	-	522	-
2b.1.1.15	Diesel Rooms Ventilation	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	113	-
2b.1.1.16	Electrical - Clean	-	1,359	-	-	-	-	-	204	1,563	-	-	1,563	-	-	-	-	-	-	26,981	-
2b.1.1.17	Electrical - Contaminated	-	427	4	16	202	10	-	142	801	801	-	-	2,527	67	-	-	-	108,671	8,376	-
2b.1.1.18	Electrical - Decontaminated	-	2,571	28	140	1,884	-	-	949	5,572	5,572	-	-	23,551	-	-	-	-	956,401	49,378	-
2b.1.1.19	Fuel Handling	-	89	3	8	73	22	-	40	235	235	-	-	908	154	-	-	-	50,677	1,782	-
2b.1.1.20	Fuel Oil	-	86	-	-	-	-	-	13	99	-	-	99	-	-	-	-	-	-	1,697	-
2b.1.1.21	HVAC - Clean	-	84	-	-	-	-	-	13	97	-	-	97	-	-	-	-	-	-	1,891	-
2b.1.1.22	HVAC - Contaminated	-	275	5	21	261	12	-	115	688	688	-	-	3,261	87	-	-	-	140,234	5,031	-
2b.1.1.23	Incore Instrumentation	0	20	1	1	5	6	-	8	40	40	-	-	60	40	-	-	-	6,015	424	-
2b.1.1.24	Misc Drains & Vents	-	162	8	9	31	52	-	60	322	322	-	-	390	363	-	-	-	48,363	3,080	-
2b.1.1.25	Reactor Coolant	112	192	12	13	28	78	-	131	566	566	-	-	344	548	-	-	-	63,108	5,963	-
2b.1.1.26	Reactor Hot Sampling	110	94	7	5	5	34	-	89	344	344	-	-	66	241	-	-	-	24,259	3,940	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt, Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2b.1.1.27	Reactor Makeup	-	52	-	-	-	-	-	8	60	-	-	60	-	-	-	-	-	-	1,042	-
2b.1.1.28	Reactor Vessel	7	11	0	0	2	1	-	7	29	29	-	-	26	10	-	-	-	1,965	367	-
2b.1.1.29	Residual Heat Removal	234	274	46	61	232	327	-	316	1,490	1,490	-	-	2,895	2,295	-	-	-	323,397	7,114	-
2b.1.1.30	Safeguards Chilled Water	-	13	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	259	-
2b.1.1.31	Safety Injection	-	616	24	56	543	116	-	275	1,630	1,630	-	-	6,788	855	-	-	-	348,807	12,044	-
2b.1.1.32	Sampling	-	42	2	2	5	11	-	14	75	75	-	-	59	76	-	-	-	9,163	809	-
2b.1.1.33	Shield Bldg Ventilation	-	100	7	19	172	49	-	67	415	415	-	-	2,152	346	-	-	-	118,482	2,015	-
2b.1.1.34	Station & Instrument Air	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	300	-
2b.1.1.35	Station & Instrument Air - RCA	-	56	0	2	27	-	-	18	104	104	-	-	332	-	-	-	-	13,496	1,053	-
2b.1.1.36	Turbine Bldg Traps & Drains	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	767	-
2b.1.1.37	Unit Coolers	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	611	-
2b.1.1.38	Unit Coolers - RCA	-	36	0	1	18	-	-	12	68	68	-	-	230	-	-	-	-	9,348	657	-
2b.1.1	Totals	1,294	9,291	241	606	6,206	1,080	-	4,095	22,813	20,621	-	2,192	77,571	7,816	-	-	-	3,829,133	202,380	-
2b.1.2	Scaffolding in support of decommissioning	-	885	3	1	15	2	-	224	1,130	1,130	-	-	173	11	-	-	-	8,728	7,591	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor	888	771	90	140	178	546	-	830	3,443	3,443	-	-	2,230	5,949	-	-	-	657,193	30,845	-
2b.1.3.2	Backwash Waste Receiving Tank	-	23	7	10	-	23	-	14	78	78	-	-	-	439	-	-	-	43,896	311	-
2b.1.3	Totals	888	794	97	150	178	569	-	844	3,521	3,521	-	-	2,230	6,388	-	-	-	701,089	31,155	-
2b.1	Subtotal Period 2b Activity Costs	2,183	10,970	341	757	6,400	1,650	-	5,163	27,464	25,272	-	2,192	79,974	14,215	-	-	-	4,538,950	241,127	-
Period 2b Collateral Costs																					
2b.3.1	Process liquid waste	139	-	96	537	-	695	-	334	1,801	1,801	-	-	-	1,783	-	-	-	149,807	348	-
2b.3.2	Small tool allowance	-	189	-	-	-	-	-	28	217	217	-	-	-	-	-	-	-	-	-	-
2b.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,876	1,781	13,657	-	13,657	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	139	189	96	537	-	695	11,876	2,143	15,676	2,019	13,657	-	-	1,783	-	-	-	149,807	348	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	345	-	-	-	-	-	-	86	431	431	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	768	77	845	845	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	1,615	162	1,777	1,777	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	1,536	-	-	-	-	-	384	1,920	1,920	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	3,479	-	-	-	-	-	522	4,001	4,001	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	55	36	-	248	-	73	411	411	-	-	-	3,640	-	-	-	72,796	133	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	3,614	542	4,156	4,156	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,241	124	1,365	1,365	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	188	19	207	-	207	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	703	105	808	-	808	-	-	-	-	-	-	-	-	-
2b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	354	53	407	407	-	-	-	-	-	-	-	-	-	-
2b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	82	12	94	-	94	-	-	-	-	-	-	-	-	-
2b.4.13	Security Staff Cost	-	-	-	-	-	-	2,061	309	2,371	2,371	-	-	-	-	-	-	-	-	-	42,263
2b.4.14	DOC Staff Cost	-	-	-	-	-	-	15,392	2,309	17,701	17,701	-	-	-	-	-	-	-	-	-	212,297
2b.4.15	Utility Staff Cost	-	-	-	-	-	-	22,218	3,333	25,550	25,550	-	-	-	-	-	-	-	-	-	395,109
2b.4	Subtotal Period 2b Period-Dependent Costs	345	5,015	55	36	-	248	48,236	8,110	62,044	60,934	1,109	-	-	3,640	-	-	-	72,796	133	649,669
2b.0	TOTAL PERIOD 2b COST	2,667	16,174	492	1,330	6,400	2,593	60,112	15,416	105,184	88,225	14,767	2,192	79,974	19,637	-	-	-	4,761,552	241,607	649,669
PERIOD 2c - Delay Before End Of Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
Period 2c Collateral Costs																					
2c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	51,490	7,723	59,213	-	59,213	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	-	-	-	-	-	-	51,490	7,723	59,213	-	59,213	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	4,704	470	5,174	5,174	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	9,918	992	10,910	10,910	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	963	-	-	-	-	-	241	1,203	1,203	-	-	-	-	-	-	-	-	-	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2c Period-Dependent Costs (continued)																					
2c.4.4	Disposal of DAW generated	-	-	22	14	-	99	-	29	165	165	-	-	-	1,460	-	-	-	29,205	53	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	5,917	888	6,805	6,805	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	2,112	211	2,323	2,323	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	1,156	116	1,272	-	1,272	-	-	-	-	-	-	-	-	-
2c.4.8	Spent Fuel Pool O&M	-	-	-	-	-	-	4,313	647	4,960	-	4,960	-	-	-	-	-	-	-	-	-
2c.4.9	ISFSI Operating Costs	-	-	-	-	-	-	504	76	579	-	579	-	-	-	-	-	-	-	-	-
2c.4.10	Security Staff Cost	-	-	-	-	-	-	36,761	5,514	42,275	42,275	-	-	-	-	-	-	-	-	-	706,011
2c.4.11	Utility Staff Cost	-	-	-	-	-	-	37,813	5,672	43,485	43,485	-	-	-	-	-	-	-	-	-	699,977
2c.4	Subtotal Period 2c Period-Dependent Costs	-	963	22	14	-	99	103,198	14,855	119,151	112,339	6,812	-	-	1,460	-	-	-	29,205	53	1,405,989
2c.0	TOTAL PERIOD 2c COST	-	963	22	14	-	99	154,688	22,578	178,364	112,339	66,025	-	-	1,460	-	-	-	29,205	53	1,405,989
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	249	26	65	28	-	211	-	194	773	773	-	-	-	1,477	-	-	-	132,519	576	-
Disposal of Plant Systems																					
2d.1.2.1	Electrical - Contaminated - Fuel Pool	-	106	1	4	49	2	-	35	197	197	-	-	615	16	-	-	-	26,444	2,077	-
2d.1.2.2	Electrical - Decontaminated - Fuel Pool	-	642	7	35	471	-	-	237	1,393	1,393	-	-	5,893	-	-	-	-	239,327	12,340	-
2d.1.2.3	HVAC - Contaminated - Fuel Pool	-	118	2	9	112	5	-	49	295	295	-	-	1,398	37	-	-	-	60,100	2,156	-
2d.1.2.4	Safeguards Chilled Water - RCA	-	58	1	3	40	-	-	21	122	122	-	-	495	-	-	-	-	20,100	1,019	-
2d.1.2.5	Spent Fuel Pool Cooling	209	240	18	23	64	133	-	213	901	901	-	-	806	935	-	-	-	116,589	7,356	-
2d.1.2.6	Station & Instrument Air - RCA Fuel Pool	-	14	0	0	7	-	-	5	26	26	-	-	83	-	-	-	-	3,374	263	-
2d.1.2	Totals	209	1,178	29	74	743	141	-	560	2,935	2,935	-	-	9,290	989	-	-	-	465,935	25,212	-
