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February 19, 2015

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

> Braidwood Station, Units 1 and 2 Facility Operating License Nos. NPF-72 and NPF-77 NRC Docket Nos. STN 50-456 and STN 50-457

> Byron Station, Units 1 and 2
> Facility Operating License Nos. NPF-37 and NPF-66
> NRC Docket Nos. STN 50-454 and STN 50-455

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Subject: Submittal of Updated Site-Specific SAFSTOR Decommissioning Cost Estimates for Braidwood Station, Byron Station, and LaSalle County Station

References: 1. Letter from Patrick R. Simpson (Exelon Generation Company, LLC) to U.S. NRC, "Submittal of Braidwood Station Site-Specific SAFSTOR Decommissioning Cost Estimate," dated January 11, 2010

- 2. Letter from Patrick R. Simpson (Exelon Generation Company, LLC) to U.S. NRC, "Submittal of Byron Station Site-Specific SAFSTOR Decommissioning Cost Estimate," dated November 16, 2009
- 3. Letter from Patrick R. Simpson (Exelon Generation Company, LLC) to U.S. NRC, "Submittal of LaSalle County Station Site-Specific SAFSTOR Decommissioning Cost Estimate," dated August 27, 2009

In References 1, 2, and 3, Exelon Generation Company, LLC (EGC) submitted site-specific SAFSTOR Decommissioning Cost Estimates (DCEs) for Braidwood Station Units 1 and 2, Byron Station Units 1 and 2, and LaSalle County Station Units 1 and 2. Attached are updated DCEs that have been performed in accordance with EGC's normal practice of updating DCEs every five years.

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There are no new regulatory commitments contained in this letter. If you have any questions about this letter, please contact Timothy A. Byam at (630) 657-2818.

Respectfully,

Patrick R. Simpson Manager – Licensing

Exelon Generation Company, LLC

Attachments:

- 1. Braidwood Station, Units 1 and 2 Decommissioning Cost Estimate
- 2. Byron Station, Units 1 and 2 Decommissioning Cost Estimate
- 3. LaSalle County Station, Units 1 and 2 Decommissioning Cost Estimate

cc: Regional Administrator - NRC Region III

NRC Senior Resident Inspector – Braidwood Station

NRC Senior Resident Inspector – Byron Station

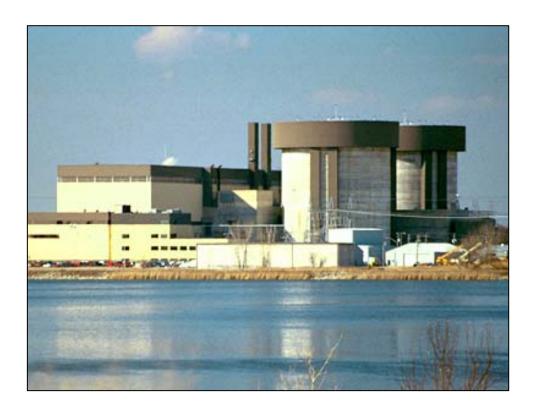
NRC Senior Resident Inspector – LaSalle County Station

ATTACHMENT 1

Braidwood Station, Units 1 and 2 Decommissioning Cost Estimate

DECOMMISSIONING COST ANALYSIS for the

BRAIDWOOD NUCLEAR POWER STATION



 $prepared\ for$

Exelon Generation Company LLC

prepared by

TLG Services, Inc. Bridgewater, Connecticut

September 2014

APPROVALS

Project Manager

Project Engineer

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REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
0 1		08-28-2014 09-12-2014	Section 6 text	Original Issue Clarification to Comparison of the 2009 and 2014 Estimates; specifically on Property Taxes and Decommissioning and Demolition

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the Braidwood Nuclear Power Station (Braidwood) for the selected decommissioning scenarios following a scheduled cessation of plant operations. The updated estimates are designed to provide Exelon Generation Company LLC (Exelon) with the information to assess its current decommissioning liability, as it relates to the nuclear station.

The analysis relies upon site-specific, technical information, developed in an evaluation in 2009,^[1] and updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a comprehensive engineering evaluation, but presents estimates prepared in advance of the detailed planning required to execute the decommissioning of the nuclear units. It may also not reflect the actual plan to decommission Braidwood; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

The 2009 inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis. No substantive changes were identified to the configuration of the station or site facilities (that would impact decommissioning).

The costs to decommission Braidwood for the scenarios evaluated are tabulated at the end of this section. Costs are reported in 2014 dollars and include monies anticipated to be spent for radiological remediation and operating license termination, spent fuel management, and site restoration activities.

A complete discussion of the assumptions relied upon in this analysis is provided in Section 3, along with schedules of annual expenditures for each scenario. A sequence of significant project activities is provided in Section 4 with a timeline for each scenario. Detailed cost reports used to generate the summary tables contained within this document are provided in Appendices C, D and E.

TLG Services, Inc.

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¹ "Decommissioning Cost Analysis for the Braidwood Nuclear Power Station," Document No. E16-1555-014, Rev. 0, TLG Services, Inc., October 2009

Consistent with the 2009 analysis, the current cost estimates assume that the shutdown of the nuclear station is a scheduled and pre-planned event (e.g., there is no delay in transitioning the plant and workforce from operations or in obtaining regulatory relief from operating requirements, etc.). The estimates incorporate a minimum cooling period of approximately five and one-half years for the spent fuel in the storage pool at the cessation of Unit 2 operations. In the DECON and SAFSTOR scenarios, any residual fuel remaining in the pool after the cooling period is relocated to an on-site independent spent fuel storage installation (ISFSI) to await transfer to a Department of Energy (DOE) facility (the fuel present in the spent fuel pools or reactors is assumed to remain in the storage pool for the Delayed DECON scenario and transferred directly from the pool to DOE). The estimates also include the dismantling of non-essential structures and limited restoration of the site.

<u>Alternatives and Regulations</u>

The U.S. 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.

<u>DECON</u> 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]

<u>SAFSTOR</u> 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.

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

³ Ibid. Page FR24022, Column 3

⁴ Ibid.

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 viable option. The resulting evaluation provided recommendations, however, rulemaking has been deferred based upon several factors (e.g., 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 amended its decommissioning regulations 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 amendments 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 estimates is also consistent with the recommendations of Regulatory Guide 1.202, issued in February 2005.^[7]

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will

 $^{^{5}}$ <u>Ibid</u>. Page FR24023, Column 2

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

[&]quot;Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, U.S. Nuclear Regulatory Commission, February 2005

become a legacy site. [8] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details are included in this analysis, including the ISFSI decommissioning estimate (Appendix F).

Decommissioning Scenarios

The following scenarios were evaluated and are representative of the alternatives available to the owner. The scenarios assume that the units operate for 60 years, followed by a planned and scheduled shutdown.

- 1. DECON: The first scenario assumes that the two units are promptly decommissioned as an integrated activity. Spent fuel is relocated from the wet storage pool to the ISFSI so as to facilitate decontamination and dismantling activities within the fuel handling building. Spent fuel storage operations continue at the site, independent of decommissioning operations, until the transfer of the fuel to the DOE is complete, assumed for purposes of this study to be in the year 2078. At that time, the ISFSI is decommissioned and the site released for alternative use.
- 2. Delayed DECON: In the second scenario, the units are prepared for an abbreviated period of safe-storage. The spent fuel resident in the fuel handling building's storage pool, remains in the pool until it can be transferred to the DOE (i.e., the ISFSI is not used to off-load the pool following the cessation of operations). Spent fuel placed at the ISFSI during operations remains in storage until the pool is emptied at which time the ISFSI is also emptied. Decommissioning is scheduled to commence once the transfer of the fuel to the DOE is complete (i.e., in the year 2078).
- 3. SAFSTOR: The units are also placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent permitted by the current regulations. Similar to the DECON alternative, the spent fuel in the wet storage pool is relocated to the ISFSI for interim storage. The units remain in protective storage following the removal

⁸ U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011

of spent fuel from the site. Decommissioning operations commence such that license termination is completed within the required 60-year period. As with the first two scenarios, decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling process.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines [9] 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.

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

Contingency

Consistent with standard cost estimating practice, contingencies are applied to the decontamination and dismantling costs 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." [10] The cost elements in the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

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

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

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

<u>Low-Level Radioactive Waste Disposal</u>

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] and its Amendments of 1985,^[12] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

With the exception of Texas, no new compact facilities have been successfully sited, licensed, and constructed. The Texas Compact disposal facility is now operational and waste is being accepted from generators within the Compact by the operator, Waste Control Specialists (WCS). The facility is also able to accept limited quantities of non-Compact waste.

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to Exelon. The majority of the low-level radioactive waste designated for direct disposal (Class A^[13]) can be sent to Energy Solutions' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon Exelon's Life of Plant Agreement with Energy Solutions. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. For purposes of this analysis, GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner to, and at a cost equivalent to that envisioned for the spent fuel. The GTCC is either stored on site with

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

¹² "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986

¹³ Waste is classified in accordance with U.S. Code of Federal Regulations, Title 10, Part 61.55

the spent fuel or shipped directly to a DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act" (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 DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008. The current administration has cut the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle ... and make recommendations for a new plan."[14] Towards this goal, the administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[0]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[15]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on nuclear waste disposal. Two of the recommendations that may impact decommissioning planning are:

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"[16]
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[17]

Blue Ribbon Commission on America's Nuclear Future Charter, http://cybercemetery.unt.edu/archive/brc/20120620215336/http://brc.gov/index.php?q=page/charter

¹⁵ Ibid.

[&]quot;Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf, p. 32, January 2012

¹⁷ <u>Ibid</u>., p.27

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."^[18]

"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."[19]

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013) [20] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in

¹⁸ "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013

¹⁹ Ibid., p.2

United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, August 2013

 $[\]underline{http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB}\\18/\$file/11-1271-1451347.pdf$

which it was discharged from the reactor.^[21] With a large fleet of reactors, Exelon may be able to re-assign allocations between its units to minimize on-site storage costs.

Assuming a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (based upon the proposed timeline for the availability of the larger interim storage facility), the assemblies generated from Braidwood operations are projected to be shipped from the Braidwood site in the years 2074 through 2078 (assuming the cessation of plant operations in 2046 and 2047 for Units 1 and 2, respectively). This equates to 90 multi-purpose canisters (at 32 assemblies per canister), in addition to the 59 on the pad from operations.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[22]), has been constructed to support continued plant operations. This analysis assumes that the facility can be expanded to support decommissioning operations (in the DECON and SAFSTOR scenarios).

The spent fuel in the wet storage pools at the cessation of plant operations is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios) within the first five and one-half years following shutdown. Once the wet storage pool is emptied, the fuel handling building can be either decontaminated and dismantled or prepared for long-term storage. The pool is kept operational in the Delayed DECON scenario until the spent fuel stored in the pools can be transferred to the DOE.

Exelon's strongly held position is that the DOE has a contractual obligation to accept Braidwood's fuel in a timely manner and 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 the DOE has not met its contractual obligation to take the fuel.

U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV – Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) ... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such materials from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance ..."

U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites."

Site Restoration

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

This estimate assumes that some site features will remain following the decommissioning project. These include the existing electrical switchyard, which is assumed to remain functional in support of the regional electrical distribution system. The existing shoreline, canals and ponds will also be left intact.

Consequently, this analysis assumes that non-essential site structures within the restricted access area are removed to a nominal depth of three feet below the local grade level wherever possible. The site is then graded and stabilized.

Summary

The costs to decommission Braidwood were evaluated for several decommissioning scenarios, incorporating the attributes of both the DECON and SAFSTOR decommissioning alternatives. Regardless of the timing of the decommissioning activities, the estimates assume the eventual removal of all the contaminated and activated plant components and structural materials, such that the facility operator may then have unrestricted use of the site with no further requirement for an operating license. Delayed decommissioning is initiated after the spent fuel has been removed from the site and 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 can be completed. Once the transfer is complete, the storage facilities are also decommissioned.

The scenarios analyzed for the purpose of generating the estimates are 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 Appendices C, D, and E. Cost summaries for the various scenarios are provided at the end of this section for the major cost components.

The cost elements in the estimates for the DECON and SAFSTOR alternatives are assigned to one of three subcategories: NRC License Termination (radiological remediation), 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 §50.75). The cost reported for this subcategory is generally sufficient to terminate the operating license(s), recognizing that there may be some additional cost impact from spent fuel management. The License Termination cost subcategory also includes costs to decommission the ISFSI (as required by 10 CFR §72.30). Section 3.5.1 provides the basis for the ISFSI decommissioning cost.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pool to the ISFSI for interim storage or directly to the DOE, as well as the transfer of the spent fuel in storage at the ISFSI. Costs are included for the operation of the storage pool and the management of the ISFSI until such time that the transfer is complete. It does not include any spent fuel management expenses incurred prior to the cessation of plant operations, nor does it include any costs related to the final disposal of the spent fuel.

"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 below grade 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., Asset Retirement Obligation 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.

As noted within this document, the estimates were developed and costs are presented in 2014 dollars. As such, the estimates do not reflect the escalation of costs (due to inflationary and market forces) over the remaining operating life of the station or during the decommissioning period.

SUMMARY OF DECOMMISSIONING COST ELEMENTS DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	12,717	17,460	30,177
Removal	126,722	173,786	300,508
Packaging	32,108	30,962	63,070
Transportation	18,242	15,679	33,922
Waste Disposal	91,110	84,052	175,162
Off-site Waste Processing	0	0	0
Program Management [1]	261,119	297,626	558,745
Security	55,302	103,985	159,287
Spent Fuel Pool Isolation	0	12,434	12,434
Spent Fuel Management [2]	155,177	153,203	308,380
Insurance and Regulatory Fees	19,643	17,239	36,882
Energy	11,591	12,117	23,708
Characterization and Licensing Surveys	26,318	25,818	52,136
Property Taxes	44,528	43,885	88,413
Miscellaneous Equipment	6,640	6,959	13,599
Site O&M	6,122	5,900	12,022
Total [3]	867,339	1,001,105	1,868,444

Cost Element			
NRC License Termination	549,813	659,003	1,208,816
Spent Fuel Management	239,792	237,817	477,609
Site Restoration	77,734	104,284	182,019
Total [3]	867,339	1,001,105	1,868,444

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS DELAYED DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	14,691	21,290	35,981
Removal	131,965	177,458	309,423
Packaging	27,010	26,185	53,195
Transportation	17,022	14,507	31,529
Waste Disposal	81,936	75,286	157,223
Off-site Waste Processing	0	0	0
Program Management [1]	386,503	401,996	788,499
Security	131,571	142,840	274,412
Spent Fuel Pool Isolation	0	12,434	12,434
Spent Fuel Management [2]	102,353	99,315	201,668
Insurance and Regulatory Fees	40,457	37,268	77,725
Energy	25,141	25,805	50,947
Characterization and Licensing Surveys	27,403	26,554	53,957
Property Taxes	49,716	49,071	98,787
Miscellaneous Equipment	13,317	15,871	29,189
Site O&M	8,012	7,790	15,802
Total [3]	1,057,100	1,133,671	2,190,771

Cost Element			
NRC License Termination	599,809	711,318	1,311,127
Spent Fuel Management	379,532	317,892	697,424
Site Restoration	77,759	104,462	182,220
Total [3]	1,057,100	1,133,671	2,190,771

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS SAFSTOR ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	14,681	21,267	35,949
Removal	131,998	177,399	309,396
Packaging	26,988	26,163	53,151
Transportation	17,082	14,558	31,640
Waste Disposal	80,752	74,112	154,865
Off-site Waste Processing	0	0	0
Program Management [1]	339,117	373,478	712,596
Security	93,212	140,655	233,867
Spent Fuel Pool Isolation	0	12,434	12,434
Spent Fuel Management [2]	151,935	148,896	300,832
Insurance and Regulatory Fees	57,046	53,759	110,805
Energy	24,420	24,897	49,317
Characterization and Licensing Surveys	27,403	26,554	53,957
Property Taxes	60,856	60,211	121,067
Miscellaneous Equipment	16,976	21,052	38,028
Site O&M	11,861	11,639	23,499
Total [3]	1,054,326	1,187,075	2,241,402

Cost Element			
NRC License Termination	775,904	844,618	1,620,522
Spent Fuel Management	200,054	237,391	437,445
Site Restoration	78,368	105,067	183,435
Total [3]	1,054,326	1,187,075	2,241,402

^[1] Includes engineering costs

 $^{^{[2]}}$ Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

1. INTRODUCTION

This report presents estimates of the cost to decommission the Braidwood Nuclear Power Station (Braidwood) for the selected decommissioning scenarios following a scheduled cessation of plant operations. The updated estimates are designed to provide Exelon Generation Company LLC (Exelon) with the information to assess its current decommissioning liability, as it relates to the nuclear station.

The analysis relies upon site-specific, technical information, developed in an evaluation in 2009,^[1] * and updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a comprehensive engineering evaluation, but presents estimates prepared in advance of the detailed planning required to execute the decommissioning of the nuclear unit. It may also not reflect the actual plan to decommission Braidwood; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the cost to decommission Braidwood, to provide a sequence or schedule for the associated activities, and to develop waste stream projections from the decontamination and dismantling activities. Operating licenses were issued on October 17, 1986, for Unit 1 and December 18, 1987, for Unit 2. A sixty year operating lifetime has been assumed for the purpose of this study. As such, the cessation of operations would then be October 17, 2046, for Unit 1 and December 18, 2047, for Units 1 and 2, respectively. These dates were used to schedule the decommissioning activities.

1.2 SITE DESCRIPTION

Braidwood is located near the Kankakee River, approximately 6 line miles southwest of Wilmington, Illinois. The station is comprised of two essentially identical pressurized water reactors with supporting facilities.

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

The primary coolant system for each unit consists of a pressurized water reactor system designed by the Westinghouse Corporation. The reactor coolant system is comprised of the reactor vessel and four heat transfer loops. Each loop contains a reactor coolant pump, steam generator, and associated piping and valves. In addition, the system includes a pressurizer, a pressurizer relief tank, interconnected piping, and the instrumentation necessary for operational control. All components of the reactor coolant system are located in the containment building. The design reactor thermal power level is 3,645 Megawatts thermal (MWth). The corresponding electrical outputs are approximately 1,295 Megawatts electric (MWe) and 1,265 MWe for Units 1 and 2, respectively.

The containment structure at Braidwood Station is a prestressed concrete shell structure made up of a cylinder with a shallow dome roof and a flat foundation slab. The entire structure is lined on the inside with steel plate, which acts as a leaktight membrane. The containment completely encloses the entire primary coolant system, including portions of the auxiliary and engineered safety features systems.

Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of steam produced in the reactor into mechanical shaft power and then into electrical energy. The main turbine consists of one double-flow, high-pressure turbine and three double-flow, low-pressure turbines. The generator is driven at 1800 rpm and is rated at 1300 MVA. The exhaust steam from the turbine is condensed and deaerated in the main condenser. The heat rejected to the main condenser is removed by the circulating water system.

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

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," 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 these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the 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. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. [4] 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 had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. [5] However, the NRC's staff has recommended that rulemaking be deferred, based upon several factors, e.g., 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.

The NRC published amendments to its decommissioning regulations in 1996.^[6] When the regulations were originally 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 applications to the NRC to terminate the license, which will include a License Termination Plan (LTP).

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site. [7] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details, including an ISFSI decommissioning estimate, are included in this analysis.

1.3.1 <u>High-Level Radioactive Waste Management</u>

Congress passed the "Nuclear Waste Policy Act" (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 DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008. The current administration has cut the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle ... and make recommendations for a new plan." Towards this goal, the administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed." [9]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on nuclear waste disposal. Two of the recommendations that may impact decommissioning planning are:

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[10]

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."^[11]

"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013)^[12] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. [13] With a large fleet of reactors, Exelon may be able to re-assign allocations between its units to minimize onsite storage costs.

Assuming a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (based upon the proposed timeline for the availability of the larger interim storage facility), the assemblies generated from Braidwood operations are projected to be shipped from the Braidwood site in the years 2074 through 2078 (assuming the cessation of plant operations in 2046 and 2047 for Units 1 and 2, respectively). This equates to 90 multi-purpose canisters (at 32

assemblies per canister), in addition to the 59 on the pad from operations.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[14]), has been constructed to support continued plant operations. This analysis assumes that the facility can be expanded to support decommissioning operations (in the DECON and SAFSTOR scenarios).

The spent fuel in the wet storage pools at the cessation of plant operations is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios) within the first five and one-half years following shutdown. Once the wet storage pool is emptied, the fuel handling building can be either decontaminated and dismantled or prepared for long-term storage. The spent fuel pool is kept operational in the Delayed DECON scenario until the transfer of spent fuel from the pool to the DOE can be completed.

Exelon's strongly held position is that the DOE has a contractual obligation to accept Braidwood's fuel in a timely manner and 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 the DOE has not met its contractual obligation to take the fuel.

1.3.2 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,^[15] and its Amendments of 1985,^[16] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. It was expected that groups of states would combine together to jointly deal with their radioactive wastes; these organizations are referred to as waste disposal compacts.

With the exception of Texas, no new compact facilities have been successfully sited, licensed, and constructed. The Texas Compact disposal

facility is now operational and waste is being accepted from generators within the Compact by the operator, Waste Control Specialists (WCS). The facility is also able to accept limited quantities of non-Compact waste.

All options and services currently available to Exelon for disposition of the various waste streams produced by the decommissioning process were considered. The majority of the low-level radioactive waste designated for direct disposal (Class A^[17]) can be sent to Energy *Solutions*' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon Exelon's *Life of Plant Agreement* with Energy *Solutions*. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. For purposes of this analysis, GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner to, and at a cost equivalent to that envisioned for the spent fuel. The GTCC is either stored on site with the spent fuel or shipped directly to a DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination," [18] amending 10 CFR §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 estimates for Braidwood assume that the site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). [19] An additional limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water. [20]

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)^[21] 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 ALTERNATIVES

Detailed cost estimates were developed to decommission Braidwood for three variations of the approved decommissioning alternatives: DECON and SAFSTOR. Although the scenarios differ with respect to technique, process, cost, and schedule, they attain the same result: the ultimate release of the site for unrestricted use.

The following scenarios were evaluated and are representative of the alternatives available to the owner. The scenarios assume that the units operate for 60 years, followed by a planned and scheduled shutdown.

- 1. DECON: The first scenario assumes that the two units are promptly decommissioned as an integrated activity. Spent fuel in the wet storage pool is relocated to the ISFSI so as to facilitate decontamination and dismantling activities within the fuel handling building. Spent fuel storage operations continue at the site, independent of decommissioning operations, until the transfer of the fuel to the DOE is complete, assumed for purposes of this study to be in the year 2078. At that time, the ISFSI is decommissioned and the site released for alternative use.
- 2. Delayed DECON: In the second scenario, the units are prepared for an abbreviated period of safe-storage. The spent fuel resident in the fuel handling building's storage pool, remains in the pool until it can be transferred to the DOE (i.e., the ISFSI is not used to off-load the pool following the cessation of operations). Spent fuel placed at the ISFSI during operations remains in storage until the pool is emptied at which time the ISFSI is also emptied. Decommissioning is scheduled to commence once the transfer of the fuel to the DOE is complete (i.e., in the year 2078).
- 3. SAFSTOR: The units are also placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent permitted by the current regulations. Similar to the DECON alternative, the spent fuel in the wet storage pool is relocated to the ISFSI for interim storage. The units remain in protective storage following the removal of spent fuel from the site. Decommissioning operations commence such that license termination is completed within the required 60-year period. As with the first two scenarios, decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling process.

The following sections describe the basic activities associated with each 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 facilitate deactivation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

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

2.1 DECON

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." This study does not address the cost to dispose of the spent fuel residing at the site; such costs are funded through a surcharge on electrical generation. However, the study does estimate the costs incurred with the interim on-site storage of the fuel pending shipment by the DOE to an off-site disposal facility.

2.1.1 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.

Engineering and Planning

The PSDAR, required within two years of the notice of cessation of a description of the licensee's planned operations. provides 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 meeting to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure (10 CFR §50.59 establishes the conditions under which licensees may make changes to the facility or procedures and conduct test or experiments, i.e., without prior 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 §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

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

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

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

Site Preparations

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

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), internal piping, and biological shield cores.
- Isolation of 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 areas to optimize the overall project schedule. The fuel is transferred to the ISFSI as it decays to the point that it meets the heat load criteria of the containers. Consequently, it is assumed that the fuel pool remains operational for approximately five and one-half years following the cessation of Unit 2 operations.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and nonmetallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.2 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 §50 operating license. Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. 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 fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Removal of control rod drive housings and the head service structure from reactor vessel head. Segmentation of the vessel closure head.
- Removal and segmentation of the upper internals assemblies. Segmentation will maximize the loading of the shielded transport casks (i.e., by weight and activity). The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly and segmentation of the remaining reactor internals, including the core former and lower core support assembly. Some material is expected to exceed Class C disposal requirements. As such, the segments will be packaged in modified fuel storage canisters for geologic disposal.

- Segmentation of 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.
- Removal of the activated portions of the concrete biological shield and
 accessible contaminated concrete surfaces. If dictated by the steam
 generator and pressurizer removal scenarios, those portions of the
 associated steam generator cubicles necessary for access and
 component extraction are removed.
- Removal of the steam generators and pressurizer for material recovery and controlled disposal. These components can serve as their own burial containers provided that all penetrations are properly sealed and the internal contaminants are stabilized (e.g., with lightweight grout). Steel shielding is added, as necessary, to those external areas of the package to meet transportation limits and regulations.
- Transfer of the spent fuel from the storage pool to the ISFSI pad for interim storage.
- Expansion of the ISFSI and transfer of the spent fuel from the storage pool to the ISFSI pad for interim storage. Spent fuel storage operations continue throughout the active decommissioning period. Fuel transfer is expected to begin in 2074 and to be completed by the end of the year 2078.

At least two years prior to the anticipated date of license termination, an LTP is required. Submitted as a supplement to the Final Safety Analysis Report (FSAR) or its 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 meeting. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from the refueling canal, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/ contaminated concrete.
- Surveys of the decontaminated areas of the containment structures.
- Removal of the contaminated equipment and material from the auxiliary and fuel buildings, and any other contaminated facility. Use radiation and contamination control techniques until radiation surveys 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 will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.
- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).
- Routing of material removed during 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 for 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)."[22] 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 amend the operating license when 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 property (exclusive of the ISFSI) is suitable for release.

2.1.3 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 and auxiliary buildings. Under certain circumstances, verifying that subsurface radionuclide concentrations meet NRC site release requirements will require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The effort 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.

2.1.4 ISFSI Operations and Decommissioning

The ISFSI will continue to operate under the general license provisions of 10 CFR §72 following the amendment of the §50 operating license to release the adjacent (power block) property. Assuming the DOE starts accepting fuel in 2025, transfer of spent fuel from Braidwood is anticipated to begin in 2074 and continue through the year 2078.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the Part 50 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. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

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

2.2 SAFSTOR and DELAYED DECON

The NRC defines SAFSTOR 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." The facility is left intact (during the dormancy period), with structures maintained in a sound condition. Systems not required to operate in support of the spent fuel pool or site surveillance and security are drained, de-energized, and secured. Minimal cleaning/removal of loose contamination and/or fixation and sealing of remaining contamination are performed. Access to contaminated areas is secured to provide controlled access for inspection and maintenance.

The engineering and planning requirements are similar to those for the DECON alternative. Site preparations are also similar to those for the DECON alternative. However, with the exception of the required radiation surveys and site characterizations, the mobilization and preparation of site facilities is less extensive.

The following discussion is appropriate for both the SAFSTOR and Delayed DECON scenarios, the primary differences being in the length of the dormancy period. In the Delayed DECON scenario, the fuel in the spent fuel pool remains in the fuel handling building's storage pool until such time that the transfer to a DOE facility is complete. Decommissioning operations are assumed to begin once fuel is off site. By contrast, in the SAFSTOR scenario, the spent fuel is relocated to the ISFSI. The plant remains in safe-storage even after the fuel is removed from site. Decommissioning operations are initiated such that the license is terminated within the required 60-year time period.

2.2.1 Period 1 - Preparations

Preparations for long-term storage include the planning for permanent defueling of the reactors, revision of technical specifications appropriate to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

The process of placing the plant in safe-storage includes, but is not limited to, the following activities:

• Isolation of the spent fuel storage services and fuel handling systems located in the fuel handling building so that safe-storage operations may commence on the balance of the plant. This activity may be

carried out by plant personnel in accordance with existing operating technical specifications.

- Draining and de-energizing of the non-contaminated systems not required to support continued site operations or maintenance.
- Disposing of contaminated filter elements and resin beds not required for processing wastes from layup activities for future operations.
- Draining of the reactor vessel, with the internals left in place and the vessel head secured.
- Draining and de-energizing non-essential systems, decontaminating them as required for future maintenance and inspection.
- Preparing lighting and alarm systems whose continued use is required; de-energizing portions of fire protection, electric power, and HVAC systems whose continued use is not required.
- Cleaning of the loose surface contamination from building access pathways.
- Performing an interim radiation survey of plant, posting warning signs where appropriate.
- Erecting physical barriers and/or securing all access to radioactive or contaminated areas, except as required for inspection and maintenance.
- Installing security and surveillance monitoring equipment and relocating security fence around secured structures, as required.

2.2.2 Period 2 - Dormancy

The second phase identified by the NRC in its rule addresses licensed activities during a storage period and is applicable to the dormancy phase of the deferred decommissioning alternatives. Dormancy activities include a 24-hour security force, preventive and corrective maintenance on security systems, area lighting, general building maintenance, heating and ventilation of buildings, routine radiological inspections of contaminated structures, maintenance of structural integrity, and a site and radiation monitoring environmental program. maintenance personnel perform equipment maintenance, inspection activities, routine services to maintain safe conditions, adequate lighting, heating, and ventilation, and periodic preventive maintenance on essential site services.

An environmental surveillance program is carried out during the dormancy period to ensure that releases of radioactive material to the environment are prevented and/or detected and controlled. Appropriate emergency procedures are established and initiated for potential releases that exceed prescribed limits. The environmental surveillance program constitutes an abbreviated version of the program in effect during normal plant operations.

Security during the dormancy period is conducted primarily to prevent unauthorized entry and to protect the public from the consequences of their own actions. The security fence, sensors, alarms, and other surveillance equipment provide security. Fire and radiation alarms are also monitored and maintained. While remote surveillance is an option, it does not offer the immediate response time of a physical presence.

The transfer of the spent fuel to a DOE facility continues during this period until complete. Fuel is shipped exclusively from the ISFSI in the SAFSTOR scenario and from both the pool and the ISFSI in the Delayed DECON scenario.

After an optional period of storage (such that license terminations are accomplished within 60 years of final shutdown of Unit 1), it is required that the licensee submit applications to terminate the license, along with an LTP (described in Section 2.1.2), thereby initiating the third phase.

2.2.3 Periods 3 and 4 - Delayed Decommissioning

Prior to the commencement of decommissioning operations, preparations are undertaken to reactivate site services and prepare for decommissioning. Preparations include engineering and planning, a detailed site characterization, and the assembly of a decommissioning management organization. Final planning for activities and the writing of activity specifications and detailed procedures are also initiated at this time.

Much of the work in developing a termination plan is relevant to the development of the detailed engineering plans and procedures. The activities associated with this phase and the follow-on decontamination and dismantling processes are detailed in Sections 2.1.1 and 2.1.2. The primary difference between the sequences anticipated for the DECON and deferred scenarios is the absence, in the latter, of any constraint on

the availability of the fuel storage facilities located within the fuel handling building for decommissioning.

Variations in the length of the dormancy period are expected to have little effect upon the quantities of radioactive wastes generated from system and structure removal operations. Given the levels of radioactivity and spectrum of radionuclides expected from sixty years of plant operation, no plant process system identified as being contaminated upon final shutdown will become releasable due to the decay period alone (i.e., there is no significant reduction in the waste generated from the decommissioning activities). However, due to the lower activity levels, a greater percentage of the waste volume can be designated for off-site processing and recovery.

The delay in decommissioning also yields lower working area radiation levels. As such, the estimates for the delayed scenarios incorporate reduced ALARA controls for the lower occupational exposure potential.

Although the initial radiation levels due to ⁶⁰Co will decrease during the dormancy period, the internal components of the reactor vessel will still exhibit sufficiently high radiation dose rates to require remote sectioning under water due to the presence of long-lived radionuclides such as ⁹⁴Nb, ⁵⁹Ni, and ⁶³Ni. Therefore, the dismantling procedures described for the DECON alternative would still be employed during deferred scenarios. Portions of the biological shield will still be radioactive due to the presence of activated trace elements with long half-lives (¹⁵²Eu and ¹⁵⁴Eu). Decontamination will require controlled removal and disposal. It is assumed that radioactive corrosion products on inner surfaces of piping and components will not have decayed to levels that will permit unrestricted use or allow conventional removal. These systems and components will be surveyed as they are removed and disposed of in accordance with the existing radioactive release criteria.

2.2.4 Period 5 - Site Restoration

Following completion of decommissioning operations, site-restoration activities can begin. If the site structures are to be dismantled, dismantling as a continuation of the decommissioning process is clearly the most appropriate and cost-effective option, as described in Section 2.1.3. The basis for the dismantling cost in the deferred scenarios is consistent with that described for DECON, removal of structures and

site facilities to a nominal depth of three feet below grade and limited restoration of the site.

3. COST ESTIMATE

The cost estimates prepared for decommissioning Braidwood consider the unique features of the site, including the NSSS, power generation systems, support services, site buildings, and ancillary facilities. The basis of the estimates, 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 ESTIMATE

The estimates were developed with site-specific, technical information developed in an evaluation prepared for Exelon in 2009. The information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluation 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 "Decommissioning Handbook."[24] Estimates,"[23] and the DOE documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal (\$/cubic yard), steel removal (\$/ton), and cutting costs (\$/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.^[25]

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, San

Onofre-1, Crystal River and Vermont Yankee nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units.

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

Work Difficulty Factors

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

•	Access Factor	10% to 20%
•	Respiratory Protection Factor	10% to 50%
•	Radiation/ALARA Factor	10% to 40%
•	Protective Clothing Factor	10% 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 radiologically controlled areas. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities are 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 resulting cost estimate.

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 estimates do 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 (~ 43%).
- Segmenting the reactor vessel and internals will require the use of special equipment. 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. This permits sharing of the segmentation equipment between the two units.
- 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. Trying to complete the final status survey of Unit 1, while Unit 2 still has ongoing radiological remediation work and waste handling in process is considered impractical. As such, the transfer of

the spent fuel from the storage pool and subsequent decontamination of the fuel handling building is coordinated so as to synchronize the final status survey for the station.

- 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 emergency response fees, regulatory agency fees, corporate overhead, 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, i.e., license termination and site restoration.

3.4.1 <u>Contingency</u>

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.

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^[26] 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, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a "safety factor issue." Safety factors provide additional security and address situations that may never occur. Contingency funds are expected to be fully expended throughout the program. They also provide assurance that sufficient funding is available to accomplish the intended tasks. An estimate without contingency, or from which contingency has been removed, can disrupt the orderly progression of events and jeopardize a successful conclusion to the decommissioning process.

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

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

operation of highly specialized tooling, field conditions, and water clarity.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies ranged from 10% to 75%, depending on the degree of difficulty judged to be appropriate from TLG's actual decommissioning experience. The contingency values used in this study are as follows:

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

Operations and Maintenance Expenses	15%
ISFSI Decommissioning	25%

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each estimate. For example, the composite contingency values reported for the DECON alternative are 17.3% and 17.3% for Units 1 and 2, respectively. Values for the other alternatives are delineated within the detailed cost tables in Appendices D and E.

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:

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.
- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.
- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.
- Regulatory changes (e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal).

- Policy decisions altering national commitments (e.g., in the ability to accommodate certain waste forms for disposition or in the timetable for such, for example, in the start and rate of acceptance of spent fuel by the DOE).
- Pricing changes for basic inputs, such as labor, energy, materials, and burial.

This cost study does not add any additional cost 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 will 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 impacts of the considerations identified below are included in this cost study.

3.5.1 Spent Fuel Management

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

The total inventory of assemblies that will require handling during decommissioning is based upon several assumptions. The pickup of commercial fuel is assumed to begin in the year 2025. The maximum rate at which the fuel is removed from the commercial sites is based upon an annual capacity at the geologic repository of 3,000 metric tons of uranium (MTU). 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 all three scenarios, the ISFSI will continue to operate until such time that the transfer of spent fuel to the DOE can be completed. Assuming that the DOE commences repository operation in 2025, fuel is projected to be removed from the Braidwood site by the year 2078. In the Delayed DECON scenario, the ISFSI is only used to store fuel placed during plant operations. Spent fuel off-loaded from the reactors after operations cease, remains in the pool during the transfer period. The inventory of fuel assemblies located in the spent fuel pool is preferentially off-loaded as the allocations permit.

Operation and maintenance costs for the storage facilities (the ISFSI and the pool for the Delayed DECON scenario) are included within the estimates and address the cost for staffing the facilities, as well as security, insurance, and licensing fees. The estimates include the costs to purchase (DECON and SAFSTOR scenarios), load, and transfer the fuel storage canisters. Costs are also provided for the final disposition of the facilities once the transfer is complete.

Repository Startup

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. With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that could result in an interim storage facility being available by 2025.

Spent Fuel Management Model

The Exelon nuclear fleet consists of 26 units at 14 sites in Illinois, Pennsylvania, New Jersey, New York and Maryland, including the inactive units at Dresden, Peach Bottom and Zion (Zion is still included in the spent fuel analysis model since the fuel transfer to DOE will be done as part of the Exelon allocation). The ability to complete the decommissioning of these units, particularly for the DECON and Delayed DECON alternatives, is highly dependent upon when the DOE is assumed to remove spent fuel from the sites.

The DOE's repository program assumes that spent fuel will be accepted for disposal from the nation's commercial nuclear plants in the order (the "queue") in which it was removed from service ("oldest fuel first"). A

computer model developed by Exelon Nuclear was used to determine when the DOE would provide allocations in the queue for removal of spent fuel from the individual sites. Repository operations were based upon annual industry-wide receipt of 400 Metric Tons Heavy Metal (MTHM) in the first year of operation, a total of 3,800 MTHM in years 2 through 4 and 3,000 MTHM for year 5 and beyond. [27]

ISFSIs are constructed as necessary to maintain full-core discharge capability at the individual sites. Once the DOE begins repository operations, spent fuel shipments are managed across the fleet to optimize spent fuel storage.

Canister Design

The design and capacity of the ISFSI is based upon a Holtec HI-STORM vertical cask system, with a 32-fuel assembly capacity. This is also the basis for future cask acquisitions. The DOE is assumed to provide the MPC for fuel transferred directly from the pool to the DOE at no cost to the owner.

Canister Loading and Transfer

An average cost of \$250,000 is used for the labor to load/transport the spent fuel from the pool to the ISFSI pad, based upon Exelon experience. For estimating purposes, 50% of this cost is used to estimate the cost to transfer the fuel from the ISFSI to the DOE.

Operations and Maintenance

Annual costs (excluding labor) of approximately \$792,000 and \$96,000 are used for operation and maintenance of each spent fuel pool and the ISFSI, respectively.

ISFSI Decommissioning

A multi-purpose (storage and transport) dry shielded storage canister with a vertical, reinforced concrete storage module is used as a basis for the cost analysis. The final core off load from each unit, equivalent to 14 total casks, are assumed to have some level of neutron-induced activation as a result of the long-term storage of the fuel (i.e., to levels exceeding free-release limits). The cost of the disposition of this material is included in the estimate. Appendix F details the costs

necessary to survey, decontaminate, and terminate the NRC license on the ISFSI facility. The estimates in Appendices C through E also include the costs for the demolition of the ISFSI facility following NRC license termination (as a Site Restoration expense).

3.5.2 <u>Reactor Vessel and Internal Components</u>

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

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

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal (i.e., GTCC). Although the material is not classified as high-level waste, federal regulations under the LLRW Policy Amendments Act specifies the GTCC LLWR is designated a federal responsibility under Section 3(b)(1)(D). However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has been packaged and disposed of in the same manner as high-level waste, at a cost equivalent to that envisioned for the spent fuel. This is consistent with the concept that the generator of GTCC waste will bear all reasonable costs of disposing of such wastes. [28]

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 would remain in storage at the Braidwood site.