2d.1.4	Scaffolding in support of decommissioning	-	177	1	0	3	0	-	45	226	226	-	-	35	2	-	-	-	1,746	1,518	-
2d.1	Subtotal Period 2d Activity Costs	458	1,381	95	103	746	352	-	799	3,934	3,934	-	-	9,325	2,468	-	-	-	600,199	27,307	-
Period 2d Collateral Costs																					
2d.3.1	Process liquid waste	49	-	34	193	-	252	-	120	648	648	-	-	-	640	-	-	-	54,310	125	-
2d.3.2	Small tool allowance	-	25	-	-	-	-	-	4	29	29	-	-	-	-	-	-	-	-	-	-
2d.3.3	Decommissioning Equipment Disposition	-	-	96	55	532	53	-	111	848	848	-	-	6,000	373	-	-	-	303,507	88	-
2d.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	227	34	261	-	261	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	49	25	131	248	532	305	227	269	1,786	1,524	261	-	6,000	1,014	-	-	-	357,817	213	-
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	32	-	-	-	-	-	-	8	40	40	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	285	28	313	313	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	599	60	659	659	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	323	-	-	-	-	-	81	403	403	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,290	-	-	-	-	-	193	1,483	1,483	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	11	8	-	52	-	15	86	86	-	-	-	765	-	-	-	15,294	28	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	714	107	822	822	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	460	46	506	506	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	70	7	77	-	77	-	-	-	-	-	-	-	-	-
2d.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	-
2d.4.11	ISFSI Operating Costs	-	-	-	-	-	-	30	5	35	-	35	-	-	-	-	-	-	-	-	-
2d.4.12	Security Staff Cost	-	-	-	-	-	-	213	32	245	245	-	-	-	-	-	-	-	-	-	4,371
2d.4.13	DOC Staff Cost	-	-	-	-	-	-	3,875	581	4,456	4,456	-	-	-	-	-	-	-	-	-	53,186
2d.4.14	Utility Staff Cost	-	-	-	-	-	-	4,900	735	5,635	5,635	-	-	-	-	-	-	-	-	-	88,157
2d.4	Subtotal Period 2d Period-Dependent Costs	32	1,612	11	8	-	52	11,408	1,938	15,061	14,949	112	-	-	765	-	-	-	15,294	28	145,714
2d.0	TOTAL PERIOD 2d COST	538	3,018	237	359	1,278	709	11,635	3,005	20,780	20,407	373	-	15,325	4,246	-	-	-	973,310	27,548	145,714
PERIOD 2e - License Termination																					
Period 2e Direct Decommissioning Activities																					
2e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	148	44	193	193	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	148	44	193	193	-	-	-	-	-	-	-	-	-	-
Period 2e Additional Costs																					
2e.2.1	License Termination Survey	-	-	-	-	-	-	2,928	878	3,806	3,806	-	-	-	-	-	-	-	-	49,489	-
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	2,928	878	3,806	3,806	-	-	-	-	-	-	-	-	49,489	-
Period 2e Collateral Costs																					
2e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	912	137	1,049	1,049	-	-	-	-	-	-	-	-	-	-
2e.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	184	28	211	-	211	-	-	-	-	-	-	-	-	-
2e.3	Subtotal Period 2e Collateral Costs	-	-	-	-	-	-	1,096	164	1,261	1,049	211	-	-	-	-	-	-	-	-	-
Period 2e Period-Dependent Costs																					
2e.4.1	Insurance	-	-	-	-	-	-	274	27	301	301	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	641	64	705	705	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	395	-	-	-	-	-	99	493	493	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	5	3	-	22	-	6	36	36	-	-	-	316	-	-	-	6,325	12	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	382	57	440	440	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	528	53	581	581	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	75	7	82	-	82	-	-	-	-	-	-	-	-	-
2e.4.8	ISFSI Operating Costs	-	-	-	-	-	-	33	5	37	-	37	-	-	-	-	-	-	-	-	-
2e.4.9	Security Staff Cost	-	-	-	-	-	-	228	34	263	263	-	-	-	-	-	-	-	-	-	4,680
2e.4.10	DOC Staff Cost	-	-	-	-	-	-	2,591	389	2,979	2,979	-	-	-	-	-	-	-	-	-	35,880
2e.4.11	Utility Staff Cost	-	-	-	-	-	-	2,280	342	2,622	2,622	-	-	-	-	-	-	-	-	-	39,000
2e.4	Subtotal Period 2e Period-Dependent Costs	-	395	5	3	-	22	7,032	1,084	8,540	8,420	120	-	-	316	-	-	-	6,325	12	79,560
2e.0	TOTAL PERIOD 2e COST	-	395	5	3	-	22	11,204	2,171	13,799	13,468	331	-	-	316	-	-	-	6,325	49,501	79,560
PERIOD 2 TOTALS		3,919	38,377	14,410	5,245	10,520	22,755	305,275	72,434	472,934	370,363	98,385	4,187	132,037	54,724	1,904	918	-	10,058,730	492,701	3,024,285
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor	-	4,991	-	-	-	-	-	749	5,740	-	-	5,740	-	-	-	-	-	-	66,349	-
3b.1.1.2	Condensate Storage Tank Foundation	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	95	-
3b.1.1.3	Turbine	-	2,265	-	-	-	-	-	340	2,605	-	-	2,605	-	-	-	-	-	-	34,340	-
3b.1.1.4	Turbine Pedestal	-	685	-	-	-	-	-	103	788	-	-	788	-	-	-	-	-	-	7,580	-
3b.1.1	Totals	-	7,948	-	-	-	-	-	1,192	9,140	-	-	9,140	-	-	-	-	-	-	108,365	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	126	-	-	-	-	-	19	145	-	-	145	-	-	-	-	-	-	316	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	169	25	195	195	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,074	-	-	-	-	169	1,236	9,480	195	-	9,285	-	-	-	-	-	-	108,680	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	210	-	-	-	-	2	32	244	-	-	244	-	-	-	-	-	-	1,126	-
3b.2	Subtotal Period 3b Additional Costs	-	210	-	-	-	-	2	32	244	-	-	244	-	-	-	-	-	-	1,126	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	92	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	397	60	456	-	456	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	92	-	-	-	-	397	73	562	-	456	105	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	847	85	932	-	932	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	153	15	168	-	168	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,726	-	-	-	-	-	859	6,585	-	-	6,585	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	592	89	681	0	204	476	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	294	29	323	-	323	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	231	23	254	-	254	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	101	15	116	-	116	-	-	-	-	-	-	-	-	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b Period-Dependent Costs (continued)																					
3b.4.8	Security Staff Cost	-	-	-	-	-	-	4,458	669	5,127	0	4,204	923	-	-	-	-	-	-	-	81,506
3b.4.9	DOC Staff Cost	-	-	-	-	-	-	6,695	1,004	7,699	-	-	7,699	-	-	-	-	-	-	-	91,743
3b.4.10	Utility Staff Cost	-	-	-	-	-	-	1,788	268	2,056	0	1,193	864	-	-	-	-	-	-	-	31,386
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,726	-	-	-	-	15,159	3,057	23,942	0	7,395	16,547	-	-	-	-	-	-	-	204,635
3b.0	TOTAL PERIOD 3b COST	-	14,102	-	-	-	-	15,728	4,398	34,228	195	7,851	26,181	-	-	-	-	-	-	109,806	206,195
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,263	339	2,602	-	2,602	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	2,263	339	2,602	-	2,602	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	7,446	745	8,191	-	8,191	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	1,346	135	1,480	-	1,480	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	1,560	234	1,794	-	1,794	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	2,582	258	2,840	-	2,840	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	2,033	203	2,236	-	2,236	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Operating Costs	-	-	-	-	-	-	885	133	1,018	-	1,018	-	-	-	-	-	-	-	-	-
3c.4.7	Security Staff Cost	-	-	-	-	-	-	32,189	4,828	37,017	-	37,017	-	-	-	-	-	-	-	-	572,786
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	9,036	1,355	10,392	-	10,392	-	-	-	-	-	-	-	-	143,409
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	57,077	7,891	64,968	-	64,968	-	-	-	-	-	-	-	-	716,194