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. 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 Braidwood ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, the study assumes the reactor vessel will require segmentation, as a bounding condition.

3.5.3 Primary System Components

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

A trolley crane will be 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, will be removed to create sufficient laydown space for processing these large components.

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

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

Braidwood Unit 1 has replaced its original set of steam generators; this original set is still on site, stored within a concrete protective structure. The cost for transportation and disposal of this original set of Unit 1 steam generators has been included in this analysis.

3.5.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condensers will also be disassembled and moved to a laydown area. Clean material is released on site as scrap metal; radioactive or potentially radioactive material is then prepared for transportation to an off-site recycling facility where it will be surveyed and designated for either decontamination or volume reduction, conventional disposal, or controlled disposal. Components will

be packaged and readied for transport in accordance with the intended disposition.

3.5.5 <u>Transportation Methods</u>

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.^[29] 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 §71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Transport of the highly activated metal, produced in the segmentation of the reactor vessels 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. Truck transport costs were estimated using published tariffs from Tri-State Motor Transit.^[30]

3.5.6 Low-Level Radioactive Waste Disposal

The mass of radioactive waste generated during the various decommissioning activities is reported by line-item in Appendices C, D and E, and summarized in Section 5. The Section 5 waste summaries are consistent with 10 CFR §61 classifications. Commercially available steel containers are 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 waste volumes are calculated on the exterior package dimensions for

containerized material or a dimensional calculation for components serving as their own waste containers.

The more highly activated reactor components are transported in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume, with surcharges added for the special handling requirements and the radiological characteristics 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 calculated using current disposal agreements, with surcharges added for the highly activated components, such as those 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 Exelon's current disposal agreement with Energy *Solutions* for its facility in Clive, Utah.

EnergySolutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the reactor vessel and segmentation of the components closest to the core. As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. This material is packaged in the same multipurpose canisters used for spent fuel storage/transport and designated for geologic disposal.

3.5.7 <u>Site Conditions Following Decommissioning</u>

The NRC will terminate (or amend) the site license when it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the

next step in the decommissioning process, as well as the owner's own future plans for the site.

Non-essential structures or buildings severely damaged in decontamination process are removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities is processed and made available as clean fill. The excavations will be regraded such that the power block area will have a final contour consistent with adjacent surroundings.

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

3.6 ASSUMPTIONS

The following are the major assumptions made in the development of the estimates for decommissioning the site.

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

Exelon, 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 Exelon. 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.

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

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

Staffing levels are assigned for each unit by sub-period and functional area. Economies of a multi-unit decommissioning are recognized by establishing a primary and a secondary staff level. The unit assigned the primary staff will include common supervisory positions and positions that may be shared across both units. The types of positions and staffing levels are adjusted based upon the type of activity occurring in each sub-period.

A profile of the staffing level for the two-unit decommissioning, including contractors and craft, is provided in Figures 3.1 through 3.3 for the DECON, Delayed DECON, and SAFSTOR scenarios, respectively. Utility staffing levels will gradually decrease after completing the removal of physical systems at each of the units.

Staffing levels and management support will vary based upon the amount and type of decommissioning work. Craft manpower levels decrease after systems removal and structures decontamination and drop substantially during the delay period and the license termination survey period. However, craft staff levels increase again during the site restoration period due to the work associated with structures demolition.

3.6.3 <u>Design Conditions</u>

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

The curie contents of the vessel and internals at final shutdown are derived from those listed in NUREG/CR-3474.^[31] Actual estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the Braidwood components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from CR-0130^[32] and CR-0672,^[33] and benchmarked to the long-lived values from CR-3474.

It is anticipated that there will be control element assemblies (CEAs) in the spent fuel pool at the cessation of operations, including those CEAs from the final core. This analysis assumes that the CEAs can be disposed of along with the spent fuel at no additional cost (in accordance with Appendix E of the Standard Contract)

Activation of the reactor building structures is confined to the biological shield.

3.6.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by Exelon and its subcontractors. The plant's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale.
- Processes operating waste inventories, i.e., the estimates do not address the disposition of any legacy wastes; 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. Exelon will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG 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 possible salvage 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 estimates do not include the additional cost for size reduction and preparation to meet "furnace ready" conditions. For example, the recovery of copper from electrical cabling may require the removal and disposition of any contaminated insulation, an added expense. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. This assumption is an implicit recognition of scrap value in the disposal of clean metallic waste at no additional cost to the project.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other property will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other facilities. Spare parts will also be 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. Replacement power costs are used for the cost of energy consumption during decommissioning for tooling, lighting, ventilation, and essential services.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums throughout the decommissioning process are based upon guidance provided by Exelon.

<u>Taxes</u>

Property taxes are included for all decommissioning periods. Exelon provided a schedule of decreasing tax payments against the current tax assessment. These reductions continue until reaching a minimum property tax payment of \$1 million per year for the site; this level is maintained for the balance of the decommissioning program.

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

A schedule of expenditures for each scenario is provided in Tables 3.1 through 3.3. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2014 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure. The annual expenditures are based upon the detailed activity costs reported in Appendices C through E, along with the schedules discussed in Section 4.

TABLE 3.1a BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	11,744	2,127	420	10	2,484	16,785
2047	60,523	13,605	2,436	2,144	13,591	92,300
2048	69,420	30,859	2,542	28,849	24,054	155,723
2049	64,750	31,308	1,887	34,217	24,525	156,687
2050	43,854	15,188	1,512	4,736	9,562	74,852
2051	43,854	15,188	1,512	4,736	9,562	74,852
2052	13,937	4,538	443	1,394	5,443	25,755
2053	1,524	121	0	8	3,720	5,373
2054	24,987	1,749	323	28	3,975	31,061
2055	19,450	8,028	202	0	3,302	30,982
2056	19,503	8,050	202	0	3,311	31,067
2057	9,055	3,079	77	0	3,318	15,530
2058	2,587	0	0	0	3,329	5,916
2059	2,587	0	0	0	3,329	5,916
2060	2,594	0	0	0	3,338	5,932
2061	2,587	0	0	0	3,329	5,916
2062	2,587	0	0	0	3,329	5,916
2063	2,587	0	0	0	3,329	5,916
2064	2,594	0	0	0	3,338	5,932
2065	2,587	0	0	0	3,329	5,916
2066	2,587	0	0	0	3,329	5,916
2067	2,587	0	0	0	3,329	5,916
2068	2,594	0	0	0	3,338	5,932
2069	2,587	0	0	0	3,329	5,916
2070	2,587	0	0	0	3,329	5,916
2071	2,587	0	0	0	3,329	5,916
2072	2,594	0	0	0	3,338	5,932
2073	2,587	0	0	0	3,329	5,916
2074	2,677	270	0	0	3,329	6,275
2075	3,234	1,941	0	0	3,329	8,503

TABLE 3.1a (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2076	3,241	1,941	0	0	3,338	8,520
2077	3,234	1,941	0	0	3,329	8,503
2078	3,234	1,941	0	0	3,329	8,503
2079	1,799	1,601	35	1,117	16,795	21,347
Total	441,447	143,473	11,591	77,238	193,590	867,339

TABLE 3.1b BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2047	2,297	392	77	2	442	3,210
2048	60,594	10,724	2,099	400	12,821	86,637
2049	75,149	27,440	2,896	19,400	32,917	157,802
2050	75,967	31,470	1,916	28,202	22,993	160,548
2051	68,152	17,736	1,553	8,434	11,182	107,058
$\frac{2051}{2052}$	67,455	16,232	1,516	6,221	9,876	101,301
2053	56,557	11,528	1,131	5,598	8,461	83,275
$\frac{2053}{2054}$	35,759	3,315	446	806	4,352	44,680
$\frac{2054}{2055}$	25,820	11,216	202	0	3,303	40,541
$\frac{2055}{2056}$	25,891	11,246	202	0	3,312	40,652
$\frac{2050}{2057}$	11,499	4,302	77	0	3,312	19,197
2058	2,587	0	0	0	3,329	5,916
$\frac{2058}{2059}$	2,587	0	0	0	3,329	5,916
$\frac{2039}{2060}$	2,594	0	0	0	3,338	5,932
2061	2,594 $2,587$	0	0	0	3,329	5,916
$\frac{2061}{2062}$	2,587	0	0	0	3,329	5,916
2062	2,587	0	0	0	3,329	5,916
$\frac{2063}{2064}$	<u> </u>	0	0	0	3,338	
	2,594	0		0		5,932
2065	2,587		0		3,329	5,916
2066	2,587	0	0	0	3,329	5,916
2067	2,587	0	0	0	3,329	5,916
2068	2,594	0	0	0	3,338	5,932
2069	2,587	0	0	0	3,329	5,916
2070	2,587	0	0	0	3,329	5,916
2071	2,587	0	0	0	3,329	5,916
2072	2,594	0	0	0	3,338	5,932
2073	2,587	0	0	0	3,329	5,916
2074	2,677	270	0	0	3,329	6,275
2075	3,234	1,941	0	0	3,329	8,503
2076	3,241	1,941	0	0	3,338	8,520

TABLE 3.1b (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2077	3,234	1,941	0	0	3,329	8,503
2078	3,234	1,941	0	0	3,329	8,503
2079	1,799	1,467	0	1,117	16,795	21,178
Total	563,985	155,101	12,117	70,181	199,722	1,001,105

TABLE 3.2a BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	9,007	301	420	10	1,335	11,073
2047	47,301	3,844	2,016	491	9,320	62,972
2048	19,015	1,989	873	507	9,365	31,748
2049	8,091	427	403	17	4,953	13,892
2050	8,091	427	403	17	4,953	13,892
2051	8,091	427	403	17	4,953	13,892
2052	8,113	428	404	17	4,967	13,930
2053	8,091	427	403	17	4,953	13,892
2054	8,091	427	403	17	4,953	13,892
2055	8,091	427	403	17	4,953	13,892
2056	8,113	428	404	17	4,967	13,930
2057	8,091	427	403	17	4,953	13,892
2058	8,091	427	403	17	4,953	13,892
2059	8,091	427	403	17	4,953	13,892
2060	8,113	428	404	17	4,967	13,930
2061	8,091	427	403	17	4,953	13,892
2062	8,091	427	403	17	4,953	13,892
2063	8,091	427	403	17	4,953	13,892
2064	8,113	428	404	17	4,967	13,930
2065	8,091	427	403	17	4,953	13,892
2066	8,091	427	403	17	4,953	13,892
2067	8,091	427	403	17	4,953	13,892
2068	8,113	428	404	17	4,967	13,930
2069	8,091	427	403	17	4,953	13,892
2070	8,091	427	403	17	4,953	13,892
2071	8,091	427	403	17	4,953	13,892
2072	8,113	428	404	17	4,967	13,930
2073	8,091	427	403	17	4,953	13,892
2074	8,450	1,505	403	17	4,953	15,329
2075	10,679	8,189	403	17	4,953	24,242

TABLE 3.2a (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2076	8,401	1,291	404	17	4,967	15,080
2077	6,337	1,603	303	13	4,351	12,606
2078	4,391	2,240	202	8	3,745	10,585
2079	42,790	1,846	2,016	41	1,718	48,411
2080	61,619	18,080	1,971	18,493	12,305	112,470
2081	61,571	23,584	1,909	36,320	22,547	145,932
2082	36,640	7,054	1,512	5,304	5,986	56,497
2083	36,640	7,054	1,512	5,304	5,986	56,497
2084	8,235	1,508	302	1,067	2,462	13,575
2085	7,616	399	95	14	1,668	9,793
2086	23,294	4,597	306	18	1,382	29,597
2087	17,532	8,136	202	0	754	26,624
2088	17,484	8,114	201	0	752	26,551
Total	629,412	112,013	25,141	68,065	222,468	1,057,099

TABLE 3.2b BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
			- 60			
2047	1,912	55	77	2	231	2,277
2048	50,892	1,960	2,022	139	6,569	61,582
2049	32,930	4,708	1,146	1,186	24,322	64,292
2050	8,141	443	403	17	4,976	13,981
2051	8,141	443	403	17	4,976	13,981
2052	8,163	445	404	17	4,990	14,019
2053	8,141	443	403	17	4,976	13,981
2054	8,141	443	403	17	4,976	13,981
2055	8,141	443	403	17	4,976	13,981
2056	8,163	445	404	17	4,990	14,019
2057	8,141	443	403	17	4,976	13,981
2058	8,141	443	403	17	4,976	13,981
2059	8,141	443	403	17	4,976	13,981
2060	8,163	445	404	17	4,990	14,019
2061	8,141	443	403	17	4,976	13,981
2062	8,141	443	403	17	4,976	13,981
2063	8,141	443	403	17	4,976	13,981
2064	8,163	445	404	17	4,990	14,019
2065	8,141	443	403	17	4,976	13,981
2066	8,141	443	403	17	4,976	13,981
2067	8,141	443	403	17	4,976	13,981
2068	8,163	445	404	17	4,990	14,019
2069	8,141	443	403	17	4,976	13,981
2070	8,141	443	403	17	4,976	13,981
2071	8,141	443	403	17	4,976	13,981
2072	8,163	445	404	17	4,990	14,019
2073	8,141	443	403	17	4,976	13,981
2074	8,141	443	403	17	4,976	13,981
2075	8,141	443	403	17	4,976	13,981
2076	10,463	7,345	404	17	4,990	23,219

TABLE 3.2b (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2077	7,321	4,423	303	13	4,356	16,415
2078	4,440	2,256	202	8	3,733	10,639
2079	1,268	342	241	8	1,581	3,440
2080	26,603	1,826	2,022	39	1,672	32,162
2081	47,871	15,240	1,966	13,165	10,328	88,569
2082	60,205	21,915	1,916	26,359	19,034	129,429
2083	56,445	9,054	1,538	8,020	6,751	81,808
2084	56,347	8,212	1,516	6,805	5,941	78,821
2085	50,686	6,607	1,251	5,196	4,939	68,680
2086	28,522	6,223	306	18	1,267	36,336
2087	23,902	11,324	202	0	755	36,183
2088	23,837	11,293	201	0	753	36,084
Total	695,440	124,320	25,805	61,415	226,692	1,133,671

TABLE 3.3a BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	9,482	1,724	420	10	2,484	14,120
$\frac{2046}{2047}$	<u> </u>		2,016	491		
	48,229	10,677	873		13,691	75,104
2048	17,476	8,829		505	11,805	39,487
2049	5,376	7,243	403	15	8,378	21,416
2050	5,376	7,243	403	15	8,378	21,416
2051	5,376	7,243	403	15	8,378	21,416
2052	5,391	7,263	404	15	8,401	21,474
2053	4,495	3,495	294	12	5,877	14,173
2054	3,744	299	202	8	3,745	7,997
2055	3,744	299	202	8	3,745	7,997
2056	3,754	300	202	8	3,755	8,019
2057	3,744	299	202	8	3,745	7,997
2058	3,744	299	202	8	3,745	7,997
2059	3,744	299	202	8	3,745	7,997
2060	3,754	300	202	8	3,755	8,019
2061	3,744	299	202	8	3,745	7,997
2062	3,744	299	202	8	3,745	7,997
2063	3,744	299	202	8	3,745	7,997
2064	3,754	300	202	8	3,755	8,019
2065	3,744	299	202	8	3,745	7,997
2066	3,744	299	202	8	3,745	7,997
2067	3,744	299	202	8	3,745	7,997
2068	3,754	300	202	8	3,755	8,019
2069	3,744	299	202	8	3,745	7,997
2070	3,744	299	202	8	3,745	7,997
2070	3,744	299	202	8	3,745	7,997
2071	3,754	300	$\frac{202}{202}$	8	3,745	8,019
	<u> </u>	299	202	8		
2073	3,744			8	3,745	7,997
2074	3,833	569	202		3,745	8,357
2075	4,391	2,240	202	8	3,745	10,585

TABLE 3.3a (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2076	4,401	2,240	202	8	3,755	10,607
2077	4,391	2,240	202	8	3,745	10,585
2078	4,391	2,240	202	8	3,745	10,585
2079	2,256	295	202	8	1,577	4,337
2080	2,262	296	202	8	1,581	4,349
2081	2,256	295	202	8	1,577	4,337
2082	2,256	295	202	8	1,577	4,337
2083	2,256	295	202	8	1,577	4,337
2084	2,262	296	202	8	1,581	4,349
2085	2,256	295	202	8	1,577	4,337
2086	2,256	295	202	8	1,577	4,337
2087	2,256	295	202	8	1,577	4,337
2088	2,262	296	202	8	1,581	4,349
2089	2,256	295	202	8	1,577	4,337
2090	2,256	295	202	8	1,577	4,337
2091	2,256	295	202	8	1,577	4,337
2092	2,262	296	202	8	1,581	4,349
2093	2,256	295	202	8	1,577	4,337
2094	2,256	295	202	8	1,577	4,337
2095	2,256	295	202	8	1,577	4,337
2096	2,262	296	202	8	1,581	4,349
2097	2,256	295	202	8	1,577	4,337
2098	2,256	295	202	8	1,577	4,337
2099	29,241	1,327	1,410	30	1,671	33,680
2100	55,001	10,625	2,000	5,914	5,160	78,700
2101	61,793	23,667	1,916	35,754	22,650	145,780
2102	45,057	12,623	1,647	15,479	11,771	86,578
2103	36,655	7,078	1,512	5,300	6,309	56,855
2104	20,696	3,952	833	2,922	4,187	32,591
2105	1,130	121	0	8	1,576	2,835

TABLE 3.3a (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2106	25,328	2,689	346	27	1,699	30,089
2107	17,732	8,182	202	0	754	26,869
2108	17,780	8,204	202	0	756	26,943
2109	4,761	2,197	54	0	202	7,214
Total	557,855	155,801	24,420	66,881	249,371	1,054,326

TABLE 3.3b BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
	Labor	Wiaterials	Hilergy	Duriai	Other	
2047	2,018	373	77	2	442	2,912
2048	53,661	10,268	2,022	139	11,878	77,968
2049	39,388	13,003	1,146	1,186	26,839	81,562
2050	17,750	8,746	403	18	9,639	36,558
2051	17,750	8,746	403	18	9,639	36,558
2052	17,799	8,770	404	18	9,666	36,658
2053	10,217	4,196	294	13	6,451	21,172
2054	3,793	316	202	8	3,733	8,051
2055	3,793	316	202	8	3,733	8,051
2056	3,804	316	202	8	3,743	8,074
2057	3,793	316	202	8	3,733	8,051
2058	3,793	316	202	8	3,733	8,051
2059	3,793	316	202	8	3,733	8,051
2060	3,804	316	202	8	3,743	8,074
2061	3,793	316	202	8	3,733	8,051
2062	3,793	316	202	8	3,733	8,051
2063	3,793	316	202	8	3,733	8,051
2064	3,804	316	202	8	3,743	8,074
2065	3,793	316	202	8	3,733	8,051
2066	3,793	316	202	8	3,733	8,051
2067	3,793	316	202	8	3,733	8,051
2068	3,804	316	202	8	3,743	8,074
2069	3,793	316	202	8	3,733	8,051
2070	3,793	316	202	8	3,733	8,051
2071	3,793	316	202	8	3,733	8,051
2072	3,804	316	202	8	3,743	8,074
2073	3,793	316	202	8	3,733	8,051
2074	3,883	585	202	8	3,733	8,411
2075	4,440	2,256	202	8	3,733	10,639

TABLE 3.3b (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2076	4,451	2,257	202	8	3,743	10,661
2077	4,440	2,256	202	8	3,733	10,639
2078	4,440	2,256	202	8	3,733	10,639
2079	2,306	312	202	8	1,579	4,406
2080	2,312	313	202	8	1,583	4,418
2081	2,306	312	202	8	1,579	4,406
2082	2,306	312	202	8	1,579	4,406
2083	2,306	312	202	8	1,579	4,406
2084	2,312	313	202	8	1,583	4,418
2085	2,306	312	202	8	1,579	4,406
2086	2,306	312	202	8	1,579	4,406
2087	2,306	312	202	8	1,579	4,406
2088	2,312	313	202	8	1,583	4,418
2089	2,306	312	202	8	1,579	4,406
2090	2,306	312	202	8	1,579	4,406
2091	2,306	312	202	8	1,579	4,406
2092	2,312	313	202	8	1,583	4,418
2093	2,306	312	202	8	1,579	4,406
2094	2,306	312	202	8	1,579	4,406
2095	2,306	312	202	8	1,579	4,406
2096	2,312	313	202	8	1,583	4,418
2097	2,306	312	202	8	1,579	4,406
2098	2,306	312	202	8	1,579	4,406
2099	2,306	312	202	8	1,579	4,406
2100	18,558	1,313	1,410	28	1,638	22,947
2101	36,955	8,612	2,000	4,354	4,591	56,513
2102	62,335	22,701	1,916	26,726	19,753	133,431
2103	58,271	13,090	1,648	13,501	10,758	97,268
2104	56,359	8,228	1,516	6,797	6,203	79,103
2105	56,205	8,205	1,512	6,779	6,186	78,887

TABLE 3.3b (continued) BRAIDWOOD NUCLEAR POWER STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2106	31,904	3,792	404	287	1,708	38,095
$\frac{2100}{2107}$	24,102	11,370	202	0	755	36,428
2108	24,168	11,401	202	0	757	36,528
2109	6,471	3,053	54	0	203	9,781
Total	679,937	168,344	24,897	60,241	$253,\!657$	1,187,075

FIGURE 3.1 DECON SCENARIO BRAIDWOOD NUCLEAR POWER STATION MANPOWER LEVELS

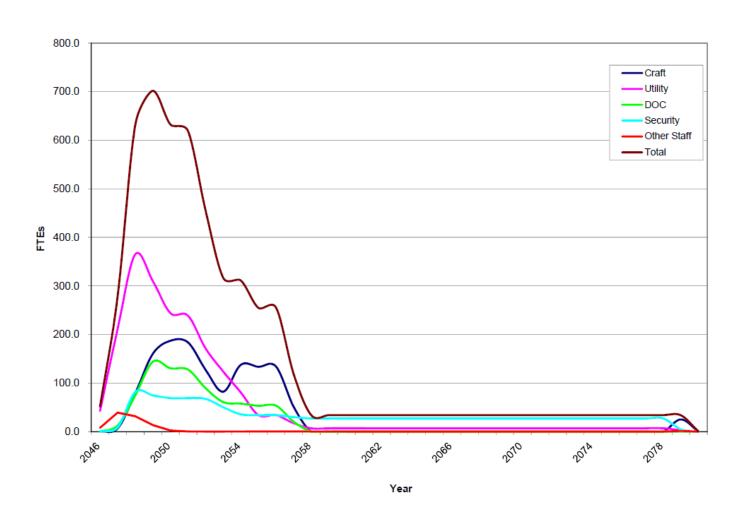


FIGURE 3.2 DELAYED DECON SCENARIO BRAIDWOOD NUCLEAR POWER STATION MANPOWER LEVELS

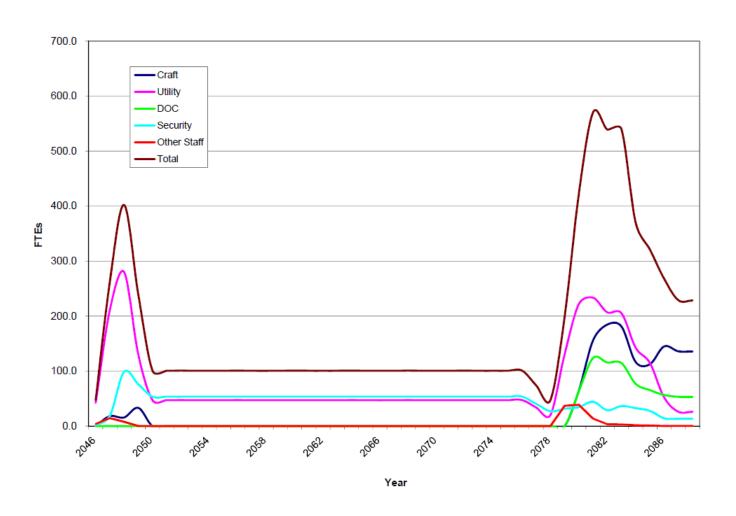
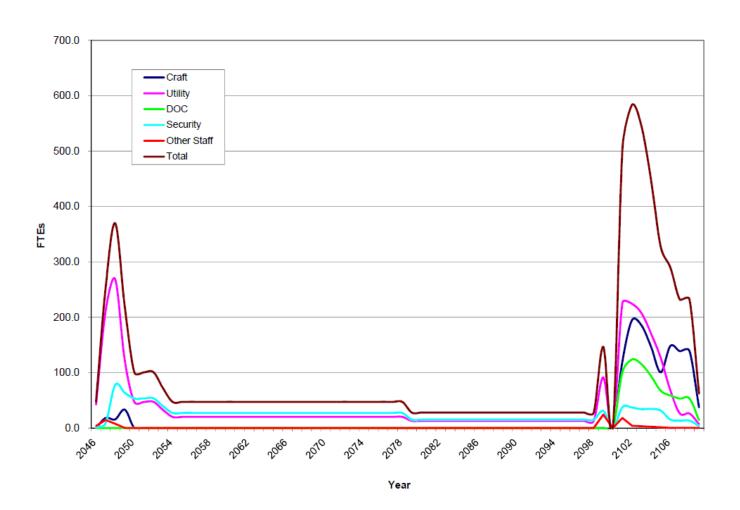


FIGURE 3.3 SAFSTOR SCENARIO BRAIDWOOD NUCLEAR POWER STATION MANPOWER LEVELS



4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this study follow 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 plans described in Section 3.5.1.

A schedule or sequence of activities is presented in Figure 4.1 for the DECON decommissioning alternative. The schedule is also representative of the work activities identified in the delayed dismantling scenarios, absent any spent fuel constraints. The scheduling sequence assumes that fuel is removed from the spent fuel pool within the first five and one-half years after operations cease at Unit 2. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost tables, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2010" computer software. [34]

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 tables, 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 DECON decommissioning schedule:

- The fuel handling building is isolated until such time that all spent fuel has been discharged to the ISFSI (DECON and SAFSTOR) or to the DOE (Delayed DECON). Decontamination and dismantling of the storage pool are initiated once the transfer of spent fuel to the ISFSI or DOE 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 the detailed cost tables are based upon the durations developed in the schedule for decommissioning Braidwood. 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 also shown for the spent fuel cooling period, which determines the release of the fuel handling building for final decontamination.

Project timelines are provided in Figures 4.2 through 4.4; the milestone dates are based on this same shutdown date. The start of decommissioning activities in the Delayed Decommissioning scenario is concurrent with the end of the fuel transfer activity (i.e. to an off-site DOE facility).

FIGURE 4.1 DECON ACTIVITY SCHEDULE

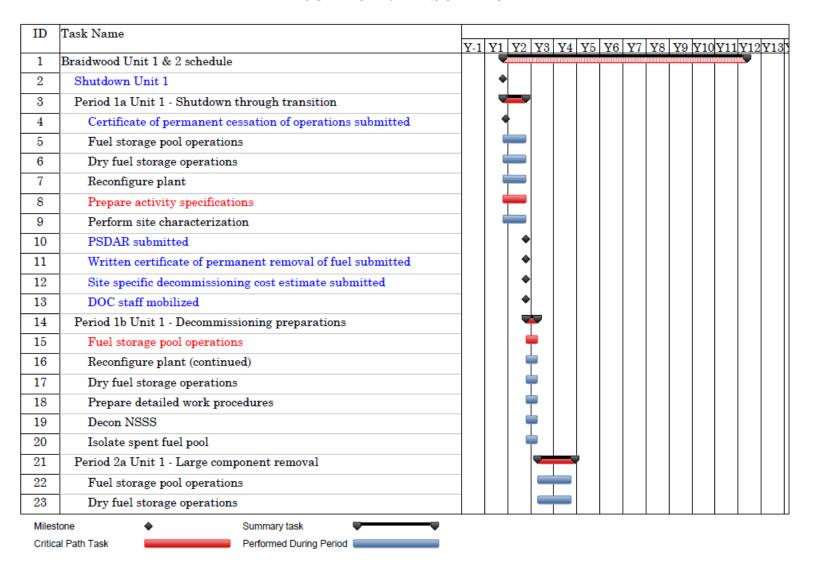


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

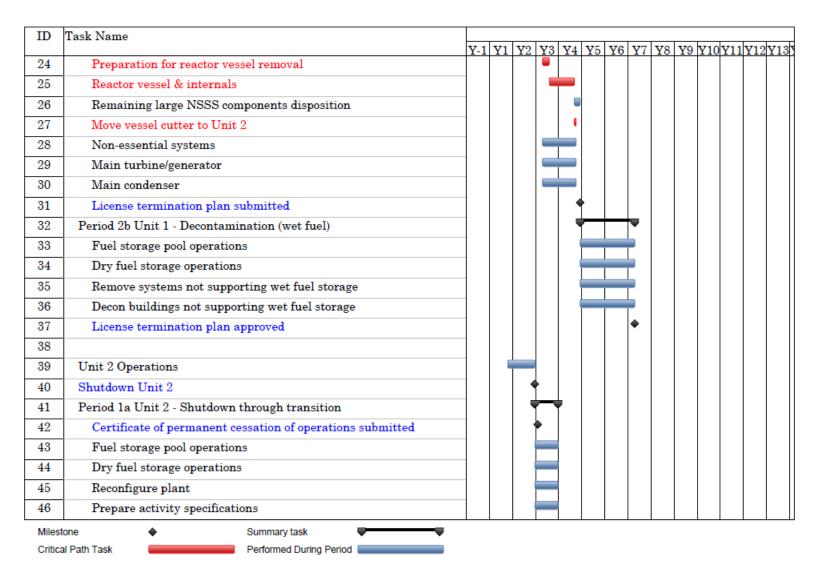


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

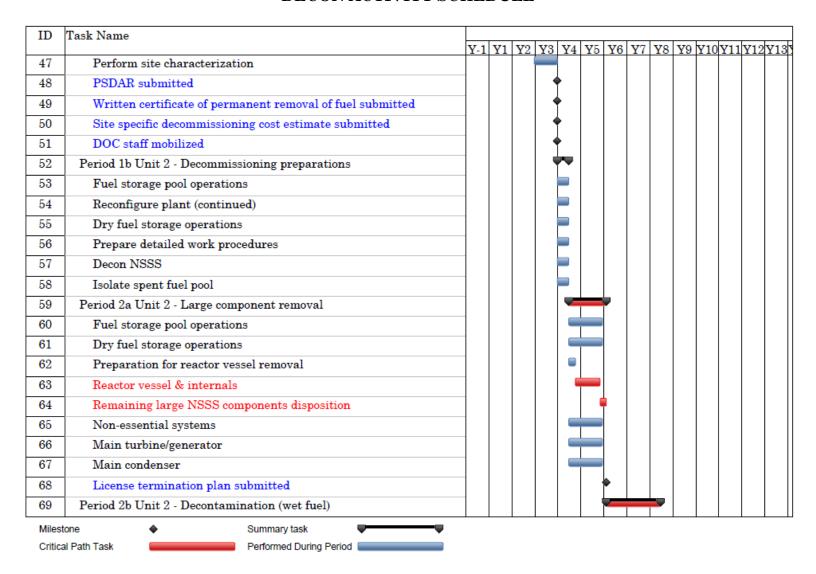


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

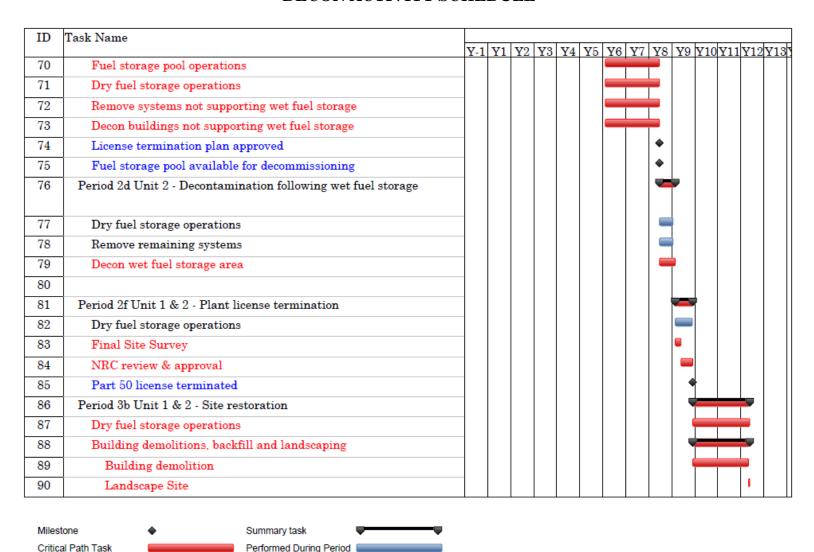


FIGURE 4.2 DECOMMISSIONING TIMELINE DECON

(not to scale)

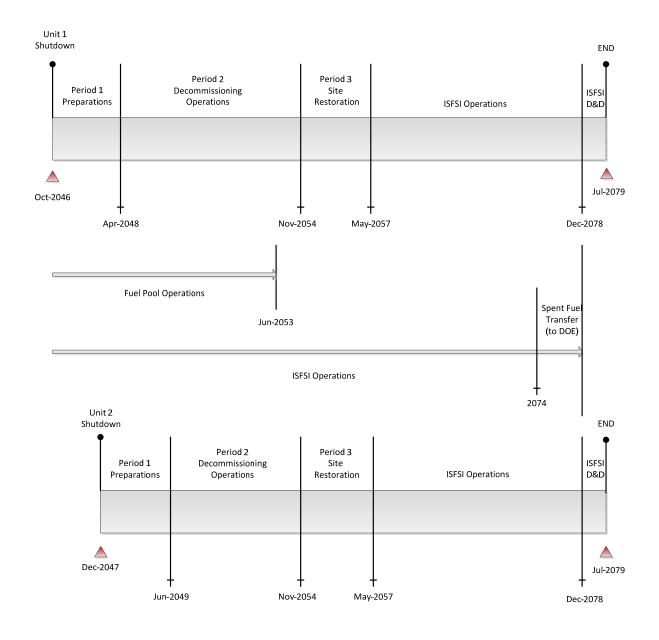


FIGURE 4.3 DECOMMISSIONING TIMELINE DELAYED DECON

(not to scale)

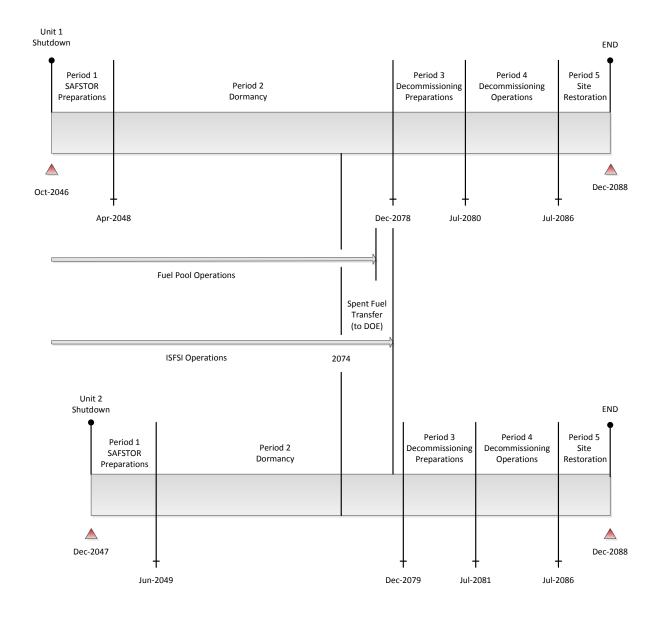
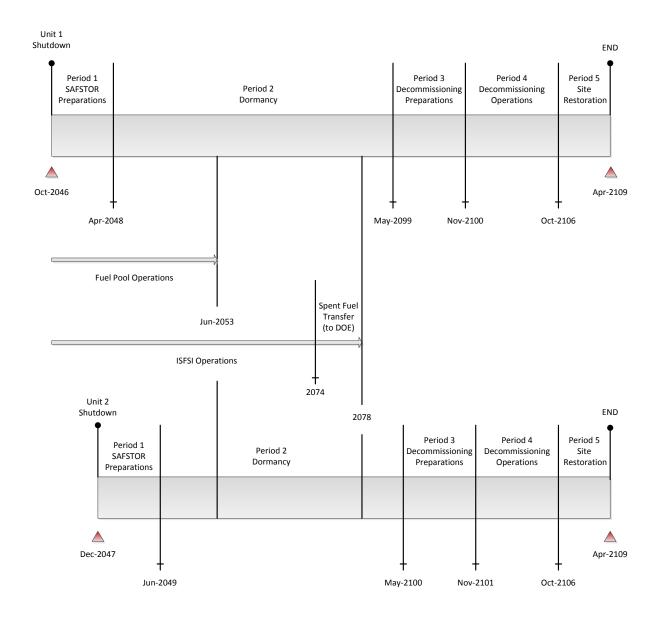


FIGURE 4.4 DECOMMISSIONING TIMELINE SAFSTOR

(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act, [35] 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, §71 defines radioactive material as it pertains to packaging and transportation and §61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR §173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3, as defined in subpart 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 destinations for the various waste streams from decommissioning are identified in Figures 5.1 and 5.2. The volumes of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in Appendices C, D, and E and summarized in Tables 5.1 through 5.3. The quantified waste volume summaries shown in these tables are consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material 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 $^{137}\mathrm{Cs}$ will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of Braidwood is primarily generated during Period 2 of the DECON alternative and Period 4 of the deferred alternatives. All radioactive waste is sent offsite for controlled disposal.

Disposal fees are calculated using current disposal agreements, 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 Exelon's current disposal agreement with Energy Solutions for its facility in Clive, Utah.

Energy Solutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the reactor vessel and segmentation of the components closest to the core. As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

FIGURE 5.1 RADIOACTIVE WASTE DISPOSITION

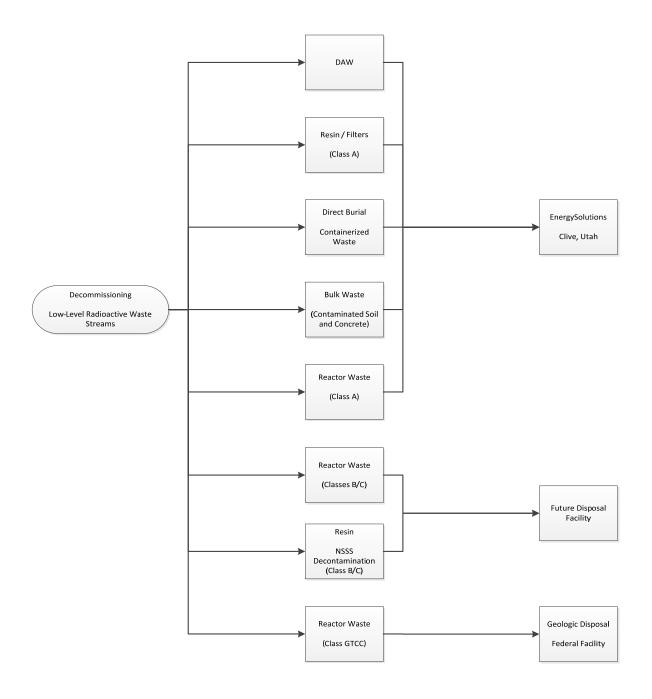
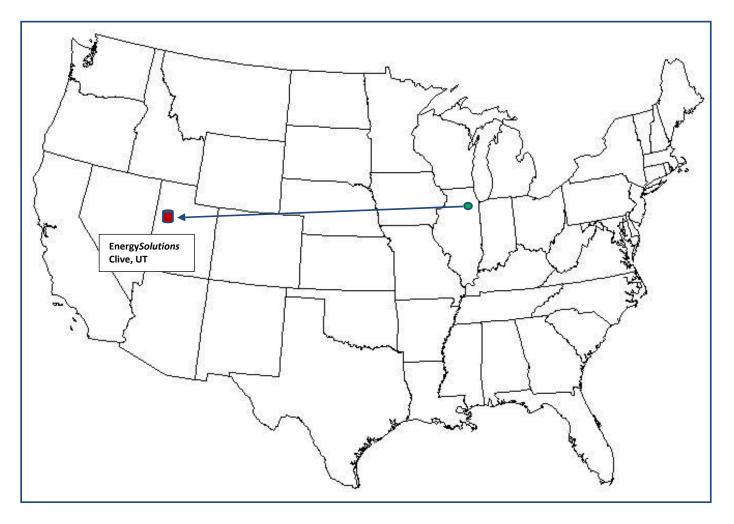


FIGURE 5.2 DECOMMISSIONING WASTE DESTINATIONS RADIOLOGICAL



The figure indicates the destinations for the low-level radioactive waste designated for direct disposal (Class A at Energy *Solutions*).