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	59,339	8,231	67,570	-	67,570	-	-	-	-	-	-	-	-	716,194
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	200	-	-	8,951	-	1,363	10,514	10,514	-	-	-	-	-	-	512	105,595	-	-
3d.1.1	Totals	-	-	200	-	-	8,951	-	1,363	10,514	10,514	-	-	-	-	-	-	512	105,595	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	200	-	-	8,951	-	1,363	10,514	10,514	-	-	-	-	-	-	512	105,595	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	31	3	34	-	34	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	6	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	7	1	7	-	7	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	11	1	12	-	12	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	8	1	9	-	9	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	4	1	4	-	4	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	134	20	155	-	155	-	-	-	-	-	-	-	-	2,391
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	38	6	43	-	43	-	-	-	-	-	-	-	-	599
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	238	33	271	-	271	-	-	-	-	-	-	-	-	2,990
3d.0	TOTAL PERIOD 3d COST	-	-	200	-	-	8,951	238	1,396	10,785	10,514	271	-	-	-	-	-	512	105,595	-	2,990
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	ISFSI License Termination (TN-40)	-	5	317	177	-	3,271	827	1,001	5,598	-	5,598	-	-	31,862	-	-	-	6,426,376	2,909	1,120
3e.2	Subtotal Period 3e Additional Costs	-	5	317	177	-	3,271	827	1,001	5,598	-	5,598	-	-	31,862	-	-	-	6,426,376	2,909	1,120
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	121	12	133	-	133	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	22	2	24	-	24	-	-	-	-	-	-	-	-	-

Table C-1
Prairie Island Nuclear Generating Plant, Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3e Period-Dependent Costs (continued)																					
3e.4.3	Heavy equipment rental	-	244	-	-	-	-	-	37	281	-	281	-	-	-	-	-	-	-	-	-
3e.4.4	Plant energy budget	-	-	-	-	-	-	85	13	97	-	97	-	-	-	-	-	-	-	-	-
3e.4.5	NRC ISFSI Fees	-	-	-	-	-	-	33	3	36	-	36	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	146	22	167	-	167	-	-	-	-	-	-	-	-	2,510
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	119	18	137	-	137	-	-	-	-	-	-	-	-	1,901
3e.4	Subtotal Period 3e Period-Dependent Costs	-	244	-	-	-	-	525	107	876	-	876	-	-	-	-	-	-	-	-	4,411
3e.0	TOTAL PERIOD 3e COST	-	249	317	177	-	3,271	1,353	1,108	6,474	-	6,474	-	-	31,862	-	-	-	6,426,376	2,909	5,531
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	ISFSI Demolition & Site Restoration (TN-40)	-	372	-	-	-	-	23	59	454	-	454	-	-	-	-	-	-	-	1,591	80
3f.2	Subtotal Period 3f Additional Costs	-	372	-	-	-	-	23	59	454	-	454	-	-	-	-	-	-	-	1,591	80
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	1	-	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	1	-	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	11	1	12	-	12	-	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	81	-	-	-	-	-	12	94	-	94	-	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	43	6	49	-	49	-	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	73	11	84	-	84	-	-	-	-	-	-	-	-	1,265
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	49	7	57	-	57	-	-	-	-	-	-	-	-	784
3f.4	Subtotal Period 3f Period-Dependent Costs	-	81	-	-	-	-	177	38	296	-	296	-	-	-	-	-	-	-	-	2,050
3f.0	TOTAL PERIOD 3f COST	-	455	-	-	-	-	199	98	752	-	752	-	-	-	-	-	-	-	1,591	2,130
PERIOD 3 TOTALS		-	14,806	517	177	-	12,222	76,858	15,230	119,809	10,708	82,919	26,181	-	31,862	-	-	512	6,531,971	114,306	933,040
TOTAL COST TO DECOMMISSION		6,492	57,055	14,998	5,816	11,488	37,154	481,847	104,946	719,795	487,988	200,095	31,713	132,037	100,572	2,469	918	512	16,850,170	626,920	4,892,411

TOTAL COST TO DECOMMISSION WITH 17.07% CONTINGENCY:	**$719,795**	**thousands of 2008 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 67.8% OR:	**$487,988**	**thousands of 2008 dollars**
SPENT FUEL MANAGEMENT COST IS 27.8% OR:	**$200,094**	**thousands of 2008 dollars**
NON-NUCLEAR DEMOLITION COST IS 4.41% OR:	**$31,713**	**thousands of 2008 dollars**
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	**103,959**	**cubic feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**512**	**cubic feet**
TOTAL SCRAP METAL REMOVED:	**27,868**	**tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**626,920**	**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
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	60	9	69	69	-	-	-	-	-	-	-	-	-	556
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	-	-	-	-	-	-	93	14	107	107	-	-	-	-	-	-	-	-	-	856
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	214	32	246	246	-	-	-	-	-	-	-	-	-	1,969
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	428
1a.1.10	End product description	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	428
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	60	9	69	69	-	-	-	-	-	-	-	-	-	556
1a.1.12	Define major work sequence	-	-	-	-	-	-	348	52	401	401	-	-	-	-	-	-	-	-	-	3,210
1a.1.13	Perform SER and EA	-	-	-	-	-	-	144	22	166	166	-	-	-	-	-	-	-	-	-	1,327
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	232	35	267	267	-	-	-	-	-	-	-	-	-	2,140
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	190	29	219	219	-	-	-	-	-	-	-	-	-	1,753
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	229	34	263	237	-	26	-	-	-	-	-	-	-	2,106
1a.1.17.2	Plant systems	-	-	-	-	-	-	194	29	223	200	-	22	-	-	-	-	-	-	-	1,783
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	23	3	27	27	-	-	-	-	-	-	-	-	-	214
1a.1.17.4	Reactor internals	-	-	-	-	-	-	330	49	379	379	-	-	-	-	-	-	-	-	-	3,039
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	2,782
1a.1.17.6	Biological shield	-	-	-	-	-	-	23	3	27	27	-	-	-	-	-	-	-	-	-	214
1a.1.17.7	Steam generators	-	-	-	-	-	-	145	22	167	167	-	-	-	-	-	-	-	-	-	1,335
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	74	11	85	43	-	43	-	-	-	-	-	-	-	685
1a.1.17.9	Main Turbine	-	-	-	-	-	-	19	3	21	-	-	21	-	-	-	-	-	-	-	171
1a.1.17.10	Main Condensers	-	-	-	-	-	-	19	3	21	-	-	21	-	-	-	-	-	-	-	171
1a.1.17.11	Plant structures & buildings	-	-	-	-	-	-	145	22	167	83	-	83	-	-	-	-	-	-	-	1,335
1a.1.17.12	Waste management	-	-	-	-	-	-	214	32	246	246	-	-	-	-	-	-	-	-	-	1,969
1a.1.17.13	Facility & site closeout	-	-	-	-	-	-	42	6	48	24	-	24	-	-	-	-	-	-	-	385
1a.1.17	Total	-	-	-	-	-	-	1,758	264	2,021	1,780	-	241	-	-	-	-	-	-	-	16,190
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	112	17	128	128	-	-	-	-	-	-	-	-	-	1,027
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,700	405	3,105	3,105	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	65	10	75	75	-	-	-	-	-	-	-	-	-	599
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,100	315	2,415	2,415	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	57	9	66	66	-	-	-	-	-	-	-	-	-	526
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	8,227	1,234	9,461	9,219	-	241	-	-	-	-	-	-	-	31,566
Period 1a Additional Costs																					
1a.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	5,140	771	5,911	5,911	-	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	5,140	771	5,911	5,911	-	-	-	-	-	-	-	-	-	-
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	9,475	1,421	10,896	-	10,896	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	9,475	1,421	10,896	-	10,896	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	775	77	852	852	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	1,745	174	1,919	1,919	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	363	-	-	-	-	-	91	454	454	-	-	-	-	-	-	-	-	-	-