Disposition of the Class B and C low-level radioactive waste will be at a future disposal facility (to be determined). For estimating purposes, the facility is located (for capturing transportation costs) at a distance equivalent to the Energy *Solutions* facility and the disposal cost is based upon the currently operating Barnwell Low-Level Radioactive Waste Disposal Facility in South Carolina.

Disposal options (and destinations) for GTCC are still being evaluated.

TABLE 5.1 DECOMMISSIONING WASTE SUMMARY DECON

			Waste Volume	Mass
Waste	Cost Basis	Class [1]	(cubic feet)	(pounds)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	897,671	49,116,590
disposal)	EnergySolutions			
	Bulk	A	55,012	3,174,540
	Future LLRW			
	Disposal Facility		2 224	400.004
	(Proxy)	В	3,691	403,221
	Future LLRW			
	Disposal Facility			
	(Proxy)	C	785	94,822
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,433	866,361
Total [2]			961,592	53,655,534
Scrap Metal				257,968,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

TABLE 5.2 DECOMMISSIONING WASTE SUMMARY DELAYED DECON

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
				Transity.
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	897,707	48,712,280
disposal)	EnergySolutions			
	Bulk	A	64,003	3,166,325
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	2,254	213,522
	Future LLRW			
	Disposal Facility			
	(Proxy)	С	785	94,822
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,433	866,361
Total [2]			969,182	53,053,310
10001			555,102	33,333,310
Scrap Metal				257,968,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

TABLE 5.3 DECOMMISSIONING WASTE SUMMARY SAFSTOR

			Waste Volume	Mass
Waste	Cost Basis	Class [1]	(cubic feet)	(pounds)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	898,846	48,818,540
disposal)	EnergySolutions			
	Bulk	A	62,812	3,142,502
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	1,002	100,508
	Future LLRW			
	Disposal Facility			
	(Proxy)	С	785	94,822
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,433	866,361
Total [2]			967,879	53,022,733
				22,2==,:00
Scrap Metal				257,968,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

6. RESULTS

The analysis to estimate the costs to decommission Braidwood relied upon the site-specific, technical information developed for a previous analysis prepared in 2009. While not an engineering study, the estimates provide Exelon with sufficient information to assess its financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenarios assume continued operation of the plant's spent fuel pool for a minimum of five and one-half years following the cessation of operations for continued cooling of the assemblies. For the DECON and SAFSTOR scenarios, the ISFSI is expanded to accommodate the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository. The spent fuel in the storage pools and reactors at the cessation of operations remains in the storage pools in the Delayed-DECON alternative.

The cost projected to promptly decommission (DECON) Braidwood is estimated to be \$1,868.4 million. The majority of this cost (approximately 64.7%) is associated with the physical decontamination and dismantling of the nuclear units so that the licenses can be terminated. Another 25.6% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 9.7% is for the demolition of the designated structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 through 6.3, 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. This analysis assumes that Exelon 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. However, once the operating license is terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel (for the DECON alternative).

As described in this report, the spent fuel pool will remain operational for a minimum of five and one-half years following the cessation of operations. The pool will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the pool areas. Over the five and one-half year period, the spent fuel will be packaged into transportable steel canisters for future loading into a DOE-provided transport cask (DECON and SAFSTOR alternatives). The canisters will be stored in concrete overpacks at the ISFSI until the DOE is able to receive them. Dry storage of the fuel provides additional flexibility in the event the DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the majority of the radioactive material is at EnergySolutions facility in Clive, Utah or some alternative facility. Highly activated components, requiring additional isolation from the environment, are packaged for geologic disposal. Disposal of these components is based upon a cost equivalent for spent fuel.

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 union wages. Non-radiological demolition is a natural extension of the decommissioning process. 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, e.g., 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.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling,

isotopic analysis, and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also require confirmation and will add to the expense of surveying the facilities alone.

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.

Comparison of the 2009 and 2014 Estimates

For illustrative purposes, the estimates for the 2009 and 2014 DECON scenarios are compared, with the cost difference for the major cost elements shown in Table 6.4. The 2009 cost elements are inflated using the CPI, Services index to 2014 dollars to remove the effect of financial escalation from the comparison. The cost difference between the escalated 2009 estimate (increased approximately 8.6%) and the 2014 estimate is approximately \$381 million. Unless otherwise noted, all cost values and percentages reflect 2009 estimate costs adjusted for inflation.

Spent Fuel Management

Approximately \$154 million, or 40% of the total cost difference, is directly attributable to the additional 13 years of post-dismantling ISFSI operation reflected in the 2014 estimate. The cost of ISFSI operations (including plant staff, security, insurance, property taxes, fees, and other operating costs) during this timeframe is approximately \$5.92 million per year per unit (2014 estimate \$s). The increased residence time was based upon Exelon's revised projections for fleet-wide DOE spent fuel acceptance, and with consideration of an additional delay in DOE startup (first acceptance of commercial spent fuel) from 2018 to 2025.

Spent Fuel Management (Direct Costs)

This cost category increased approximately \$130 million. It includes the costs for the dry storage casks and loading campaign costs, as well as emergency planning fees while fuel is on site. The principal contributor to the increase was from emergency planning fees, which represents approximately \$128 million or 98% of the increase. In 2009, a nominal emergency planning fee allowance was used. The 2014 estimate incorporates an annual state fee of \$3.8 million (for the station) while spent fuel was on site. An increase (14%) in the capital cost of the dry storage system was responsible for the remainder of the increase in this cost category from years 2009 to 2014.

These increases were partially offset by a reduced number of dry storage overpacks and canisters required (93 in 2009 to 90 in 2014) and a reduction in the costs to expand the ISFSI (from a nominal cost of \$200 thousand per cask in 2009 dollars to a nominal cost of \$100 thousand per slot in 2014 dollars).

Security

The majority of the increase in security costs (68%) was due to the longer spent fuel site residence time as described previously. Contributing to the increase was a 30% increase in average personnel costs.

Property Taxes

Property taxes for the 1st four years following unit shut down changed substantially. This was due to the method by which the Exelon schedule of property taxes was applied in the two estimates. Property taxes are assumed to be paid in arrears; therefore the tax payment in the year following shutdown is actually for the final year of operations, and therefore is not included in either the 2009 or 2014 estimates. In 2009 the cost model assumed that this first year (which as not included) was part of the reduction in tax payments; the 2014 estimate does not make this assumption. The 2009 estimate also assumed that the second year of payment was already reduced to 67% of the operations level; the 2014 estimate begins property tax payments at the operations level for the second year. The total impact of the change was that the 2009 estimate paid the equivalent of one year of operations-level taxes before beginning the \$1 million per year level payments; the 2014 estimate paid the equivalent of approximately two years of operations-level taxes prior to the \$1 million per year level payments. The increase in the spent fuel site residence time (13 years) also contributed to the increased in costs.

Decommissioning and Demolition

Plant system and structural commodity "Removal" costs increased as a result of an 8% increase in craft labor over the five year period (used to perform physical plant dismantling) and a 14% increase in health physics personnel (used to support work crew activities, perform interim radiological assessments, and license termination surveys). The 2014 "Removal" cost also includes the perimeter excavation of the power blocks for removing underground services. This was added in 2014 based upon industry experience.

In the 2009 cost estimate, a significant portion of the contaminated waste stream was designated for off-site processing, volume reduction and recovery. This included the secondary side of the steam generators. In the 2014 estimate, he LLRW

strategy changed such that metal material was sent directly to the LLRW burial facility, where is can be separated for burial or processing by the waste vendor consistent with recent industry practice. This results in a single rate for burial or processing of waste metals. With the low direct disposal rate, third-party off-site processing was not utilized in the 2014 estimate. As a result of the change:

- The packaging cost increased, since direct disposal of contaminated metals incorporates the mass and volume of the waste package, as well as the cost of the one-time use waste package. Off-site processing typically uses reusable containers that do not contribute substantially to the packaging cost. "Packaging" costs also increased with the addition (in 2014) of four spent fuel multi-purpose canisters and storage overpacks for GTCC waste (2 per unit at a nominal cost of \$1.2 million for each canister and transfer costs). The additional packages resulted from a payload constraint being applied on the storage canisters, as a result of industry experience.
- 2) Shipping costs increased for three reasons, the greater distance to the waste disposal site v. the off-site waste processing site, the increased number of waste packages weight, and a 2014 price for diesel fuel being 46% higher than in 2009.
- 3) In 2014 low-level waste disposal costs increased relative to the combination of waste disposal and processing cost in 2009 principally because the 2014 cost of waste disposal for system components (using a single waste stream) is substantially larger than 2009 cost for disposal (which used separate waste streams for direct burial and off-site waste processing). Also contributing to the change was a 10% increase in the large component disposal rate (applied to large primary system components such as steam generators and the reactor vessel. This cost increase was offset to a limited extent by a decrease in the on-site decontamination of systems.

Characterization and Licensing Surveys

Characterization and surveys increased by \$16.0 million (44%). The majority of the increase in this cost category (93%) is associated with the addition (in 2014) of remedial action survey personnel during the active decontamination and dismantling periods. These teams are used to assess, process, and identify areas of concerns, and confirm that the desired remediation results have been achieved. This activity has been added based on industry experience.

Other

Additional costs were realized in the 2014 cost model from an updated "Insurance" model and "Site O&M" charges provided by Exelon (combined with the longer spent fuel site residence time). "Energy" costs increased 23% percent since the 2009 estimate. This is commensurate with the 21.2% increase in the price of electricity used in the 2014 estimate and the model that adjusts energy consumption based on reactor thermal rating (Braidwood had a power uprate between the 2009 and 2014 studies).

TABLE 6.1 SUMMARY OF DECOMMISSIONING COST ELEMENTS DECON ALTERNATIVE

Cost Element	Total	Percentage
Decontamination	30,177	1.6
Removal	300,508	16.1
Packaging	63,070	3.4
Transportation	33,922	1.8
Waste Disposal	175,162	9.4
Off-site Waste Processing	0	0.0
Program Management [1]	558,745	29.9
Security	159,287	8.5
Spent Fuel Pool Isolation	12,434	0.7
Spent Fuel Management [2]	308,380	16.5
Insurance and Regulatory Fees	36,882	2.0
Energy	23,708	1.3
Characterization and Licensing Surveys	52,136	2.8
Property Taxes	88,413	4.7
Miscellaneous Equipment	13,599	0.7
Site O&M	12,022	0.6
Total [3]	1,868,444	100.0

Cost Element	Total	Percentage
NRC License Termination	1,208,816	64.7
Spent Fuel Management	477,609	25.6
Site Restoration	182,019	9.7
Total [3]	1,868,444	100.0

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.2 SUMMARY OF DECOMMISSIONING COST ELEMENTS DELAYED DECON ALTERNATIVE

Cost Element	Total	Percentage
Decontamination	35,981	1.6
Removal	309,423	14.1
Packaging	53,195	2.4
Transportation	31,529	1.4
Waste Disposal	157,223	7.2
Off-site Waste Processing	0	0.0
Program Management [1]	788,499	36.0
Security	274,412	12.5
Spent Fuel Pool Isolation	12,434	0.6
Spent Fuel Management [2]	201,668	9.2
Insurance and Regulatory Fees	77,725	3.5
Energy	50,947	2.3
Characterization and Licensing Surveys	53,957	2.5
Property Taxes	98,787	4.5
Miscellaneous Equipment	29,189	1.3
Site O&M	15,802	0.7
Total [3]	2,190,771	100.0

Cost Element	Total	Percentage
NRC License Termination	1,311,127	59.8
Spent Fuel Management	697,424	31.8
Site Restoration	182,220	8.3
Total [3]	2,190,771	100.0

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.3 SUMMARY OF DECOMMISSIONING COST ELEMENTS SAFSTOR ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	35,949	1.6
Removal	309,396	13.8
Packaging	53,151	2.4
Transportation	31,640	1.4
Waste Disposal	154,865	6.9
Off-site Waste Processing	0	0.0
Program Management [1]	712,596	31.8
Security	233,867	10.4
Spent Fuel Pool Isolation	12,434	0.6
Spent Fuel Management [2]	300,832	13.4
Insurance and Regulatory Fees	110,805	4.9
Energy	49,317	2.2
Characterization and Licensing Surveys	53,957	2.4
Property Taxes	121,067	5.4
Miscellaneous Equipment	38,028	1.7
Site O&M	23,499	1.0
Total [3]	2,241,402	100.0

Cost Element	Total	Percentage
NRC License Termination	1,620,522	72.3
Spent Fuel Management	437,445	19.5
Site Restoration	183,435	8.2
Total [3]	2,241,402	100.0

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.4 SUMMARY COMPARISON DECON ALTERNATIVE

(thousands of dollars)

Cost Element	2009 Estimate (dollars)	2009 Escalated to 2014 ^[1] (dollars)	2014 Estimate (dollars)	Delta ^[2]
Decontamination	36,446	39,562	30,177	-9,386
Removal	249,366	270,688	300,508	29,819
Packaging	29,993	32,558	63,070	30,512
Transportation	20,786	22,563	33,922	11,358
Waste Disposal	119,684	129,918	175,162	45,244
Off-site Waste Processing	8,110	8,803	0	-8,803
Program Management	513,377	557,274	558,745	1,471
Security	77,874	84,533	159,287	74,754
Spent Fuel Pool Isolation	11,143	12,096	12,434	339
Spent Fuel Management (Direct Costs)	164,291	178,339	308,380	130,041
Insurance and Regulatory Fees	23,532	25,544	36,882	11,338
Energy	17,702	19,216	23,708	4,493
Characterization/Licensing Surveys	33,288	36,134	52,136	16,001
Property Taxes	39,113	42,457	88,413	45,956
Miscellaneous Equipment	12,921	14,026	13,599	-427
Site O&M	5,508	5,979	12,022	6,043
Total	1,363,134	1,479,691	1,868,444	388,753

NRC License Termination	971,127	1,054,165	1,208,816	154,651
Spent Fuel Management	238,232	258,602	323,688	65,086
Additional 13 Years of ISFSI Ops [3]			153,921	153,921
Site Restoration	153,775	166,924	182,019	15,095
Total	1,363,134	1,479,691	1,868,444	388,753

^[1] Escalated by CPI, Services for comparative purposes

^[2] "2014 Estimate" value minus "2009 Escalated to 2014" value

^[3] Based upon average annual cost of \$5.92 million per unit for 13 years

- 1. "Decommissioning Cost Analysis for the Braidwood Nuclear Power Station," Document No. E16-1555-014, Rev. 0, TLG Services, Inc., October 2009
- 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, 53 Fed. Reg., 24018-, June 27, 1988
- 3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," Rev. 2, October 2011
- 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, 66 Fed. Reg. 52551, 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, 61 Fed. Reg. 39278, July 29, 1996.
- 7. U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011
- 8. "Nuclear Waste Policy Act of 1982," 42 U.S. Code 10101, et seq. http://pbadupws.nrc.gov/docs/ML1327/ML13274A489.pdf#page=419
- 9. Blue Ribbon Commission on America's Nuclear Future Charter, http://cybercemetery.unt.edu/archive/brc/20120620215336/http://brc.gov/index.php?q=page/charter
- 10. "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/, January 2012.
- 11. "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013.

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- 12. United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, Et Al., August 2013, http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD9852 57BC6004DEB18/\$file/11-1271-1451347.pdf
- 13. U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) "... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such materials from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance ..."
- 14. U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites"
- 15. "Low Level Radioactive Waste Policy Act," Public Law 96-573, 1980
- 16. "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986
- 17. U.S. Code of Federal Regulations, Title 10, Part 61.55 "Waste Classification"
- 18. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Final Rule, Radiological Criteria for License Termination," 62 Fed. Reg. 39058, July 21, 1997
- 19. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," EPA Memorandum OSWER No. 9200.4-18, August 22, 1997
- 20. U.S. Code of Federal Regulations, Title 40, Part 141.16, "Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems."
- 21. "Memorandum of Understanding Between the Environmental Protection Agency and the Nuclear Regulatory Commission: Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites," OSWER 9295.8-06a, October 9, 2002

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- 22. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG/CR-1575, Rev. 1, EPA 402-R-97-016, Rev. 1, August 2000
- 23. T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986
- 24. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980.
- 25. "Building Construction Cost Data 2014," Robert Snow Means Company, Inc., Kingston, Massachusetts
- 26. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984
- 27. Civilian Radioactive Waste Management System Waste Acceptance System Requirements Document," Revision 5, ICN01 (DOE/RW-0351) effective March 10, 2008
- 28. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995.
- 29. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178.
- 30. Tri-State Motor Transit Company Radioactive Materials Tariff
- 31. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, August 1984.
- 32. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, June 1978.

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- 33. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1980
- 34. "Microsoft Project 2010," Microsoft Corporation, Redmond, WA, 2003
- 35. "Atomic Energy Act of 1954," (68 Stat. 919)

APPENDIX A UNIT COST FACTOR DEVELOPMENT

APPENDIX A UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

Act ID	Activity Description	Activity Duration (minutes)	Critical Duration (minutes)*
а	Remove insulation	60	(b)
a 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, send to waste processing area	60	_60
•	Totals (Activity/Critical)	$\frac{-66}{355}$	$\underline{\phantom{0000000000000000000000000000000000$
Dura	tion adjustment(s):		
	espiratory protection adjustment (50% of critical dura	tion)	128
	diation/ALARA adjustment (37% of critical duration)	,	<u>95</u>
	sted work duration		$\overline{478}$
	otective clothing adjustment (30% of adjusted duration	on)	$\frac{143}{621}$
	ork break adjustment (8.33 % of productive duration) I work duration (minutes)		$\frac{52}{673}$

*** Total duration = 11.217 hr ***

^{*} Alpha designators indicate activities that can be performed in parallel

APPENDIX A (Continued)

3. LABOR REQUIRED

lumber	Duration (Hours)	Rate (\$/hr)	Cost	
3.00	11.217	66.26	2,229.72	
2.00	11.217	79.04	1,773.18	
1.00	11.217	81.75	916.99	
0.25	11.217	85.24	239.03	
0.05	11.217	66.26	37.16	
1.00	11.217	63.44	711.61	
			\$5,907.69	
MABLES (COSTS			
			none	
q ft {1}			\$31.50	
.28/sq ft {2}			\$14.00	
\$19.99 x 1	/hr {3}		\$19.99	
aterials			\$65.49	
nd materia	ls @ 16.25 %		\$10.64	
Total costs, equipment & material				
TOTAL COST:				
hanger <30	000 pounds:		\$5,983.82	
			\$5,907.69	
Total labor cost: Total equipment/material costs:				
Total craft labor man-hours required per unit:				
	3.00 2.00 1.00 0.25 0.05 1.00 WABLES O 4 ft {1} 28/sq ft {2} \$19.99 x 1 A aterials and materials	3.00 11.217 2.00 11.217 1.00 11.217 0.25 11.217 1.00 11.217 1.00 11.217 1.00 11.217 MABLES COSTS Q ft {1} 28/sq ft {2} \$19.99 x 1 /hr {3} Aterials and materials @ 16.25 % hanger <3000 pounds:	Sumber (Hours) (\$/hr) (\$/hr) (\$3.00	

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the Atomic Industrial Forum's (now NEI) program to standardize nuclear decommissioning cost estimates and are delineated in Volume 1, Chapter 5 of the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.
- References for equipment & consumables costs:
 - 1. <u>www.mcmaster.com</u> online catalog, McMaster Carr Spill Control (7193T88)
 - 2. R.S. Means (2014) Division 01 56, Section 13.60-0600, page 23
 - 3. R.S. Means (2014) Division 01 54 33, Section 40-6360, page 698
- Material and consumable costs were adjusted using the regional indices for Joliet, Illinois.

Unit Cost Factor	Cost/Unit
Removal of clean instrument and sampling tubing, \$/linear foot	0.71
Removal of clean pipe 0.25 to 2 inches diameter, \$/linear foot	7.62
Removal of clean pipe >2 to 4 inches diameter, \$/linear foot	10.74
Removal of clean pipe >4 to 8 inches diameter, \$/linear foot	20.59
Removal of clean pipe >8 to 14 inches diameter, \$/linear foot	40.11
Removal of clean pipe >14 to 20 inches diameter, \$/linear foot	52.15
Removal of clean pipe >20 to 36 inches diameter, \$/linear foot	76.72
Removal of clean pipe >36 inches diameter, \$/linear foot	91.16
Removal of clean valve >2 to 4 inches	136.61
Removal of clean valve >4 to 8 inches	205.88
Removal of clean valve >8 to 14 inches	401.14
Removal of clean valve >14 to 20 inches	521.45
Removal of clean valve >20 to 36 inches	767.21
Removal of clean valve >36 inches	911.59
Removal of clean pipe hanger for small bore piping	47.09
Removal of clean pipe hanger for large bore piping	170.47
Removal of clean pump, <300 pound	347.23
Removal of clean pump, 300-1000 pound	954.07
Removal of clean pump, 1000-10,000 pound	3,785.79
Removal of clean pump, >10,000 pound	7,321.60
Removal of clean pump motor, 300-1000 pound	399.26
Removal of clean pump motor, 1000-10,000 pound	1,573.57
Removal of clean pump motor, >10,000 pound	3,540.53
Removal of clean heat exchanger <3000 pound	2,030.43
Removal of clean heat exchanger >3000 pound	5,111.15
Removal of clean feedwater heater/deaerator	14,425.58
Removal of clean moisture separator/reheater	29,678.35
Removal of clean tank, <300 gallons	446.65
Removal of clean tank, 300-3000 gallon	1,408.54
Removal of clean tank, >3000 gallons, \$/square foot surface area	11.70

Unit Cost Factor	Cost/Unit
Removal of clean electrical equipment, <300 pound	188.64
Removal of clean electrical equipment, 300-1000 pound	650.04
Removal of clean electrical equipment, 1000-10,000 pound	1,300.09
Removal of clean electrical equipment, >10,000 pound	3,070.55
Removal of clean electrical transformer < 30 tons	2,132.46
Removal of clean electrical transformer > 30 tons	6,141.10
Removal of clean standby diesel generator, <100 kW	$2,\!178.12$
Removal of clean standby diesel generator, 100 kW to 1 MW	4,861.70
Removal of clean standby diesel generator, >1 MW	10,064.70
Removal of clean electrical cable tray, \$/linear foot	17.70
Removal of clean electrical conduit, \$/linear foot	7.73
Removal of clean mechanical equipment, <300 pound	188.64
Removal of clean mechanical equipment, 300-1000 pound	650.04
Removal of clean mechanical equipment, 1000-10,000 pound	1,300.09
Removal of clean mechanical equipment, >10,000 pound	3,070.55
Removal of clean HVAC equipment, <300 pound	228.10
Removal of clean HVAC equipment, 300-1000 pound	781.09
Removal of clean HVAC equipment, 1000-10,000 pound	1,556.69
Removal of clean HVAC equipment, >10,000 pound	3,070.55
Removal of clean HVAC ductwork, \$/pound	0.75
Removal of contaminated instrument and sampling tubing, \$/linear foot	2.12
Removal of contaminated pipe 0.25 to 2 inches diameter, \$/linear foot	28.56
Removal of contaminated pipe >2 to 4 inches diameter, \$/linear foot	49.95
Removal of contaminated pipe >4 to 8 inches diameter, \$/linear foot	78.26
Removal of contaminated pipe >8 to 14 inches diameter, \$/linear foot	156.02
Removal of contaminated pipe >14 to 20 inches diameter, \$/linear foot	188.10
Removal of contaminated pipe >20 to 36 inches diameter, \$/linear foot	261.57
Removal of contaminated pipe >36 inches diameter, \$/linear foot	309.74
Removal of contaminated valve >2 to 4 inches	602.04
Removal of contaminated valve >4 to 8 inches	726.27

Unit Cost Factor	Cost/Unit
Removal of contaminated valve >8 to 14 inches	1,507.33
Removal of contaminated valve >14 to 20 inches	1,920.40
Removal of contaminated valve >20 to 36 inches	2,562.83
Removal of contaminated valve >36 inches	3,044.48
Removal of contaminated pipe hanger for small bore piping	197.41
Removal of contaminated pipe hanger for large bore piping	653.12
Removal of contaminated pump, <300 pound	1,293.91
Removal of contaminated pump, 300-1000 pound	2,990.42
Removal of contaminated pump, 1000-10,000 pound	9,917.66
Removal of contaminated pump, >10,000 pound	24,162.77
Removal of contaminated pump motor, 300-1000 pound	1,254.78
Removal of contaminated pump motor, 1000-10,000 pound	4,017.44
Removal of contaminated pump motor, >10,000 pound	9,019.53
Removal of contaminated heat exchanger <3000 pound	5,983.82
Removal of contaminated heat exchanger >3000 pound	17,299.15
Removal of contaminated tank, <300 gallons	2,145.94
Removal of contaminated tank, >300 gallons, \$/square foot	42.24
Removal of contaminated electrical equipment, <300 pound	1,009.61
Removal of contaminated electrical equipment, 300-1000 pound	2,438.80
Removal of contaminated electrical equipment, 1000-10,000 pound	4,695.49
Removal of contaminated electrical equipment, >10,000 pound	9,152.53
Removal of contaminated electrical cable tray, \$/linear foot	48.87
Removal of contaminated electrical conduit, \$/linear foot	22.70
Removal of contaminated mechanical equipment, <300 pound	1,123.89
Removal of contaminated mechanical equipment, 300-1000 pound	2,695.93
Removal of contaminated mechanical equipment, 1000-10,000 pound	5,182.17
Removal of contaminated mechanical equipment, >10,000 pound	$9,\!152.53$
Removal of contaminated HVAC equipment, <300 pound	1,123.89
Removal of contaminated HVAC equipment, 300-1000 pound	2,695.93
Removal of contaminated HVAC equipment, 1000-10,000 pound	5,182.17

Unit Cost Factor	Cost/Unit
Removal of contaminated HVAC equipment, >10,000 pound	9,152.53
Removal of contaminated HVAC ductwork, \$/pound	2.88
Removal/plasma arc cut of contaminated thin metal components, \$/linear in	. 5.39
Additional decontamination of surface by washing, \$/square foot	11.27
Additional decontamination of surfaces by hydrolasing, \$/square foot	47.03
Decontamination rig hook up and flush, \$/ 250 foot length	9,529.12
Chemical flush of components/systems, \$/gallon	20.28
Removal of clean standard reinforced concrete, \$/cubic yard	185.92
Removal of grade slab concrete, \$/cubic yard	252.17
Removal of clean concrete floors, \$/cubic yard	480.40
Removal of sections of clean concrete floors, \$/cubic yard	1,447.14
Removal of clean heavily rein concrete w/#9 rebar, \$/cubic yard	307.62
Removal of contaminated heavily rein concrete w/#9 rebar, \$/cubic yard	2,849.80
Removal of clean heavily rein concrete w/#18 rebar, \$/cubic yard	388.88
Removal of contaminated heavily rein concrete w/#18 rebar, \$/cubic yard	3,772.75
Removal heavily rein concrete w/#18 rebar & steel embedments, \$/cubic yar	d 598.89
Removal of below-grade suspended floors, \$/cubic yard	480.40
Removal of clean monolithic concrete structures, \$/cubic yard	$1,\!217.15$
Removal of contaminated monolithic concrete structures, \$/cubic yard	2,845.80
Removal of clean foundation concrete, \$/cubic yard	955.80
Removal of contaminated foundation concrete, \$/cubic yard	2,651.26
Explosive demolition of bulk concrete, \$/cubic yard	40.89
Removal of clean hollow masonry block wall, \$/cubic yard	138.07
Removal of contaminated hollow masonry block wall, \$/cubic yard	446.65
Removal of clean solid masonry block wall, \$/cubic yard	138.07
Removal of contaminated solid masonry block wall, \$/cubic yard	446.65
Backfill of below-grade voids, \$/cubic yard	36.47
Removal of subterranean tunnels/voids, \$/linear foot	157.20
Placement of concrete for below-grade voids, \$/cubic yard	140.71
Excavation of clean material, \$/cubic yard	3.88

Unit Cost Factor	Cost/Unit
Excavation of contaminated material, \$/cubic yard	53.12
Removal of clean concrete rubble (tipping fee included), \$/cubic yard	29.50
Removal of contaminated concrete rubble, \$/cubic yard	34.40
Removal of building by volume, \$/cubic foot	0.40
Removal of clean building metal siding, \$/square foot	1.86
Removal of contaminated building metal siding, \$/square foot	6.06
Removal of standard asphalt roofing, \$/square foot	3.31
Removal of transite panels, \$/square foot	2.90
Scarifying contaminated concrete surfaces (drill & spall), \$/square foot	16.41
Scabbling contaminated concrete floors, \$/square foot	10.52
Scabbling contaminated concrete walls, \$/square foot	28.21
Scabbling contaminated ceilings, \$/square foot	97.23
Scabbling structural steel, \$/square foot	8.40
Removal of clean overhead crane/monorail < 10 ton capacity	896.58
Removal of contaminated overhead crane/monorail < 10 ton capacity	2,476.96
Removal of clean overhead crane/monorail >10-50 ton capacity	2,151.79
Removal of contaminated overhead crane/monorail >10-50 ton capacity	5,943.70
Removal of polar crane > 50 ton capacity	8,938.01
Removal of gantry crane > 50 ton capacity	38,381.84
Removal of structural steel, \$/pound	0.27
Removal of clean steel floor grating, \$/square foot	6.32
Removal of contaminated steel floor grating, \$/square foot	18.05
Removal of clean free standing steel liner, \$/square foot	17.55
Removal of contaminated free standing steel liner, \$/square foot	49.49
Removal of clean concrete-anchored steel liner, \$/square foot	8.78
Removal of contaminated concrete-anchored steel liner, \$/square foot	57.69
Placement of scaffolding in clean areas, \$/square foot	18.27
Placement of scaffolding in contaminated areas, \$/square foot	32.46
Landscaping with topsoil, \$/acre	27,031.38
Cost of CPC B-88 LSA box & preparation for use	2,224.75

Unit Cost Factor	Cost/Unit
Cost of CPC B-25 LSA box & preparation for use	2,038.85
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,670.38
Cost of CPC B-144 LSA box & preparation for use	11,162.35
Cost of LSA drum & preparation for use	239.59
Cost of cask liner for CNSI 8 120A cask (resins)	13,419.39
Cost of cask liner for CNSI 8 120A cask (filters)	9,766.44
Decontamination of surfaces with vacuuming, \$/square foot	1.10

APPENDIX C

DETAILED COST ANALYSIS

DECON

	<u>Page</u>
Braidwood Nuclear Power Station, Unit 1	
Braidwood Nuclear Power Station, Unit 2	

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111	ousanus	oi 2014 Dolla	13)											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet			Cu. Feet		Manhours	
PERIOD	1a - Shutdown through Transition																				
	Direct Decommissioning Activities							4.04	2.4		***										4 000
1a.1.1	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	161	24		185	-	-	-	-	-	-	-	-	-	1,300
1a.1.2 1a.1.3	Remove fuel & source material									a n/a											
1a.1.3	Notification of Permanent Defueling									а											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	248	37	285	285	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	570	85		655	-	-	-	-	-	-	-	-	-	4,600
1a.1.8 1a.1.9	Perform detailed rad survey Estimate by-product inventory							124	19	a 142	142										1,000
1a.1.3 1a.1.10	End product description		-	-	-	-	-	124	19		142	-		-	-	-	-		-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	_		_	161	24		185	_	-	_	-	-	-		-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	929	139	1,069	1,069	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	384	58		442	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	619	93		712	-	-	-	-	-	-	-	-	-	5,000
1a.1.15 1a.1.16	Prepare/submit License Termination Plan Receive NRC approval of termination plan	-	-	-	-	-	-	507	76	584 a	584	-	-	-	-	-	-	-	-	-	4,096
	Specifications																				
	Plant & temporary facilities	-	-	-	-	-	-	610	91	701	631	-	70	-	-	-	-	-	-	-	4,920
	Plant systems NSSS Decontamination Flush	-	-	-	-	-	-	516 62	77 9		534 71	-	59	-	-	-	-	-	-	-	4,167 500
	Reactor internals				-		-	880	132		1,012	-				-	-		-	-	7,100
	Reactor vessel	_	-	-	_	_	_	805	121	926	926	_	-	-	_	-	_		_	-	6,500
	Biological shield	-	-	-	-	-	-	62	9		71	-	-	-	-	-	-	-	-	-	500
	Steam generators	-	-	-	-	-	-	387	58		445	-	-	-	-	-	-	-	-	-	3,120
	Reinforced concrete	•	-	-	-	-	-	198	30		114	-	114	-	-	-	-	-	-	-	1,600
	Main Turbine 0 Main Condensers	-	-	-	-	-	-	50 50	7 7	57 57	-	-	57 57	-	-	-	-	-	-	-	400 400
	1 Plant structures & buildings		-	-	-	-	-	387	58		222	-	222	-	-	-	-		-	-	3,120
	2 Waste management		-	-	-	-	-	570	85		655	-		-	-	-	-	-	-	-	4,600
1a.1.17.13	3 Facility & site closeout	-	-	-	-	-	-	112	17		64	-	64	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,686	703	5,389	4,746	-	644	-	-	-	-	-	-	-	37,827
	& Site Preparations																				
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	297	45		342	-	-	-	-	-	-	-	-	-	2,400
1a.1.19 1a.1.20	Plant prep. & temp. svces Design water clean-up system	-	-	-	-	-	-	3,000 173	450 26		3,450 199	-	-	-	-	-	-	-	-	-	1,400
1a.1.20	Rigging/Cont. Cntrl Envlps/tooling/etc.		-	-	-	-	-	2,300	345		2,645	-	-	-	-	-	-		-	-	1,400
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	152	23		175	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,437	2,166	16,603	15,959	-	644	-	-	-	-	-	-	-	73,753
Period 1a 1a.2.1	a Additional Costs ISFSI Expansion							4,800	720	5,520		5,520									
1a.2.1 1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	4,800	720			5,520	-	-					-	-	-
	Collateral Costs							,		-,-		-7-									
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	9,606	1,441	11,047	-	11,047	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	9,606	1,441	11,047	-	11,047	-	-	-	-	-	-	-	-	-
Period 1a 1a.4.1	n Period-Dependent Costs Insurance		_					1,815	181	1,996	1,996										
1a.4.1 1a.4.2	Property taxes	-	-	-	-	-	-	1,819	181	1,996	1,996	-	-	-		-		-	-	-	-
1a.4.3	Health physics supplies	-	527		-	-	-	-	132	658	658	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	565	-	-	-	-	-	85	649	649	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	14	1 7	-	39		12		72	-	-	-	610	-	-	-	12,190	20	
1a.4.6	Plant energy budget NRC Fees	-	-	-	-	-	-	1,753	263 118	2,016 1,299	2,016 1,299	-	-	-		-	-		-		-
1a.4.7 1a.4.8	Emergency Planning Fees	-	-	-	-	-		1,181 2,188	219		1,299	2,407	-	-		-	-		-	-	-
1a.4.9	Site O&M Cost	-	-	-		-	-	165	25		190	2,407	-	-					-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	396	59	455	-	455	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55		55	-	-	-	-	-	-	-	-	
1a.4.12	Security Staff Cost	-	-	-	-	-	-	672	101	772	772	-	-	-	-	-	-	-	-	-	12,264
1a.4.13	Utility Staff Cost Subtotal Period 1a Period-Dependent Costs	-	1,091	. 14	. 7	- '	39	32,063 40,280	4,809 6,011		36,873 44,526	2,917	-	-	610	-	-	-	12,190	20	423,400 435,664
1a.4	Subtotal Feriou 1a Feriou-Dependent Costs	-	1,091	. 14	t 1	-	38	40,480	0,011	47,443	44,026	2,917	-	-	010	-	-	-	12,190	20	450,064

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Ruriol	Volumes		Burial/		Utility and
Activit	y	Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet				Wt., Lbs.	Manhours	Manhours
1a.0	TOTAL PERIOD 1a COST	-	1,091	14	7	-	39	69,124	10,338	80,613	60,485	19,484	644	-	610	-	-	-	12,190	20	509,417
PERIO	0 1b - Decommissioning Preparations																				
Period 1	Direct Decommissioning Activities																				
Detailed	Work Procedures																				
	Plant systems	-	-	-	-	-	-	586	88	674	607	-	67	-	-	-	-	-	-	-	4,733
1b.1.1.2		-	-	-	-	-	-	124	19	142	142	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3		•	-	-	-	-	-	310	46	356	356	-	144	-	-	-	-	-	-	-	2,500
	Remaining buildings CRD cooling assembly	-	-	-	-	-		$\frac{167}{124}$	25 19	$\frac{192}{142}$	48 142	-	144	-	-	-	-	-	-	-	1,350 1,000
	CRD housings & ICI tubes		-	-	-		-	124	19	142	142		-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Incore instrumentation		_	_	-	-	-	124	19	142	142			-	-	-	-	-	-	-	1,000
	Reactor vessel	-	-	-	-	-	-	450	67	517	517	-	-	-	-	-	-	-	-	-	3,630
	Facility closeout	-	-	-	-	-	-	149	22	171	85	-	85	-	-	-	-	-	-	-	1,200
	Missile shields	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	450
	Biological shield		-	-	-	-	-	149	22	171	171	-	-	-	-	-	-	-	-	-	1,200
	Steam generators	-	-	-	-	-	-	570	85	655	655	-	-	-	-	-	-	-	-	-	4,600
	Reinforced concrete		-	-	-	-	-	124	19 29	$\frac{142}{222}$	71	-	71	-	-	-	-	-	-	-	1,000
	Main Turbine Main Condensers	-	-	-	-	-	-	193 193	29 29	222	-	-	222 222	-	-	-	-	-	-	-	1,560 1,560
	Auxiliary building		-	-				338	51	389	350		39			-				-	2,730
	Reactor building		-	-	-	-	-	338	51	389	350	_	39	_	-	-	-	-	_	-	2,730
1b.1.1		-	-	-	-	-	-	4,118	618	4,736	3,846	-	891	-	-	-	-	-	-	-	33,243
1b.1.2	Decon primary loop	794	-	-	-	-	-	-	397	1,190	1,190	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	794	-	-	-	-	-	4,118	1,015	5,927	5,036	-	891	-	-	-	-	-	-	1,067	33,243
	Additional Costs																				
1b.2.1 1b.2	Site Characterization Subtotal Period 1b Additional Costs	-	-	-	-	-	-	6,480 6,480	1,944 1,944	8,424 8,424	8,424 8,424	-	-	-	-	-	-	-	-	30,500 30,500	
								ŕ	,	,	,									,	•
	Collateral Costs	0.45							1.40	1.000	1.000										
1b.3.1 1b.3.2	Decon equipment	947		-	-	-	-	1,163	142 175	1,089 1,338	1,089 1,338	-	-	-	-	-	-	-	-	-	-
1b.3.2 1b.3.3	DOC staff relocation expenses Process decommissioning water waste	52		37	92	-	115	1,100	72	368	368	-	-	-	328	-	-	-	19,686	- 64	
1b.3.4	Process decommissioning water waste	2		99	353		3,918		1,044	5,416	5,416		-	-	520	926	-	-	98,699	173	
1b.3.5	Small tool allowance		2	-	-	-	-	-	0	2	2			-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,100	-	-	-	-		165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,500	-	-	-	-	-	-	225	1,725	1,725	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	4,816	722	5,539	-	5,539	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,501	1,102	136	445	-	4,034	5,980	2,545	16,742	11,203	5,539	-	-	328	926	-	-	118,386	237	-
Period 1 1b.4.1	Deriod-Dependent Costs Decon supplies	29							7	36	36										
1b.4.1 1b.4.2	Insurance	29	-	-	-	-	-	688	69	757	757	-		-	-	-			-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	6,155	616	6,771	6,771	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies		296	-	-	-	-	-	74	371	371	-		-	-	-	-	-	-	-	
1b.4.5	Heavy equipment rental	-	283	-	-	-	-		42	326	326	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	8	4	-	23	-	7	42	42	-	-	-	358	-	-	-	7,159	12	-
1b.4.7		-	-	-	-	-	-	1,758	264	2,022	2,022	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381		-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,097	110	1,207	- 05	1,207	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	83 198	12 30	95 228	95	228	-	-	-		•		-	-	-
1b.4.11 1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	198	30 4	228	-	228	-	-	-	-			-	-	-
1b.4.12 1b.4.13	Security Staff Cost	-		-	-	-		337	51	387	387	-	-	-		-			-	-	6,149
1b.4.14	DOC Staff Cost		-	-	-	-	-	5,438	816	6,254	6,254	-		-	-	-			-		63,789
	Utility Staff Cost	-	-	-	-	-	-	16,140	2,421	18,561	18,561	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	29	580	8	4	-	23	32,265	4,556	37,465	36,003	1,462	-	-	358	-	-	-	7,159	12	
1b.0	TOTAL PERIOD 1b COST	3,323	1,682	144	449	-	4,056	48,844	10,060	68,558	60,666	7,001	891	-	686	926	-	-	125,545	31,816	327,358
PERIOI	O 1 TOTALS	3,323	2,773	158	456	-	4,095	117,967	20,398	149,171	121,152	26,485	1,535	-	1,296	926	-	-	137,735	31,836	836,775