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1a Period-Dependent Costs (continued)																					
1a.4.4	Heavy equipment rental	-	387	-	-	-	-	-	58	445	445	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	8	6	-	38	-	11	64	64	-	-	-	565	-	-	-	11,299	21	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,557	383	2,940	2,940	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	471	47	518	518	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	275	27	302	-	302	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	373	56	429	-	429	-	-	-	-	-	-	-	-	-
1a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	44	7	50	-	50	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-	-	-	-	-	8,099	1,215	9,314	9,314	-	-	-	-	-	-	-	-	-	157,471
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	19,030	2,855	21,885	21,885	-	-	-	-	-	-	-	-	-	346,229
1a.4	Subtotal Period 1a Period-Dependent Costs	-	750	8	6	-	38	33,368	5,002	39,172	38,391	781	-	-	565	-	-	-	11,299	21	503,700
1a.0	TOTAL PERIOD 1a COST	-	750	8	6	-	38	56,209	8,428	65,440	53,522	11,677	241	-	565	-	-	-	11,299	21	535,266
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	220	33	253	228	-	25	-	-	-	-	-	-	-	2,026
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	428
1b.1.1.3	Reactor internals	-	-	-	-	-	-	116	17	134	134	-	-	-	-	-	-	-	-	-	1,070
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	63	9	72	18	-	54	-	-	-	-	-	-	-	578
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	428
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	428
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	428
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	169	25	194	194	-	-	-	-	-	-	-	-	-	1,554
1b.1.1.9	Facility closeout	-	-	-	-	-	-	56	8	64	32	-	32	-	-	-	-	-	-	-	514
1b.1.1.10	Missile shields	-	-	-	-	-	-	21	3	24	24	-	-	-	-	-	-	-	-	-	193
1b.1.1.11	Biological shield	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	514
1b.1.1.12	Steam generators	-	-	-	-	-	-	214	32	246	246	-	-	-	-	-	-	-	-	-	1,969
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	46	7	53	27	-	27	-	-	-	-	-	-	-	428
1b.1.1.14	Main Turbine	-	-	-	-	-	-	72	11	83	-	-	83	-	-	-	-	-	-	-	668
1b.1.1.15	Main Condensers	-	-	-	-	-	-	72	11	83	-	-	83	-	-	-	-	-	-	-	668
1b.1.1.16	Auxiliary building	-	-	-	-	-	-	127	19	146	131	-	15	-	-	-	-	-	-	-	1,168
1b.1.1.17	Reactor building	-	-	-	-	-	-	127	19	146	131	-	15	-	-	-	-	-	-	-	1,168
1b.1.1	Total	-	-	-	-	-	-	1,545	232	1,776	1,442	-	334	-	-	-	-	-	-	-	14,228
1b.1.2	Decon primary loop	380	-	-	-	-	-	-	190	570	570	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	380	-	-	-	-	-	1,545	422	2,346	2,012	-	334	-	-	-	-	-	-	1,067	14,228
Period 1b Additional Costs																					
1b.2.1	Site Characterization	-	-	-	-	-	-	1,407	422	1,829	1,829	-	-	-	-	-	-	-	-	-	-
1b.2.2	Mixed Waste	-	-	11	53	989	-	-	157	1,209	1,209	-	-	-	-	-	-	-	-	-	-
1b.2.3	Asbestos Abatement	-	1,598	1	103	-	88	-	437	2,227	2,227	-	-	-	12,843	-	-	-	166,959	18,667	-
1b.2.4	RCRA Waste	-	-	2	4	19	-	-	4	28	28	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	1,598	13	159	1,008	88	1,407	1,020	5,294	5,294	-	-	-	12,843	-	-	-	166,959	18,667	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	743	-	-	-	-	-	-	111	855	855	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	912	137	1,049	1,049	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process liquid waste	27	-	40	225	-	2,023	-	557	2,872	2,872	-	-	-	174	565	-	-	73,114	144	-
1b.3.4	Small tool allowance	-	21	-	-	-	-	-	3	25	25	-	-	-	-	-	-	-	-	-	-
1b.3.5	Pipe cutting equipment	-	1,000	-	-	-	-	-	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
1b.3.6	Decon rig	1,400	-	-	-	-	-	-	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
1b.3.7	Spent Fuel Capital and Transfer	-	-	-	-	-	-	5,844	877	6,720	-	6,720	-	-	-	-	-	-	-	-	-

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
1b.3	Subtotal Period 1b Collateral Costs	2,170	1,021	40	225	-	2,023	6,756	2,045	14,280	7,560	6,720	-	-	174	565	-	-	73,114	144	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	23	-	-	-	-	-	-	6	29	29	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	391	39	430	430	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	880	88	968	968	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	268	-	-	-	-	-	67	335	335	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	195	-	-	-	-	-	29	224	224	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	5	3	-	22	-	7	37	37	-	-	-	327	-	-	-	6,541	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,578	387	2,964	2,964	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	237	24	261	261	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	139	14	152	-	152	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	188	28	216	-	216	-	-	-	-	-	-	-	-	-
1b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	22	3	25	-	25	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	4,083	612	4,695	4,695	-	-	-	-	-	-	-	-	-	79,383
1b.4.13	DOC Staff Cost	-	-	-	-	-	-	3,536	530	4,066	4,066	-	-	-	-	-	-	-	-	-	47,314
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	9,593	1,439	11,032	11,032	-	-	-	-	-	-	-	-	-	174,537
1b.4	Subtotal Period 1b Period-Dependent Costs	23	463	5	3	-	22	21,645	3,273	25,435	25,041	394	-	-	327	-	-	-	6,541	12	301,234
1b.0	TOTAL PERIOD 1b COST	2,573	3,083	58	388	1,008	2,134	31,353	6,760	47,356	39,908	7,114	334	-	13,344	565	-	-	246,614	19,889	315,462
PERIOD 1 TOTALS		2,573	3,833	66	393	1,008	2,172	87,562	15,188	112,796	93,430	18,791	576	-	13,909	565	-	-	257,913	19,910	850,728
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Reactor Coolant Piping	41	34	4	7	-	55	-	45	187	187	-	-	-	288	-	-	-	34,807	1,414	-
2a.1.1.2	Pressurizer Relief Tank	18	15	3	5	-	34	-	22	97	97	-	-	-	192	-	-	-	21,288	625	-
2a.1.1.3	Reactor Coolant Pumps & Motors	41	46	20	84	46	999	-	303	1,539	1,539	-	-	132	1,701	-	-	-	325,380	1,785	-
2a.1.1.4	Pressurizer	36	58	492	396	-	671	-	309	1,963	1,963	-	-	-	2,460	-	-	-	202,122	2,282	-
2a.1.1.5	Steam Generators	181	2,513	1,739	1,330	1,149	3,088	-	2,037	12,036	12,036	-	-	18,672	11,316	-	-	-	1,668,341	11,617	2,875
2a.1.1.6	CRDMs/ICIs/Service Structure Removal	126	55	118	34	-	84	-	115	531	531	-	-	-	2,404	-	-	-	53,072	3,225	-
2a.1.1.7	Reactor Vessel Internals	98	1,777	9,977	908	-	9,334	174	8,796	31,065	31,065	-	-	-	501	527	918	-	219,145	21,733	1,001
2a.1.1.8	Reactor Vessel	58	3,450	1,022	459	-	4,412	174	5,218	14,793	14,793	-	-	-	4,319	1,377	-	-	619,525	21,733	1,001
2a.1.1	Totals	599	7,949	13,375	3,223	1,195	18,677	349	16,845	62,212	62,212	-	-	18,804	23,180	1,904	918	-	3,143,680	64,414	4,878
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	245	130	51	357	160	-	176	1,120	1,120	-	-	2,131	1,187	-	-	-	287,637	4,667	-
2a.1.3	Main Condensers	-	2,045	56	35	253	120	-	590	3,099	3,099	-	-	2,851	841	-	-	-	203,723	39,151	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor	-	862	-	-	-	-	-	129	992	992	-	-	-	-	-	-	-	-	11,414	-
2a.1.4.2	Auxiliary	-	357	-	-	-	-	-	54	411	411	-	-	-	-	-	-	-	-	4,945	-
2a.1.4.3	Radwaste	-	13	-	-	-	-	-	2	15	15	-	-	-	-	-	-	-	-	179	-
2a.1.4	Totals	-	1,233	-	-	-	-	-	185	1,417	1,417	-	-	-	-	-	-	-	-	16,538	-
Disposal of Plant Systems																					
2a.1.5.1	Admin Bldg Ventilation	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	76	-
2a.1.5.2	Air Removal	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	422	-
2a.1.5.3	Auxiliary Feedwater	-	32	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	676	-
2a.1.5.4	Auxiliary Feedwater - RCA	-	25	0	1	14	-	-	8	48	48	-	-	178	-	-	-	-	7,214	466	-
2a.1.5.5	Bleed Steam	-	63	-	-	-	-	-	9	73	-	-	73	-	-	-	-	-	-	1,331	-