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Marketing Anticing Protesting and Secure 1 (1982) 1982							Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
From From From From From From From From			Decon				Processing	Disposal				Lic. Term.	Management	Restoration	Volume		Class B	Class C		Processed		Contractor
No. Process	Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Note Process	ERIOD 2a - Laı	rge Component Removal																				
2.1.1.1 Control Colonial Filtery 26 97 30 83 271 280 1/5	eriod 2a Direct D	ecommissioning Activities																				
1.1.	uclear Steam Su	pply System Removal																				
14.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.							-		-				-	-	-		-	-	-			
March Marc							-						-	-	-		-	-				100
14.1.1.1 Marked Second Occorde Clare 1.077 2.086 1.080		-					-						-	-	-				-	,		
124.1.7 1962			502	4,584	,		-		-				-	-	-		-	-	-			
12.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.			110				-						-	-	-		-	-	-			
13. 17 Monte Powel 150 5,000 150 5,0							-						-	-	-							1,383
Second Content Conte		Vessel		5,369		1,195	-				18,874	18,874	-	-	-			-	-		31,267	1,383
Part	a.1.1 Totals		1,449	13,967	17,703	10,155	-	35,397	659	25,462	104,792	104,792	-	-	-	154,264	963	393	-	9,855,751	117,060	11,803
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1																						
Constitute Constitute Constitution Constitu			-				-	,					-	-	-		-	-	-			
20.1.4 Section 1.907 1	a.1.3 Main C	ondensers	-	1,528	1,965	1,020	-	5,039	-	1,991	11,544	11,544	-	-	-	75,240	-	-	-	3,906,532	20,428	-
20.1.4.1 Audillery Brieffring	0	8		4.00=						24.0	4.00=	4 00=									40.400	
24. 1.4. Set Merchanger Panchity 157 - 21. 1.08 1.08 - 2.07			-		-	-	-	-	-				-	-	-	-	-	-	-	-		
Assert Generate Storage Pacifity			-		-	-	-	-					-	-	-					-		
Page Part Systems Page Pa	a.1.4.4 Steam	Generator Storage Facility	-	57	-	-	-	-	-	9	66	66	-	-	-	-	-	-	-	-	507	-
2a.1.5.1 Asadisary Feedbatter 92 -	a.1.4 Totals		-	2,363	-	-	-	-	-	354	2,717	2,717	-	-	-	-	-	-	-	-	20,718	-
2a 1.52 Availary Steam S2	isposal of Plant S	Systems																				
2a.1.5.3 Auxiliary Stoam RCA 153 24 11 04 56 298 298 - 805 - 805 42,088 1,984 201. 201. 201. 201. 201. 201. 201. 201.			-		-	-	-	-	-				-		-	-	-	-	-	-		
Lai 1.5.4 Braik Andi Processing			-		- 24	- 11	-	- 54	-				-	95	-	- 805	-		-			
2a.1.5a. Chemistreed			-				-		-				-	-	-				-			
2a.1.5.7 Chemical Feed 68			-		-	-	-	-	-				-	35	-		-	-	-	-		
2a.1.5.8 (billed Water			-		5	2	-	11	-				-	- 79	-	159	-	-	-	8,312		
An 1.50 Circulating Water 375			-		-	-	-	-					-		-					-		
2a.1.5.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	a.1.5.9 Circula	ting Water	-		-	-	-	-	-	56		-	-		-	-	-	-	-	-	5,174	-
2a.1.5.12 Condensate Cleanup			-		-	-	-	-	-				-		-	-	-	-	-	-		
2a.1.5.1.8 Containment Spray 294 88 47 233 148 810 91 3.81 180.655 3.89 2a.1.5.1.6 Escapital Service Water 280 - - 18 138 - 138 - 3.81 2a.1.5.1.6 Execution Steam 223 - - 42 322 - 322 - 3.808 2a.1.5.1.7 Feedwater 372 - - - 56 428 - 428 - - 51,236 2a.1.5.1.8 Execution Steam 372 - - - 56 428 - 428 - - 51,236 2a.1.5.1.9 Gland Steam 67 - - - 134 1,025 - 10,255 - - 51,236 2a.1.5.20 Gland Water - - - - 57 47 - 77 77 - - - 52 2a.1.5.22 Main Steam RCA 380 - - - 57 437 - 437 - - 52 2a.1.5.23 Sittogen 4 1 1 3 2 10 10 - 49 2,447 50			-		-	-	-	-	-				-		-				-			
2a.1.5.16 Essential Service Water			-		88	47	-	233					-	-	-	3,481						-
2a.1.5.16 Extraction Steam 2b.1.5.17 Fedewater 2c.1.5.18 Fedewater 2c.1.5.18 Fedewater 2c.1.5.19 Fedewater 2c.1.5.19 Fedewater 2c.1.5.19 Fedewater 2c.1.5.19 Fedewater 2c.1.5.19 Fedewater 2c.1.5.20 Gland Water 2c.1.5.20 G			-		-	-	-	-	-			-	-		-	-	-	-	-	-		-
2a.1.5.17 Feedwater Prains			-		-	-	-	-	-				-		-	-	-	-	-	-		
2a.1.5.18 Feedwater Drains 2a.1.5.19 Gland Steam 67 67 67 68 167 68 177 68 189 2a.1.5.20 Gland Water 2a.1.5.20					-	-	-	-				-	-		-					-		
2a.1.5.20 Gland Water 59 - - - 59 - - - 59 - - - 59 - - 59 17 10 49 30 164 164 - - 726 37,727 769 2a.1.5.23 Min Steam RCA 59 17 10 49 30 164 164 - 726 37,727 769 2a.1.5.23 Nicrogen 4 1 1 3 2 10 10 - 49 . 2,47 50 2a.1.5.24 Non-Essential Service Water 210 - - 32 242 - 242 - - 49 . 2,47 50 2a.1.5.27 Non-Essential Service Water RCA 107 34 19 94 56 310 310 - 1,400 - 2,7290 1,358 2a.1.5.29 Croses Radiation Monitoring 53 3 1 7 16 81 81 . 109 - 5,726 753	a.1.5.18 Feedwa	ter Drains	-	891	-		-	-	-	134	1,025	-	-	1,025	-	-	-	-	-	-	12,366	-
2a.1.5.21 Main Steam CA			-		-	-	-	-	-			-	-		-	-	-	-	-	-		
2a.1.5.22 Min Steam RCA			-					-	-				-		-	-		-	-	-		-
2a.1.5.24 Non-Essential Service Water CA 2a.1.5.25 Non-Essential Service Water RCA 2a.1.5.26 Off Gas 2a.1.5.27 Process Radiation Monitoring 3a 19 9 9 9 5 66 310 310 310 - 1,400 - 72,790 1,358 2a.1.5.27 Process Radiation Monitoring 3a 1 7 7 16 81 81 81 - 5 109 - 5,726 753 2a.1.5.28 Process Sampling 3a 1 7 7 16 81 81 81 - 5 109 - 5,726 753 2a.1.5.29 Screen Wash 3a 6 9 9 68 9 68 9 9 9 9 9 9 9 9 9 9 9 9 9	a.1.5.22 Main S	team RCA	-		17	10	-	49	-			164	-	-	-	726	-	-	-	37,727	769	-
2a.1.5.25 Non-Essential Service Water RCA			-		1	1	-	3	-	_		10	-		-	49	-	-	-	2,447		
2a.1.5.26 Off Gas			-		9.4	- 10	-	- Q/I	-			- 910	-	242	-	1 400		-	-	- 79 700		
2a.1.5.27 Process Radiation Monitoring - 53 3 1 7 16 81 81 - 109 - 5726 753 2a.1.5.28 Process Sampling - 156 14 8 40 51 269 269 - 590 - 30,697 2,183 2a.1.5.29 Screen Wash - 59			-				-		-				-				-					
2a.1.5.29 Screen Wash 9 68 9 68 9 821 2a.1.5.30 Station Air 36 9 42 9 42 9 42 9 498 2a.1.5.31 Station Heating 130 130 130 149 1	a.1.5.27 Process	Radiation Monitoring	-	53	3	1	-	7	-	16	81	81	-	-	-	109	-	-	-	5,726	753	-
2a.1.5.30 Station Air - 36 - - - 5 42 - - 42 - - - 498 2a.1.5.31 Station Heating - 130 - - - 19 149 - - 149 - - - 1,771 2a.1.5.32 Switchgear Heat Removal - 10 - - - 2 12 - - 12 - - - 139 2a.1.5.33 Turbine Bldg Equip Drains - 1 - - - 0 1 - - 1 - - 17 2a.1.5.34 Turbine Glenerator - 67 - - - 10 77 - - 18 - - 1,399 2a.1.5.35 Turbine Oil - 103 - - - 15 118 - - 118 - - - 1,399			-		14	8	-	40	-				-	-	-	590	-	-	-	30,697		
2a.1.5.31 Station Heating - 130 - - - 19 149 - - 149 - - - - 1,771 2a.1.5.32 Switchgear Heat Removal - 10 - - - - 2 12 - - 12 - - - - 139 2a.1.5.33 Turbine Bldg Equip Drains - 1 - - - 0 1 - - 1 - - 17 2a.1.5.35 Turbine Generator - 67 - - - - 15 118 - - 18 - - - 1,399			-			-	-	-	-				-			-	-					-
2a.1.5.32 Switchgear Heat Removal - 10 - - - 2 12 - - 12 - - - - 139 2a.1.5.33 Turbine Bldg Equip Drains - 1 -	a.1.5.31 Station	Heating	-	130		-	-	-		-	149		-	149								-
2a.1.5.34 Turbine Generator - 67 - - - - - - 901 2a.1.5.35 Turbine Oil - 103 -	a.1.5.32 Switch	gear Heat Removal	-		-	-	-	-	-	_		-	-		-	-	-	-	-	-	139	
2a.1.5.35 Turbine Oil - 103 15 118 118 1,399			-	1	-	-	-	-	-	•		-	-	-	-	-	-	-	-	-		
			-			-	-	-	-				-				-		-	-		
	a.1.5.36 Waste		-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-		483	-
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	a.1.5 Totals		-	6,927	457	251	-	1,242	-	1,656	10,534	5,133	-	5,401	-	18,774	-	-	-	962,836	94,702	-
2a.1.6 Scaffolding in support of decommissioning - 1,293 9 5 - 24 - 331 1,662 1,662 359 18,654 18,871	a.1.6 Scaffold	ling in support of decommissioning	-	1,293	9	5	-	24	-	331	1,662	1,662	-	-	-	359	-	-	-	18,654	18,871	-

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	ousanus (of 2014 Dollar	18)											
Activit	v	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet		Cu. Feet	Cu. Feet		Manhours	Manhours
2a.1	Subtotal Period 2a Activity Costs	1,449	26,865	23,520	12,524	-	45,101	659	31,344	141,463	136,062	-	5,401	-	307,192	963	393	-	17,783,990	282,344	11,803
Period 2: 2a.2.1	a Additional Costs Remedial Action Surveys							2,161	648	2,809	2,809									34,055	
2a.2.1 2a.2.2	Asbestos Abatement		-	-	-	-	-	2,161	8		2,009		-	-	-		-		-	54,055	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,211	656		2,866		-	-	-	-	-	-	-	34,055	
	a Collateral Costs																				
2a.3.1 2a.3.2	Process decommissioning water waste Process decommissioning chemical flush waste	96	-	69	173	-	216	-	135	688	688	-	-	-	615	-	-	-	36,878	120	-
2a.3.3	Small tool allowance	-	362	-	-	-	-	-	54		374	-	42	-					-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	15,739	2,361	18,100	-	18,100	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	96	362	69	173	-	216	15,739	2,550	19,203	1,062	18,100	42	-	615	-	-	-	36,878	120	-
Period 2a 2a.4.1	a Period-Dependent Costs Decon supplies	95						_	24	118	118										
2a.4.2	Insurance	-		-		-	-	1,696	170		1,865		-						-		
2a.4.3	Property taxes	-		-	-	-	-	15,160	1,516		15,009	-	1,668	-	-	-	-	-	-	-	-
2a.4.4 2a.4.5	Health physics supplies Heavy equipment rental	-	2,427 3,556	-	-	-	-	-	607 533		3,034 4,089	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	3,556	98	50	-	277		86	,	511	-	-	-	4,324				86.474	141	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,729	409		3,138	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	1,026	103	,	1,128		-	-	-	-	-	-	-	-	-
2a.4.9 2a.4.10	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	3,111 270	311 41		311	3,422	-	-	-	-	-	-	-	-	-
2a.4.10 2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	648	97		- 311	745	-	-					-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12		-	90	-	-	-		-		-	-	-
2a.4.13	Security Staff Cost	-	-	-	-	-	-	1,030	155		1,185		-	-	-	-	-	-	-	-	18,794
2a.4.14 2a.4.15	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	21,496 $36,892$	3,224 5,534		24,720 42,426		-	-	-	-	-	-	-	-	259,703 483,526
2a.4.10 2a.4	Subtotal Period 2a Period-Dependent Costs	95	5,983	98	50	-	277	84,137	12,821		97,535		1,668	-	4,324	-	-	-	86,474	141	762,023
2a.0	TOTAL PERIOD 2a COST	1,639	33,209	23,687	12,748	-	45,594	102,745	47,370	266,992	237,525	22,357	7,110	-	312,130	963	393	-	17,907,340	316,660	773,826
PERIO	2b - Site Decontamination																				
Disposal	of Plant Systems																				
2b.1.2.1	Chemical & Volume Control	-	1,399	171	85		419	-	484		2,558	-	-	-	6,236	-	-	-	324,551	18,408	
2b.1.2.2 2b.1.2.3	Chilled Water RCA Component Cooling RCA	-	360 760	116 209	62 112		304 553		187 366		1,028 1,999	-	-		4,527 8,239				235,699 428,586	4,956 10,074	
2b.1.2.4	Electrical	-	3,573	-	-	-	-	-	536		-	-	4,109	-	-					48,490	-
2b.1.2.5	Electrical - Contaminated	-	1,432	137	87	-	430	-	492		2,578		-	-	6,418	-	-	-	333,233	19,322	
2b.1.2.6		-	2,162 152	372	227	-	1,123	-	892		4,776	-	- 175	-	16,763	-	-	-	870,329	29,753	
2b.1.2.7 2b.1.2.8	Emergency Diesel Generator Essential Service Water RCA	-	342	120	- 67	-	- 333	-	23 191		1,053	-	175	-	4,958		-		257,885	2,066 4,643	
2b.1.2.9		-	146	-	-	-	-		22		-	-	168	-	-		-			1,984	
	Fire Protection RCA	-	206	30	14		68	-	74		391	-	-	-	1,002	-	-	-	52,396	2,641	-
	HVAC-Auxiliary Building HVAC-Diesel Generator Room	•	637 50	104	65	-	323	-	260 8		1,390	-	- 58	-	4,827	-	-	-	250,668	8,352 682	-
	HVAC-Miscellaneous	-	48	-	-	-	-	-	7	56	_	-	56	-	_		-	-	-	656	_
2b.1.2.14	HVAC-Primary Containment	-	771	218	138	-	683	-	406	, -	2,216	-	-	-	10,197	-	-	-	529,451	10,184	-
	HVAC-Turbine Building	•	219	-	-	-	-	-	33		-	-	252	-	-	-	-	-	-	3,177	-
	Instrument Air Supply Instrument Air Supply RCA	-	54 84	- 11	- 5	-	24	-	8 29		153	-	62	-	354		-	-	18,493	760 1,096	
	Miscellaneous Drains	-	49	7	4	-	20	-	19		99	-	-	-	299		-	-	15,562	663	
2b.1.2.19	Primary Containment Purge	-	355	138	76		377	-	208	1,154	1,154		-	-	5,614	-	-	-	292,306	5,019	-
	Primary Water	-	76	7	3 90		15		24		125	-	-	-	218		-	-	11,425	1,032	
	Radioactive Waste Disposal Reactor Building Equipment Drains	-	1,168 123	171 18	90		446 47		434 46		2,309 243		-		6,808 695	-	-	-	345,754 36,107	16,011 1,619	
2b.1.2.23	Reactor Building Floor Drains	-	58	7	4	-	18		20	107	107		-	-	265	-	-	-	13,801	770	-
	Reactor Coolant	-	216	23	11		55		72		377	-	-	-	812	-	-	-	42,440	2,826	
	6 Residual Heat Removal 6 Safety Injection	-	244 1,118	$\frac{52}{247}$	30 140		147 694	-	107 499		580 2,697		-	-	2,184 10,622	-	-	-	113,636 537,761	3,334 15,372	
	Station Air RCA	-	1,118	247 5	140		11	-	499 14		2,697		-	-	10,622		-	-	8,811	15,372	
2b.1.2.28	Station Heating RCA	-	138	33	16		81	-	61	330	330	-	-	-	1,209	-	-	-	63,061	1,826	
	Waste Oil Sumps RCA	-	15.000	1	1 240	-	3		3		17		4.050	-	50		-	-	2,602	95	
2b.1.2	Totals	-	15,988	2,199	1,249		6,172		5,523		26,252		4,879	-	92,465		-	-	4,784,556	216,344	
2b.1.3	Scaffolding in support of decommissioning	-	1,940	14	7	-	36	-	496	2,494	2,494	-	-	-	539	-	-	-	27,981	28,306	-

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							`			,											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	\mathbf{Cost}	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
-																					
	ination of Site Buildings	0.800	1.041	20.	0.0 =		1 000		0.150	0.040	0.040				0.5.550				1 004 500	¥# 000	
2b.1.4.1 2b.1.4.2	Reactor Auxiliary Building	2,526 254	1,941 161	$\frac{235}{22}$	365 23	-	1,399 82		2,176 193	8,642 735	8,642 735	-	-	-	25,576 $1,329$	-	-	-	1,334,799 83,033	57,982 5,419	-
2b.1.4.2 2b.1.4.3	Refueling Water Storage Tank	463	554	42	25 19	-	82 87	-	399	1,564	1,564	-	-	-	1,329	-	-	-	72,866	13,642	-
2b.1.4.4	Steam Generator Storage Facility	74	0	0	0	_	0		37	111	111			-	1,504	_	_	-	46	993	-
2b.1.4	Totals	3,317	2,656	299	407	-	1,568		2,805	11,052	11,052	_	-	_	28,210	_	_	-	1,490,745	78,037	_
		-,-	,				,		,	,	,				-,				,,-	,	
2b.1	Subtotal Period 2b Activity Costs	3,317	20,583	2,512	1,664	-	7,776	-	8,825	44,677	39,798	-	4,879	-	121,214	-	-	-	6,303,281	322,688	-
D : 101	A1122 1.0 /																				
2b.2.1	Additional Costs License Termination Survey Planning							983	295	1,278	1,278										6,240
2b.2.1 2b.2.2	Remedial Action Surveys		-	-	-	-	-	3,118	935	4,053	4,053	-	-	-	-	-	-	-	-	49,147	6,240
2b.2.3	Asbestos Abatement		_	_	_	_	_	50	8	58	58			-		_	_	-	_	-	-
2b.2.4	Underground Services Excavation		554	-	-		-	-	83	637	637		-	-	-	-	-	-		2,755	
2b.2.5	Operational Tools and Equipment	-	-	9	52	-	189	-	56	306	306	-	-	-	5,855	-	-	-	146,375	16	-
2b.2	Subtotal Period 2b Additional Costs	-	554	9	52	-	189	4,151	1,377	6,333	6,333	-	-	-	5,855	-	-	-	146,375	51,918	6,240
D	0.11 - 1.01																				
	Collateral Costs	00		00	1.77		014		100	055	055				400				00 515	110	
2b.3.1 2b.3.3	Process decommissioning water waste Small tool allowance	92	418	68	171	-	214	-	132 63	677 480	677 480	-	-	-	609	-	-	-	36,517	119	-
2b.3.4	Decommissioning Equipment Disposition	-	418	184	96		472	-	151	903	903	-	-	-	7,054			-	366,237	- 88	-
2b.3.5	Spent Fuel Capital and Transfer	-		-	-	-		22,713	3,407	26,120	-	26,120	-	-	- 1,004				-	-	-
2b.3	Subtotal Period 2b Collateral Costs	92	418	252	267	-	686		3,753	28,181	2,061	26,120	-	-	7,662	-	-	-	402,755	207	-
	Period-Dependent Costs																				
2b.4.1	Decon supplies	838	-	-	-	-	-	-	209	1,047	1,047	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,197	120 552	1,316	1,316 6,072	-	-	-	-	-	-	-	-	-	-
2b.4.3 2b.4.4	Property taxes Health physics supplies	-	2,977	-	-	-	-	5,520	744	6,072 $3,722$	3,722	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	5,080	-	-	-	-		762	5,842	5,842		-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated		-	108	56	-	307		96	566	566	_	-	-	4,790	_	_	-	95,798	156	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	3,109	466	3,576	3,576	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,481	148	1,629	1,629	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	4,489	449	4,938	-	4,938	-	-	-	-	-	-	-	-	-
2b.4.10	Site O&M Cost	-	-	-	-	-	-	390	59	449	449	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	935	140	1,075	-	1,075	-	-	-	-	-	-	-	-	-
2b.4.12 2b.4.13	Liquid Radwaste Processing Equipment/Services ISFSI Operating Costs	-	-	-	-	-	-	474 113	71 17	545 130	545	130	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-	-	-	-	-	-	1,487	223	1,710	1,710	130	-	-	-	-	-	-	-	-	27,123
2b.4.15	DOC Staff Cost		-	-	-	-	-	20,595	3,089	23,684	23,684		-	-	-	-	_	-		-	266,297
2b.4.16	Utility Staff Cost	-	-	-	-	-	-	36,076	5,411	41,487	41,487	-	-	-	-	-	-	-	-	-	495,609
2b.4	Subtotal Period 2b Period-Dependent Costs	838	8,058	108	56	-	307	75,865	12,557	97,788	91,644	6,143	-	-	4,790	-	-	-	95,798	156	789,029
2b.0	TOTAL PERIOD 2b COST	4,247	29,613	2,882	2,039	-	8,957	102,730	26,511	176,979	139,836	32,264	4,879	-	139,522	-	-	-	6,948,210	374,969	795,269
DEDIOD	2e - Delay before License Termination																				
FERIOD	2e - Delay before License Termination																				
Period 2e	Period-Dependent Costs																				
2e.4.1	Insurance	-		-	-	-	-	942	94	1,037	1,037	-	-	-					-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	931	93	1,024	1,024	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	177	-		-		-	44	221	221	-	-	-	-	-	-	-	-		-
2e.4.4	Disposal of DAW generated	-	-	4	2	-	12		4	22	22	-	-	-	186	-	-	-	3,714	6	-
2e.4.5	Plant energy budget NRC Fees	-	-	-	-	-	-	473	- 477	- #90	-	-	-	-	-	-	-	-	-	-	-
2e.4.6 2e.4.7	Emergency Planning Fees	-		-	-	-	-	3,537	47 354	520 3,891	520	3,891	-	-	-				-	-	-
2e.4.7 2e.4.8	Site O&M Cost	-		-	-	-	-	307	46	353	- 353	5,031	-	-	-				-	-	-
2e.4.9	ISFSI Operating Costs	-	-	-	-	-	-	89	13	102	-	102	-	-	-	-			-	-	-
2e.4.10	Security Staff Cost	-	-	-	-	-	-	639	96	735	735	-	-	-	-	-	-		-	-	11,657
2e.4.11	Utility Staff Cost	-	-	-	-	-	-	1,830	274	2,104	2,104	-	-	-	-	-	-	-	-	-	27,200
2e.4	Subtotal Period 2e Period-Dependent Costs	-	177	4	2	-	12	8,748	1,066	10,009	6,016	3,993	-	-	186	-	-	-	3,714	6	38,857
2e.0	TOTAL PERIOD 2e COST	-	177	4	2	-	12	8,748	1,066	10,009	6,016	3,993	-	-	186	-	-	-	3,714	6	38,857
PERIOD	2f - License Termination																				
Period 9f	Direct Decommissioning Activities																				
2f.1.1	ORISE confirmatory survey	-		-	-	_	_	172	52	224	224	_	_	_				_	-	_	_
2f.1.2	Terminate license								J 2	a											
2f.1	Subtotal Period 2f Activity Costs	-		-	-	-	-	172	52	224	224	-	-	-	-				-	-	-

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	usumus (oi 2014 Dollar	,											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activit Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 2	2f Additional Costs																				
2f.2.1 2f.2	License Termination Survey Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,331 7,331	2,199 2,199	9,530 9,530	9,530 9,530	-	-	-	-	-	-	-	-	97,452 97,452	3,120 3,120
Period 2	2f Collateral Costs																				
2f.3.1 2f.3	DOC staff relocation expenses Subtotal Period 2f Collateral Costs	-	-	-	-	-		1,163 1,163	175 175	1,338 1,338	1,338 1,338	-	-	-	-		-	-	-	-	-
	2f Period-Dependent Costs																				
2f.4.1 2f.4.2	Insurance Property taxes	-	-	-	-	-	-	381 376	38 38	419 414	419 414	-	-	-	-	-	-	-	-	-	-
2f.4.2	Health physics supplies	-	601	-		-		-	150	752		-	-	-					-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	4	-	22	-	7	40	40	-	-	-	337	-	-	-	6,734	11	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	264	40	304	304	-	-	-	-	-	-	-	-	-	-
2f.4.6 2f.4.7	NRC Fees Emergency Planning Fees	-		-	-			455 $1,431$	46 143	501 1,574	501	1,574	-	-					-	-	
2f.4.8	Site O&M Cost	-	-	-	-	-	-	124	19	143	143	-	-	-	-		-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	36	5	41	-	41	-	-	-	-	-	-	-	-	-
2f.4.10	Security Staff Cost	-	-	-	-	-	-	1,648 3,870	247 580	1,895	1,895 4,450	-	-	-	-	-	-	-	-	-	27,893
2f.4.11 2f.4.12	DOC Staff Cost Utility Staff Cost		-	-	-	-	-	4,980	747	4,450 $5,727$	5,727	-	-	-					-	-	46,750 60,107
2f.4	Subtotal Period 2f Period-Dependent Costs	-	601	8	4	-	22	13,565	2,060	16,259	14,645	1,615	-	-	337	-	-	-	6,734	11	134,750
2f.0	TOTAL PERIOD 2f COST	-	601	8	4	-	22	22,231	4,485	27,351	25,736	1,615	-	-	337	-	-		6,734	97,463	137,870
PERIO	D 2 TOTALS	5,886	63,600	26,581	14,792	-	54,584	236,455	79,432	481,331	409,113	60,229	11,989	-	452,174	963	393	-	24,866,000	789,097	1,745,822
PERIO	D 3b - Site Restoration																				
Period 3	3b Direct Decommissioning Activities																				
	tion of Remaining Site Buildings																				
	Reactor	-	8,057	-	-	-	-	-	1,209	9,266	-	-	9,266	-	-	-	-	-	-	69,546	-
3b.1.1.2 3b.1.1.3		-	6,941 1,234	-	-	-	-	-	1,041 185	7,982 1,419	-	-	7,982 1,419	-					-	61,038 11,692	-
3b.1.1.4		-	516	-	-	-	-		77	593	-	-	593	-					-	4,559	-
3b.1.1.5		-	6,833	-	-	-	-	-	1,025	7,858	-	-	7,858	-	-	-	-	-	-	70,342	-
3b.1.1.6 3b.1.1	Turbine Pedestal Totals	-	1,627 $25,209$	-	-	-	-	-	244 3,781	1,872 $28,990$	-	-	1,872 28,990	-	-	-	-	-	-	12,628 229,806	-
Site Clos	seout Activities																				
3b.1.2	Grade & landscape site	-	986	-	-	-	-	-	148	1,134	-	-	1,134	-	-	-	-	-	-	1,942	-
3b.1.3	Final report to NRC	-	- 00 105	-	-	-	-	193 193	29 3,958	222	222	-	30,124	-	-	-	-	-	-	991 749	1,560
3b.1	Subtotal Period 3b Activity Costs	-	26,195	-		-	-	195	5,958	30,346	222	-	50,124	-	-	-	-	-	-	231,748	1,560
Period 3 3b.2.1	Bb Additional Costs Concrete Crushing		662	_				4	100	766			766							2,798	
3b.2	Subtotal Period 3b Additional Costs	-	662	-	-	-	-	4	100	766	-	-	766	-	-	-	-	-	-	2,798	-
	Bb Collateral Costs		222						40	200			200								
3b.3.1 3b.3	Small tool allowance Subtotal Period 3b Collateral Costs	-	320 320	-	-	-	-	-	48 48	368 368	-	-	368 368	-	-	-	-	-	-	-	-
Period 3	Bb Period-Dependent Costs																				
3b.4.1	Insurance	-	-	-	-	-	-	627	63	690	-	690	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	7,568	-	-	-	-	1,239	124	1,363	-	1,363	- 8,704	-	-	-	-	-	-	-	-
3b.4.3 3b.4.4	Heavy equipment rental Plant energy budget	-	7,568	-		-	-	- 435	1,135 65	8,704 500	-	-	8,704 500		-	-	-			-	
3b.4.5	NRC ISFSI Fees	-	-	-		-	-	314	31	346	-	346	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-		4,708	471	5,179		5,179	-		-	-	-	-	-	-	
3b.4.7 3b.4.8	ISFSI Operating Costs Site O&M Cost	-	-	-	-	-	-	118 409	18 61	136 470	-	136	470	-	-	-	-	-	-	-	-
3b.4.8 3b.4.9	Site O&M Cost Security Staff Cost	-	-	-		-		5,175	776	5,951	- 0	4,880	1,071		-	-	-	-	-	-	87,29
3b.4.10	DOC Staff Cost	-	-	-		-	-	11,846	1,777	13,623	-	-	13,623	-	-	-	-	-	-	-	137,043
3b.4.11		-		-	-	-	-	7,283	1,093	8,376	-	1,591	6,785	-	-	-	-	-	-	-	87,294
3b.4	Subtotal Period 3b Period-Dependent Costs	-	7,568	-	-	-	-	32,155	5,614	45,338	0	14,184	31,153	-	-	-	-	-	-	-	311,630
3b.0	TOTAL PERIOD 3b COST	-	34,745	-	-	-	-	32,352	9,720	76,817	222	14,184	62,411	-	-	-	-	-		234,546	313,190

Table C-1
Braidwood Nuclear Power Station Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111)	ousanus (of 2014 Dollar	(5)											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs		Contingency	Costs	Costs	Costs	Costs	Cu. Feet		Cu. Feet				Manhours	Manhours
PERIOD 3c - Fuel Stor	rage Operations/Shipping																				
Period 3c Direct Decomn	missioning Activities																				
Period 3c Collateral Cost	ots																				
	apital and Transfer	-	-	-	-	-	-	9,313	1,397		-	10,709	-	-	-	-	-	-	-	-	-
3c.3 Subtotal Perio	iod 3c Collateral Costs	-	-	-	-	-	-	9,313	1,397	10,709	-	10,709	-	-	-	-	•	-	-		•
Period 3c Period-Depend	dent Costs							# 4 # 0				0.04=									
3c.4.1 Insurance 3c.4.2 Property taxe	PS .	-	-	-	-	-		5,470 10,808	547 1,081	6,017 11,888	-	6,017 11,888	-	-	-		-	-	-	-	-
3c.4.4 NRC ISFSI F		-		-	-	-		3,297	330	3,626	-	3,626	-	-			-		-	-	-
3c.4.5 Emergency P		-	-	-	-	-	-	41,069	4,107		-	45,176	-	-		-	-	-	-	-	-
3c.4.6 Site O&M Cos 3c.4.7 ISFSI Operat		-		-		-		3,568 1,033	535 155		-	4,104 1,188	-	-	-		-	-	-	-	
3c.4.8 Security Staff		-		-		-		36,799	5,520		-	42,319	-	-	-			-	-	-	609,043
3c.4.9 Utility Staff (-	-	-	-	-	-	11,866	1,780	13,646	-	13,646	-	-	-	-	-	-	-	-	152,486
3c.4 Subtotal Perio	iod 3c Period-Dependent Costs	-	-	-	-	-	-	113,910	14,054	127,964	-	127,964	-	-	-	-	-	-	-	-	761,529
3c.0 TOTAL PERI	IOD 3c COST	-	-	-	-	-	-	123,222	15,451	138,673	-	138,673	-	-	-	-	-	-	-	-	761,529
PERIOD 3d - GTCC sh	hipping																				
Period 3d Direct Decomp	missioning Activities																				
Nuclear Steam Supply S	System Removal																				
3d.1.1.1 Vessel & Inte		-	-	625	-	-	12,062		1,966		14,653		-	-	-	-	-	2,217	433,180	-	-
3d.1.1 Totals 3d.1 Subtotal Perio	iod 3d Activity Costs	-	-	$625 \\ 625$	-	-	12,062 12,062		1,966 1,966		14,653 14,653		-	-	-	-	-	2,217 $2,217$	433,180 433,180	-	-
50.1 Subtotal Peri	iod 5d Activity Costs	-	-	628	-	-	12,062	-	1,966	14,653	14,600	-	-	-	-	-		2,211	455,180	•	-
Period 3d Period-Depend	dent Costs																				
3d.4.1 Insurance 3d.4.2 Property taxe	22	-	-	-	-	-	-	10 19	$\frac{1}{2}$	11 21	-	11 21	-	-	-	-	-	-	-	-	-
3d.4.4 Emergency P		-		-		-		73	7	80	-	80	-	-	-		-		-	-	-
3d.4.5 Site O&M Cos	ost	-	-	-	-	-	-	6	1	7	-	7	-	-	-	-	-	-	-	-	-
3d.4.6 ISFSI Operat		-	-	-	-	-	-	2	0	_	-	2	-	-	-	-	-	-	-	-	1 000
3d.4.7 Security Staff 3d.4.8 Utility Staff (-	-	-		-	-	$\frac{65}{21}$	10 3		-	75 24	-	-	-	-			-	-	1,080 270
	iod 3d Period-Dependent Costs	-		-		-		196	24		-	220	-	-	-			-	-	-	1,350
3d.0 TOTAL PERI		-		625	_	-	12,062	196	1,990	14,873	14,653	220	_	_		-	-	2,217	433,180	_	1,350
PERIOD 3e - ISFSI De							,		,	ŕ	,							ŕ	,		,
Period 3e Direct Decomn	missioning Activities																				
Period 3e Additional Cos																					
3e.2.1 License Term			200	207	324	_	893	1,592	804	4,022	4,022	_		_	14,549		-		1,178,830	11,786	1,032
	iod 3e Additional Costs	-	200	207	324		893		804		4,022	-	-	-	14,549	-	-	-	1,178,830	11,786	1,032
Period 3e Period-Depend	dent Costs																				
3e.4.1 Insurance	acii Costs	-		-	-	-	-	62	15	77	77	-	-			-	-	-	-		-
3e.4.2 Property taxe		-	-	-	-	-	-	163	41	204	204	-	-	-	-	-	-	-	-	-	-
3e.4.3 Plant energy		-	-	-	-	-	-	148	37	- 184	- 184	-	-	-	-	-	-	-	-	-	2,468
3e.4.4 Security Staff 3e.4.5 Utility Staff (-		-		-		148	37		187	-	-	-			-	-	-	-	2,468 1,870
	iod 3e Period-Dependent Costs	-	-	-	-	-	-	522	130		652	-	-	-	-	-	-	-	-	-	4,338
3e.0 TOTAL PERI	IOD 3e COST	-	200	207	324	-	893	2,114	935	4,674	4,674	-		-	14,549	-	-	-	1,178,830	11,786	5,370
PERIOD 3f - ISFSI Sit	te Restoration																				
Period 3f Direct Decomm	missioning Activities																				
Period 3f Additional Cos	ets																				
3f.2.1 Site Restorati	tion ISFSI	-	1,147	-	-	-	-	28	176		-	-	1,351		-	-	-	-	-	13,036	80
3f.2 Subtotal Perio	iod 3f Additional Costs	-	1,147	-	-		-	28	176	1,351	-	-	1,351	-	-	-	-	-	-	13,036	80

Table C-1 **Braidwood Nuclear Power Station Unit 1** DECON Decommissioning Cost Estimate (Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Davied of	Collateral Costs																				
3f.3.1	Small tool allowance		18					_	વ	20			20	_				_	_		
3f.3	Subtotal Period 3f Collateral Costs		18						3	20			20								
51.5	Subtotal I effor of Collateral Costs		10						0	20			20								
Period 3f	Period-Dependent Costs																				
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	86	9	95	-	-	95	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	116	-	-	-	-	-	17	134	-	-	134	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	30	5	35	-	-	35	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	78	12	90	-	-	90	-	-	-	-	-	-	-	1,307
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	65	10	75	-	-	75	-	-	-	-	-	-	-	810
3f.4	Subtotal Period 3f Period-Dependent Costs	-	116	-	-	-	-	260	52	428	-	-	428	-	-	-	-	-	-	-	2,117
3f.0	TOTAL PERIOD 3f COST	-	1,281	-	-	-	-	288	231	1,799	-	-	1,799	-	-	-	-	-	-	13,036	2,197
PERIOD	3 TOTALS	-	36,227	832	324	-	12,956	158,171	28,327	236,837	19,549	153,078	64,210	-	14,549	-	-	2,217	1,612,010	259,367	1,083,637
TOTAL O	COST TO DECOMMISSION	9,209	102,600	27,572	15,573	-	71,635	512,593	128,157	867,339	549,813	239,792	77,734	-	468,019	1,889	393	2,217	26,615,740	1,080,300	3,666,233