2a.1.5.6	Caustic Addition - RCA	-	27	0	1	19	-	-	10	57	57	-	-	240	-	-	-	-	9,761	466	-
2a.1.5.7	Chemical Feed	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	261	-
2a.1.5.8	Chemical Feed - RCA	-	2	0	0	1	-	-	1	4	4	-	-	16	-	-	-	-	634	31	-

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt, Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2a.1.5.9	Circulating Water	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	401	-
2a.1.5.10	Condensate	-	373	-	-	-	-	-	56	429	-	-	429	-	-	-	-	-	-	7,537	-
2a.1.5.11	Condensate Polishing	-	146	-	-	-	-	-	22	168	-	-	168	-	-	-	-	-	-	2,987	-
2a.1.5.12	Condensate Polishing - RCA	-	26	1	3	39	-	-	13	81	81	-	-	483	-	-	-	-	19,616	486	-
2a.1.5.13	Electro-Hydraulic	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	143	-
2a.1.5.14	External Circulating Water	-	19	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	385	-
2a.1.5.15	External Circulating Water - RCA	-	50	1	4	58	-	-	22	134	134	-	-	721	-	-	-	-	29,284	927	-
2a.1.5.16	Feedwater	-	90	-	-	-	-	-	13	103	-	-	103	-	-	-	-	-	-	1,840	-
2a.1.5.17	Feedwater - RCA	-	170	5	25	332	-	-	96	628	628	-	-	4,147	-	-	-	-	168,414	3,319	-
2a.1.5.18	Gland Seal	-	23	-	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	504	-
2a.1.5.19	Heater Drain	-	270	-	-	-	-	-	41	311	-	-	311	-	-	-	-	-	-	5,638	-
2a.1.5.20	Hypobromous Acid Feed	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	86	-
2a.1.5.21	Hypobromous Acid Feed - RCA	-	1	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	100	11	-
2a.1.5.22	Internal Circ Water & CDSR	-	18	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	366	-
2a.1.5.23	Main Gen/Exciter/Transformer	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	5	-
2a.1.5.24	Main Steam	-	71	-	-	-	-	-	11	81	-	-	81	-	-	-	-	-	-	1,482	-
2a.1.5.25	Main Steam - RCA	-	260	6	31	413	-	-	132	843	843	-	-	5,166	-	-	-	-	209,799	5,051	-
2a.1.5.26	Repairable Spare Snubbers	-	4	0	0	1	-	-	1	6	6	-	-	12	-	-	-	-	490	75	-
2a.1.5.27	Steam Exclusion	-	1	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	32	-
2a.1.5.28	Steam Exclusion - RCA	-	3	0	0	2	-	-	1	6	6	-	-	24	-	-	-	-	966	47	-
2a.1.5.29	Steam Generator Blowdown	-	277	11	20	153	64	-	112	636	636	-	-	1,906	457	-	-	-	117,369	5,408	-
2a.1.5.30	Steam Generators	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	75	-
2a.1.5.31	Turbine & Moisture Separators	-	268	-	-	-	-	-	40	308	-	-	308	-	-	-	-	-	-	5,472	-
2a.1.5.32	Turbine Oil Purification	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	757	-
2a.1.5.33	Water Treatment	-	316	-	-	-	-	-	47	364	-	-	364	-	-	-	-	-	-	6,676	-
2a.1.5.34	Water Treatment - RCA	-	14	0	1	9	-	-	5	29	29	-	-	115	-	-	-	-	4,652	250	-
2a.1.5	Totals	-	2,654	25	86	1,041	64	-	671	4,540	2,473	-	2,067	13,010	457	-	-	-	568,299	53,692	-
2a.1.6	Scaffolding in support of decommissioning	-	2,304	16	8	90	9	-	595	3,022	3,022	-	-	1,012	63	-	-	-	51,199	25,908	-
2a.1	Subtotal Period 2a Activity Costs	599	16,430	13,603	3,403	2,935	19,030	349	19,061	75,410	73,343	-	2,067	37,809	25,727	1,904	918	-	4,254,538	204,371	4,878
Period 2a Collateral Costs																					
2a.3.1	Process liquid waste	59	-	22	118	-	111	-	77	386	386	-	-	-	400	-	-	-	23,991	78	-
2a.3.2	Small tool allowance	-	165	-	-	-	-	-	25	190	171	-	19	-	-	-	-	-	-	-	-
2a.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	14,036	2,105	16,141	-	16,141	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	59	165	22	118	-	111	14,036	2,207	16,718	558	16,141	19	-	400	-	-	-	23,991	78	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	57	-	-	-	-	-	-	14	71	71	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	513	51	564	564	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	2,194	219	2,414	2,172	-	241	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,229	-	-	-	-	-	307	1,536	1,536	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,338	-	-	-	-	-	351	2,689	2,689	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	54	36	-	246	-	72	409	409	-	-	-	3,621	-	-	-	72,430	132	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	3,054	458	3,512	3,512	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	567	57	623	623	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	126	13	138	-	138	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	469	70	539	-	539	-	-	-	-	-	-	-	-	-
2a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	55	8	63	-	63	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	8,617	1,293	9,910	9,910	-	-	-	-	-	-	-	-	-	165,896
2a.4.13	DOC Staff Cost	-	-	-	-	-	-	15,373	2,306	17,679	17,679	-	-	-	-	-	-	-	-	-	199,337
2a.4.14	Utility Staff Cost	-	-	-	-	-	-	21,772	3,266	25,038	25,038	-	-	-	-	-	-	-	-	-	371,134
2a.4	Subtotal Period 2a Period-Dependent Costs	57	3,567	54	36	-	246	52,739	8,485	65,184	64,203	740	241	-	3,621	-	-	-	72,430	132	736,367
2a.0	TOTAL PERIOD 2a COST	715	20,162	13,678	3,556	2,935	19,388	67,123	29,754	157,312	138,103	16,881	2,327	37,809	29,749	1,904	918	-	4,350,959	204,580	741,245

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	ADT & Misc Ventilation	-	18	0	1	12	1	-	7	40	40	-	-	153	7	-	-	-	6,793	363	-
2b.1.1.2	Aux Bldg Normal Ventilation	-	51	1	5	55	4	-	23	139	139	-	-	692	27	-	-	-	30,558	1,012	-
2b.1.1.3	Aux Bldg Special Ventilation	-	10	0	0	6	1	-	4	20	20	-	-	70	4	-	-	-	3,225	197	-
2b.1.1.4	Battery Rm Special Ventilation	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	20	-
2b.1.1.5	Boron Recycle	0	3	0	0	0	1	-	1	5	5	-	-	3	6	-	-	-	680	50	-
2b.1.1.6	Chemical & Volume Control	553	622	35	41	189	199	-	520	2,158	2,158	-	-	2,356	1,485	-	-	-	220,756	22,365	-
2b.1.1.7	Cold Chemical Lab Ventilation	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	8	-
2b.1.1.8	Component Cooling - RCA	-	442	14	71	960	-	-	266	1,753	1,753	-	-	11,996	-	-	-	-	487,169	8,420	-
2b.1.1.9	Containment Cooling	-	24	-	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	477	-
2b.1.1.10	Containment Cooling - RCA	-	204	3	16	219	-	-	87	529	529	-	-	2,743	-	-	-	-	111,390	3,872	-
2b.1.1.11	Containment Hydrogen Control - RCA	-	25	0	1	11	-	-	8	46	46	-	-	141	-	-	-	-	5,742	487	-
2b.1.1.12	Containment Spray - RCA	-	127	2	9	116	-	-	51	305	305	-	-	1,453	-	-	-	-	59,019	2,507	-
2b.1.1.13	Containment Ventilation	-	169	13	38	378	73	-	124	794	794	-	-	4,721	509	-	-	-	237,445	3,366	-
2b.1.1.14	Control/Relay/Cmptr Rm Vent	-	23	1	2	21	2	-	10	58	58	-	-	260	14	-	-	-	11,856	454	-
2b.1.1.15	Cooling Water	-	112	-	-	-	-	-	17	129	-	-	129	-	-	-	-	-	-	2,344	-
2b.1.1.16	Cooling Water - RCA	-	329	10	50	675	-	-	192	1,256	1,256	-	-	8,442	-	-	-	-	342,822	6,243	-
2b.1.1.17	Cranes/Hoists/Elevators - RCA	-	2	0	1	8	-	-	2	13	13	-	-	103	-	-	-	-	4,184	48	-
2b.1.1.18	D3 Emergency Diesel	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	140	-
2b.1.1.19	D4 Emergency Diesel	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	140	-
2b.1.1.20	D5 Emergency Diesel	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	5	-
2b.1.1.21	Electrical - Clean	-	1,222	-	-	-	-	-	183	1,405	-	-	1,405	-	-	-	-	-	-	24,276	-
2b.1.1.22	Electrical - Contaminated	-	332	3	13	160	8	-	111	626	626	-	-	1,997	53	-	-	-	85,872	6,502	-
2b.1.1.23	Electrical - Decontaminated	-	2,003	22	111	1,500	-	-	745	4,382	4,382	-	-	18,753	-	-	-	-	761,569	38,423	-
2b.1.1.24	Filter Rm Ventilation	-	3	0	0	2	0	-	1	7	7	-	-	24	1	-	-	-	1,017	69	-
2b.1.1.25	Fire Protection & Detection	-	142	-	-	-	-	-	21	163	-	-	163	-	-	-	-	-	-	3,009	-
2b.1.1.26	Fire Protection & Detection - RCA	-	164	2	11	146	-	-	65	388	388	-	-	1,828	-	-	-	-	74,245	3,057	-
2b.1.1.27	Fuel Handling	-	54	1	2	16	5	-	18	96	96	-	-	200	35	-	-	-	11,259	1,101	-