TOTAL COST TO DECOMMISSION WITH 17.34% CONTINGENCY:	\$867,339	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 63.39% OR:	\$549,813	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 27.65% OR:	\$239,792	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 8.96% OR:	\$77,734	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	470,300	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	Cubic Feet
TOTAL SCRAP METAL REMOVED:	54,939	Tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,080,300	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
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(iio ubuiiub	01 2014 Dolla												
Activity	,	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet			Cu. Feet		Manhours	
PERIOD	1a - Shutdown through Transition																				
	Direct Decommissioning Activities							40	10	5 0	5 0										***
1a.1.1 1a.1.2	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	•	69	10	79 a	79	-	-	-	-	•	-	-	-	-	556
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							400	4.0	a	400										0=0
1a.1.6 1a.1.7	Prepare and submit PSDAR Review plant dwgs & specs.	•	-	-	-	-	-	106 244	16 37	122 281	122 281	-	-	-	-	-	-	-	-	-	856 1,969
1a.1.7	Perform detailed rad survey	-	-	-	-	-	-	244	37	201 a	201	-	-	-	•	-	-	-	-	-	1,500
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	53	8	61	61	-	-	-		-	-	-	-	-	428
1a.1.10	End product description	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	428
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	69	10	79	79	-	-	-	-	-	-	-	-	-	556
1a.1.12 1a.1.13	Define major work sequence Perform SER and EA	-	-	-	-	-	-	398 164	60 25	457 189	457 189	-	-	-		-	-		-	-	3,210 1,327
1a.1.14	Perform Site-Specific Cost Study		_		_	-	-	265	40	305	305	_	_		-	-	_		_	-	2,140
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	217	33	250	250	-	-	-	-	-	-	-	-	-	1,753
1a.1.16	Receive NRC approval of termination plan									a											
	Specifications Plant & temporary facilities		_				_	261	39	300	270	_	30	_	_	_	_	_	_	_	2,106
	Plant systems		-	-	-	-	-	221	33	254	229	-	25	-	-	-	-		-	-	1,783
	NSSS Decontamination Flush	-	-	-	-	-	-	27	4	30	30	-	-	-	-	-	-	-	-	-	214
	Reactor internals	-	-	-	-	-	-	376	56	433	433	-	-	-	-	-	-	-	-	-	3,039
	Reactor vessel	-	-	-	-	-	-	345	52	396	396	-	-	-	-	-	-	-	-	-	2,782
	Biological shield Steam generators	-	-	-	-	-	-	27 165	4 25	30 190	30 190	-	-	-		-	-		-	-	214 1,335
	Reinforced concrete		-	-	-	-	-	85	13	98	49	-	49	-	-	-	-		-	-	685
	Main Turbine	-	-	-	-	-	-	21	3	24	-	-	24	-		-	-		-	-	171
	0 Main Condensers	-	-	-	-	-	-	21	3	24	-	-	24	-	-	-	-	-	-	-	171
	1 Plant structures & buildings	-	-	-	-	-	-	165	25	190	95	-	95	-	-	-	-	-	-	-	1,335
	2 Waste management	-	-	-	-	-	-	244	37	281	281	-	- 95	-	-	-	-	-	-	-	1,969 385
1a.1.17.1. 1a.1.17	3 Facility & site closeout Total	-	-	-	-	-	-	48 2,006	7 301	55 $2,307$	27 2,031	-	27 276	-	-	-	-	-	-	-	16,190
	& Site Preparations																				
	Prepare dismantling sequence	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,027
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
1a.1.20 1a.1.21	Design water clean-up system Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	74 $2,300$	11 345	85 $2,645$	85 $2,645$	-	-	-	-	-	-	-	-	-	599 -
1a.1.21	Procure casks/liners & containers	-	-	-	-	-	-	2,300	10	75	75	-	-	-		-	-		-	-	526
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	9,211	1,382	10,592	10,317	-	276	-	-	-	-	-	-	-	31,566
Period 1a	Additional Costs																				
1a.2.1	ISFSI Expansion	-	-	-	-	-	-	4,800	720	5,520	-	5,520		-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	4,800	720	5,520	-	5,520	-	-	-	-	-	-	-	-	-
	Collateral Costs									a											
1a.3.1	Spent Fuel Capital and Transfer Subtotal Period 1a Collateral Costs	-		-	-	-	-	9,633 9,633	1,445	11,078 11,078	-	11,078 11,078		-	-	-	-		-	-	-
1a.3		•	-	-	-	-	-	9,633	1,445	11,078	-	11,078	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs							1.01#	101	1.002	1.003										
1a.4.1 1a.4.2	Insurance Property taxes	-		-	-	-	-	1,815	181	1,996	1,996	-	-	-	-	-	-		-	-	-
1a.4.2 1a.4.3	Health physics supplies	-	528	-	-	-			132	660	660	-	-	-					-	-	
1a.4.4	Heavy equipment rental	-	566		-	-	-	-	85	651	651	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	14	1 7	-	39		12	72	72	-	-	-	611	-	-	-	12,224	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,758	264	2,022	2,022	-	-	-	-	-	-	-	-	-	-
1a.4.7 1a.4.8	NRC Fees Emergency Planning Fees	-		-	-	-		836 2,194	84 219	920 2,413	920	2,413	-	-	-				-		-
1a.4.9	Site O&M Cost	-		-	-	-		165	25	190	190	2,410	-	-					-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456		-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-		48	7	55	-	55	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	8,971	1,346	10,317	10,317	-	-	-	-	-	-	-	-	-	157,903
1a.4.13 1a.4	Utility Staff Cost Subtotal Period 1a Period-Dependent Costs	-	1,094	14		- '	- 39	32,151 48,335	4,823 7,237	36,974 56,727	36,974 53,802	2,925	-	-	611	-	-	-	12,224	20	424,560 582,463
14.4	Daniotal i erioù la i erioù-Dependent Costs	-	1,094	14	. /	-	99	40,000	1,231	50,141	55,002	4,320	-	-	011	-	-	-	14,424	20	904,403

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(11	iousanus	01 2014 Dolla	13)											
Activit	hv.	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial /	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet				Wt., Lbs.	Manhours	Manhours
1a.0	TOTAL PERIOD 1a COST	-	1,094	14	1 7	-	39	71,979	10,784	83,917	64,119	19,522	276	-	611	-	-	-	12,224	20	614,029
PERIO	D 1b - Decommissioning Preparations																				
Period 1	b Direct Decommissioning Activities																				
	l Work Procedures Plant systems							951	90	200	960		29								9.096
1b.1.1.1 1b.1.1.2				-		-	-	251 53	38 8	289 61	260 61		29						-		2,026 428
	Reactor internals	-	-		-		-	133	20	152	152		-	-	-	-	-	-	-	-	1,070
	Remaining buildings	-	-	-	-	-	-	72	11	82	21	-	62	-	-	-	-	-	-	-	578
	CRD cooling assembly	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	428
	CRD housings & ICI tubes	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	428
	Incore instrumentation	-	-	-	-	-	-	53 192	8 29	61 221	61 221	-	-	-	-	-	-	-	-	-	428 1,554
	Reactor vessel Facility closeout	-	-	-	-	-	-	64	10	73	37	-	- 37	-	-	-	-	-	-	-	1,554 514
	0 Missile shields	-	_	_	-		-	24	4	27	27	_	-	-	-	-	-	-	-	_	193
	1 Biological shield	-	-	-	-	-	-	64	10	73	73	-	-	-	-	-	-	-	-	-	514
	2 Steam generators	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	-	1,969
	3 Reinforced concrete	-	-	-	-	-	-	53	8	61	30	-	30	-	-	-	-	-	-	-	428
	4 Main Turbine	-	-	-	-	-	-	83	12	95	-	-	95	-	-	-	-	-	-	-	668
	5 Main Condensers	-	-	-	-	-	-	83	12	95	-	-	95	-	-	-	-	-	-	-	668
	6 Auxiliary building 7 Reactor building	-	-	-	-	-	-	145 145	22 22	166 166	150 150	-	17 17	-	-	-	-	-	-	-	1,168 1,168
1b.1.1.1 1b.1.1		-	-	-	-		-	1,763	264	2,027	1,646	-	381		-	-	-	-	-	-	14,228
1b.1.2 1b.1	Decon primary loop Subtotal Period 1b Activity Costs	730 730		-		-	-	- 1,763	365 629	1,095 3,122	1,095 2,741	-	381	-	-	-		-	-	1,067 1,067	- 14,228
Period 1	b Additional Costs																				
1b.2.1	Site Characterization	-	-	-	-	-	-	2,771	831	3,602	3,602	-	-	-	-	-	-	-	-	13,042	4,640
1b.2.2	Spent Fuel Pool Isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	13,583	2,453	16,037	16,037	-	-	-	-	-	-	-	-	13,042	4,640
	b Collateral Costs	947							140	1,089	1,089										
1b.3.1 1b.3.2	Decon equipment DOC staff relocation expenses	947	-	-	-	-	-	1,163	142 175	1,089	1,338	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	51	-	36	91	-	114		72	365	365		-	-	325	-	-	-	19,489	63	-
1b.3.4	Process decommissioning chemical flush waste	2		90			3,550		945	4,907	4,907			-	-	839	-	-	89,417	157	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,500		-	-	-	-		225	1,725	1,725	-	-	-	-	-	-	-	-	-	-
1b.3.8 1b.3	Spent Fuel Capital and Transfer Subtotal Period 1b Collateral Costs	2,500	1,102	126	- 3 411	-	3,664	4,816 5,980	722 2,446	5,539 16,229	10,690	5,539 5,539	-	-	325	- 839	-	-	108,906	- 220	-
Period 1	b Period-Dependent Costs																				
1b.4.1	Decon supplies	29	-	-	-	-	-	-	7	36	36	-	-	-	-				-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	690	69	759	759	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	6,172	617	6,789	6,789	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	296	-	-	-	-	-	74	370	370	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	283	-	-	-	-	-	42	326	326	-	-	-	-	-	-	-	- 7.150	- 10	-
1b.4.6 1b.4.7	Disposal of DAW generated Plant energy budget	-	-	8	5 4	-	23	1,758	264	$\frac{42}{2,022}$	42 2,022	-	-	-	398	-	-	-	7,159	12	-
1b.4.7 1b.4.8	NRC Fees	-	-	-	-	-	-	234	23	2,022	257	-	-	-					-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,097	110	1,207	-	1,207	-	-					-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	83	12	95	95	-,	-	-	-	-	-	-	-	-	-
1b.4.11		-	-	-	-	-	-	198	30	228	-	228	-	-	-	-	-	-	-	-	-
1b.4.12		-	-	-	-	-	-	24	4	28	-	28	-	-	-	-		-	-	-	
1b.4.13		-	-	-	-	-	-	4,486	673	5,158	5,158	-	-	-	-	-	-	-	-	-	78,951
1b.4.14 1b.4.15		-	-	-	-	-	-	5,438	816	6,254 $18,561$	6,254 $18,561$	-	-	-	-	-	-	-	-	-	63,789
1b.4.15 1b.4	Utility Staff Cost Subtotal Period 1b Period-Dependent Costs	29	580	- 8	3 4		23	16,140 $36,320$	2,421 $5,169$	42,133	40,671	1,462			358	-	-		7,159	12	213,326 356,066
1b.0	TOTAL PERIOD 1b COST	3,259	1,682	135	5 415	-	3,687	57,646	10,698	77,521	70,139	7,001	381	_	683	839	-	_	116,066	14,341	374,934
	D 1 TOTALS	3,259					3,726		21,482	161,438	134,258	26,523	657		1,294				128,289	14,361	988,963
LEVIO	DITOIALS	5,259	4,116	148	422	-	5,726	149,640	41,482	101,458	134,238	26,923	7.60	-	1,294	839	-	-	140,469	14,561	900,903

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(11	lousanu	s of 2014 Dolla	113)											
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	Class A	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Large Component Removal	Cost	Cost	Costs	Costs	Costs	Costs	Costs	contingency	Costs	Costs	Costs	Costs	ou. Teet	cu. r ccr	cu. i cct	ou. reet	cu. rect	W., 155.	Mumours	Mumours
	ect Decommissioning Activities																				
Nuclear Steam	n Supply System Removal																				
2a.1.1.1 Rea	actor Coolant Piping	248	207	39	53		271	-	256	1,075	1,075	-	-	-	1,838	-	-	-	210,083	6,092	-
	essurizer Relief Tank actor Coolant Pumps & Motors	42 134	38 138	7 158	10 212		47 1,390	-	45 497	189 2,530	189 2,530	-	-		329 4,796			-	36,553 780,540	1,072 4,291	100
	essurizer	65	79	536	115		879	-	343	2,017	2,017	-	-		3,033				284,696	2,505	938
	am Generators DMs/ICIs/Service Structure Removal	500 119	4,584 358	2,543 219	2,997 56		10,502 141	-	4,725 214	25,852 1,107	25,852 1,107	-	-	-	62,711 2,843	-	-	-	3,280,862 109,650	23,233 6,533	3,500
	actor Vessel Internals	188	3,194	8,540	1,772		8,243	330		31,504	31,504	-	-		1,878		393	-	329,968	31,267	1,383
	actor Vessel	150	5,369	2,487	1,195		2,847	330		18,874	18,874	-	-	-	9,361	- 963	- 202	-	960,884	31,267	1,383
2a.1.1 Tota		1,446	13,967	14,530	6,412	-	24,321	659	21,814	83,149	83,149	-	-	-	86,788	963	393	-	5,993,236	106,260	7,303
Removal of Ma 2a.1.2 Mai	ajor Equipment in Turbine/Generator	_	773	3,324	1,256		3,337	_	1,548	10,237	10,237	_			57,484	_			2,984,647	10,371	_
	in Condensers	-	1,528	1,965	1,022		5,039	-	1,992	11,546	11,546	-	-	-	75,240		-	-	3,906,532	20,428	-
Cascading Cos	sts from Clean Building Demolition																				
	actor	-	1,397	-	-	-	-	-	210	1,607	1,607	-	-	-	-	-	-	-	-	12,130	-
	xiliary Building dwaste/Service Building	-	785 513	-	-	-	-	-	118 77	902 590	902 590	-	-	-	-	-	-	-	-	6,896 5,059	-
2a.1.4.4 Ref	ueling Water Storage Tank	-	137		-	-			21	158	158	-	-		-				-	1,299	-
2a.1.4.5 Fue 2a.1.4 Tota	el Handling Building		403 3,235					-	60 485	463 3,720	463 3,720	-	-							3,690 29,075	-
			0,200						400	5,120	5,720									20,010	
Disposal of Pla 2a.1.5.1 Aux	ant Systems xiliary Feedwater	_	85	_					13	97	_	_	97						_	1,143	_
	xiliary Steam	-	153	-	-	-	-	-	23	176	-	-	176	-	-	-	-	-	-	2,107	-
	xiliary Steam RCA	-	410 593	74 88	37 48	-	183 238	-	161	864 1,190	864 1,190	-	-	-	2,714 3,611	-	-	-	141,487	5,387 7,871	-
	ric Acid Processing 2 & H2	-	21	- 00	- 48	-	200	-	224 3	1,190	1,190	-	24		5,611	-	-	-	184,114	289	-
	2 & H2 RCA	-	39	7	4	-	18	-	16	84	84	-	-	-	276	-	-	-	14,104	492	-
	emical Feed emical Feed at Intake	-	194 27		-	-		-	29 4	223 30		-	223 30			-		-	-	2,663 364	-
2a.1.5.9 Chi	illed Water	-	107	-	-	-		-	16	124	-	-	124	-	-	-	-	-	-	1,454	-
2a.1.5.10 Circ 2a.1.5.11 Con		-	641 392			-		-	96 59	737 450	-	-	737 450		-	-		-	-	8,814 5,317	-
2a.1.5.12 Con	ndensate Booster	-	391	-	-	-	-	-	59	449		-	449	-	-	-	-	-	-	5,314	-
	ndensate Cleanup ntainment Spray	-	214 289	- 87	47	-	231	-	32 146	246 800	800	-	246	-	- 3,455	-	-	-	- 179,291	3,000 3,839	-
2a.1.5.14 Con 2a.1.5.15 Die		-	212	-	- 47	-	201	-	32	244	-	-	244			-	-	-	179,291	2,848	-
	sential Service Water	-	368	-	-	-	-	-	55	423	-	-	423	-	-	-	-	-	-	5,049	-
2a.1.5.17 Ext 2a.1.5.18 Fee		-	263 357		-	-		-	39 53	302 410		-	302 410			-		-	-	3,637 4,925	-
2a.1.5.19 Fee	edwater Drains	-	845	-	-	-	-	-	127	972	-	-	972	-	-	-	-	-	-	11,719	-
2a.1.5.20 Gla 2a.1.5.21 Gla		-	44 33		-	-		-	7 5	51 37	-	-	51 37	-	-	-	-	-	-	616 458	-
2a.1.5.22 Mai	in Steam	-	363		-	-			54	417		-	417		-				-	4,979	-
2a.1.5.23 Mai		-	96	23	13	-	64	-	44	240	240	-	- 010	-	947	-	-	-	49,262	1,292	-
2a.1.5.24 Mai 2a.1.5.25 Niti	ke-up Demineralizer rogen	-	183 1	-	-	-		-	27 0	210 1	-	-	210 1		-	-		-	-	2,595 18	-
2a.1.5.26 Nor	n-Essential Service Water	-	426			-	-	-	64	490	-	-	490	-	-	-	-	-		5,903	-
2a.1.5.27 Nor 2a.1.5.28 Off	n-Essential Service Water RCA	-	205 850	87 176	51 97	-	251 478	-	130 364	724 1,965	724 1,965	-	-		3,738 7,112	-		-	194,273 370,343	2,692 11,479	-
2a.1.5.29 Pota	able Water	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	75	-
2a.1.5.30 Pro 2a.1.5.31 Pro	ocess Radiation Monitoring	-	85 188	4 15	2	-	9 41	-	24 60	125 312	125 312	-	-	-	134 615	-	-	-	7,021 31,992	1,219 2,649	-
2a.1.5.32 Scr	een Wash	-	53	- 10	- 0		- 41	-	8	61	- 512	-	61		- 010	-			31,332	740	-
2a.1.5.33 Star			51 174	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	705	-
2a.1.5.34 Star 2a.1.5.35 Stea	tion Heating am Humidification	-	174 8	-				-	26 1	200 10		-	200 10				-	-		2,391 115	-
2a.1.5.36 Swi	itchgear Heat Removal	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	519	-
	rbine Bldg Equip Drains rbine Bldg Floor Drains	-	91 155	•	•	-	•	-	14 23	104 179	•	-	104 179	-		-	-	-	-	1,235 2,117	-
2a.1.5.39 Tur	rbine Oil		98	-				-	15	112	-	-	112			-	-	-		1,359	-
2a.1.5.40 Tur	rbine-Generator Auxilaries	-	65	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	884	-

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							`			,											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activit	y	Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	of Plant Systems (continued)									40			40							*15	
	Waste Oil Sumps Well Water	-	38 92	-		-	-	-	6 14	43 106		-	43 106	-	-	-	-	-	-	517 1,247	-
2a.1.5.42 2a.1.5	Totals		8,943	560	307	-	1,512	-	2,097	13,419	6,302	•	7,116	-	22,603	-	-	-	1,171,887	122,034	-
24.1.0	100010		0,010	900	501		1,012		2,001	10,110	0,502		1,110		22,000				1,171,007	122,001	
2a.1.6	Scaffolding in support of decommissioning	-	1,908	15	8	-	37		489	2,456	2,456	-	-	-	556	-	-	-	28,884	27,854	-
2a.1	Subtotal Period 2a Activity Costs	1,446	30,353	20,394	9,004	-	34,246	659	28,424	124,527	117,411	-	7,116	-	242,672	963	393	-	14,085,190	316,021	7,303
Poriod 9	a Additional Costs																				
2a.2.1	Remedial Action Surveys							2,161	648	2,809	2,809									34,055	-
2a.2.2	Asbestos Abatement		-	-	-	-		50	8	58	58		_	-	-	-	-	-	-	-	_
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,211	656	2,866	2,866	-	-	-	-	-	-	-	-	34,055	-
	a Collateral Costs																				
2a.3.1	Process decommissioning water waste	97	-	70	176	-	219		137	699	699	-	-	-	625	-	-	-	37,506	122	-
2a.3.2 2a.3.3	Process decommissioning chemical flush waste Small tool allowance	-	419	-	-	-	-	-	- 63	482	433	-	48	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	15,739	2,361	18,100	-	18,100	40	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	97	419	70	176	-	219	15,739	2,560	19,281	1,133	18,100	48	-	625	-	-	-	37,506	122	-
								-,	,	-, -	,	-,									
	a Period-Dependent Costs																				
2a.4.1	Decon supplies	95	-	-	-	-	-	-	24	118	118	-	-	-	-		-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,695	170	1,865	1,865	-	-	-	-	-	-	-	-	-	-
2a.4.3 2a.4.4	Property taxes Health physics supplies	-	2,591	-	-	-	-	15,159	1,516 648	16,675 3,239	15,007 3,239	-	1,667	-	-	-	-	-	-	-	-
2a.4.4 2a.4.5	Heavy equipment rental		$\frac{2,551}{3,556}$		-	-			533	4,089	4,089						-			-	
2a.4.6	Disposal of DAW generated		-	99	51	-	281		88	519	519	_	_	_	4.389	-	-	-	87,787	143	_
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,729	409	3,138	3,138	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	714	71	785	785	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,111	311	3,422	-	3,422	-	-	-	-	-	-	-	-	-
2a.4.10	Site O&M Cost	-	-	-	-	-	-	270	41	311	311	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	648 78	97 12	745 90	-	745 90	-	-	-	-	-	-	-	-	-
2a.4.12 2a.4.13	Security Staff Cost	-	-	-	-	-	-	12,364	1,855	14,218	14,218	- 50	-	-	-	-	-	-	-	-	216,134
2a.4.14	DOC Staff Cost		-	-	-	-		21,496	3,224	24,720	24,720		_	-	-	-	-	-	-	-	259,703
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	36,892	5,534	42,426	42,426	-	-	-	-	-	-	-	-	-	483,526
2a.4	Subtotal Period 2a Period-Dependent Costs	95	6,147	99	51	-	281	95,156	14,532	116,361	110,437	4,257	1,667	-	4,389	-	-	-	87,787	143	959,363
2a.0	TOTAL PERIOD 2a COST	1,638	36,919	20,563	9,231		34 747	113,765	46,173	263,035	231,846	22,357	8,832		247,686	963	393		14,210,480	350,342	966,666
		1,000	50,515	20,000	3,231		51,111	110,700	40,175	200,000	251,040	22,001	0,002		241,000	300	000		14,210,400	550,542	300,000
PERIO	D 2b - Site Decontamination																				
Period 2	b Direct Decommissioning Activities																				
Disposal	of Plant Systems																				
	Chemical & Volume Control	-	1,338	164	82	-	407	-	465	2,456	2,456	-	-	-	6,063	-	-	-	315,292	17,657	-
2b.1.1.2		-	742	180	95	-	470	-	335	1,823	1,823	-	-	-	7,000	-	-	-	364,517	9,521	-
2b.1.1.3		-	790	224	122	-	600	-	388	2,123	2,123	-	-	-	8,936	-	-	-	464,778	10,502	-
	Electrical Floatrical Contaminated	-	4,890	194	123	-	608	-	734 732	5,624	3,824	-	5,624	-	9,079	-	-	-	471,393	66,259 29,048	-
2b.1.1.6	Electrical - Contaminated Electrical - RCA		2,166 2,815	194 454	278	-	1,372		1,134	3,824 6,054	5,824 6,054	-	-	-	20,491	-		-	1,063,899	29,048 38,351	-
	Emergency Diesel Generator	-	111	-	-	-	1,572		1,154	127	-	-	127	-	20,431				1,005,655	1,514	-
2b.1.1.8	0 1		385	209	122	-	601	-	286	1,603	1,603	-	-	-	8,972		-	-	466,273	5,336	-
2b.1.1.9		-	362	-	-	-	-	-	54	416	´-	-	416	-	-	-	-	-	´-	4,983	-
	Fire Protection RCA	-	597	153	85	-	419	-	282	1,537	1,537	-	-	-	6,243	-	-	-	324,808	7,672	-
	HVAC-Auxiliary Building	-	694	116	73	-	361	-	286	1,531	1,531	-	-	-	5,390		-	-	279,889	9,167	-
	2 HVAC-Control Room HVAC	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	127	-
	B HVAC-Diesel Generator Room HVAC-Laboratory	-	51 23	-	-	-	-	-	8	58 27		-	58 27	-			-	-	-	686 315	-
	5 HVAC-Machine Shop	-	25 21	-	-	-	-		3 3	24	-	-	24	-	-			-	-	297	-
	5 HVAC-Primary Containment	-	771	218	139	-	683		406	2,217	2,217	-	-	-	10,197				529,451	10,184	-
	7 HVAC-Pumphouse	-	20	-	-	-	-		3	23	-,	-	23	-	-				-	275	-
2b.1.1.18	B HVAC-Radwaste	-	398	68	43	-	213	-	166	888	888	-	-	-	3,177	-	-	-	164,931	5,099	-
	HVAC-Turbine Building	-	218	-	-	-	-	-	33	250	-	-	250	-	-	-	-	-	-	3,158	-
	Instrument Air Supply	-	85	-	-	-	-	-	13	97	-	-	97	-	1 000	-		-	-	1,197	-
	I Instrument Air Supply RCA 2 Miscellaneous Drains	-	276	31	14	-	68	-	91	480	480	-	-	-	1,002 592	-	-	-	52,414	3,630	-
	2 Miscellaneous Drains 3 Primary Containment Purge	-	94 374	15 138	8 76	-	40 375	-	$\frac{36}{212}$	192 1,175	192 1,175	-	-	-	5,582				30,841 290,664	1,259 5,256	-
20.1.1.20	, I Illiary Comaniment I urge	-	914	100	10	-	515	-	414	1,110	1,110	-	-	-	0,002	-	-	-	230,004	5,256	-

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(io abanas	6 01 2014 Dolla	,											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activi: Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
			0000	00000	0000	00000	00000	COSTS	contingency	00505	COBUB	00000	0 0505	04,1000	04,100	04,100	04,100	04,100	1101, 22001	in a second	iliani ou i
	l of Plant Systems (continued) 4 Primary Water		1,040	234	136		670		471	2,551	2,551				10.451				#10.204	14 949	
	5 Radioactive Waste Disposal	-	3,439	523	282		1,391	-	1,302	6,937	6,937	-		-	10,451 $21,101$				519,324 1,078,202	14,343 45,313	
	6 Reactor Bldg Equipment Drains	_	135	25	14		67		55	295	295	_		_	997	-	-		51,818	1,790	-
	7 Reactor Building Floor Drains	-	51	6			16	-	18	95	95	-	-	-	245	-	-	-	12,768	678	-
	8 Reactor Coolant	-	205	22	10		51	-	68	357	357	-	-	-	763	-	-	-	39,871	2,697	-
	9 Residual Heat Removal	-	236	51	29		143	-	104	564	564	-	-	-	2,129	-	-	-	110,771	3,232	-
	0 Safety Injection 1 Station Air RCA	-	1,086	241	137		676	-	485	2,625	2,625	-	-	-	10,357	-	-	-	523,998	14,960	-
	2 Station Heating RCA	-	65 281	8 60	4 32		19 156	-	22 120	118 648	118 648	-	-	-	283 2,315	-	-		14,808 120,573	833 3,664	-
	3 Waste Oil Sumps RCA	_	29	4	2		100		10	56	56	_	-	_	149	-	-		7,762	370	-
	4 Waste Water Treatment	-	105	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	1,464	-
2b.1.1	Totals	-	23,901	3,340	1,910	-	9,416	-	8,360	46,926	40,148	-	6,778	-	141,515	-	-	-	7,299,044	320,838	-
2b.1.2	Scaffolding in support of decommissioning	-	2,385	18	9	-	47	-	611	3,070	3,070	-	-	-	695	-	-	-	36,104	34,817	-
	mination of Site Buildings	0.50		25=	2		4 05-		0.45-	0.04-	0.0/-				C= ===				1.001.00	*= 0.5-	
2b.1.3.1		2,526 299	1,941 196	235 22	366 28		1,399 94	-	2,176 229	8,643 869	8,643 869	-	-	-	25,576 $1,545$	-	-	-	1,334,799 101,706	57,982 6,427	-
2b.1.3.2 2b.1.3.3		197	196	10			55 55	-	138	509	509	-	-		988			-	68,345	3,692	-
2b.1.3.4	<u> </u>	463	554	42			87		399	1,564	1,564	_	_	_	1,304	-	-		72,866	13,642	-
2b.1.3	Totals	3,484	2,781	309			1,634	-	2,942	11,584	11,584	-	-	-	29,412	-	-	-	1,577,717	81,743	-
2b.1	Subtotal Period 2b Activity Costs	3,484	29,067	3,667	2,352	-	11,097	-	11,913	61,581	54,803	-	6,778	-	171,623	-	-	-	8,912,865	437,399	-
Period 2	b Additional Costs																				
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	3,111	933	4,044	4,044	-	-	-	-	-	-	-	-	49,033	-
2b.2.2	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
2b.2	Subtotal Period 2b Additional Costs	-	-	•	-	•	-	3,161	941	4,102	4,102	-	-	-	-	-	-	-	•	49,033	-
	Cb Collateral Costs	07		70	101		005		120	715	715				040				20 520	105	
2b.3.1 2b.3.2	Process decommissioning water waste Process decommissioning chemical flush waste	97		72	181	-	225	-	139	715	715	-	-	-	642	-	-	-	38,539	125	-
2b.3.2 2b.3.3	Small tool allowance	-	559	-					84	643	643	-				-			-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	_	-	22,687	3,403	26,090	-	26,090		-	-	-	-		-	-	-
2b.3	Subtotal Period 2b Collateral Costs	97	559	72	181		225	22,687	3,626	27,448	1,358	26,090	-	-	642	-	-	-	38,539	125	-
	b Period-Dependent Costs																				
2b.4.1	Decon supplies	898	-	-	-	-	-		224	1,122	1,122	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,195	120	1,315	1,315	-	-	-	-	-	-	-	-	-	-
2b.4.3 2b.4.4	Property taxes Health physics supplies	-	3,628	-	-	-	-	5,505	550 907	6,055 4,535	6,055 4,535	-	-	-	_	-	-		-	-	-
2b.4.5	Heavy equipment rental	_	5,074	-	_	_	-		761	5,835	5,835	_	-	_	-	-	-		-	-	-
2b.4.6	Disposal of DAW generated	-	-	141	73	-	400		125	738	738	-	-	-	6,244	-	-		124,887	204	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	3,106	466	3,572	3,572	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,029	103	1,132	1,132	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees Site O&M Cost	-		-	-	-	-	4,484	448	4,932	- 449	4,932	-					-	-	-	-
2b.4.10 2b.4.11	Site O&M Cost Spent Fuel Pool O&M	-		-	-	-	-	390 1,397	58 210	448 1,606	448	1,606	-		-		-	-	-	-	-
2b.4.11 2b.4.12	-	-		-	-	-	-	473	71	544	544	1,000	-						-	-	-
2b.4.13		-	-	-	-	-	-	113	17	130	-	130	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-		-	-	-	-	17,822	2,673	20,495	20,495	-	-						-	-	311,551
2b.4.15		-	-	-	-	-	-	29,773	4,466	34,240	34,240	-	-	-	-	-	-	-	-	-	359,577
2b.4.16 2b.4	Utility Staff Cost Subtotal Period 2b Period-Dependent Costs	- 898	- 8,703	- 141	- 73	-	400	51,088 116,375	7,663 18,863	58,751 $145,452$	58,751 138,783	6,668	-	-	6,244	-	-	-	124,887	204	667,434 1,338,563
2b.0	TOTAL PERIOD 2b COST	4,479		3,880			11,722		35,343	238,583	199,046	32,759		-	178,509	-	-	-	9,076,291	486,760	1,338,563
PERIO	D 2d - Decontamination Following Wet Fuel Storage																				
Period 9	dd Direct Decommissioning Activities																				
2d.1.1	Remove spent fuel racks	1,412	139	369	143	-	705	-	975	3,744	3,744	-	-	-	10,524	-	-	-	546,426	2,174	-
Disposa	l of Plant Systems																				
	Fuel Handling Bldg Equip Drains	-	206	34	18		91	-	80	429	429	-	-	-	1,386	-	-	-	70,185	2,721	-
2d.1.2.2		-	37	4	2		9	-	12	63	63	-	-	-	129		-	-	6,739	479	-
2d.1.2.3		-	210	33			82	-	79	420	420	-	-	-	1,241	-	-	-	63,725	2,768	-
2d.1.2.4 2d.1.2.5		-	147 279	23 49			58 133	-	55 112	295 601	295 601	-	-	-	874 1,989	-	-	-	44,626 103,404	1,978 3,712	-
∠u.1.∠.∂	r der r oor Coornig & Creanup	-	419	49	21	-	199	•	112	001	001	-	-	-	1,009	-	-	-	100,404	0,112	-

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(11	iousanas	of 2014 Dolla	rs)											
Activit Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet		Craft Manhours	Utility and Contractor Manhours
Disposal	of Plant Systems (continued)																				
2d.1.2.6	Fuel Pool Cooling & Cleanup (Unit 1)	-	259		25	-	124	-	104	559	559	-	-		1,857		-	-	96,476	3,463	-
2d.1.2.7		-	128		-	-	- 01.6	-	19	148	1 100	-	148	-	-	-	-	-	0.45 1.00	1,769	-
2d.1.2.8 2d.1.2	Tritium ALPS Totals	-	472 1,737				316 813		218 679	1,180 3,694	1,180 3,546	-	148		4,948 12,424	-	-		245,163 630,319	6,507 23,396	-
			-,							-,	-,				,				,		
	mination of Site Buildings Fuel Handling Building	1 200	1,539	111	63		257		1 191	4,423	4,423				3,927				231,370	38,265	
2d.1.3.1 2d.1.3	Totals	1,322 1,322	1,539				257 257	-	1,131 1,131	4,423	4,423	-	-		3,927				231,370		-
2d.1.4	Scaffolding in support of decommissioning	-	477			-	9	_	122	614	614	_	-	_	139	_	-	_	7,221	6,963	_
2d.1	Subtotal Period 2d Activity Costs	2,735	3,893		372		1,784	_	2,908	12,474	12,327		148	_	27,014	_	_	_	1,415,337	70,799	_
		2,100	5,000	100	012		1,701		2,000	12,111	12,021		110		21,011				1,110,001	10,100	
Period 2 2d.2.1	d Additional Costs License Termination Survey Planning	_		_			_	983	295	1,278	1,278	_	_	_	_	_	_	_			6,240
2d.2.1	Remedial Action Surveys	-	-	-	-	-	-	918	275	1,193	1,193	-	-	-	-	-	-	-	-	14,465	-
2d.2.3	Underground Services Excavation	-	554	-	-	-	-	-	83	637	637	-	-	-		-	-	-	-	2,755	-
2d.2.4 2d.2	Operational Tools and Equipment Subtotal Period 2d Additional Costs		- 554	9			189 189		56 709	306 3,415	306 3,415	-	-	-	5,855 5,855				146,375 146,375	16 17,236	6,240
20.2	Subtotal Feriou 2d Additional Costs		001	3	02	-	100	1,501	103	0,410	5,410				9,000				140,575	17,200	0,240
	d Collateral Costs	4.7.		2.2	010		OF C		100	0.00	0.80				E00				40.00=	4.60	
2d.3.1 2d.3.2	Process decommissioning water waste Process decommissioning chemical flush waste	115	-	86	216	-	270	-	166	853	853	-	-	-	768				46,097	150	-
2d.3.3	Small tool allowance	-	120	-	-	-	-		18	138	138	-	-	-			-		-	-	-
2d.3.4	Decommissioning Equipment Disposition	-		184			472		151	903	903	-	-	-	7,054	-	-	-	366,237	88	-
2d.3	Subtotal Period 2d Collateral Costs	115	120	270	312	-	742	-	335	1,895	1,895	-	-	-	7,822	-	-	-	412,335	238	-
Period 2	d Period-Dependent Costs																				
2d.4.1	Decon supplies	185	-	-	-	-	-	-	46	232	232	-	-	-	-	-	-	-	-	-	-
2d.4.2 2d.4.3	Insurance Property taxes	-	-	-	-	-	-	351 346	35 35	386 381	386 381	-	-	-	-			-		-	-
2d.4.4	Health physics supplies	-	762	-	-	-	-	-	191	953	953	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,489		- 10	-	100	-	223	1,713	1,713	-	-	-	1 505	-	-	-	91.040	-	-
2d.4.6 2d.4.7	Disposal of DAW generated Plant energy budget	-	-	36	19	-	102	486	32 73	189 559	189 559	-	-	-	1,597			-	31,949	52	-
2d.4.8	NRC Fees	-	-	-	-	-	-	253	25	279	279	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,316	132	1,448	-	1,448	-	-	-	-	-	-	-	-	-
2d.4.10 2d.4.11	Site O&M Cost Liquid Radwaste Processing Equipment/Services	-		-		-		114 278	17 42	132 320	132 320	-	-	-	-				-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	33	5	38	-	38	-	-	-	-	-	-	-	-	-
2d.4.13	Security Staff Cost	-	-	-	-	-	-	2,854	428	3,282	3,282	-	-	-	-	-	-	-	-	-	48,070
2d.4.14 2d.4.15	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	6,020 10,969	903 1,645	6,923 12,614	6,923 12,614	-	-	-	-	-	-	-	-	-	72,286 138,066
2d.4.15 2d.4	Subtotal Period 2d Period-Dependent Costs	185	2,252	36	19		102		3,832	29,446	27,960		-	-	1,597		-		31,949	52	258,421
2d.0	TOTAL PERIOD 2d COST	3,035	6,819	1,098	755	-	2,817	24,921	7,784	47,231	45,597	1,486	148	-	42,289	-	-	-	2,005,995	88,325	264,661
PERIO	D 2f - License Termination																				
Pariod 9	f Direct Decommissioning Activities																				
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license							450	* 0	a	224										
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	•
	f Additional Costs							9,744	2,923	12,667	12,667									132,123	9 100
2f.2.1 2f.2	License Termination Survey Subtotal Period 2f Additional Costs	-	-	-	-	-		9,744	2,923 2,923	12,667	12,667	-	-		-	-	-	-	-	132,123	3,120 3,120
								-,	_,,,,_	-,	,									,	5,230
Period 2 2f.3.1	f Collateral Costs DOC staff relocation expenses	_	_	_				1,163	175	1,338	1,338	_	_	_	-	-	_	_			_
2f.3.1 2f.3	Subtotal Period 2f Collateral Costs	-	-				-	1,163	175 175	1,338	1,338		-	-	-	-	-	-			-
								, -		, ,	,										
Period 2 2f.4.1	f Period-Dependent Costs Insurance	_				_		381	38	419	419	<u>-</u>	_	-	_	-	-	_	_		_
2f.4.2	Property taxes	-	-		-	-		376	38	414	414	-	-						-	-	-
2f.4.3	Health physics supplies	-	705		-	-	-	-	176	881	881	-	-	-	-	-	-	-	-	-	-
2f.4.4 2f.4.5	Disposal of DAW generated Plant energy budget	-	-	8	4	· · · · · · · · · · · · · · · · · · ·	22	- 264	7 40	40 304	40 304		-	-	337	-	-	-	6,734	11	-
41.4.0	I failt cliefgy budget	-	-	-	-	-	-	404	40	504	504	-	-	-	-	-	-		-	-	-