2b.1.1.28	Fuel Oil	-	0	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	9	-
2b.1.1.29	HVAC - Clean	-	106	-	-	-	-	-	16	122	-	-	122	-	-	-	-	-	-	2,373	-
2b.1.1.30	HVAC - Contaminated	-	905	16	69	860	41	-	377	2,268	2,268	-	-	10,745	286	-	-	-	462,026	16,575	-
2b.1.1.31	Heating	-	224	-	-	-	-	-	34	257	-	-	257	-	-	-	-	-	-	4,804	-
2b.1.1.32	Heating - RCA	-	224	2	11	153	-	-	81	471	471	-	-	1,907	-	-	-	-	77,458	4,028	-
2b.1.1.33	Hot Lab & Sample Rm Ventilation	-	14	0	1	9	0	-	5	29	29	-	-	107	3	-	-	-	4,621	285	-
2b.1.1.34	Incore Instrumentation	0	22	1	1	5	6	-	8	43	43	-	-	60	41	-	-	-	6,097	457	-
2b.1.1.35	Misc Drains & Vents	-	157	7	8	37	43	-	57	309	309	-	-	458	302	-	-	-	45,599	3,050	-
2b.1.1.36	Misc Lab & Service Areas Vent	-	90	5	5	30	24	-	34	189	189	-	-	370	172	-	-	-	30,430	1,709	-
2b.1.1.37	Miscellaneous Gas	-	49	-	-	-	-	-	7	57	-	-	57	-	-	-	-	-	-	1,073	-
2b.1.1.38	Miscellaneous Gas - RCA	-	88	1	4	48	-	-	30	170	170	-	-	600	-	-	-	-	24,378	1,593	-
2b.1.1.39	Radiation Monitoring	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	111	-
2b.1.1.40	Radiation Monitoring - RCA	-	44	0	2	25	-	-	15	87	87	-	-	316	-	-	-	-	12,826	782	-
2b.1.1.41	Reactor Coolant	120	152	11	11	18	73	-	122	507	507	-	-	229	516	-	-	-	55,497	5,247	-
2b.1.1.42	Reactor Hot Sampling	103	87	6	5	4	31	-	83	319	319	-	-	54	220	-	-	-	21,920	3,680	-
2b.1.1.43	Reactor Makeup	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	583	-
2b.1.1.44	Reactor Makeup - RCA	-	3	0	0	2	-	-	1	6	6	-	-	28	-	-	-	-	1,148	47	-
2b.1.1.45	Reactor Vessel	7	10	0	0	2	1	-	7	27	27	-	-	22	10	-	-	-	1,781	337	-
2b.1.1.46	Residual Heat Removal	227	260	46	61	228	327	-	308	1,457	1,457	-	-	2,853	2,290	-	-	-	321,222	6,693	-
2b.1.1.47	Safeguards Chilled Water	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	75	-
2b.1.1.48	Safety Injection	-	605	24	55	534	117	-	271	1,606	1,606	-	-	6,676	857	-	-	-	344,588	11,818	-
2b.1.1.49	Sampling	-	36	2	1	3	9	-	12	64	64	-	-	37	66	-	-	-	7,398	712	-
2b.1.1.50	Service Bldg & New Cmptr Vent	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	5	-
2b.1.1.51	Shield Bldg Ventilation	-	85	7	19	162	49	-	61	383	383	-	-	2,028	342	-	-	-	113,039	1,717	-
2b.1.1.52	Station & Instrument Air	-	112	-	-	-	-	-	17	129	-	-	129	-	-	-	-	-	-	2,424	-

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2b.1.1.53	Station & Instrument Air - RCA	-	203	2	10	130	-	-	72	416	416	-	-	1,625	-	-	-	-	65,986	3,626	-
2b.1.1.54	Turbine Bldg Traps & Drains	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	462	-
2b.1.1.55	Turbine Bldg Traps & Drains - RCA	-	20	0	1	14	-	-	7	43	43	-	-	180	-	-	-	-	7,321	342	-
2b.1.1.56	Turbine Bldg Ventilation	-	28	-	-	-	-	-	4	32	-	-	32	-	-	-	-	-	-	547	-
2b.1.1.57	Unit Coolers	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	332	-
2b.1.1.58	Unit Coolers - RCA	-	36	0	1	19	-	-	12	69	69	-	-	232	-	-	-	-	9,413	665	-
2b.1.1.59	Waste Gas Disposal	414	340	25	33	196	137	-	363	1,509	1,509	-	-	2,453	1,086	-	-	-	185,530	14,293	-
2b.1.1.60	Waste Liquid Disposal	1,061	1,167	65	70	292	361	-	973	3,990	3,990	-	-	3,655	2,677	-	-	-	375,774	42,536	-
2b.1.1.61	Waste Solid Disposal	84	100	6	8	31	40	-	84	353	353	-	-	389	288	-	-	-	40,666	3,429	-
2b.1.1	Totals	2,569	11,339	335	749	7,277	1,552	-	5,534	29,356	26,930	-	2,426	90,963	11,297	-	-	-	4,670,322	265,371	-
2b.1.2	Scaffolding in support of decommissioning	-	2,880	20	10	112	11	-	743	3,777	3,777	-	-	1,265	79	-	-	-	63,999	32,385	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor	888	772	90	140	178	546	-	830	3,444	3,444	-	-	2,230	5,953	-	-	-	657,547	30,856	-
2b.1.3.2	Auxiliary	929	326	45	73	85	156	-	613	2,228	2,228	-	-	1,060	2,911	-	-	-	332,476	23,886	-
2b.1.3.3	Backwash Waste Receiving Tank	-	23	7	10	-	23	-	14	78	78	-	-	-	439	-	-	-	43,896	311	-
2b.1.3.4	Drum Transfer & Truck Loading Enclosure	13	7	1	2	1	3	-	10	37	37	-	-	19	64	-	-	-	7,118	370	-
2b.1.3.5	LLRW Storage Enclosure	89	42	7	10	3	23	-	63	237	237	-	-	38	435	-	-	-	44,969	2,436	-
2b.1.3.6	Radwaste	39	19	3	5	3	10	-	29	108	108	-	-	42	196	-	-	-	21,136	1,087	-
2b.1.3.7	Resin Disposal	12	9	1	2	7	3	-	10	44	44	-	-	83	60	-	-	-	9,271	384	-
2b.1.3	Totals	1,970	1,198	154	242	278	766	-	1,569	6,176	6,176	-	-	3,471	10,058	-	-	-	1,116,412	59,330	-
2b.1	Subtotal Period 2b Activity Costs	4,539	15,417	510	1,001	7,667	2,329	-	7,846	39,309	36,883	-	2,426	95,700	21,434	-	-	-	5,850,732	357,087	-
Period 2b Collateral Costs																					
2b.3.1	Process liquid waste	213	-	137	768	-	973	-	479	2,570	2,570	-	-	-	2,552	-	-	-	209,631	498	-
2b.3.2	Small tool allowance	-	276	-	-	-	-	-	41	318	318	-	-	-	-	-	-	-	-	-	-
2b.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,876	1,781	13,657	-	13,657	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	213	276	137	768	-	973	11,876	2,302	16,545	2,888	13,657	-	-	2,552	-	-	-	209,631	498	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	777	-	-	-	-	-	-	194	971	971	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	810	81	891	891	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	1,702	170	1,873	1,873	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,054	-	-	-	-	-	513	2,567	2,567	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	3,667	-	-	-	-	-	550	4,217	4,217	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	81	53	-	369	-	108	612	612	-	-	-	5,422	-	-	-	108,444	198	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	3,809	571	4,380	4,380	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	895	90	985	985	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	198	20	218	-	218	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	740	111	851	-	851	-	-	-	-	-	-	-	-	-
2b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	373	56	428	428	-	-	-	-	-	-	-	-	-	-
2b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	86	13	99	-	99	-	-	-	-	-	-	-	-	-
2b.4.13	Security Staff Cost	-	-	-	-	-	-	13,611	2,042	15,653	15,653	-	-	-	-	-	-	-	-	-	262,036
2b.4.14	DOC Staff Cost	-	-	-	-	-	-	23,389	3,508	26,897	26,897	-	-	-	-	-	-	-	-	-	302,429
2b.4.15	Utility Staff Cost	-	-	-	-	-	-	33,023	4,953	37,976	37,976	-	-	-	-	-	-	-	-	-	561,357
2b.4	Subtotal Period 2b Period-Dependent Costs	777	5,720	81	53	-	369	78,636	12,981	98,618	97,449	1,169	-	-	5,422	-	-	-	108,444	198	1,125,821
2b.0	TOTAL PERIOD 2b COST	5,529	21,414	728	1,822	7,667	3,670	90,512	23,129	154,472	137,220	14,827	2,426	95,700	29,408	-	-	-	6,168,807	357,782	1,125,821

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2c - Delay Before End Of Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
Period 2c Collateral Costs																					
2c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	51,490	7,723	59,213	-	59,213	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	-	-	-	-	-	-	51,490	7,723	59,213	-	59,213	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	4,171	417	4,589	4,589	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	8,796	880	9,675	9,675	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	854	-	-	-	-	-	213	1,067	1,067	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	19	13	-	88	-	26	146	146	-	-	-	1,295	-	-	-	25,900	47	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	5,248	787	6,035	6,035	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	1,751	175	1,926	1,926	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	1,026	103	1,128	-	1,128	-	-	-	-	-	-	-	-	-
2c.4.8	Spent Fuel Pool O&M	-	-	-	-	-	-	3,825	574	4,399	-	4,399	-	-	-	-	-	-	-	-	-
2c.4.9	ISFSI Operating Costs	-	-	-	-	-	-	447	67	514	-	514	-	-	-	-	-	-	-	-	-