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(11	iousanus	6 01 2014 Dolla	115)											
Activity Index		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	Class A Cu. Feet	Burial Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet		Craft Manhours	Utility and Contractor Manhours
Pariod 26	f Period-Dependent Costs (continued)																				
2f.4.6	NRC Fees	_		-	-	_	-	302	30	333	333	_	_	-			-		-	_	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	1,431	143	1,574	-	1,574	-	-	-	-	-	-	-	-	-
2f.4.8	Site O&M Cost	-	-	-	-	-	-	124	19	143	143	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	36	5	41	-	41	-	-	-	-	-	-	-	-	-
2f.4.10 2f.4.11	Security Staff Cost DOC Staff Cost	-	-	-	-	-	-	1,648 3,870	247 580	1,895 4,450	1,895 4,450	-	-	-	-	-	-	-	-	-	27,893 46,750
2f.4.11	Utility Staff Cost		-	-	-	-	-	4,980	747	5,727	5,727	-		-	-	-	-	-	-	-	60,107
2f.4	Subtotal Period 2f Period-Dependent Costs	-	705	8	4	-	22		2,070	16,220	14,605	1,615	-	-	337	-	-	-	6,734	11	
2f.0	TOTAL PERIOD 2f COST	-	705	8	4	-	22	24,492	5,220	30,449	28,834	1,615	-	-	337	-	-	-	6,734	132,134	137,870
PERIOI	D 2 TOTALS	9,153	82,771	25,549	12,596	-	49,307	305,401	94,520	579,297	505,324	58,216	15,758	-	468,821	963	393	-	25,299,500	1,057,561	2,707,761
PERIOI	D 3b - Site Restoration																				
Period 3l	b Direct Decommissioning Activities																				
Demoliti	ion of Remaining Site Buildings																				
	Reactor		8,057	-	-	-	-	-	1,209	9,266	-	-	9,266	-	-	-	-	-	-	69,546	-
3b.1.1.2	Aux Feedwater-Steam Tunnel/Penetr. Area	-	795	-	-	-	-	-	119	914	-	-	914	-	-	-	-	-	-	5,187	
3b.1.1.3		-	7,062	-	-	-	-	-	1,059	8,121	-	-	8,121	-	-	-	-	-	-	62,064	
3b.1.1.4		-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	295	
3b.1.1.5	e e e e e e e e e e e e e e e e e e e	-	31 265	-	-	-	-	-	5 40	36 305	-	-	36 305	-	-	-	-	-	-	340 2,887	
3b.1.1.6 3b.1.1.7		-	397	-	-	-	-	-	60	457	-	-	457	-	-	-			-	4,193	
3b.1.1.8		-	112	-	-	-	-	-	17	129	-	-	129	-	-	-	-		-	1,190	
3b.1.1.9		-	1,788	-	-	-	-		268	2,056	-	-	2,056	-	-	-	-		-	15,283	
	0 Make-up Demineralizer Area	-	764	-	-	-	-	-	115	878	-	-	878	-	-	-	-	-	-	8,158	
	1 Miscellaneous Warehouses	-	2,333	-	-	-	-	-	350	2,683	-	-	2,683	-	-	-	-	-	-	26,794	
	2 Miscellaneous Yard Structures	-	1,517	-	-	-	-	-	228	1,744	-	-	1,744	-	-	-	-	-	-	14,701	
	Radwaste/Service Building Receiving Building	-	4,681 218	-	-	-	-	-	702 33	5,383 250	-	-	5,383 250	-	-	-	-	-	-	45,685 2,293	
	5 Refueling Water Storage Tank	-	1,234	-	-	-	-	-	185	1,419	-	-	1,419	-	-	-	-		-	11,692	
	8 River Screen House	-	726	-	-	-	-	-	109	835	-	-	835	-	-	-	-		-	6,844	
3b.1.1.17	7 Security Modifications	-	1,084	-	-	-	-	-	163	1,246	-	-	1,246	-	-	-	-	-	-	6,939	-
	8 Sewage Treatment Plant	-	124	-	-	-	-	-	19	143	-	-	143	-	-	-	-	-	-	1,330	
	9 Tech Support Center & Cond Cleanup Bldg	-	594	-	-	-	-	-	89	683	-	-	683	-	-	-	-	-	-	6,095	
	0 Turbine Building 1 Turbine Pedestal	-	6,833 1,627	-	-	-	-	-	1,025 244	7,858 1,872		-	7,858 1,872	-	-	-	-	-	-	70,342 12,628	
	2 Waste Treatment Building	-	1,027	-	-	-	-	-	18	1,072	-	-	141	-	-	-	-		-	1,265	
	Fuel Handling Building	-	3,632	-	-	-	-	-	545	4,177	-	-	4,177	-	-	-	-	-	_	33,245	
3b.1.1		-	44,032	-	-	-	-	-	6,605	50,637	-	-	50,637	-	-	-	-	-	-	408,996	
Site Clos	seout Activities																				
3b.1.2	Remove Rubble	-	294	-	-	-	-	-	44	339	-	-	339	-	-	-	-	-	-	1,367	
3b.1.3	Grade & landscape site	-	986	-	-	-	-	-	148	1,134	-	-	1,134	-	-	-	-	-	-	1,942	
3b.1.4 3b.1	Final report to NRC Subtotal Period 3b Activity Costs	-	45,312	-	-		-	83 83	12 6,809	95 $52,204$	95 95	-	52,109	-	-	-	-	-		412,305	668 668
Period 31	b Additional Costs																				
3b.2.1	Concrete Crushing		1,120	-	-	-	-	6	169	1,295	-	-	1,295	-	-		-	-	-	4,730	-
3b.2.2	Cofferdam Construction and Teardown	-	889	-	-	-	-	-	133	1,023	-	-	1,023	-	-	-	-	-	-	7,391	
3b.2	Subtotal Period 3b Additional Costs	-	2,009	-	-	-	-	6	302	2,317	-	-	2,317	-	-	-	-	-	-	12,121	-
	b Collateral Costs																				
3b.3.1	Small tool allowance	-	574	-	-	-	-	-	86	660	-	-	660	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	574	-	-	-	•	-	86	660	-	•	660	-	-	-	-	-	-	-	-
Period 3l 3b.4.1	b Period-Dependent Costs Insurance							627	63	690	_	690									
3b.4.1	Property taxes	-	-	-		-	-	1,239	124	1,363	-	1,363	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	7,568	-	-	-	-		1,135	8,704	-	-	8,704	-			-			-	_
3b.4.4	Plant energy budget	-	-	-	-	-	-	435	65	500	-	-	500	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	314	31	346	-	346	-		-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	•	-	-	-	-	-	4,708	471	5,179	-	5,179	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	118	18	136	-	136	470	-	-	-	-	-	-	-	-
3b.4.8	Site O&M Cost	-	-	-	-	-		409	61	470	-	-	470	-	-		-	-	-	-	-

Table C-2
Braidwood Nuclear Power Station Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(T)	housands	of 2014 Dolla	rs)											
Activity		Decon							Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	endent Costs (continued)																				
3b.4.9 Security St		-	-	-	-	-	-	5,175	776	5,951	0	,	1,071	-	-	-	-	-	-	-	87,294
3b.4.10 DOC Staff		-	-	-	-	-	-	11,846	1,777	13,623	-	1 701	13,623	-	-	-	-	-	-	-	137,043
3b.4.11 Utility Stat 3b.4 Subtotal Po	or Cost Period 3b Period-Dependent Costs	-	7,568	-	-	-	-	7,283 $32,155$	1,093 5,614	8,376 45,338	- 0	1,591 14,184	6,785 31,153	-	-	-	-		-	-	87,294 311,630
		-	1,500	•	-	-	-	32,199	5,614	40,000	U	14,164	31,133	-		•	-	-	-	-	
	ERIOD 3b COST	-	55,463	-	-	-	-	32,244	12,812	100,519	95	14,184	86,239	-	-	-	-	-	-	424,426	312,298
	Storage Operations/Shipping																				
Period 3c Direct Decor	mmissioning Activities																				
Period 3c Collateral C	Costs l Capital and Transfer							9,313	1 207	10,709		10,709									
	Period 3c Collateral Costs		-		-	-	-	9,313	1,397 1,397	10,709	-	10,709	-	-		-	-	-			
Danied to Danied Dane	and ant Costs																				
Period 3c Period-Depe 3c.4.1 Insurance			_	_			_	5,470	547	6,017	_	6,017	_	_	_	_	_	_	_	_	_
3c.4.1 Insurance 3c.4.2 Property ta		-	-	-	-	-		10,808	1,081	11,888	-	11,888	-	-					-	-	-
3c.4.3 Plant energ		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4 NRC ISFS		-	-	-	-	-	-	3,297	330	3,626	-	3,626	-	-	-	-	-	-	-	-	-
	y Planning Fees	-	-	-	-	-	-	41,069	4,107	45,176	-	45,176	-	-	-	-	-	-	-	-	-
3c.4.6 Site O&M		-	-	-	-	-	-	3,568	535	4,104	-	4,104	-	-	-	-	-	-	-	-	-
3c.4.7 ISFSI Oper 3c.4.8 Security St	erating Costs	-	-	-	-	-	-	1,033 36,799	155 5,520	1,188 42,319	-	1,188 42,319	-	-	-	-	-	-	-	-	609,043
3c.4.9 Utility Stat			-	-	-	-	-	11,866	1,780	13,646	-	13,646	-	-	-	-	-	-	-	-	152,486
	Period 3c Period-Dependent Costs	-	-	-	-	-	-	113,910	14,054	127,964	-	127,964	-	-	-	-	-	-	-	-	761,529
3c.0 TOTAL PE	ERIOD 3c COST		-	-	-	-	-	123,222	15,451	138,673	-	138,673		-	-	-	-	-	-	-	761,529
PERIOD 3d - GTCC	shipping																				
Period 3d Direct Deco	ommissioning Activities																				
Nuclear Steam Supply	y System Removal																				
	nternals GTCC Disposal	-	-	625		-	12,062		1,966	14,653	14,653		-	-	-	-	-	2,217	433,180	-	-
3d.1.1 Totals		-	-	625		-	12,062		1,966	14,653	14,653		-	-	-	-	-	2,217			-
3d.1 Subtotal Po	Period 3d Activity Costs	-	-	625	-	-	12,062	-	1,966	14,653	14,653	-	-	-	-	-	-	2,217	433,180	-	-
Period 3d Period-Depe									_												
3d.4.1 Insurance		-	-	-	-	-	-	10 19	1 2	11 21	-	11 21	-	-	-	-	-	-	-	-	-
3d.4.2 Property to 3d.4.3 Plant energy		-	-	-	-	-	-	19	2	21	-	21	-	-	-	-		-	-	-	-
	y Planning Fees	_	_	_	-	-	-	73	7	80	_	80	-	-	-	-	-	-	_	_	_
3d.4.5 Site O&M		-	-	-	-	-	-	6	1	7	-	7	-	-	-	-	-	-	-	-	-
	erating Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.7 Security St		-	-	-	-	-	-	65	10	75	-	75	-	-	-	-	-	-	-	-	1,080
3d.4.8 Utility Stat 3d.4 Subtotal Po	off Cost Period 3d Period-Dependent Costs	-	-	-	-	-	-	21 196	3 24	$\frac{24}{220}$	-	24 220	-	-	-	-	-	-	-	-	270 1,350
		-			-		-						-	•	-	-	-	-	-	-	ŕ
	ERIOD 3d COST	•	-	625	· -	-	12,062	196	1,990	14,873	14,653	220	-	-	-	-	-	2,217	433,180	-	1,350
PERIOD 3e - ISFSI																					
	ommissioning Activities																				
Period 3e Additional C 3e.2.1 License Te	Costs ermination ISFSI		200	207	324	1 -	893	1,592	804	4,022	4,022				14,549				1,178,830	11,786	1,032
	Period 3e Additional Costs	-	200				893		804	4,022	4,022			-	14,549		-	-	1,178,830	11,786	
Period 3e Period-Depe																					
3e.4.1 Insurance		-	-	-	-	-	-	62	15	77	77		-	-	-	-	-	-	-	-	-
3e.4.2 Property ta		-	-	-	-	-	-	163	41	204	204	-	-	-	-	-	-	-	-	-	-
3e.4.3 Plant energy 3e.4.4 Security St		-	-	-	-	-	-	148	- 37	184	184	-	-	-			-	-	-	-	2,468
3e.4.5 Utility Stat		-	-	-	-	-		150	37	187	187		-	-					-	-	1,870
	Period 3e Period-Dependent Costs	-	-	-	-	-	-	522	130	652	652		-	-	-	-	-	-	-	-	4,338
3e.0 TOTAL PE	ERIOD 3e COST	_	200	207	324	1 -	893	2,114	935	4,674	4,674		_		14,549	_	_	_	1,178,830	11,786	5,370
JULIAN I	11101 00 0001	-	200	201	024	•	000	-,117	555	4,014	4,014	=	=	-	14,040	-	-	-	1,110,000	11,100	5,570

Table C-2 **Braidwood Nuclear Power Station Unit 2 DECON Decommissioning Cost Estimate** (Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 3f - ISFSI Site	e Restoration																				
Period 3f Direct Decomm	nissioning Activities																				
Period 3f Additional Cost 3f.2.1 Site Restoration		_	1,147			_	_	28	176	1,351	_		1,351						_	13,036	80
	od 3f Additional Costs	-	1,147	-	-	-	-	28	176	1,351	-	-	1,351	-	-	-	-	-	-	13,036	80
Period 3f Collateral Costs 3f.3.1 Small tool allo 3f.3 Subtotal Perio			18 18	-	-			-	3	20 20	-		20 20		-	-	-	-	-	-	-
Period 3f Period-Depende	ent Costs																				
3f.4.1 Insurance 3f.4.2 Property taxes	a e	-	-	-	-	-	-	- 86	- 9	- 95	-	-	- 95	-	-	-	-	-	-	-	-
3f.4.3 Plant energy b	budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3f.4.4 Security Staff 3f.4.5 Utility Staff C		-	-	-	-	-	-	78 65	12 10	90 75	-	-	90 75	-	-	-	-	-	-	-	1,307 810
3f.4 Subtotal Perio	od 3f Period-Dependent Costs	-	-	-	-	-	-	229	30	260	-	-	260	-	-	-	-	-	-	-	2,117
3f.0 TOTAL PERIO	OD 3f COST	-	1,165	-	-	-	-	257	209	1,631	-	-	1,631	-	-	-	-	-	-	13,036	2,197
PERIOD 3 TOTALS		-	56,828	832	324	-	12,956	158,033	31,396	260,370	19,422	153,078	87,870	-	14,549	-	-	2,217	1,612,010	449,247	1,082,745
TOTAL COST TO DEC	COMMISSION	12,412	142,375	26,530	13,342	_	65,989	593,059	147,398	1,001,105	659,003	237,817	104,284	_	484,664	1,802	393	2,217	27,039,800	1,521,169	4,779,468

TOTAL COST TO DECOMMISSION WITH 17.27% CONTINGENCY:	\$1,001,105	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 65.83% OR:	\$659,003	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 23.76% OR:	\$237,817	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 10.42% OR:	\$104,284	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	486,859	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	Cubic Feet
TOTAL SCRAP METAL REMOVED:	74,045	Tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,521,169	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

APPENDIX D

DETAILED COST ANALYSIS

DELAYED DECON

	Page
Braidwood Nuclear Power Station, Unit 1	D-2
Braidwood Nuclear Power Station, Unit 2	D-11

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(Th	ousands o	of 2014 Dollar	s)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	g Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
	down through Transition								gy										, =		
	commissioning Activities																				
	-																				
	R site characterization survey preliminary decommissioning cost	-	-	-		-	-	481 161	144 24	625 185	625 185	-	-		-	-	-	-	-	-	1,300
	ion of Cessation of Operations	•	-	-	-	-	-	101	24	100 a	100	-	-	•	-	•	-	-	-	-	1,500
	fuel & source material									n/a											
	ion of Permanent Defueling te plant systems & process waste									a a											
	and submit PSDAR	-		-		-		248	37	285	285	-	-					-	-	-	2,000
	lant dwgs & specs.	-	-	-	-	-	-	161	24	185	185	-	-	-	-	-	-	-	-	-	1,300
1a.1.9 Perform 1a.1.10 Estimate	detailed rad survey by-product inventory							124	19	a 142	142	_	_						_		1,000
	luct description	-		-		-	-	124	19	142	142	-	-						-	-	1,000
	by-product inventory	-	-	-	-	-	-	186	28	214	214	-	-	-	-	-	-	-	-	-	1,500
	ajor work sequence SER and EA	-	-	-		-	-	124 384	19 58	142 442	142 442	-	-		-	-	-	-	-		1,000 3,100
	Site-Specific Cost Study	-	-	-	-	-	-	619	93	712	712	-		-	-	-	-	-	-	-	5,000
Activity Specificatio	ns																				
	plant and facilities for SAFSTOR	-	-	-	-	-	-	610	91	701	701	-	-	-	-	-	-	-	-	-	4,920
1a.1.16.2 Plant sys		-	-	-	-	-	-	516	77	594	594	-	-	-	-	-	-	-	-	-	4,167
1a.1.16.3 Plant str 1a.1.16.4 Waste m	uctures and buildings	-		-	-	-	-	387 248	58 37	445 285	445 285	-	-	-					-	-	3,120 2,000
1a.1.16.5 Facility a		-		-	-	-	-	248	37	285	285	-		-					-	-	2,000
1a.1.16 Total	•	-	-	-	-	-	-	2,008	301	2,309	2,309	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Proc																					
1a.1.17.1 Plant sys		-	-	-	-	-	-	147	22	169	169	-	-	-	-	-	-	-	-	-	1,183
1a.1.17.2 Facility of 1a.1.17 Total	eloseout & dormancy	-	-	-	-	-	-	149 295	$\frac{22}{44}$	171 340	171 340			-	-	-	-	-		-	1,200 2,383
1a.1.18 Procure	vacuum drying system	_	_	_	_	_		12	2	14	14	-				_		_	_	_	100
1a.1.19 Drain/de	-energize non-cont. systems									a											
	dry NSSS									a											
	-energize contaminated systems cure contaminated systems									a											
	Period 1a Activity Costs	-	-	-	-	-	-	4,927	811	5,738	5,738	-	-	-	-	-	-	-	-	-	35,890
Period 1a Collateral	Costs																				
1a.3 Subtotal	Period 1a Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 1a Period-De											4.000										
1a.4.1 Insuranc 1a.4.2 Property		-	-	-	-			1,815	181	1,996	1,996	-		-					-	-	-
	hysics supplies	-	527	-	-	-	-	-	132	658	658	-		-	-	-	-		-		-
	uipment rental	-	565		-	-	-	-	85	649	649	-	-	-	-	-	-	-	-	-	-
	of DAW generated ergy budget	-	-	14	7	7 -	39) - 1,753	12 263	72 2,016	72 2,016	-	-	-	610	-	-	-	12,190	20	-
1a.4.7 NRC Fee		-		-	-	-	-	1,783	118	1,299	1,299	-	-	-					-	-	-
1a.4.8 Emergen	cy Planning Fees	-	-	-	-	-	-	2,188	219	2,407	-	2,407	-	-	-	-	-	-	-	-	-
1a.4.9 Site O&N		-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	-
	tel Pool O&M perating Costs	-		-	-			396 48	59 7	455 55		455 55		-					-	-	-
	Staff Cost	-		-	-	-	-	672	101	772	772	-	-	-		-	-		-	-	12,264
1a.4.13 Utility St		-	-	-	-	-	-	32,063	4,809	36,873	36,873	-	-	-	-	-	-	-	-	-	423,400
1a.4 Subtotal	Period 1a Period-Dependent Costs	-	1,091	14	7	7 -	39	9 40,280	6,011	47,443	44,526	2,917	-	-	610	-	-	-	12,190	20	435,664
1a.0 TOTAL I	PERIOD 1a COST	-	1,091	14	7	7 -	39	45,207	6,823	53,181	50,264	2,917	-	-	610	-	-	-	12,190	20	471,554
PERIOD 1b - SAF	STOR Limited DECON Activities																				
Period 1b Direct De	commissioning Activities																				
Decontamination of	Site Buildings	0.400							1.040	9.7744	9.744									99.009	
1b.1.1.1 Reactor 1b.1.1.2 Auxiliary	Building	2,496 247		-		-		-	1,248 124	3,744 371	3,744 371	-	-		-		-	-	-	33,093 3,289	
15.1.1.2 Auxillary	Dullullig	241	-	•	-	-	-	-	124	911	911	-	-	-	-	-	-	-	-	5,400	•

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	, and a second	oi 2014 Dollar	,											
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	Class A	Class B	Volumes Class C Cu. Feet	GTCC	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	•								gy										, =		
	ination of Site Buildings (continued) Refueling Water Storage Tank	411							90*	010	010									* 000	
	Steam Generator Storage Facility	411 67	-	-	-	-	-	-	205 33	616 100	616 100	-	-	-	-	_	-	_	-	5,322 887	-
	Totals	3,221	-		-	-		-	1,610	4,831	4,831	-	-	-	-	-	-	-	-	42,591	-
1b.1	Subtotal Period 1b Activity Costs	3,221	-	-	-	_	-		1,610	4,831	4,831	-			-	-	-	-		42,591	-
Di. d 1h (Callatanal Casta																				
	Collateral Costs Decon equipment	947		-	_	_			142	1,089	1,089	_	_	_	-	-	_	-	_	-	_
	Process decommissioning water waste	180	-	127	321	-	400	-	251	1,279	1,279	-	-	-	1,139	-	-	-	68,312		-
	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Small tool allowance Subtotal Period 1b Collateral Costs	1,127	56 56	127	321	-	400	-	8 401	65 2,432	65 2,432	-		-	1,139	-	-	-	68,312	- 222	-
Period 1h F	Period-Dependent Costs																				
	Decon supplies	687	-	-	-	-	-	-	172	859	859	-	-		-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	342	34	376	376	-	-	-	-	-	-	-	-	-	-
	Property taxes	-	- 0.40	-	-	-	-	3,061	306	3,367	3,367	-	-	-	-	-	-	-	-	-	-
	Health physics supplies Heavy equipment rental	-	340 141	-	-	-	-	-	85 21	425 162	$\frac{425}{162}$	-	-	-	-	-	-	-	-		-
	Disposal of DAW generated	-	141	12	- 6	-	34	-	11	63	63	-	-		529	-	-	-	10.586	17	-
	Plant energy budget	-	-	-	-	-	-	437	66	503	503	-	-	-	-	-	-	-		-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	172	17	189	189	-	•	-	-	-	-	-	-	-	-
	Emergency Planning Fees	-	-	-	-	-	-	546	55	600		600	-	-	-	-	-	-	-	-	-
	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	41 99	6 15	47 113	47	- 113	-	-	-	-	-	-	-	-	-
	ISFSI Operating Costs		-	-	-	-	-	12	2		-	113	-	-	-	-	-	-	-	-	-
	Security Staff Cost		_	_	-	_	_	1,573	236	1,809	1,809		-	_	-	-	_	-	-	-	27,721
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	7,994	1,199	9,193	9,193	-	-	-	-	-	-	-	-	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	687	481	12	6	-	34	14,276	2,224	17,720	16,993	727	•	-	529	-	-	-	10,586	17	133,281
1b.0	TOTAL PERIOD 1b COST	5,034	537	139	327	-	434	14,276	4,235	24,983	24,256	727	-	-	1,668	-	-	-	78,898	42,830	133,281
PERIOD 1	1c - Preparations for SAFSTOR Dormancy																				
Period 1c I	Direct Decommissioning Activities																				
	Prepare support equipment for storage	-	517	-	-	-	-	-	78	595	595	-	-	-	-	-	-	-		3,000	
	Install containment pressure equal. lines	-	55	-	-	-	-	-	8	64	64	-	-	-	-	-	-	-	-	700	
	Interim survey prior to dormancy Secure building accesses	•	-	-	-	-	-	733	220	953 a	953	-	-	-	-	-	-	-	-	10,874	-
	Prepare & submit interim report	-	-	-	-	-	-	72	11	83	83			-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	572	-	-	-	-	805	317	1,694	1,694	-	-	-	-	-	-	-	-	14,574	583
Period 1c C	Collateral Costs																				
	Process decommissioning water waste	142		100	252	-	314		197	1,006	1,006	-	-	-	896	-		-	53,749	175	-
	Process decommissioning chemical flush waste	-		-	-	-	-	-		- 0	-	-	-	-	-	-	-	-	-	-	-
	Small tool allowance Subtotal Period 1c Collateral Costs	142	5 5	100	252	-	314		1 198	$\frac{6}{1,012}$	6 1,012	-	-	-	896	-	-	-	53,749	175	-
Period 1c F	Period-Dependent Costs																				
1c.4.1	Insurance	-	-	-	-	-	-	342	34	376	376	-	-	-	-	-	-	-	-	-	-
	Property taxes	-	-	-	-	-	-	3,061	306	3,367	3,367	-	-	-	-	-	-	-	-	-	-
	Health physics supplies Heavy equipment rental	-	203 141	-	-	-	-	-	51 21	254 162	254 162	-	-	-	-	-	-	-	-	-	-
	Disposal of DAW generated	-	141	- 3	- 2	-	10	-	3		162	-	-		152	-	-	-	3.039	- 5	-
	Plant energy budget	-		-		-	-	437	66	503	503	-	-	-	-				-	-	-
1c.4.7	NRC Fees	-		-	-	-	-	172	17	189	189	-	-		-	-	-	-	-	-	-
	Emergency Planning Fees	-	-	-	-	-	-	546	55		- 45	600	-	-	-	-	-	-	-	-	-
	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	41 99	6 15	47 113	47	- 113	-	-	-	-	-	-	-	-	-
	ISFSI Operating Costs	-		-	-	-		99 12	15		-	113	-	-	-	-	-	-	-	-	-
	Security Staff Cost	-		-	-	-	-	167	25		193	-	-		-	-		-	-	-	3,058
1c.4.13	Utility Staff Cost	-		-	-	-		7,994	1,199	9,193	9,193	-	-	-	-	-		-	-	-	105,560
1c.4	Subtotal Period 1c Period-Dependent Costs	-	344	3	2	-	10	12,871	1,800	15,029	14,302	727	-	-	152	-	-	-	3,039	5	108,618
1c.0	TOTAL PERIOD 1c COST	142	922	104	254	-	324	13,676	2,314	17,735	17,008	727	-	-	1,048	-	-	-	56,788	14,753	109,201

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Rurial	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor
	Activity Description					Costs			<u> </u>				Costs			Cu. Feet	Cu. Feet				
ERIOD 1 TOTALS		5,176	2,550	257	588	-	797	73,159	13,372	95,899	91,528	4,371	-	-	3,325	-	-	-	147,877	57,603	714,03
ERIOD 2a - SAFSTOR	Dormancy with Wet Spent Fuel Storage																				
eriod 2a Direct Decommis a.1.1 Quarterly Inspe										a											
	nvironmental survey									a											
2a.1.3 Prepare reports										a											
2a.1.4 Bituminous room		-	-	-	-	-	-	149	22	171	171	-	-	-	-	-	-	-	-	-	-
2a.1.5 Maintenance su 2a.1 Subtotal Period	applies I 2a Activity Costs	-	-	-		-	-	4,061 4,210	1,015 1,037	5,076 $5,247$	5,076 5,247	-	-		-	-	-	-	-		-
								1,210	1,001	0,211	0,211										
Period 2a Collateral Costs 2a.3.1 Spent Fuel Cap	pital and Transfer							11,250	1,688	12,938		12,938									
	l 2a Collateral Costs	-	-	-	-	-		11,250	1,688	12,938	-	12,938	-	-					-	-	-
Period 2a Period-Depender	nt Coata																				
2a.4.1 Insurance	111 00000	-	-	-	-	-	-	15,665	1,566	17,231		17,231	-	-	-	-	-	-	-		-
2a.4.2 Property taxes		-	-	-	-	-	-	33,328	3,333	36,660	36,660	-	-	-	-	-	-	-	-	-	-
2a.4.3 Health physics		-	5,782	-	-	-	-	-	1,446	7,228	7,228	-	-	-	-	-	-	-	-	-	-
2a.4.4 Disposal of DAV		-	-	139	71	-	394		123	729	729		-	-	6,162	-	-	-	123,249	201	-
2a.4.5 Plant energy bu	ıdget	-	-	-	-	-	-	10,252	1,538	11,789	- 0.00	11,789	-	-	-	-	-	-	-	-	-
2a.4.6 NRC Fees 2a.4.7 Emergency Plan	nning Food	-	-	-	-	-	-	8,459 55,504	846 5,550	9,305 $61,055$	9,305	61,055	-	-	-	-	-	-	-	-	-
2a.4.7 Emergency Flan 2a.4.8 Site O&M Cost		-	-	-	-	-	-	4,823	5,550 723	5,546	-	5,546	-	-	-	-	-	-	-	-	-
2a.4.9 Spent Fuel Pool		-	-	-	-	-	-	11,563	1,734	13,297	-	13,297	-	-	-	-	-	-	-	-	-
2a.4.10 ISFSI Operatin		_	_	_	-	_	-	1,396	209	1,605	-	1,605	-	-	_	-	-	-	_	_	-
2a.4.11 Security Staff C		-	-	-	-	-	-	93,593	14,039	107,632	-	107,632	-	-	-	-	-	-	-	-	1,623,669
2a.4.12 Utility Staff Cos		-	-	-	-	-	-	111,971	16,796	128,767	-	128,767	-	-	-	-	-	-	-	-	1,432,829
2a.4 Subtotal Period	l 2a Period-Dependent Costs	-	5,782	139	71	-	394	346,553	47,904	400,844	53,922	346,922	-	-	6,162	-	-	-	123,249	201	3,056,498
2a.0 TOTAL PERIO	D 2a COST	-	5,782	139	71	-	394	362,012	50,629	419,029	59,169	359,860	-	-	6,162	-	-	-	123,249	201	3,056,498
PERIOD 2b - SAFSTOR	Dormancy with Dry Spent Fuel Storage																				
Period 2b Direct Decommis																					
2b.1.1 Quarterly Inspe										a											
	nvironmental survey									a											
2b.1.3 Prepare reports								0		a	0										
2b.1.4 Bituminous root 2b.1.5 Maintenance su		-	-	-	-	-	-	8 208	1 52	9 260	9 260	-	-	-	-	-	-	-	-	-	-
	l 2b Activity Costs		-		-	-		208	52 53	269	269				-			-	-		
	•							210		200	200										
Period 2b Collateral Costs 2b.3.1 Spent Fuel Cap	oital and Transfer	_						3,688	553	4,241		4,241	-			-					_
	l 2b Collateral Costs	-	-	-	-	-	-	3,688	553	4,241	-	4,241	-	-	-	-	-	-	-	-	-
Period 2b Period-Depender	nt Costs																				
2b.4.1 Insurance		-	-	-	-	-	-	758	76	834	-	834	-	-	-	-	-	-	-	-	-
2b.4.2 Property taxes	1:	-	146	-	-	-	-	749	75 37	824 183	183	824	-	-	-	-	-	-	-	-	-
2b.4.3 Health physics 2b.4.4 Disposal of DAV		-	146	- 4	- 9	-	10	-	31 3	183	183	-	-	-	- 155	-	-	-	3.096	- 5	-
2b.4.5 Plant energy bu				-			- 10	263	39	302	-	302			100				5,030		
2b.4.6 NRC Fees	augo-	-	-	-	-	-	-	414	41	455	455	-	-	-	-				-	-	-
2b.4.7 Emergency Plan	nning Fees	-	-	-	-		-	2,845	285	3,130	-	3,130	-	-	-	-			-		-
2b.4.8 Site O&M Cost		-	-	-	-	-	-	247	37	284	-	284	-	-	-				-	-	-
2b.4.9 ISFSI Operatin	ng Costs	-	-	-	-	-	-	72	11	82	-	82	-	-	-	-	-	-	-	-	-
2b.4.10 Security Staff C		-	-	-	-	-	-	2,550	382	2,932	-	2,932	-	-	-	-	-	-	-	-	42,197
2b.4.11 Utility Staff Co.		-		-	-	-		2,324	349	2,672	-	2,672	-	-	-	-	-	-	-		31,25
	l 2b Period-Dependent Costs	-	146	4	2	-	10	10,221	1,334	11,716	656	11,060	-	-	155	-	-	-	3,096	5	73,454
2b.0 TOTAL PERIO	D 2b COST	-	146	4	2	-	10	14,124	1,941	16,226	925	15,301	-	-	155	-	-	-	3,096	5	73,454
PERIOD 2 TOTALS		-	5,928	143	73	-	404	376,136	52,570	435,254	60,094	375,161	-	-	6,317		-		126,345	206	3,129,952

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111	o usunus (01 2014 Dollar	3)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes	~=~	Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 3a - Rea	ctivate Site Following SAFSTOR Dormancy																				
	ecommissioning Activities																				
	preliminary decommissioning cost plant dwgs & specs.	-	-	-	-	-	-	161 570	24 85	185 655	185 655	-		-	-	-	-	-	-	-	1,300 4,600
	detailed rad survey							104	10	a	140										1.00
	duct description l by-product inventory	-	-		-	-	-	124 161	19 24	142 185	142 185	-	-		-	-	-	-			1,000 1,300
	najor work sequence	-	-	-	-	-	-	929	139	1,069	1,069	-	-	-	-	-	-	-	-	-	7,50
	SER and EA Site-Specific Cost Study	-	-	-		-		384 619	58 93	442 712	442 712	-	-		-	-	-	-	-	-	3,10 5,00
3a.1.9 Prepare	submit License Termination Plan	-	-	-	-	-	-	507	76	584	584	-	-	-	-	-	-	-	-	-	4,09
	NRC approval of termination plan									a											
Activity Specificati																					
3a.1.11.1 Re-activ 3a.1.11.2 Plant sy	rate plant & temporary facilities		-		-	-	-	913 516	137 77	1,050 594	945 534	-	105 59		-	-	-	-		-	7,370 4,167
3a.1.11.3 Reactor	internals	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,100
3a.1.11.4 Reactor 3a.1.11.5 Biologic		-	-		-	-	-	805 62	121 9	926 71	926 71	-	-		-		-			-	6,500 500
3a.1.11.6 Steam g		-		-		-	-	387	58	445	445	-	-		-	-	-		-		3,120
3a.1.11.7 Reinford		-	-	-	-	-	-	198	30 7	228	114	-	114	-	-	-	-	-	-	-	1,600
3a.1.11.8 Main To 3a.1.11.9 Main Co		-		-		-	-	50 50	7	57 57	-	-	57 57		-	-	-	-	-		400 400
	ructures & buildings	-	-	-	-	-	-	387	58	445	222	-	222		-	-	-	-	-		3,120
3a.1.11.11 Waste r 3a.1.11.12 Facility				-		-		$570 \\ 112$	85 17	655 128	655 64		64		-	-	-	-	-		4,600 900
3a.1.11 Total	a sice dissection	-	-	-	-	-	-	4,928	739	5,667	4,988	-	679	-	-	-	-	-	-	-	39,777
Planning & Site Pr								207	45	342	342										2,400
	dismantling sequence ep. & temp. svces	-	-	-		-	-	297 3,000	45 450	3,450	3,450	-	-		-	-	-	-	-		2,400
	water clean-up system	-	-	-	-	-	-	173	26	199	199	-	-	-	-	-	-	-	-	-	1,400
	Cont. Cntrl Envlps/tooling/etc. casks/liners & containers	-	-	-		-		2,300 152	345 23	2,645 175	2,645 175	-	-		-	-	-	-	-		1,230
	l Period 3a Activity Costs	-	-	-	-	-	-	14,307	2,146	16,453	15,775	-	679	-	-	-	-	-	-	-	72,708
Period 3a Period-D								E00	F1	EEC	EEC										
3a.4.1 Insuran 3a.4.2 Propert		-	-	-		-		506 500	51 50	556 550	556 550	-	-		-	-	-	-	-		-
3a.4.3 Health	physics supplies	-	460	-	-	-	-	-	115	575	575	-	-	-	-	-	-	-	-	-	-
	quipment rental l of DAW generated	-	565 -	12	- 6	-	- 38	-	85 10	649 61	649 61	-	-		514	-	-	-	10,287	17	
3a.4.6 Plant er	nergy budget	-	-	-	- "	-	-	1,753	263	2,016	2,016	-	-	-	-	-	-	-			-
3a.4.7 NRC Fe 3a.4.8 Site O&				-		-		378 165	38 25	416 190	416 190		-		-	-	-	-	-	-	
3a.4.9 Security	Staff Cost	-	-	-	-	-	-	3,888	583	4,472	4,472	-	-	-	-	-	-	-	-	-	65,179
	Staff Cost I Period 3a Period-Dependent Costs	-	1,025	12	- 6		- 38	19,542 26,732	2,931 4,151	22,473 $31,958$	22,473 $31,958$	-	-	-	- 514	-	-	-	10,287	- 17	258,629 323,807
3a.0 TOTAL	PERIOD 3a COST	-	1,025	12	6	-	38	41,039	6,297	48,411	47,733	-	679	-	514	-	-	-	10,287	17	396,510
PERIOD 3b - Dec	ommissioning Preparations																				
Period 3b Direct D	ecommissioning Activities																				
Detailed Work Pro																					
3b.1.1.1 Plant sy 3b.1.1.2 Reactor		-	-		-	-	-	586 310	88 46	674 356	607 356	-	67		-		-	-		-	4,73 2,50
3b.1.1.3 Remain	ing buildings				-		-	167	25	192	48	-	144		-						1,350
3b.1.1.4 CRD co		-	-	-	-	-	-	$\frac{124}{124}$	19 19	$\frac{142}{142}$	142 142	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5 CRD ho 3b.1.1.6 Incore i	usings & ICI tubes astrumentation	-	-	-	-		-	124 124	19	142 142	142 142	-	-	-	-	-	-	-	-	-	1,000 1,000
3b.1.1.7 Reactor	vessel	-	-	-	-	-	-	450	67	517	517	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8 Facility	closeout	-	-	-	-	-	-	149	22	171	85	-	85	-	-	-	-	-	-	-	1,200

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	ousanus (of 2014 Dollar	5)											
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	Class A Cu. Feet	Class B		GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Detailed Work Procedures (cc 3b.1.1.9 Missile shields 3b.1.1.10 Biological shield 3b.1.1.11 Steam generators 3b.1.1.12 Reinforced concret		- - - -	: : :	- - -	- - - -	- - -	- - - -	56 149 570 124	8 22 85 19	64 171 655 142	64 171 655 71	- - -	- - - 71	- - -	- - - -	- - -	- - -	: : :	: : :	- - -	450 1,200 4,600 1,000
3b.1.1.13 Main Turbine 3b.1.1.14 Main Condensers 3b.1.1.15 Auxiliary building 3b.1.1.16 Reactor building 3b.1.1 Total 3b.1 Subtotal Period 3b		- - - -				- - - -	- - - -	193 193 338 338 3,995 3,995	29 29 51 51 599 599	222 222 389 389 4,594 4,594	350 350 3703 3,703	- - - -	222 222 39 39 891 891	- - - -		- - - -	- - - -		- - - -	- - - -	1,560 1,560 2,730 2,730 32,243 32,243
Period 3b Additional Costs 3b.2.1 Site Characterizat 3b.2 Subtotal Period 3b	tion	· .	-	-	-	-	-	6,480 6,480	1,944 1,944	8,424 8,424	8,424 8,424	- -	- -	-	-	-	-	-		30,500 30,500	10,852
Period 3b Collateral Costs 3b.3.1 Decon equipment 3b.3.2 DOC staff relocati 3b.3.3 Pipe cutting equip 3b.3 Subtotal Period 3b	oment	947 - - 947	1,100 1,100				- - -	1,163 - 1,163	142 175 165 482	1,089 1,338 1,265 3,692	1,089 1,338 1,265 3,692	- - - -	:	- - -	- - -	- - -	- - -	- - -	- - -	- - -	:
Period 3b Period-Dependent 0 3b.4.1 Decon supplies 3b.4.2 Insurance 3b.4.3 Property taxes 3b.4.4 Health physics sup 3b.4.5 Heavy equipment 3b.4.6 Disposal of DAW g 3b.4.7 Plant energy budg 3b.4.8 NRC Fees 3b.4.9 Site O&M Cost 3b.4.10 Security Staff Cost	pplies rental generated get	29 - - - - - - - - -	254 283 - - -	- - - - - 7 - - -		: : : : : :	- - - - 19 -	254 251 - - - 879 190 83 1,950	7 25 25 64 42 6 132 19 12 292	36 279 276 318 326 34 1,011 208 95	36 279 276 318 326 34 1,011 208 95 2,242	: : : : : :	- - - - - - - - - -	- - - - - - - - - -	- - - - 292 - - -	-			5,834	- - - - 10 - -	- - - 32,679
	o Period-Dependent Costs	- - 29	- - 537	7	3	:	19	,	750 1,470 2,845	5,752 11,267 21,845	5,752 11,267 21,845	:	- - -	- - -	- 292	-	-		5,834	10	
3b.0 TOTAL PERIOD 3	Bb COST	976	1,637	7	3	-	19	,	5,870	38,554	37,664	-	891	-	292	-	-	-	5,834	30,510	264,002
PERIOD 3 TOTALS		976	2,662	18	9	-	52	71,082	12,167	86,966	85,396	•	1,569	-	806	-	-	-	16,121	30,526	660,512
PERIOD 4a - Large Compo	onent Removal																				
Period 4a Direct Decommission Nuclear Steam Supply System																					
4a.1.1.1 Reactor Coolant P 4a.1.1.2 Pressurizer Relief 4a.1.1.3 Reactor Coolant P 4a.1.1.4 Pressurizer 4a.1.1.5 Steam Generators 4a.1.1.6 Retired Steam Gen	riping 'Tank 'umps & Motors s nerator Units ice Structure Removal	54 9 32 14 109 - 26 104 - 129 477	186 34 121 79 4,584 - 315 2,920 - 5,095 13,334	39 7 85 370 2,883 1,659 219 6,538 - 2,175 13,975	40 8 198 105 3,734 2,955 43 1,071 - 1,159 9,312	- - - - - - - - - -	271 47 1,390 879 11,075 10,309 141 5,071 12,062 2,832 44,079	- - - - - 292 - 292 585	151 27 432 299 4,818 3,187 155 6,723 1,809 6,179 23,781	742 132 2,259 1,746 27,202 18,110 899 22,719 13,872 17,862 105,542	$742 \\ 132 \\ 2,259 \\ 1,746 \\ 27,202 \\ 18,110 \\ 899 \\ 22,719 \\ 13,872 \\ 17,862 \\ 105,542$	- - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	1,838 329 4,796 3,033 67,463 62,044 2,843 1,835 - 9,331 153,512	- - - - - 1,127	-	2,217	210,083 36,553 780,540 240,915 3,820,664 3,098,576 109,650 328,507 433,180 960,579 10,019,250	3,290 596 2,726 1,532 20,508 10,800 4,745 27,350 - 27,350 98,898	- 80 750 4,500 2,250 - 1,226 - 1,226
Removal of Major Equipment 4a.1.2 Main Turbine/Gen 4a.1.3 Main Condensers	nerator		695 1,368	3,385 1,965	1,093 1,020	-	3,399 5,039	-	1,526 1,951	10,098 11,344	10,098 11,344	:		-	58,555 75,240	-	-	-	3,040,215 3,906,532	9,317 18,250	-
Cascading Costs from Clean I 4a.1.4.1 Reactor 4a.1.4.2 Auxiliary Building 4a.1.4.3 Refueling Water S 4a.1.4.4 Steam Generator S 4a.1.4 Totals	g Storage Tank		1,397 771 137 57 2,363	: : :		: : :	- - - -	- - - - -	210 116 21 9 354	1,607 887 158 66 2,717	1,607 887 158 66 2,717		- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	12,130 6,782 1,299 507 20,718	-

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	ousanus (of 2014 Dollar	5)											
Activity		D	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	C St	Utility and Contractor
Index	Activity Description	Decon Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Management Costs	Costs	Cu. Feet			Cu. Feet			Craft Manhours	Manhours
Disposal of Plant Syste	ems																				
4a.1.5.1 Auxiliary F		-	92	-	-	-	-	-	14	106	-	-	106		-	-	-	-	-	1,244	-
4a.1.5.2 Auxiliary S 4a.1.5.3 Auxiliary S		-	82 153	24	- 11	-	- 54	-	12 56	95 298	298	-	95	-	805	-		-	42,068	1,126 1,984	-
4a.1.5.4 Boric Acid		-	578	137	79	-	392	-	268	1,454	1,454	-		-	6,102				303,638	8,026	-
4a.1.5.5 CO2 & H2	_	-	31	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	419	-
4a.1.5.6 CO2 & H2		-	44	5	2	-	11	-	15	77	77	-	-	-	159	-	-	-	8,312	583	-
4a.1.5.7 Chemical F 4a.1.5.8 Chilled Wa		-	68 85	-	-	-			10 13	78 98	-	-	78 98	-	-		-	-	-	934 1,142	-
4a.1.5.9 Circulating		-	375	-	-	-		-	56	432	-	-	432	-	-		-	-	-	5,174	-
4a.1.5.10 Condensate		-	443	-	-	-	-	-	66	509	-	-	509	-	-	-	-	-	-	6,023	-
4a.1.5.11 Condensate		-	399 78	-	-	-	-	-	60	459 90	-	-	459 90	-	-	-	-	-	-	5,428	-
4a.1.5.12 Condensate 4a.1.5.13 Containme		-	294	- 88	47	-	233	-	12 148	810	810	-	90	-	3,481	-	-	-	180,655	1,060 3,897	-
4a.1.5.14 Diesel Fuel		-	120	-		-	-	-	18	138	-	-	138	-	-	-	-	-	-	1,615	-
4a.1.5.15 Essential S		-	280	-	-	-	-	-	42	322	-	-	322	-	-	-	-	-	-	3,837	-
4a.1.5.16 Extraction		-	223	-	-	-	-	-	33	257	-	-	257	-	-	-	-	-	-	3,089	-
4a.1.5.17 Feedwater 4a.1.5.18 Feedwater		-	372 891	-	-				56 134	428 $1,025$	-	-	428 1,025	-	-					5,142 12,366	
4a.1.5.19 Gland Stea		-	67	-	-	-		-	10	77	-	-	77	-	-				-	932	-
4a.1.5.20 Gland Wate		-	59	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	828	-
4a.1.5.21 Main Steam		-	380	-	- 10	-	-	-	57	437	-	-	437	-	-	-	-	-	-	5,216	-
4a.1.5.22 Main Steam 4a.1.5.23 Nitrogen	m RUA	-	59 4	17	10	-	49		30	164 10	164 10	-	-	-	726 49		-	-	37,727 2,447	769 50	-
4a.1.5.24 Non-Essent	tial Service Water	-	210	-	-	-	-	-	32	242	-	-	242	-	-	-	_	-	2,441	2,916	-
4a.1.5.25 Non-Essent	tial Service Water RCA	-	107	34	19	-	94	-	56	310	310	-	-	-	1,400	-	-	-	72,790	1,358	-
4a.1.5.26 Off Gas	and the same of th	-	650	135	73	-	360	-	277	1,494	1,494	-	-	-	5,352	-	-	-	278,775	8,689	-
4a.1.5.27 Process Rac 4a.1.5.28 Process San		-	48 139	3 14	1 8	-	40	-	14 47	$\frac{74}{248}$	74 248	-	-	-	109 590	-		-	5,726 30,697	671 1,947	-
4a.1.5.29 Screen Was		-	59	-	-	-	-	-	9	68	-	-	68	-	-	-	_	-	-	821	-
4a.1.5.30 Station Air		-	36	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	498	-
4a.1.5.31 Station Hea		-	130	-	-	-	-	-	19	149	-	-	149	-	-	-	-	-	-	1,771	-
4a.1.5.32 Switchgear 4a.1.5.33 Turbine Blo		-	10	-	-	-		-	2	12	-	-	12	-	-	-		-	-	139 17	-
4a.1.5.34 Turbine Ge		-	67	-	-	-		-	10	77	-	-	77	-	-		-	-	-	901	-
4a.1.5.35 Turbine Oil		-	103	-	-	-	-	-	15	118	-	-	118	-	-	-	-	-	-	1,399	-
4a.1.5.36 Waste Oil S	Sumps	-	35	-	-	-	1.040	-	5	41	-	-	41	-	-	-	-	-	-	483	-
4a.1.5 Totals		-	6,772	457	251	-	1,242	-	1,617	10,340	4,939	-	5,401	-	18,774	-	-	-	962,836	92,492	-
4a.1.6 Scaffolding	in support of decommissioning	-	1,242	9	5	-	24	-	318	1,598	1,598	-	-	-	359	-	-	-	18,654	18,101	-
4a.1 Subtotal Pe	eriod 4a Activity Costs	477	25,774	19,792	11,682	-	53,784	585	29,548	141,640	136,239	-	5,401	-	306,440	1,127	393	2,21	7 17,947,480	257,777	10,032
Period 4a Additional C 4a.2.1 Remedial A	Costs Action Surveys							1,976	593	2,569	2,569									31,151	
4a.2.2 Asbestos Al		-	-	-	-	-		50	8	58	58	-	-	-	-				-	51,151	-
	al Tools and Equipment	-	-	9	52	-	189		56	306	306	-	-	-	5,855	-	-	-	146,375	16	-
4a.2 Subtotal Pe	eriod 4a Additional Costs	-	-	9	52	-	189	2,026	656	2,933	2,933	-	-	-	5,855	-	-	-	146,375	31,167	-
Period 4a Collateral C																					
	commissioning water waste	9		12	29	-	37	-	19	105	105	-	-	-	104	-	-	-	6,256	20	-
4a.3.2 Process dec 4a.3.3 Small tool a	commissioning chemical flush waste	-	323		-	-	-	-	49	372	- 335	-	37	-	-	-	-	-	-		-
	eriod 4a Collateral Costs	9	323	12	29	-	37	-	68	477	440	-	37	-	104	-	-	-	6,256	20	-
Period 4a Period-Depe	endent Costs																				
4a.4.1 Decon supp		86	-	-	-	-	-		21	107	107	-	-		-	-		_	-	-	-
4a.4.2 Insurance		-	-	-	-	-	-	751	75	826	826	-	-		-	-	-	-	-	-	-
4a.4.3 Property ta		-	9 190	-	-	-	-	742	74 545	816	735	-	82	-	-	-	-	-	-	-	-
	vsics supplies ipment rental	-	2,180 3,223	-	-	-	-	-	545 483	2,726 3,706	2,726 3,706	-	-			-	-	-	-		-
	DAW generated	-		83	43	-	235		73	434	434	-	-	-	3,672	-	-	-	73,441	120	-
4a.4.7 Plant energ	gy budget	-	-	-	-	-	-	2,474	371	2,845	2,845	-	-	-	-	-	-	-	-	-	-
4a.4.8 NRC Fees		-	-	-	-	-	-	896	90	986	986	-	-	-	-	-	-	-	-	-	-
4a.4.9 Site O&M (4a.4.10 Liquid Rad	Cost Iwaste Processing Equipment/Services	-		-		-	-	245 595	37 89	282 685	282 685	-	-				-	-	-		-
4a.4.11 Security St		-	-	-	-	-	-	5,774	866	6,640	6,640	-	-		-	-		-	-	-	96,786
4a.4.12 DOC Staff	Cost	-	-	-	-	-	-	17,539	2,631	20,169	20,169	-	-	-	-	-	-	-	-	-	213,703

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Property							(1110	usanus	oi 2014 Dollar	5)											
Lead of the second proposed class of the seco	Activity Index Activity Description			0 0		Processing	Disposal				Lic. Term.	Management	Restoration	Volume		Class B	Class C		Processed		Utility and Contractor Manhours
84 September 1968 1968 1968 1968 1968 1968 1968 1968	Period 4a Period-Dependent Costs (continued)							29 258	4 389	33 647	33 647										387 143
Property		86	5,403	83	43	-	235					-	82	-	3,672	-	-	-	73,441		697,631
Page	4a.0 TOTAL PERIOD 4a COST	571	31,501	19,896	11,806	-	54,244	60,885	40,017	218,919	213,399	-	5,520	-	316,071	1,127	393	2,217	18,173,550	289,084	707,663
Management Man	PERIOD 4b - Site Decontamination																				
Second Scient Common 1.50 170 180 110 101	Period 4b Direct Decommissioning Activities 4b.1.1 Remove spent fuel racks		-	-	-	-	-	-		-	-	-	-	-	-	-	-	-		-	-
1.6.2 1.6.2	Disposal of Plant Systems		4 005				44.0			2 224	0.004								224 ***	40.450	
State Company Contage RCA 170 200 112 201 300		-				-		-				-	-	-		-	-	-	,		-
1.0.0 1.0.		-						-				-		-		-	-	-			
1.6.5 Referrée d'Argenerant 1.30 1.77 87 93 4.77 4.70 5.400 6.418 5.505.28 1.234					- 112	-	-					-		-		-	-	-			-
1.1.5.2 Second-19CA				137	87	-	430				2,400	-		-	6,418	-	-	-	333,233		-
1.1 September 1.2 September 1.		-		372	227	-	1,123	-	892	4,776	4,776	-	-	-	16,763	-	-	-	870,329	29,753	-
1.1.2 For Newtonian 140		-			-	-	-	-				-	175	-		-	-	-		,	-
1.4.1.0 Per Petersker RCA 20, 20 14 48 54 301 1.002 32.006 2.041 1.002		-		120	67	-	333	-				-		-	,	-	-	-	257,885		-
State Control Contro		-			- 14	-	- 00	-				-	168	-		-	-	-	- =0.000		
1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.						-						-		-		-	-	-			
A. A. A. A. A. A. A. A.	4b.1.2.12 HVAC-Diesel Generator Room				-	_	-		8			_		-		_	_	_			
	4b.1.2.13 HVAC-Miscellaneous		48	-	-	-	-		7		-	-		-	-	-	-	-	-		-
15 - 15 Instrument we Supply	4b.1.2.14 HVAC-Primary Containment	-	692	218	138	-	683	-	386		2,118	-		-	10,197	-	-	-	529,451	8,908	-
10.1217 [Asstrometha & Supply RCA 54 17 5 24 29 1503 1503 1504 1548 1,008		-		-	-	-	-	-	33			-		-	-	-	-	-	-		-
1.1.2.1.6 Miscellamonts Parisis		-		-		-	-	-	8			-	62	-	-	-	-	-	10.400		
1.1.1.1.2 Primary Containment Purge . 318 188 76 577 . 190 1,100 1,100 . 5,014 . 22,036 1,500 . 1,1125 1,1125		-			Ð 4	-						-	-	-		_	-	-	,		
1.1.20 Prinary Water		-		•	76	_		-				-	-	-		_	_	_			
1.1.1.22 Reaton Planting Plant prints 1.12 1.8 9	4b.1.2.20 Primary Water	-		7		-						-	-	-		-	-	-			-
1.1.229 Generor Hundridge Plore Phrains 5 7 4 18 19 99 99 99 99 1,360 686 1,1228 Restrict Combant 1,228 Restrict Combant 1	4b.1.2.21 Radioactive Waste Disposal	-	1,052	171	90	-	446	-	405	2,164	2,164	-	-	-	6,808	-	-	-	345,754	14,349	-
1.1.2.12 Season Coolani	4b.1.2.22 Reactor Building Equipment Drains	-		18	9	-		-				-	-	-		-	-	-			-
1.1.22 Start Marker 1.1.		-		7	4	-		-				-	-	-		-	-	-			
1.1.2.2.6 Safety Injection						-											-		,		
5.12.27 Sation Air RCA	4b.1.2.26 Safety Injection					-		-				-		-		_	_	_	,	,	
1.1.2 Maste Ol Sumps RCA	4b.1.2.27 Station Air RCA	-	41	5	2	-	11	-		74	74	-	-	-		-	-	-			-
1.12 Totals	4b.1.2.28 Station Heating RCA	-	138	33	16	-		-				-	-	-		-	-	-			-
2.13 Scaffolding in support of decommissioning	*	-	8	1	1	-	9	-	9			-		-		-	-	-	,		
Secondarillation of Site Buildings 1.14.1 Reactor 2.64 1.625 2.33 346 1.538 1.548 1.549 7.781 7.781 24.850 1.271_843 50.420 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.424 1.425 1.42		-			1,249	-		-		,		-	4,879	-		-	-	-			-
	•	-	1,863	14	7	-	36	-	477	2,398	2,398	-	•	-	539	-	-	-	27,981	27,151	-
1.1.4.2 Auxiliary Building 1.26		2 264	1 695	933	346		1 252		1 052	7 791	7 791				24.850				1 971 849	50.420	
h.1.4.3 Refueling Water Storage Tank 412 480 41 18 8 83 . 354 1,388 1,388 1,210 67,350 11,972						-						-		-		-		-			-
5.1.4 Totals 2,969 2,228 296 381 1,510 - 2,506 9,892 9,892 - 27,192 - 1,00,531 67,855 - 1,00,531 67,85						-						-	-	-		-	-	-			-
b. 1 Subtatl Period 4b Activity Costs 2,969 19,324 2,509 1,638 7,719 - 8,318 42,478 37,599 4,879 120,196 - 6,215,068 300,260 - 20,100			0	-	-	-	0	-				-	-	-	1	-	-	-			-
eriod 4b Additional Costs 1. License Termination Survey Planning	4b.1.4 Totals	2,969	2,228	296	381	-	1,510	-	2,506	9,892	9,892	-	-	-	27,192	-	-	-	1,402,531	67,855	-
b.2.1 License Termination Survey Planning b.2.2 Remedial Action Surveys c	4b.1 Subtotal Period 4b Activity Costs	2,969	19,324	2,509	1,638	-	7,719	-	8,318	42,478	37,599	-	4,879	-	120,196	-	-	-	6,215,068	300,260	-
b.2.2 Remedial Action Surveys	Period 4b Additional Costs							069	205	1 979	1 979										C 940
b.2.3 Asbestos Abatement b.2.4 License Termination ISFSI b.2.4 License Termination ISFSI c.5 Underground Services Excavation c.5 Underground Services Excavation c.5 Subtotal Period 4b Additional Costs ceriod 4b Collateral Costs ceriod 4b			-	-	-	-	-					-		-	-	-	-	-	-		
b.2.4 License Termination ISFSI		-	_	-	-	-	-					-	-		-						
b.2.5 Underground Services Excavation b.2.5 Underground Services Excavation b.2.5 Subtotal Period 4b Additional Costs cerviced 4b Collateral Costs b.3.1 Process decommissioning water waste b.3.2 Process decommissioning chemical flush waste c	4b.2.4 License Termination ISFSI	-		207	278	-	893		776		3,880	-	-	-	14,543	-	-	-	1,178,709	7,632	5,262
eriod 4b Collateral Costs 6.3.1 Process decommissioning water waste 10 - 14 36 - 45 - 23 129 129 184 96 - 472 - 151 993 993 7,054 366,237 88 - 184 96 - 472 - 151 993 993 7,054 366,237 88 - 185 366,237 88 - 185 366,237 88 185 366,237 88 185 366,237 88 185 366,237 88 185 366,237 88 - 366,237 88 - 366,237 88 366,237 88 366,237 88 366,237 88 366,237 88 366,237 88 366,237 88 366,237 88 366,237 8		-										-	-	-		-	-	-			
b. 3.1 Process decommissioning water waste 10 - 14 36 - 45 - 23 129 129 128 7,705 25 - 128 - 128 7,705 25 - 128 - 128 7,705 25 - 128 - 128 7,705 25 - 128 - 128 7,705 25 - 128 - 128 128 7,705 25 - 128 - 128		-	997	207	278	-	893	5,239	2,039	9,653	9,653	-	-	-	14,543	-	-	-	1,178,709	56,459	11,502
b.3.2 Process decommissioning chemical flush waste	Period 4b Collateral Costs				_																
b.3.3 Small tool allowance - 397 60 456 456		10			36	-	45	-				-	-	-		-	-	-			-
b.3.4 Decommissioning Equipment Disposition 184 96 - 472 - 151 903 903 7,054 366,237 88 -		- -			-	-	-	-				-	-	-			-				
		-				-	472					-	-								
0.0 Substitute the two files of the constant of the cons	4b.3 Subtotal Period 4b Collateral Costs	10		199	132	-	518		234	1,488	1,488	-	-		7,182				373,943	113	

Table D-1
Braidwood Nuclear Power Station Unit 1
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

								(1nd	ousanus (of 2014 Dollar	s)											
Activity	7		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial /	Craft	Utility and Contractor
Index		Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Period 4b	Period-Dependent Co	losts																				
4b.4.1	Decon supplies		801	-	-	-	-	-	-	200	1,001	1,001	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance		-	-	-	-	-	-	1,121	112	1,233	1,233	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	nlina	-	2,774	-	-	-	-	1,107	111	1,218 3,467	1,218 3,467	-	-	-	-	-	-	-	-	-	-
4b.4.4 4b.4.5	Health physics supp Heavy equipment re		-	4,762	-	-	-	-	-	693 714	5,467	5,477	-	-	-		-	-	-	-	-	-
4b.4.6	Disposal of DAW ge		-	4,702	98	50		277	-	86	511	511	_			4.321	_	_	_	86,419	141	-
4b.4.7	Plant energy budge		-	_	-	-		-	2,915	437	3,352	3,352			-	-	-	_	-	-	-	
4b.4.8	NRC Fees		-	-	-	-	-	-	1,338	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost		-	-	-	-	-	-	366	55	420	420	-	-	-	-	-	-	-	-	-	-
4b.4.10		rocessing Equipment/Services	-	-	-	-	-	-	889	133	1,022	1,022	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost		-	-	-	-	-	-	1,394	209	1,603	1,603	-	-	-	-	-	-	-	-	-	25,426
4b.4.12	DOC Staff Cost		-	-	-	-	-	-	16,403	2,460	18,864	18,864 31,962	-	-	-	-	-	-	-	-	-	217,274
4b.4.13 4b.4	Utility Staff Cost	Period-Dependent Costs	801	7,536	98	50	-	277	27,793 53,325	4,169 9,515	31,962 71,602	71,602	-	-	-	4,321	-	-	-	86,419	- 141	388,320 631,020
40.4	Subtotal I ellou 40 l	remod-Dependent Costs	301	7,000	36	50	-	211	55,525	3,313	71,002	71,002	-	-	-	4,521	-	-	•	00,413	141	031,020
4b.0	TOTAL PERIOD 4b	b COST	3,780	28,255	3,013	2,098	-	9,406	58,564	20,105	125,221	120,342	-	4,879	-	146,242	-	-	-	7,854,137	356,973	642,522
PERIOD	0 4e - Delay before I	License Termination																				
Period 4e	Direct Decommission	ning Activities																				
Period 4e	Collateral Costs																					
4e.3	Subtotal Period 4e	Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pariod 4a	Period-Dependent Co	nete																				
4e.4.1	Insurance	osis							793	79	872	872										
4e.4.2	Property taxes		-	-	-	-	-	-	783	78	861	861	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supp	plies	_	149	_	-	_	-	-	37	186	186	_		-	-	_	_	-	-	-	_
4e.4.4	Disposal of DAW ge		-	-	4	2	-	10	-	3	18	18	-	-	-	156	-	-	-	3,124	5	-
4e.4.5	Plant energy budge	et	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-
4e.4.6	NRC Fees		-	-	-	-	-	-	398	40	437	437	-	-	-	-	-	-	-	-	-	-
4e.4.7	Site O&M Cost		-	-	-	-	-	-	259	39	297	297	-	-	-	-	-	-	-	-	-	-
4e.4.8	Utility Staff Cost	D 1 1 D 1 1 G 1	-	-	- ,	-	-	-	1,539	231	1,770	1,770	-	-	-	-	-	-	-	-		22,880
4e.4	Subtotal Period 4e I	Period-Dependent Costs	-	149	4	2	-	10	3,771	507	4,442	4,442	-	-	-	156	-	-	-	3,124	5	22,880
4e.0	TOTAL PERIOD 4e	e COST	-	149	4	2	-	10	3,771	507	4,442	4,442	-	-	-	156	-	-	-	3,124	5	22,880
PERIOD	4f - License Termi	nation																				
	Direct Decommission																					
4f.1.1	ORISE confirmator	y survey	-	-	-	-	-	-	172	52	224	224	-		-	-	-	-	-	-	-	-
4f.1.2	Terminate license	A street of							450	* 0	a	22.4										
4f.1	Subtotal Period 4f A	Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
Period 4f	Additional Costs																					
4f.2.1	License Termination		-	-	-	-	-	-	7,331	2,199	9,530	9,530	-		-	-	-	-	-	-	97,452	3,120
4f.2	Subtotal Period 4f A	Additional Costs	-	-	-	-	-	-	7,331	2,199	9,530	9,530	-	-	-	-	-	-	-	-	97,452	3,120
D : 1 .0																						
Period 4f 4f.3.1	Collateral Costs DOC staff relocation								1,163	175	1,338	1,338										
41.3.1 4f.3	Subtotal Period 4f (-		-				1,163	175	1,338	1,338	-	-		-	-	-	-	-		-
									,		,	,										
	Period-Dependent Co	osts							224	e =												
4f.4.1	Insurance		-	-	-	-	-	-	381	38	419	419	-	-	-	-	-	-	-	-	-	-
4f.4.2 4f.4.3	Property taxes Health physics supp	nlies	-	600	-	-	-	-	376	38 150	414 750	414 750	-	-	-	-	•	-	-	-	-	-
41.4.3 4f.4.4	Disposal of DAW ge		-	-	- 2	- 4	-	21	-	150 7	40	40	-	-	-	335			-	6,698	- 11	-
4f.4.4	Plant energy budge		-	-	-	4	-	-	264	40	304	304	-	-	-	-				-	- 11	-
4f.4.6	NRC Fees	· -	-	-	-	-	-	-	455	46	501	501	-		-	-			-	-	-	-
4f.4.7	Site O&M Cost		-	-	-	-	-		124	19	143	143	-	-	-				-	-	-	-
4f.4.8	Security Staff Cost		-	-	-	-	-	-	722	108	830	830	-	-	-	-	-	-	-	-	-	11,786
4f.4.9	DOC Staff Cost		-	-	-	-	-	-	3,870	580	4,450	4,450	-	-	-	-	-	-	-	-	-	46,750
4f.4.10 4f.4	Utility Staff Cost	Period-Dependent Costs	-	600	- 0	- 4	-	- 21	4,733 10,926	710 1,735	5,443 13,294	5,443 13,294	-	-	-	- 335	-	-	-	6,698	11	56,964 115,500
		•	-		8	4	-						-	-	-		-	-	-	ŕ		
4f.0	TOTAL PERIOD 4f	t COST	-	600	8	4	-	21		4,160	24,385	24,385	-	-	-	335	-	-	-	6,698	97,463	
PERIOD	4 TOTALS		4,351	60,504	22,920	13,910	-	63,681	142,812	64,789	372,968	362,569	-	10,399	-	462,804	1,127	393	2,217	26,037,510	743,524	1,491,686

Table D-1 **Braidwood Nuclear Power Station Unit 1** Delayed DECON Decommissioning Cost Estimate (Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. reet	Cu. Feet	Cu. Feet	Cu. reet	Cu. Feet	Wt., LDS.	Mannours	Mannours
PERIOD 5b - Site Restor	ration																				
Period 5b Direct Decommis	ssioning Activities																				
Demolition of Remaining Si	ite Buildings																				
b.1.1.1 Reactor		-	8,057	-	-	-	-	-	1,209	9,266	-	-	9,266	-	-	-	-	-	-	69,546	-
o.1.1.2 Auxiliary Buildi		-	6,941	-	-	-	-	-	1,041	7,982	-	-	7,982	-	-	-	-	-	-	61,038	-
o.1.1.3 Refueling Water		-	1,234	-	-	-	-	-	185	1,419	-	-	1,419	-	-	-	-	-	-	11,692	-
	or Storage Facility	-	516	-	-	-	-	-	77	593	-	-	593	-	-	-	-	-	-	4,559	-
.1.1.5 Turbine Building		-	6,833	-	-	-	-	-	1,025	7,858	-	-	7,858	-	-	-	-	-	-	70,342	-
1.1.6 Turbine Pedesta	al	-	1,627	-	-	-	-	-	244	1,872	-	-	1,872	-	-	-	-	-	-	12,628	-
.1.1 Totals		-	25,209	-	-	-	-	-	3,781	28,990	-	-	28,990	-	-	-	-	-	•	229,806	-
te Closeout Activities																					
1.2 Grade & landsca		-	986	-	-	-	-	-	148	1,134	-	-	1,134	-	-	-	-	-	-	1,942	-
1.3 Final report to N		-	-	-	-	-	-	193	29	222	222	-	-	-	-	-	-	-	-	-	1,56
1 Subtotal Period	5b Activity Costs	-	26,195	-	-	-	-	193	3,958	30,346	222	-	30,124	-	-	-	-	-	-	231,748	1,56
riod 5b Additional Costs																					
2.1 Site Restoration		-	625	-	-	-	-	28	98	751	-	-	751	-	-	-	-	-	-	6,273	80
2.2 Concrete Crushi		-	662	-	-	-	-	4	100	766	-	-	766	-	-	-	-	-	-	2,798	-
2 Subtotal Period	5b Additional Costs	-	1,288	-	-	-	-	31	198	1,517	-	-	1,517	-	-	-	-	-	-	9,071	80
riod 5b Collateral Costs																					
.3.1 Small tool allows		-	327	-	-	-	-	-	49	376	-	-	376	-	-	-	-	-	-	-	-
.3 Subtotal Period	5b Collateral Costs	-	327	-	-	-	-	-	49	376	-	-	376	-	-	-	-	-	-	-	-
iod 5b Period-Dependen	nt Costs																				
4.1 Insurance		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.2 Property taxes		-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
4.3 Heavy equipment		-	7,568	-	-	-	-	-	1,135	8,704	-	-	8,704	-	-	-	-	-	-	-	-
4.4 Plant energy but	dget	-	-	-	-	-	-	435	65	500	-	-	500	-	-	-	-	-	-	-	-
4.5 Site O&M Cost		-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
4.6 Security Staff Co		-	-	-	-	-	-	2,128	319	2,447	-	-	2,447	-	-	-	-	-	-	-	34,28
4.7 DOC Staff Cost			-	-	-	-	-	11,846	1,777	13,623	-	-	13,623	-	-	-	-	-	-	-	137,04
4.8 Utility Staff Cos		-	-	-	-	-	-	5,797	869	6,666	-	-	6,666	-	-	-	-	-	-	-	67,22
4 Subtotal Period	5b Period-Dependent Costs	-	7,568	-	-	-	-	21,853	4,351	33,773	-	-	33,773	-	-	-	-	-	•	•	238,55
0 TOTAL PERIOR	D 5b COST	-	35,378	-	-	-	-	22,078	8,556	66,012	222	-	65,790	-	-	-	-	-	-	240,819	240,198
ERIOD 5 TOTALS		-	35,378	-	-	-	-	22,078	8,556	66,012	222	-	65,790	-	-	-	-	-	-	240,819	240,198
OTAL COST TO DECO	MMISSION	10,503	107,024	23,338	14,580	-	64,933	685,267	151,454	1,057,100	599,809	379,532	77,759	_	473,253	1,127	393	2,217	26,327,860	1,072,678	6,236,384

TOTAL COST TO DECOMMISSION WITH 16.72% CONTINGENCY:	\$1,057,100	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 56.74% OR:	\$599,809	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 35.9% OR:	\$379,532	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 7.36% OR:	\$77,759	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	474,773	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	Cubic Feet
TOTAL SCRAP METAL REMOVED:	54,939	Tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,072,678	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 D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(Tr	ousands o	of 2014 Dollar	s)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs			Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A	Class B	Class C	GTCC Cu. Foot	Processed Wt., Lbs.	Craft Manhours	Contractor
	•	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., LDS.	Mannours	Mannours
	wn through Transition																				
Period 1a Direct Decom	nmissioning Activities																				
	site characterization survey	-	-	-	•	-	-	481	144	625	625	-	-	-	-	-	-	-	-	-	
	liminary decommissioning cost of Cessation of Operations	-	-	-	-	-		69	10	79 a	79	-	-	-	-	-	-	-	-	-	556
	l & source material									n/a											
	of Permanent Defueling									a											
	plant systems & process waste l submit PSDAR							106	16	a 122	122										85
	nt dwgs & specs.		-	-	-	-	-	69	10	79	79	-	-	-	-		-		-	-	55
a.1.9 Perform deta	ailed rad survey									a											
	-product inventory	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	42
a.1.11 End product a.1.12 Detailed by-	t description product inventory	-	-	-	-	-	-	53 80	8 12	61 91	61 91	-	-	-	-	-	-	-	-	-	42 64
	or work sequence		-	-	-	-	-	53	8	61	61	-	-	-	-		-		-	-	42
a.1.14 Perform SEI		-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,32
a.1.15 Perform Site	e-Specific Cost Study	-	-	-	-	-	-	265	40	305	305	-	-	-	-	-	-	-	-	-	2,14
etivity Specifications	nt and facilities for SAFSTOR							261	20	300	200										0.10
.1.16.1 Prepare plai .1.16.2 Plant systen		-	-	-	-	-	-	201	39 33	254	300 254	-		-	-		-		-	-	2,10 1,78
.1.16.3 Plant struct		-		-	-	-		165	25	190	190	-	-	-		-		-	-	-	1,33
.1.16.4 Waste mana		-	-	-	-	-	-	106	16	122	122	-	-	-	-	-		-	-	-	85
1.16.5 Facility and 1.16 Total	site dormancy	-	-	-	-	-	-	106 859	16 129	122 988	122 988	-	-	-	-	-	-	-	-	-	85 6,93
1.16 10tai		-	-		-		-	999	129	900	900	-	-	-	-	-	-	-			6,95
tailed Work Procedu								40		=0	5 0										* 0.
1.17.1 Plant system 1.17.2 Facility close		-	-	-	-	-		63 64	9 10	72 73	72 73	-	-	-	-	-	-	-	-	-	50 51
1.17.2 Facility close 1.17 Total	eout & dormancy	-	-	-	-	-	-	126	19	145	145	-	-	-	-	-	-	-	-	-	1,020
1.18 Procure vac	uum drying system	-	_	_			_	5	1	6	6	-			_	_	_	_	_	_	4
1.19 Drain/de-en	ergize non-cont. systems									a											
1.20 Drain & dry										a											
	ergize contaminated systems re contaminated systems									a											
	riod 1a Activity Costs	-	-	-	-	-	-	2,384	430	2,813	2,813	-	-	-	-	-	-	-	-	-	15,36
iod 1a Collateral Co	nsts																				
	riod 1a Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
iod 1a Period-Deper	ndent Costs																				
4.1 Insurance		-	-	-	-	-	-	1,815	181	1,996	1,996	-	-	-	-	-	-	-	-	-	-
1.2 Property tax 1.3 Health phys			528	-	-	-			132	660	660			-					-	-	
1.4 Heavy equip		-	566		-	-	-	-	85	651	651	-			-		-		-	-	-
1.5 Disposal of I	DAW generated	-	-	14	7	-	3		12	72	72	-	-	-	611	-	-	-	12,224	20	-
4.6 Plant energy	y budget	-	-	-	-	-	-	1,758	264	2,022	2,022	-	-	-	-	-	-	-	-	-	-
I.7 NRC Fees I.8 Emergency	Planning Fees		-	-	-			836 2,194	84 219	920 2,413	920	2,413		-							
4.9 Site O&M C		-	-	-	-	-	-	165	25	190	190	2,110	-	-	-		-	-	-	-	-
4.10 Spent Fuel I		-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-
4.11 ISFSI Opera		-	-	-	-	-	-	48 8,971	7	55 10,317	10,317	55	-	-	-	-	-	-	-	-	157,90
4.12 Security Sta 4.13 Utility Staff		-		-	-	-		32,151	1,346 4,823	36,974	36,974	-	-	-		-		-	-	-	424,56
	riod 1a Period-Dependent Costs	-	1,094	14	7	-	3		7,237	56,727	53,802	2,925	-	-	611	-	-	-	12,224		
0 TOTAL PER	RIOD 1a COST	-	1,094	14	7	-	3:	9 50,719	7,667	59,540	56,616	2,925	-	-	611	-	-	-	12,224	20	597,82
RIOD 1b - SAFSTO	OR Limited DECON Activities																				
riod 1b Direct Decom	nmissioning Activities																				
contamination of Sit	e Buildings																				
o.1.1.1 Reactor	uilding	2,496		-	-	-	-	-	1,248	3,744	3,744	-	-	-	-	-	-	-	-	33,093	
b.1.1.2 Auxiliary Bu	unang	287	-	-	-	-	-	-	144	431	431	-	-	-	-	-	-	-	-	3,829	-