2c.4.10	Security Staff Cost	-	-	-	-	-	-	32,601	4,890	37,491	37,491	-	-	-	-	-	-	-	-	-	626,117
2c.4.11	Utility Staff Cost	-	-	-	-	-	-	33,534	5,030	38,564	38,564	-	-	-	-	-	-	-	-	-	620,766
2c.4	Subtotal Period 2c Period-Dependent Costs	-	854	19	13	-	88	91,398	13,162	105,533	99,493	6,041	-	-	1,295	-	-	-	25,900	47	1,246,883
2c.0	TOTAL PERIOD 2c COST	-	854	19	13	-	88	142,888	20,885	164,747	99,493	65,254	-	-	1,295	-	-	-	25,900	47	1,246,883
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	249	26	65	28	-	211	-	194	773	773	-	-	-	1,477	-	-	-	132,519	576	-
Disposal of Plant Systems																					
2d.1.2.1	Electrical - Contaminated - Fuel Pool	-	142	1	6	69	3	-	48	269	269	-	-	864	23	-	-	-	37,160	2,783	-
2d.1.2.2	Electrical - Decontaminated - Fuel Pool	-	860	10	48	646	-	-	320	1,883	1,883	-	-	8,069	-	-	-	-	327,668	16,495	-
2d.1.2.3	Fire Protection & Detection - RCA Fuel Pool	-	25	0	2	23	-	-	10	60	60	-	-	286	-	-	-	-	11,622	464	-
2d.1.2.4	HVAC - Contaminated - Fuel Pool	-	407	7	31	386	18	-	170	1,019	1,019	-	-	4,828	128	-	-	-	207,577	7,447	-
2d.1.2.5	Safeguards Chilled Water - RCA	-	3	0	0	2	-	-	1	6	6	-	-	26	-	-	-	-	1,045	51	-
2d.1.2.6	Spent Fuel Pool Cooling	23	25	2	2	3	11	-	21	87	87	-	-	39	75	-	-	-	8,311	878	-
2d.1.2.7	Spent Fuel Pool Normal Ventilation	-	20	0	2	21	1	-	9	53	53	-	-	265	8	-	-	-	11,500	394	-
2d.1.2	Totals	23	1,481	21	90	1,150	33	-	578	3,377	3,377	-	-	14,376	235	-	-	-	604,883	28,512	-
Decontamination of Site Buildings																					
2d.1.3.1	Fuel Handling of Aux Building	777	846	16	31	193	48	-	647	2,559	2,559	-	-	2,417	806	-	-	-	177,542	30,420	-
2d.1.3	Totals	777	846	16	31	193	48	-	647	2,559	2,559	-	-	2,417	806	-	-	-	177,542	30,420	-
2d.1.4	Scaffolding in support of decommissioning	-	576	4	2	22	2	-	149	755	755	-	-	253	16	-	-	-	12,800	6,477	-
2d.1	Subtotal Period 2d Activity Costs	1,049	2,929	106	151	1,366	295	-	1,569	7,464	7,464	-	-	17,046	2,533	-	-	-	927,744	65,985	-
Period 2d Collateral Costs																					
2d.3.1	Process liquid waste	62	-	24	130	-	125	-	84	426	426	-	-	-	440	-	-	-	27,040	86	-
2d.3.2	Small tool allowance	-	57	-	-	-	-	-	9	65	65	-	-	-	-	-	-	-	-	-	-
2d.3.3	Decommissioning Equipment Disposition	-	-	96	55	532	53	-	111	848	848	-	-	6,000	373	-	-	-	303,507	88	-
2d.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	227	34	261	-	261	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	62	57	120	185	532	179	227	238	1,600	1,339	261	-	6,000	813	-	-	-	330,547	174	-

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	139	-	-	-	-	-	-	35	173	173	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	285	28	313	313	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	599	60	659	659	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	482	-	-	-	-	-	120	602	602	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,290	-	-	-	-	-	193	1,483	1,483	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	30	19	-	135	-	40	223	223	-	-	-	1,980	-	-	-	39,595	72	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	714	107	822	822	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	315	31	346	346	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	70	7	77	-	77	-	-	-	-	-	-	-	-	-
2d.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	-
2d.4.11	ISFSI Operating Costs	-	-	-	-	-	-	30	5	35	-	35	-	-	-	-	-	-	-	-	-
2d.4.12	Security Staff Cost	-	-	-	-	-	-	2,655	398	3,053	3,053	-	-	-	-	-	-	-	-	-	48,450
2d.4.13	DOC Staff Cost	-	-	-	-	-	-	5,684	853	6,536	6,536	-	-	-	-	-	-	-	-	-	72,857
2d.4.14	Utility Staff Cost	-	-	-	-	-	-	8,439	1,266	9,705	9,705	-	-	-	-	-	-	-	-	-	139,157
2d.4	Subtotal Period 2d Period-Dependent Costs	139	1,772	30	19	-	135	19,053	3,183	24,329	24,218	112	-	-	1,980	-	-	-	39,595	72	260,464
2d.0	TOTAL PERIOD 2d COST	1,250	4,757	255	356	1,898	608	19,280	4,989	33,393	33,020	373	-	23,046	5,326	-	-	-	1,297,886	66,231	260,464
PERIOD 2e - License Termination																					
Period 2e Direct Decommissioning Activities																					
2e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	148	44	193	193	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	148	44	193	193	-	-	-	-	-	-	-	-	-	-
Period 2e Additional Costs																					
2e.2.1	License Termination Survey	-	-	-	-	-	-	5,916	1,775	7,691	7,691	-	-	-	-	-	-	-	-	111,889	-
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	5,916	1,775	7,691	7,691	-	-	-	-	-	-	-	-	111,889	-
Period 2e Collateral Costs																					
2e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	912	137	1,049	1,049	-	-	-	-	-	-	-	-	-	-
2e.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	184	28	211	-	211	-	-	-	-	-	-	-	-	-
2e.3	Subtotal Period 2e Collateral Costs	-	-	-	-	-	-	1,096	164	1,261	1,049	211	-	-	-	-	-	-	-	-	-
Period 2e Period-Dependent Costs																					
2e.4.1	Insurance	-	-	-	-	-	-	274	27	301	301	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	641	64	705	705	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	636	-	-	-	-	-	159	795	795	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	5	3	-	24	-	7	40	40	-	-	-	352	-	-	-	7,046	13	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	382	57	440	440	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	352	35	388	388	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	75	7	82	-	82	-	-	-	-	-	-	-	-	-
2e.4.8	ISFSI Operating Costs	-	-	-	-	-	-	33	5	37	-	37	-	-	-	-	-	-	-	-	-
2e.4.9	Security Staff Cost	-	-	-	-	-	-	2,786	418	3,203	3,203	-	-	-	-	-	-	-	-	-	50,700
2e.4.10	DOC Staff Cost	-	-	-	-	-	-	4,604	691	5,294	5,294	-	-	-	-	-	-	-	-	-	56,940
2e.4.11	Utility Staff Cost	-	-	-	-	-	-	5,236	785	6,022	6,022	-	-	-	-	-	-	-	-	-	80,340
2e.4	Subtotal Period 2e Period-Dependent Costs	-	636	5	3	-	24	14,382	2,256	17,307	17,188	120	-	-	352	-	-	-	7,046	13	187,980
2e.0	TOTAL PERIOD 2e COST	-	636	5	3	-	24	21,543	4,240	26,452	26,121	331	-	-	352	-	-	-	7,046	111,902	187,980
PERIOD 2 TOTALS		7,494	47,823	14,687	5,750	12,500	23,778	341,346	82,997	536,375	433,957	97,666	4,753	156,555	66,130	1,904	918	-	11,850,600	740,542	3,562,393

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., 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	-	4,992	-	-	-	-	-	749	5,740	-	-	5,740	-	-	-	-	-	-	66,359	-
3b.1.1.2	Auxiliary	-	3,223	-	-	-	-	-	483	3,706	-	-	3,706	-	-	-	-	-	-	44,627	-
3b.1.1.3	Condensate Storage Tank Foundation	-	13	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	193	-
3b.1.1.4	Construction Warehouse & Fab Shop	-	141	-	-	-	-	-	21	162	-	-	162	-	-	-	-	-	-	2,477	-
3b.1.1.5	D3/D4 Emergency Generator	-	24	-	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	371	-
3b.1.1.6	Drum Transfer & Truck Loading Enclosure	-	20	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	361	-
3b.1.1.7	Hydrogen House	-	10	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	153	-
3b.1.1.8	LLRW Storage Enclosure	-	188	-	-	-	-	-	28	216	-	-	216	-	-	-	-	-	-	2,776	-
3b.1.1.9	Radwaste	-	253	-	-	-	-	-	38	291	-	-	291	-	-	-	-	-	-	3,555	-
3b.1.1.10	Resin Disposal	-	24	-	-	-	-	-	4	28	-	-	28	-	-	-	-	-	-	383	-
3b.1.1.11	Sulfuric Acid Tank Enclosure	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	54	-
3b.1.1.12	Turbine	-	2,266	-	-	-	-	-	340	2,606	-	-	2,606	-	-	-	-	-	-	34,352	-
3b.1.1.13	Turbine Pedestal	-	685	-	-	-	-	-	103	788	-	-	788	-	-	-	-	-	-	7,580	-
3b.1.1.14	Warehouse #2	-	28	-	-	-	-	-	4	32	-	-	32	-	-	-	-	-	-	457	-
3b.1.1.15	Waste Neutralizing Tank House	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	165	-
3b.1.1.16	Waste Oil Storage	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	225	-
3b.1.1.17	Water Treatment	-	433	-	-	-	-	-	65	498	-	-	498	-	-	-	-	-	-	6,498	-
3b.1.1.18	Fuel Handling of Aux Building	-	1,633	-	-	-	-	-	245	1,877	-	-	1,877	-	-	-	-	-	-	21,027	-
3b.1.1	Totals	-	13,959	-	-	-	-	-	2,094	16,052	-	-	16,052	-	-	-	-	-	-	191,613	-
Site Closeout Activities																					
3b.1.2	Remove Rubble	-	1,599	-	-	-	-	-	240	1,838	-	-	1,838	-	-	-	-	-	-	10,653	-
3b.1.3	Grade & landscape site	-	126	-	-	-	-	-	19	145	-	-	145	-	-	-	-	-	-	316	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	72	11	83	83	-	-	-	-	-	-	-	-	-	668
3b.1	Subtotal Period 3b Activity Costs	-	15,684	-	-	-	-	72	2,363	18,119	83	-	18,036	-	-	-	-	-	-	202,582	668
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	509	-	-	-	-	5	76	591	-	-	591	-	-	-	-	-	-	2,731	-
3b.2	Subtotal Period 3b Additional Costs	-	509	-	-	-	-	5	76	591	-	-	591	-	-	-	-	-	-	2,731	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	171	-	-	-	-	-	26	197	-	-	197	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	397	60	456	-	456	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	171	-	-	-	-	397	85	653	-	456	197	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	847	85	932	-	932	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	153	15	168	-	168	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,726	-	-	-	-	-	859	6,585	-	-	6,585	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	592	89	681	0	204	476	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	294	29	323	-	323	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	231	23	254	-	254	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	101	15	116	-	116	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	4,458	669	5,127	0	4,204	923	-	-	-	-	-	-	-	81,506
3b.4.9	DOC Staff Cost	-	-	-	-	-	-	13,590	2,039	15,629	-	-	15,629	-	-	-	-	-	-	-	164,171
3b.4.10	Utility Staff Cost	-	-	-	-	-	-	8,664	1,300	9,963	0	5,779	4,185	-	-	-	-	-	-	-	131,579
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,726	-	-	-	-	28,930	5,122	39,779	0	11,981	27,798	-	-	-	-	-	-	-	377,256
3b.0	TOTAL PERIOD 3b COST	-	22,090	-	-	-	-	29,405	7,647	59,142	83	12,437	46,621	-	-	-	-	-	-	205,313	377,924

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,263	339	2,602	-	2,602	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	2,263	339	2,602	-	2,602	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	7,446	745	8,191	-	8,191	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	1,346	135	1,480	-	1,480	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	1,560	234	1,794	-	1,794	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	2,582	258	2,840	-	2,840	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	2,033	203	2,236	-	2,236	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Operating Costs	-	-	-	-	-	-	885	133	1,018	-	1,018	-	-	-	-	-	-	-	-	-
3c.4.7	Security Staff Cost	-	-	-	-	-	-	32,189	4,828	37,017	-	37,017	-	-	-	-	-	-	-	-	572,786
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	9,036	1,355	10,392	-	10,392	-	-	-	-	-	-	-	-	143,409
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	57,077	7,891	64,968	-	64,968	-	-	-	-	-	-	-	-	716,194
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	59,339	8,231	67,570	-	67,570	-	-	-	-	-	-	-	-	716,194
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	200	-	-	8,951	-	1,363	10,514	10,514	-	-	-	-	-	-	512	105,595	-	-
3d.1.1	Totals	-	-	200	-	-	8,951	-	1,363	10,514	10,514	-	-	-	-	-	-	512	105,595	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	200	-	-	8,951	-	1,363	10,514	10,514	-	-	-	-	-	-	512	105,595	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	31	3	34	-	34	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	6	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	7	1	7	-	7	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	11	1	12	-	12	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	8	1	9	-	9	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	4	1	4	-	4	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	134	20	155	-	155	-	-	-	-	-	-	-	-	2,391
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	38	6	43	-	43	-	-	-	-	-	-	-	-	599
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	238	33	271	-	271	-	-	-	-	-	-	-	-	2,990
3d.0	TOTAL PERIOD 3d COST	-	-	200	-	-	8,951	238	1,396	10,785	10,514	271	-	-	-	-	-	512	105,595	-	2,990
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	ISFSI License Termination (TN-40)	-	5	317	177	-	3,271	827	1,001	5,598	-	5,598	-	-	31,862	-	-	-	6,426,376	2,909	1,120
3e.2	Subtotal Period 3e Additional Costs	-	5	317	177	-	3,271	827	1,001	5,598	-	5,598	-	-	31,862	-	-	-	6,426,376	2,909	1,120
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	121	12	133	-	133	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	22	2	24	-	24	-	-	-	-	-	-	-	-	-
3e.4.3	Heavy equipment rental	-	244	-	-	-	-	-	37	281	-	281	-	-	-	-	-	-	-	-	-
3e.4.4	Plant energy budget	-	-	-	-	-	-	85	13	97	-	97	-	-	-	-	-	-	-	-	-
3e.4.5	NRC ISFSI Fees	-	-	-	-	-	-	33	3	36	-	36	-	-	-	-	-	-	-	-	-

Table C-2
Prairie Island Nuclear Generating Plant, Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2008 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 / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3e Period-Dependent Costs (continued)																					
3e.4.6	Security Staff Cost	-	-	-	-	-	-	146	22	167	-	167	-	-	-	-	-	-	-	-	2,510
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	119	18	137	-	137	-	-	-	-	-	-	-	-	1,901
3e.4	Subtotal Period 3e Period-Dependent Costs	-	244	-	-	-	-	525	107	876	-	876	-	-	-	-	-	-	-	-	4,411
3e.0	TOTAL PERIOD 3e COST	-	249	317	177	-	3,271	1,353	1,108	6,474	-	6,474	-	-	31,862	-	-	-	6,426,376	2,909	5,531
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	ISFSI Demolition & Site Restoration (TN-40)	-	372	-	-	-	-	23	59	454	-	454	-	-	-	-	-	-	-	1,591	80
3f.2	Subtotal Period 3f Additional Costs	-	372	-	-	-	-	23	59	454	-	454	-	-	-	-	-	-	-	1,591	80
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	1	-	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	1	-	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	11	1	12	-	12	-	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	81	-	-	-	-	-	12	94	-	94	-	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	43	6	49	-	49	-	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	73	11	84	-	84	-	-	-	-	-	-	-	-	1,265
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	49	7	57	-	57	-	-	-	-	-	-	-	-	784
3f.4	Subtotal Period 3f Period-Dependent Costs	-	81	-	-	-	-	177	38	296	-	296	-	-	-	-	-	-	-	-	2,050
3f.0	TOTAL PERIOD 3f COST	-	455	-	-	-	-	199	98	752	-	752	-	-	-	-	-	-	-	1,591	2,130
PERIOD 3 TOTALS		-	22,794	517	177	-	12,222	90,535	18,479	144,723	10,597	87,505	46,621	-	31,862	-	-	512	6,531,971	209,813	1,104,769
TOTAL COST TO DECOMMISSION		10,067	74,450	15,270	6,320	13,508	38,172	519,443	116,664	793,894	537,983	203,961	51,950	156,555	111,901	2,469	918	512	18,640,480	970,265	5,517,891

TOTAL COST TO DECOMMISSION WITH 17.23% CONTINGENCY:	**$793,894**	**thousands of 2008 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 67.77% OR:	**$537,983**	**thousands of 2008 dollars**
SPENT FUEL MANAGEMENT COST IS 25.69% OR:	**$203,961**	**thousands of 2008 dollars**
NON-NUCLEAR DEMOLITION COST IS 6.54% OR:	**$51,950**	**thousands of 2008 dollars**
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	**115,289**	**cubic feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED	**512**	**cubic feet**
TOTAL SCRAP METAL REMOVED:	**34,995**	**tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**970,265**	**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