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111)	, and a second	oi 2014 Dollar	,											
Activity		Decon	Removal	Packaging	T	Off-Site	LLRW	Other	Total	Total	NRC Lic. Term.	Spent Fuel	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Processing Costs	Disposal Costs	Costs	Contingency	Costs	Costs	Management Costs	Costs	Cu. Feet			Cu. Feet			Manhours	Manhours
	on of Site Buildings (continued)																				
	lwaste/Service Building ueling Water Storage Tank	187 411	-	-	-	-	-	-	94 205	281 616	281 616	-	-	-	-	-	-	-	-	2,506 5,322	-
	l Handling Building	1,174		-	-	-		-	587	1,760	1,760	-	-	-					-	15,238	-
1b.1.1 Tota		4,555	-	-	•	-	-	-	2,277	6,832	6,832	-	÷	-	-	-	-	-	÷	59,989	÷
1b.1 Sub	total Period 1b Activity Costs	4,555	-	-	-	-	-	-	2,277	6,832	6,832	-	-	-	-	-	-	-	-	59,989	-
Period 1b Colla		0.45							1.40	1 000	1 000										
	on equipment cess decommissioning water waste	947 200	-	141	- 355	-	443	-	142 278	1,089 1,417	1,089 1,417	-	-	-	1,262	-	-	-	75,708	246	-
1b.3.3 Proc	cess decommissioning chemical flush waste	-	-	-	-	-		-	-	-	-	-	-	-	-,	-	-	-	-	-	-
	all tool allowance total Period 1b Collateral Costs	- 1,146	80 80	- 141	- 355		- 443	-	12 432	92 2,598	92 2,598		-	-	1,262	-	-	-	75,708	246	
	od-Dependent Costs	, -								,	,				, -				,		
	on supplies	871	-	-	-	-	-	-	218	1,089	1,089	-	-	-		-		-	-		-
	urance	-	-	-	-	-	-	229	23	252	252	-	-	-		-	-	-	-	-	-
	perty taxes Ilth physics supplies	-	425	-	-	-	-	3,069	307 106	3,376 531	3,376 531	-	-		-	-	-		-	-	-
	vy equipment rental	-	141	-	-	-	-	-	21	162	162	-	-	-	-	-	-	-	-	-	-
	posal of DAW generated	-	-	13	7	-	37	-	12	69	69	-	-	-	585	-	-	-	11,699	19	-
	nt energy budget C Fees	-	-	-	-	-	-	437 116	66 12	503 128	503 128	-	-	-	-	-	-	-	-	-	-
	ergency Planning Fees	-	-	-	-	-	-	546	55	600	-	600	-	-	-	-	-	-	-	-	-
	O&M Cost	-	-	-	-	-	-	41	6	47	47		-	-		-	-	-	-	-	-
	nt Fuel Pool O&M SI Operating Costs			-	-	-	-	99 12	15 2	113 14		113 14		-	-				-	-	-
	urity Staff Cost	-		-	-	-	-	2,231	335	2,565	2,565	-	-	-	-	-			-	-	39,260
	lity Staff Cost		-	-		-	-	7,994	1,199	9,193	9,193	-	-	-	-	-	-	-	-	-	105,560
	total Period 1b Period-Dependent Costs	871	566	13	7	-	37	14,773	2,375	18,643	17,916	727		-	585	-	-	-	11,699	19	144,820
	TAL PERIOD 1b COST	6,573	646	154	362	-	480	14,773	5,084	28,073	27,346	727	-	-	1,847	-	-	-	87,408	60,254	144,820
PERIOD 1c -	Preparations for SAFSTOR Dormancy																				
Period 1c Direc	et Decommissioning Activities																				
1c.1.1 Prep	pare support equipment for storage	-	517	-	-	-	-		78	595	595	-	-			-		-	-	3,000	-
	tall containment pressure equal. lines	-	55	-	-	-	-	-	8	64	64	-	-	-		-	-	-	-	700	-
	erim survey prior to dormancy ure building accesses	-	-	-	-	-	-	733	220	953 a	953	-	-	-		-	-	-	-	10,874	-
	pare & submit interim report	-	-	-	-	-	-	31	5	36	36	-	-	-	-	-	-	-	-	-	250
1c.1 Sub	total Period 1c Activity Costs	-	572	-	-	-	-	764	310	1,647	1,647	-	-	-	-	-	-	-	-	14,574	250
Period 1c Addit																					
	nt fuel pool isolation total Period 1c Additional Costs	-	-	-	-	-	-	10,813 10,813	1,622 1,622	12,434 12,434	12,434 12,434	-	-	-	-	-	-	-	-	-	-
		-	-		-	-	-	10,615	1,022	12,404	12,404	-	-	-	-	-	-	-	-	-	-
Period 1c Colla 1c.3.1 Proc	teral Costs cess decommissioning water waste	236		167	421		525		329	1,679	1,679		_	_	1,496				89,742	292	_
	cess decommissioning water waste	-		-	- 421	-	-	-	-	-	1,073	-	-	-	1,430				- 03,742	-	-
	all tool allowance	-	5	5	-	-	-	-	1	6	6	-	-	-		-	-	-			-
	total Period 1c Collateral Costs	236	5	167	421	-	525	-	330	1,685	1,685	-	-	-	1,496	-	-	-	89,742	292	-
	od-Dependent Costs urance	_						229	23	252	252	_									
	perty taxes	-		-	-	-		3,069	307	3,376	3,376	-	-	-					-	-	-
	lth physics supplies	-	204	-	-	-	-	-	51	255	255	-	-	-		-	-	-	-	-	-
	avy equipment rental posal of DAW generated		141	- 3	- 9	-	10	-	21 3	162 18	162 18	-	-	-	152	-	-	-	3,039	- 5	-
	nt energy budget	-	-	-	-	-	-	437	66	503	503	-	-	-	-	-	-	-	-	-	-
1c.4.7 NRO	C Fees	-	-	-	-	-	-	116	12	128	128	-	-	-	-	-	-	-	-	-	-
	ergency Planning Fees O&M Cost	=	-	-		-	-	546 41	55 6	600 47	- 47	600	-		-	-	-	-			-
1c.4.10 Spen	nt Fuel Pool O&M	-	-		-	-	-	99	15	113	-	113			-	-	-	-	-		-
1c.4.11 ISFS	SI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(The	ousands	of 2014 Dollar	\cdot s)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed	Craft Manhours	Contractor
Period 1c Period-Dependent Cos	.t- (ti J)																		•		
reriod 1c Period-Dependent Cos 1c.4.12 Security Staff Cost	its (continued)	_			_	_	_	2,231	335	2,565	2,565	_	_						-	_	39,260
1c.4.13 Utility Staff Cost		-	_	-	-	-	-	7,994	1,199	9,193	9,193	-	-	_	-	-	-		-	-	105,560
	eriod-Dependent Costs	-	345	3	2	-	10		2,093	17,226	16,498	727	-	-	152	-	-	-	3,039	5	,
1c.0 TOTAL PERIOD 1c (COST	236	922	171	423	-	535	26,349	4,355	32,992	32,265	727	-	-	1,648	-	-	-	92,781	14,870	145,070
PERIOD 1 TOTALS		6,809	2,663	339	792	-	1,054	91,841	17,107	120,605	116,226	4,379	_	-	4,106	-	_	_	192,413	75,144	887,713
	nancy with Wet Spent Fuel Storage	.,	,				,	- ,-	,,	,,,,,,	-, -	,			,				. , .	,	
Period 2a Direct Decommissioni	ng Activities																				
2a.1.1 Quarterly Inspection										a											
2a.1.2 Semi-annual environ	mental survey									a											
2a.1.3 Prepare reports										a											
2a.1.4 Bituminous roof repla		-	-	-	-	-	-	2,004	301	2,304	2,304	-	-	-	-	-	-	-	-	-	-
2a.1.5 Maintenance supplie		-	-	-	-	-	-	3,898	974	4,872	4,872	-	-	-	-	-	-	-	-	-	-
2a.1 Subtotal Period 2a A	ctivity Costs	-	-	-	-	-	-	5,901	1,275	7,176	7,176	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs 2a.3.1 Spent Fuel Capital as	and Transfer							11.050	1,688	12,938		10.000									
2a.3.1 Spent Fuel Capital at 2a.3 Subtotal Period 2a Co		-	-	-	-			11,250 $11,250$	1,688	12,938		12,938 12,938	-	-	-	-	-	-	-	-	-
2a.5 Subtotal Period 2a O	onateral Costs		-	-	-	-	-	11,200	1,000	12,958		12,956	-	-	-	-	-	-	-		-
Period 2a Period-Dependent Cos 2a.4.1 Insurance	sts							15,298	1,530	16,827	15,612	1,216									
2a.4.1 Insurance 2a.4.2 Property taxes		-	-	-	-	-	-	32,725	3,272	35,997	35,997	1,216	-	-	-	-	-	-	-		-
2a.4.2 Froperty taxes 2a.4.3 Health physics suppl	ios	-	5,550	-	-	-	-	32,723	1,388	6,938	6,938	-	•	-	-	-	-	-	-	-	-
2a.4.4 Disposal of DAW gen			5,550	134	69		379		118	700	700	-			5,915				118,305	193	
2a.4.4 Disposal of DAW gen 2a.4.5 Plant energy budget	erateu			104	- 03	-	-	9,840	1,476	11,317	5,658	5,658			5,515				110,505	-	
2a.4.6 NRC Fees		_	_	_	_	_	-	7,458	746	8,204	8,204	-	_	_	_	_	_	_	_	_	_
2a.4.7 Emergency Planning	Fees	_	-	-	_	-	-	53,278	5,328	58,606	-	58,606		-	_	-	-	-	_	-	
2a.4.8 Site O&M Cost		-	-	-	-		-	4,629	694	5,323	5,323	-			-	-	-	-			
2a.4.9 Spent Fuel Pool O&N	Л	-	-	-	-		-	11,099	1,665	12,764	-	12,764			-	-	-	-			
2a.4.10 ISFSI Operating Cos		-	-	-	-	-	-	1,340	201	1,541	-	1,541	-	-	-	-	-	-	-	-	-
2a.4.11 Security Staff Cost		-	-	-	-	-	-	89,839	13,476	103,315	-	103,315	-	-	-	-	-	-	-	-	1,558,540
2a.4.12 Utility Staff Cost		-	-	-	-	-	-	107,480	16,122	123,602	18,209	105,392	-	-	-	-	-	-	-	-	1,375,354
2a.4 Subtotal Period 2a Pe	eriod-Dependent Costs	-	5,550	134	69	-	379	332,985	46,016	385,132	96,641	288,491	-	-	5,915	-	-	-	118,305	193	2,933,894
2a.0 TOTAL PERIOD 2a	COST	-	5,550	134	69	-	379	350,137	48,978	405,246	103,818	301,428	-	-	5,915	-	-	-	118,305	193	2,933,894
PERIOD 2b - SAFSTOR Dorn	nancy with Dry Spent Fuel Storage																				
Period 2b Direct Decommissioni 2b.1.1 Quarterly Inspection																					
2b.1.1 Quarterly inspection 2b.1.2 Semi-annual environ										a a											
2b.1.3 Prepare reports	mentar survey									a											
2b.1.4 Bituminous roof repla	acement	_	_	_	-	-	-	107	16	123	123	-	-	_	_	_	-	-	_	_	_
2b.1.5 Maintenance supplie		-	-	-	-		-	208	52	260	260				-	-	-	-			
2b.1 Subtotal Period 2b A		-	-	-	-	-	-	315	68	383	383	-	-	-	-	-	-	-	-	-	-
Period 2b Collateral Costs																					
2b.3.1 Spent Fuel Capital as	nd Transfer	_		-	_	-		3,688	553	4,241	-	4,241	-						_	-	-
2b.3 Subtotal Period 2b Co		-	-	-	-	-	-	3,688	553	4,241	-	4,241	-	-	-	-	-	-	-	-	-
Period 2b Period-Dependent Cos	sts																				
2b.4.1 Insurance		-	-	-	-	-	-	758	76	834	834	-	-	-	-	-	-	-	-	-	-
2b.4.2 Property taxes		-	-	-	-	-	-	749	75	824	824	-	-	-	-	-	-	-	-	-	-
2b.4.3 Health physics suppl		-	146	-	-	-	-	-	37	183	183	-	-	-	-	-	-	-	-	-	-
2b.4.4 Disposal of DAW gen	erated	-	-	4	2	-	10		3	18	18	-	-	-	155	-	-	-	3,096	5	-
2b.4.5 Plant energy budget		-	-	-	-	-	-	263	39	302	302	-	-	-	-	-	-	-	-	-	-
2b.4.6 NRC Fees	E	-	-	-	-	-	-	383	38	422	422	0.100	-	-	-	-	-	-	-	-	-
2b.4.7 Emergency Planning 2b.4.8 Site O&M Cost	rees	-	-	-	-	-	-	2,845 247	285 37	3,130 284	284	3,130	-	-	-	-	-	-	-	-	-
2b.4.9 Site O&M Cost 2b.4.9 ISFSI Operating Cos	to	-	-	-	-	-	-	72	37 11	284 82	284	- 82	-	-	-	•	-	-	-	-	-
2b.4.9 ISFSI Operating Cos 2b.4.10 Security Staff Cost	us	-	-	-	-	-	-	2,550	382	2,932	-	2,932	-	-	-		-	-	-	-	42,197
2b.4.10 Security Staff Cost 2b.4.11 Utility Staff Cost		-	-	-	-	-	-	2,334	349	2,672	973	1,700		-	-		-		-	-	31,257
	eriod-Dependent Costs		146	4	2	-	10		1,331	11,683	3,839	7,844	-	-	155	-	-	-	3,096	5	
2b.0 TOTAL PERIOD 2b (COST	_	146	4	2	-	10	14,193	1,953	16,307	4,222	12,085		-	155	-	_	_	3,096	5	73,454
			- 10	•	_		10	-,	-,- 30	-,	-,	,-00							-,	J	, -0 1

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111)	Jusanus	01 2014 Dollar	9)											
Activity		Decon	Removal				LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility an Contracto
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhour
ERIOD 2c - SAFSTO	OR Dormancy without Spent Fuel Storage																				
eriod 2c Direct Decom 2.1.1 Quarterly In																					
	l environmental survey									a a											
1.3 Prepare repo 1.4 Bituminous i	orts roof replacement							70	10	a 80	80	_									
1.5 Maintenance	e supplies	-	-		-	-	-	136	34	170	170	-	-	-	-	-	-	-	-	-	
1 Subtotal Per	riod 2c Activity Costs	-	-	-	-	-	-	206	44	250	250	-	-	-	-	-	-	-	-	-	
iod 2c Collateral Cos Subtotal Per	sts iod 2c Collateral Costs	-		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-		
od 2c Period-Depen	dent Costs																				
1.1 Insurance		-	-	-	-	-	-	495 489	49 49	544 538	544 538	-	-	-	-	-	-	-	-	-	
.2 Property tax .3 Health physi			90	-	-	-		409	23	113	113	-	-		-	-	-	-	-		
1.4 Disposal of D	DAW generated	-	-	2	1	-	6		2	11	11	-	-	-	94	-	-	-	1,879	3	
1.5 Plant energy 1.6 NRC Fees	budget state of the state of th	-		-		-		$172 \\ 241$	26 24	197 265	197 265	-	-	-						-	
1.7 Site O&M Co		-	-	-	-	-		161	24	186	186	-	-	-		-	-	-	-		
4.8 Utility Staff	Cost riod 2c Period-Dependent Costs	-	- 90	2		-	- 6	552 $2,109$	83 280	635 2,488	635 2,488	-	-	-	- 0.4	-	-	-	1 970	- 3	8
	NOD 2c COST	-	90	_	1		6		324	2,738	2,738	•	•	•	94	-	-	-	1,879 1,879	3	
	HOD 20 COS1																-	-	· ·		
RIOD 2 TOTALS	ate Site Following SAFSTOR Dormancy	-	5,787	140	72	-	394	366,644	51,255	424,291	110,778	313,513	-	-	6,164	-	-	-	123,281	201	3,015,
	missioning Activities																				
	iminary decommissioning cost	-	-	-	-	-	-	69	10	79	79	-	-	-	-	-	-	-	-	-	
	t dwgs & specs.	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	-	1
1.3 Perform deta1.4 End product	ailed rad survey description	_	_		_	_	_	53	8	a 61	61	_	_	_	_	_	_		_		
 Detailed by-p 	product inventory	-	-	-	-	-	-	69	10	79	79	-	-	-	-	-	-	-	-	-	
1.6 Define major1.7 Perform SER	r work sequence	-	-	-	-	-	-	398 164	60 25	457 189	457 189	-	-	-	-	-	-	-	-	-	
	e-Specific Cost Study	-		-		-		265	40	305	305	-	-	-	-	-	-		-		
	mit License Termination Plan Capproval of termination plan	-	-	-	-	-	-	217	33	250 a	250	-	-	-	-	-	-	-	-	-	1
civity Specifications																					
	plant & temporary facilities	-	-	-	-	-	-	391	59	449	404	-	45	-	-	-	-	-	-	-	3
1.11.2 Plant system 1.11.3 Reactor inter		-	-	-	-	-	-	221 376	33 56	254 433	229 433	-	25	-	-	-	-	-	-	-	1
1.11.4 Reactor vess		-	-	-	-	-	-	345	52	396	396	-	-	-	-	-	-	-	-	-	2
.11.5 Biological sh		-	-	-	-	-		27	4	30	30	-	-	-		-	-	-	-		
1.11.6 Steam gener 1.11.7 Reinforced co		-	-	-		-		165 85	25 13	190 98	190 49	-	49	-	-	-	-	-	-		
1.11.8 Main Turbin	ne	-	-	-	-	-	-	21	3	24	-	-	24	-	-	-	-	-	-	-	
11.9 Main Conder 11.10 Plant structu		-	-	-	-	-	-	$\frac{21}{165}$	3 25	24 190	- 95	-	24 95		-	-	-	-	-	-	
1.11.10 Plant structi 1.11.11 Waste mana		-	-	-	-	-		165 244	25 37	281	95 281	-	99	-	-	-	-		-		
.11.12 Facility & sit		-	-	-	-	-	-	48	7	55	27	-	27	-	-	-	-	-	-	-	
1.11 Total		-	-	-	-	-	-	2,109	316	2,426	2,135	-	290	-	-	-	-	-	-	-	1'
nning & Site Prepar 1.12 Prepare dism	ations nantling sequence							127	19	146	146										=
1.12 Prepare dism 1.13 Plant prep. &		-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-		-	1
1.14 Design water	r clean-up system	-	-	-	-	-	-	74	11	85	85	-	-	-	-	-	-	-	-	-	
	t. Cntrl Envlps/tooling/etc. ss/liners & containers	-	-	-	-	-	-	2,300 65	345 10	2,645 75	2,645 75	-	-	-	-	-	-	-	-	-	
	riod 3a Activity Costs		-	-	-	-		9,155	1,373	10,528	10,238	-	290	-	-	-	-		-		31,
Nancour I CI																					

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111	o abanas .	01 2014 Dollar	5,											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	Period-Dependent Costs																				
	Insurance	-	-	-	-	-	-	517	52	569	569	-	-	-	-	-	-	-	-	-	-
	Property taxes Health physics supplies	-	446	-	-	-		511	51 112	562 558	562 558	-	-	-	-	-	-	-	-	-	-
	Heavy equipment rental		577	-	-	-	-		87	664	664	-		-	-	-	-	-	-	-	-
	Disposal of DAW generated		-	11	6	_	31		10	58	58	_		_	491	-	_	-	9,823		
	Plant energy budget	-	-	-	-	-	-	1,792	269	2,061	2,061	-	-	-	-	-	-	-	-	-	-
	NRC Fees	-	-	-	-	-	-	340	34	374	374	-	-	-	-	-	-	-	-	-	-
	Site O&M Cost	•	-	-	-	-	-	169	25	194	194	-	-	-	-	-	-	-	-	-	-
	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	350 $14,577$	53 2,187	403 16,763	403 16,763	-	-	-	-	-	-	-	-	-	6,394 204,617
	Subtotal Period 3a Period-Dependent Costs	-	1,023	11	6	-	31		2,878	22,204	22,204	-	-	-	491	-	-	-	9,823	16	
3a.0	TOTAL PERIOD 3a COST	-	1,023	11	6	-	31	27,410	4,251	32,733	32,442	-	290	-	491	-	-	-	9,823	16	242,128
PERIOD 8	3b - Decommissioning Preparations																				
Period 3b I	Direct Decommissioning Activities																				
	Vork Procedures							0.84	60	202	202		00								0.000
	Plant systems Pageton internals	•	-	-	-	-	-	251	38 20	289 152	260 152	-	29	-	-	-	-	-	-	-	2,026
	Reactor internals Remaining buildings					-	-	133 72	20 11	82	21		62			-	-			-	1,070 578
	CRD cooling assembly	_	-	-	-	-	-	53	8	61	61	_	- 02	_	-	-	-	-	-	-	428
	CRD housings & ICI tubes	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-		-	-	428
3b.1.1.6	Incore instrumentation		-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	428
	Reactor vessel	-	-	-	-	-	-	192	29	221	221	-	-	-	-	-	-	-	-	-	1,554
	Facility closeout	-	-	-	-	-	-	64	10	73	37	-	37	-	-	-	-	-	-	-	514
	Missile shields Biological shield	-	-	-	-	-	-	24 64	4 10	27 73	27 73	-	-	-	-	-	-	-	-	-	193 514
	Steam generators					-	-	244	37	281	281	-		-		-	-			-	1,969
	Reinforced concrete	_	-	-	_	-	-	53	8	61	30	_	30	-	-	-	-		-	-	428
	Main Turbine	-	-	-	-	-	-	83	12	95	-	-	95	-	-	-	-		-	-	668
	Main Condensers		-	-	-	-	-	83	12	95	-	-	95	-	-	-	-	-	-	-	668
	Auxiliary building	-	-	-	-	-	-	145	22	166	150	-	17	-	-	-	-	-	-	-	1,168
	Reactor building	-	-	-	-	-	-	145	22	166	150	-	17	-	-	-	-	-	-	-	1,168
	Total Subtotal Period 3b Activity Costs	-	-	-	-		-	1,710 1,710	256 256	1,966 1,966	1,585 1,585	-	381 381	-	-	-	-	-		-	13,800 13,800
Period 3b A	Additional Costs																				
3b.2.1	Site Characterization	-	-	-	-	-	-	2,771	831	3,602	3,602	-	-	-	-	-	-	-	-	13,042	4,640
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	2,771	831	3,602	3,602	-	-	-	-	-	-	-	-	13,042	4,640
	Collateral Costs	0.1=							4.10												
	Decon equipment DOC staff relocation expenses	947	-	-	-		-	1,163	142 175	1,089 1,338	1,089 1,338	-	-	-	-	-	-	-	-		-
	Pipe cutting equipment		1,100			-	-	1,100	165	1,265	1,265	-		-		-	-			-	
	Subtotal Period 3b Collateral Costs	947	1,100	-	-	-	-	1,163	482	3,692	3,692	-	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
	Decon supplies	29	-	-	-	-	-	-	7	36	36	-	-	-	-	-	-	-	-	-	-
	Insurance Proporty toyog	-	-	-	-	-	-	255	25	280	280	-	-	-	-	-	-	-	-	-	-
	Property taxes Health physics supplies	-	238	-	-	-	•	252	25 59	277 297	277 297	-	-	-			-		-	-	-
	Heavy equipment rental	-	285	-		-			43	327	327	-	-	-					-	-	-
	Disposal of DAW generated	-	-	6	3	-	17		5	32	32	-	-	-	267				5,344	9	-
3b.4.7	Plant energy budget	-	-	-	-	-		884	133	1,017	1,017	-	-	-	-	-	-	-	· -	-	-
	NRC Fees	-	-	-	-	-	-	168	17	184	184	-	-	-	-	-	-	-	-	-	-
	Site O&M Cost	-	-	-	-	-	-	83	12	96	96	-	-	-	-	-	-	-	-	-	9.154
	Security Staff Cost DOC Staff Cost	-	-	-	-	-	-	173 3,382	26 507	199 3,889	199 3,889	-	-	-	-	-	-	-	-		3,154 43,109
	Utility Staff Cost	-	-	-	-	-		7,191	1,079	8,269	8,269	-	-	-		-	-		-	-	100,937
	Subtotal Period 3b Period-Dependent Costs	29	522	6	3	-	17		1,939	14,904	14,904	-	-	-	267	-	-	-	5,344		
3b.0	TOTAL PERIOD 3b COST	976	1,622	6	3	-	17	18,031	3,508	24,163	23,782	-	381	-	267	-	-	-	5,344	13,051	165,640
PERIOD 8	3 TOTALS	976	2,646	17	9	-	49	45,441	7,759	56,896	56,224	-	672	-	758			-	15,167	13,067	407,768

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111)	Justinus	oi 2014 Dollar	5,											
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Component Removal	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	ou. Feet	Cu. Feet	ou. Feet	Cu. Feet	cu. reet	W., 105.	Mannours	Mamours
	ommissioning Activities																				
Nuclear Steam Suppl	ly System Removal																				
a.1.1.1 Reactor Co	oolant Piping er Relief Tank	54 9	186 34	39 7	40 8	-	271 47	-	151 27	742 132	742 132	-	-	-	1,838 329	-	-	-	210,083 $36,553$	3,290 596	-
	oolant Pumps & Motors	32	121	85	198	-	1,390	-	432	2,259	2,259	-	-		4,796	-	-		780,540	2,726	80
a.1.1.4 Pressurize a.1.1.5 Steam Ger		14 108	79 4,584	370 1,659	$105 \\ 2,955$	-	879 10,309		299 4,387	1,746 24,003	1,746 24,003	-	-		3,033 62,044	-		-	240,915 3,098,576	1,532 20,508	750 2,250
a.1.1.6 CRDMs/IC	CIs/Service Structure Removal	26	315	219	43	-	141	-	155	899	899	-	-	-	2,843	-	-	-	109,650	4,745	-
	essel Internals Internals GTCC Disposal	104	2,920	6,538	1,071	-	5,085 12,062		6,730 1,809	22,741 $13,872$	22,741 13,872	-	-	-	1,835	1,127	393	2,217	328,507 433,180	27,350	1,226
a.1.1.9 Reactor Ve		129	5,095	2,175	1,159	-	2,832	292	6,179	17,862	17,862	-	-		9,331	-	-	-	960,579	27,350	1,226
a.1.1 Totals		476	13,334	11,092	5,579	-	33,018	585	20,170	84,254	84,254	-	-	-	86,049	1,127	393	2,217	6,198,583	88,098	5,532
emoval of Major Equ	uipment pine/Generator		682	3,324	1,256		3,337	_	1,525	10,124	10,124				57,484			_	2,984,647	9,146	_
a.1.2 Main Turb a.1.3 Main Cond		-	1,368	3,324 1,965	1,022	-	5,039		1,952 1,952	11,347	11,347	-	-	-	75,240		-	-	3,906,532	18,250	-
	n Clean Building Demolition																				
a.1.4.1 Reactor a.1.4.2 Auxiliary l	Building	-	1,397 785	-	-	-	-	-	210 118	1,607 902	1,607 902	-	-	-	-	-	-	-	-	12,130 6,896	-
	/Service Building	-	513				-		77	590	590	-	-		-		-			5,059	-
	Water Storage Tank	•	137	-	-	-	-	-	21 60	158 463	158 463	-	-	-	-	-	-	-	-	1,299	-
a.1.4.5 Fuel Hand a.1.4 Totals	lling Building	-	403 3,235	-	-	-	-	-	485	3,720	3,720	-	-	-	-	-	-	-	-	3,690 29,075	-
isposal of Plant Syst																					
a.1.5.1 Auxiliary		•	85 153	-	-	-	-	-	13 23	97 176	-	-	97 176	-	-	-	-	-	-	1,143	-
a.1.5.2 Auxiliary S a.1.5.3 Auxiliary S	Steam RCA	-	410	74	37	-	183	-	25 161	864	864	-	176		2,714	-	-	-	141,487	2,107 5,387	
a.1.5.4 Boric Acid	Processing	-	536	88	48	-	238	-	209	1,120	1,120	-	-	-	3,611	-	-	-	184,114	7,055	-
a.1.5.5 CO2 & H2 a.1.5.6 CO2 & H2		-	21 39	- 7	4	-	18	-	3 16	24 84	84	-	24	-	- 276	-	-	-	14,104	289 492	
1.1.5.7 Chemical l	Feed	-	194	-	-	-	-	-	29	223	-	-	223		-	-	-	-	-	2,663	-
น.1.5.8 Chemical l น.1.5.9 Chilled Wa	Feed at Intake ater	-	27 107	-	-	-	-	-	4 16	30 124	-	-	30 124	-	-	-	-			364 1,454	-
.1.5.10 Circulating		-	641	-	-	-	-	-	96	737	-	-	737	-	-	-	-	-		8,814	-
i.1.5.11 Condensat i.1.5.12 Condensat		-	392 391	-	-	-	-	-	59 59	450 449	-	-	450 449	-	-	-	-	-	-	5,317	-
a.1.5.12 Condensat		-	214	-	-	-	-	-	32	246	-	-	246		-	-	-	-		5,314 3,000	-
.1.5.14 Containme		-	289	87	47	-	231	-	146	800	800	-	-	-	3,455	-	-	-	179,291	3,839	-
.1.5.15 Diesel Fue .1.5.16 Essential S		-	212 368	-	-		-	-	32 55	244 423		-	244 423		-	-	-	-		2,848 5,049	-
.1.5.17 Extraction		-	263	-	-	-	-	-	39	302	-	-	302	-	-	-	-	-	-	3,637	-
.1.5.18 Feedwater .1.5.19 Feedwater			357 845						53 127	410 972	-	-	410 972			-		-		4,925 11,719	-
.1.5.20 Gland Stea		-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-		616	-
.1.5.21 Gland Wat .1.5.22 Main Stea		-	33 363	-	-	-	-	-	5 54	37	-	-	37	-	-	-	-	-	-	458 4,979	-
.1.5.22 Main Stea .1.5.23 Main Stea		-	96	23	13	-	64	-	44	417 240	240	-	417		947	-	-	-	49,262	1,292	-
.1.5.24 Make-up I		-	183	-	-	-	-	-	27	210	-	-	210	-	-	-	-	-		2,595	-
.1.5.25 Nitrogen .1.5.26 Non-Essen	ntial Service Water	-	1 426	-	-	-	-	-	0 64	490	-	-	1 490			-		-		18 5,903	-
.1.5.27 Non-Essen	ntial Service Water RCA	-	205	87	51	-	251	-	130	724	724	-	-	-	3,738	-	-	-	194,273	2,692	-
i.1.5.28 Off Gas i.1.5.29 Potable W	oton	-	768 6	176	97	-	478	-	344 1	1,862	1,862	-	- 7	-	7,112	-	-	-	370,343	10,290 75	-
	adiation Monitoring	-	76	4	2	-	9		22	113	113	-	- '		134			-	7,021	1,093	-
.1.5.31 Process Sa		-	168	15	8	-	41	-	55	287	287	-	-		615	-	-	-	31,992	2,368	-
.1.5.32 Screen Wa .1.5.33 Station Air		-	53 51	-	-	-	-	-	8	61 59	-	-	61 59		-	-	-	-	-	740 705	-
.1.5.34 Station He	eating	-	174	-	-	-	-	-	26	200	-	-	200	-	-	-	-	-	-	2,391	-
.1.5.35 Steam Hu .1.5.36 Switchgea		-	8 38	-	-	-	-	-	1	10 44	-	-	10 44	-	-	-	-	-	-	115 519	-
1.1.5.36 Switchgea: 1.1.5.37 Turbine Bl		-	38 91	-	-	-	-	-	14	104	-	-	104	-		-		-	-	1,235	-
a.1.5.38 Turbine Bl	ldg Floor Drains	-	155	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	2,117	
a.1.5.39 Turbine O	il	-	98	-	-	-	-	-	15	112		-	112	-	-	-	-	-	-	1,359	-

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

									oi 2014 Dollar												
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed	-		Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Disposal	of Plant Systems (continued)																				
4a.1.5.40	Turbine-Generator Auxilaries	-	65	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	884	-
	Waste Oil Sumps	-	38	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	517	-
4a.1.5.42 4a.1.5	Well Water Totals	-	92 8,775	560	307	-	1,512	-	$\frac{14}{2,055}$	106 13,209	6,093	-	106 7,116		22,603				1,171,887	1,247 119,622	-
4a.1.6	Scaffolding in support of decommissioning	-	1,829	15	8	-	37	-	469	2,357	2,357	-	•	-	556	-	-	-	28,884	26,661	-
4a.1	Subtotal Period 4a Activity Costs	476	29,223	16,956	8,171	-	42,943	585	26,657	125,010	117,894	-	7,116	-	241,933	1,127	393	2,217	14,290,530	290,852	5,532
	Additional Costs																				
4a.2.1 4a.2.2	Remedial Action Surveys Asbestos Abatement	-	-	-	-	-	-	1,976 50	593 8	2,569 58	2,569 58	-	-	-	-	•	-	-		31,151	-
4a.2.2	Operational Tools and Equipment	-	-	9	52	-	189	-	56	306	306	-	-	-	5,855				146,375	16	-
4a.2	Subtotal Period 4a Additional Costs	-	-	9	52	-	189	2,026	656	2,933	2,933	-	-	-	5,855	-	-	-	146,375	31,167	-
	Collateral Costs																				
4a.3.1	Process decommissioning water waste	9	-	12	30	-	37	-	19	107	107	-	-	-	106	-	-	-	6,375	21	-
4a.3.2 4a.3.3	Process decommissioning chemical flush waste Small tool allowance	-	380	-	-		-		- 57	437	- 393	-	44	-	-				-		-
4a.3	Subtotal Period 4a Collateral Costs	9	380	12	30	-	37	-	76	544	500	-	44	-	106	-	-	-	6,375	21	-
Period 4a	Period-Dependent Costs																				
4a.4.1	Decon supplies	90	-	-	-	-	-	-	23	113	113	-	-	-	-		-	-	-	-	-
4a.4.2 4a.4.3	Insurance Property taxes	-		-	-	-	-	790 780	79 78	869 858	869 772	-	- 86	-	-	-	-	-	-	-	-
4a.4.3 4a.4.4	Health physics supplies	-	2,376	-		-	-	-	594	2,969	2,969	-	-	-	-				-	-	-
4a.4.5	Heavy equipment rental	-	3,389	-	-	-	-	-	508	3,898	3,898	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	85	44	-	240		75	444	444	-	-	-	3,758	-	-	-	75,152	123	-
4a.4.7 4a.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	2,601 654	390 65	2,992 719	2,992 719	-	-	-	-	-	-	-	-		-
4a.4.6 4a.4.9	Site O&M Cost		-	-	-	-	-	258	39	296	296		-	-	-		-	-	-		-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	626	94	720	720	-	-	-	-		-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	4,500	675	5,176	5,176	-	-	-	-	-	-	-	-	-	75,891
4a.4.12 4a.4.13	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	18,176 $29,285$	2,726 4,393	20,903 33,678	20,903 33,678	-	-	-	-	-	-	-	-		222,723 394,082
4a.4.15	Subtotal Period 4a Period-Dependent Costs	90	5,765	85	44	-	240	57,671	9,740	73,635	73,549	-	86	-	3,758	-	-	-	75,152	123	692,697
4a.0	TOTAL PERIOD 4a COST	575	35,368	17,062	8,296	-	43,410	60,282	37,129	202,123	194,877	-	7,246	-	251,652	1,127	393	2,217	14,518,430	322,162	698,229
PERIOD	4b - Site Decontamination																				
Pariod 4h	Direct Decommissioning Activities																				
4b.1.1	Remove spent fuel racks	1,277	139	369	143	-	705	-	908	3,541	3,541	-	-	-	10,524	-	-	-	546,426	2,174	-
Disposal	of Plant Systems																				
4b.1.2.1	Chemical & Volume Control	-	1,209	164	82	-	407	-	433	2,296	2,296	-	-	-	6,063	-	-	-	315,292	15,801	-
4b.1.2.2 4b.1.2.3	Chilled Water RCA Component Cooling	-	742 790	180 224	95 122		470 600	-	335 388	1,823 2,123	1,823 2,123	-	-		7,000 8,936		-	-	364,517 464,778	9,521 10,502	-
4b.1.2.4		-	4,890	-	-	-	-		734	5,624	2,120	-	5,624	-	-				-	66,259	-
4b.1.2.5	Electrical - Contaminated	-	1,953	194	123	-	608	-	678	3,557	3,557	-	-	-	9,079	-	-	-	471,393	26,007	-
4b.1.2.6	Electrical - RCA	-	2,815	454	278	-	1,372	-	1,134	6,054	6,054	-	105	-	20,491	-	-	-	1,063,899	38,351	-
4b.1.2.7 4b.1.2.8	Emergency Diesel Generator Essential Service Water RCA		111 385	209	122	-	601		17 286	127 1,603	1,603	-	127		8,972				466,273	1,514 5,336	-
	Fire Protection	-	362	-	-	-	-	-	54	416	-	-	416	-		-	-	-	-	4,983	-
	Fire Protection RCA	-	597	153	85	-	419	-	282	1,537	1,537	-	-	-	6,243	-	-	-	324,808	7,672	-
	Fuel Handling Bldg Equip Drains	-	186	34	18	-	91	-	75	405	405	-	-	-	1,386	-	-	-	70,185	2,442	-
	Fuel Handling Bldg Equip Drains (Unit 1) Fuel Handling Bldg Floor Drains	-	33 190	4 33	2 17		9 82	-	11 74	58 395	58 395	-	-	-	129 1,241	-	-	-	6,739 63,725	429 2,480	-
4b.1.2.14	Fuel Handling Bldg Floor Drains (Unit 1)	-	132	23	12		58	-	52	277	277	-	-	-	874	-	-	-	44,626	1,769	-
	Fuel Pool Cooling & Cleanup	-	252	49	27	-	133	-	105	567	567	-	-	-	1,989	-	-	-	103,404	3,329	-
	Fuel Pool Cooling & Cleanup (Unit 1) HVAC-Auxiliary Building	-	234 623	46 116	25 73	-	124 361	-	98 269	528 1,442	528 $1,442$	-	-	-	1,857 5,390	-	-	-	96,476 279,889	3,103 8,029	-
	HVAC-Control Room HVAC	-	623 9	-	13 -		- 201	-	209 1	1,442	1,442	-	10	-	5,390 -		-	-	279,889	8,029 127	-
4b.1.2.19	HVAC-Diesel Generator Room	-	51	-	-		-	-	8	58	-	-	58	-	-	-	-	-		686	-
	HVAC-Laboratory	-	23	-	-	-	-	-	3	27	-	-	27	-	-	-	-	-	-	315	-
	HVAC-Machine Shop HVAC-Miscellaneous	-	21 128	-	-	-	-	-	3 19	24 148	-	-	24 148	-	-	-	-	-	-	297 1 769	-
40.1.2.22	11 v AC-iviiscenaneous	-	128	-	-	-	-	-	19	148	-	-	148	-	-	-	-	-	-	1,769	-

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

						(1110	usanus	01 2014 Dollar	3)											
					Off-Site	LLRW				NRC	Spent Fuel	Site	Processed	-		Volumes		Burial /		Utility and
Activity Index Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Disposal of Plant Systems (continued)																				
4b.1.2.23 HVAC-Primary Containment	-	692	218	139	-	683	-	386	2,119	2,119	-	-	-	10,197	-	-	-	529,451	8,908	-
4b.1.2.24 HVAC-Pumphouse	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	275	-
4b.1.2.25 HVAC-Radwaste	•	358	68	43	-	213	-	156	838	838	-	-	-	3,177	-	-	-	164,931	4,412	-
4b.1.2.26 HVAC-Turbine Building	-	218	-	-	-	-	-	33	250	-	-	250	-	-	-	-	-	-	3,158	-
4b.1.2.27 Instrument Air Supply 4b.1.2.28 Instrument Air Supply RCA	-	85 276	31	- 14	-	- 68	-	13 91	97 480	480	-	97	-	1,002	-	-	-	52,414	1,197 3,630	-
4b.1.2.29 Miscellaneous Drains		84	15	8	-	40		34	181	181				592	-	-	-	30,841	1,125	-
4b.1.2.30 Primary Containment Purge	_	336	138	76	-	375		203	1,128	1,128	_	-	_	5,582	_	_	_	290,664	4,721	_
4b.1.2.31 Primary Water	-	939	234	136	-	670	-	446	2,424	2,424	-	-	-	10,451	-	-	-	519,324	12,918	-
4b.1.2.32 Radioactive Waste Disposal	-	3,117	523	282	-	1,391	-	1,222	6,535	6,535	-	-	-	21,101	-	-	-	1,078,202	40,671	-
4b.1.2.33 Reactor Bldg Equipment Drains	•	122	25	14	-	67	-	52	279	279	-	-	-	997	-	-	-	51,818	1,605	-
4b.1.2.34 Reactor Building Floor Drains	-	46	6	3 10	-	16	-	17	89	89	-	-	-	245	-	-	-	12,768	604	-
4b.1.2.35 Reactor Coolant 4b.1.2.36 Residual Heat Removal	-	186 213	22 51	29	-	51 143	-	63 98	332 534	332 534	-	-	-	763 2,129	-	-	-	39,871 110,771	2,413 2,894	-
4b.1.2.37 Safety Injection		980	241	137		676		459	2,493	2,493			-	10,357				523,998	13,451	
4b.1.2.38 Station Air RCA	-	65	8	4	-	19		22	118	118		-	_	283	_	_	_	14,808	833	-
4b.1.2.39 Station Heating RCA	-	281	60	32	-	156		120	648	648	-	-	-	2,315	-	-	-	120,573	3,664	-
4b.1.2.40 Tritium ALPS	-	427	110	64	-	316	-	206	1,123	1,123	-	-	-	4,948	-	-	-	245,163	5,864	-
4b.1.2.41 Waste Oil Sumps RCA	-	29	4	2	-	10	-	10	56	56	-	-	-	149	-	-	-	7,762	370	-
4b.1.2.42 Waste Water Treatment	•	105			-	-	-	16	120		-	120	-		-	-	-		1,464	-
4b.1.2 Totals	-	24,315	3,638	2,075	-	10,229	-	8,709	48,965	42,040	-	6,926	-	153,939	-	-	-	7,929,364	324,897	-
4b.1.3 Scaffolding in support of decommissioning	-	2,743	22	11	-	56	-	704	3,536	3,536	-	-	-	834	-	-	-	43,325	39,992	-
Decontamination of Site Buildings																				
4b.1.4.1 Reactor	2,264	1,625	233	347	-	1,358	-	1,953	7,782	7,782		-	-	24,850	-	-	-	1,271,843	50,420	-
4b.1.4.2 Auxiliary Building	265	138	22	20	-	75	-	191	710	710	-	-	-	1,209	-	-	-	72,597	5,258	-
4b.1.4.3 Radwaste/Service Building 4b.1.4.4 Refueling Water Storage Tank	174	54 480	9	12 18	-	38 83	-	112 354	399 1,388	399	-	-	-	686 1,240	-	-	-	42,196	2,958 11,972	-
4b.1.4.4 Refueling Water Storage Tank 4b.1.4.5 Fuel Handling Building	412 1,180	1,321	41 110	53	-	236	-	998	3,898	1,388 3,898	-	-	-	3,552	-	-		67,350 198,847	33,507	-
4b.1.4 Totals	4,295	3,619	415	450	-	1,790	-	3,609	14,177	14,177	-	-	-	31,536	-	-	-	1,652,832	104,115	-
4b.1 Subtotal Period 4b Activity Costs	5,572	30,816	4,445	2,679	-	12,779	-	13,929	70,220	63,294	-	6,926	-	196,834	-	-	-	10,171,950	471,178	-
Period 4b Additional Costs																				
4b.2.1 License Termination Survey Planning	-	-	-	-	-	-	983	295	1,278	1,278	-	-	-	-	-	-	-	-	-	6,240
4b.2.2 Remedial Action Surveys 4b.2.3 Asbestos Abatement	-	-	-	-	-	-	3,566 50	1,070 8	4,636 58	4,636 58	-	-	-	-	-	-	-	-	56,209	-
4b.2.4 License Termination ISFSI		443	207	278		893	1,283	776	3,880	3,880			-	14,543				1,178,709	7,632	5,262
4b.2.5 Underground Services Excavation	-	554		-	_	-	-,200	83	637	637	_	_	-	- 1,010	-	_	_	-	2,755	
4b.2 Subtotal Period 4b Additional Costs	-	997	207	278	-	893	5,882	2,232	10,490	10,490	-	-	-	14,543	-	-	-	1,178,709	66,596	11,502
Period 4b Collateral Costs																				
4b.3.1 Process decommissioning water waste	24	-	34	87	-	108	-	56	309	309	-	-	-	308	-	-	-	18,491	60	-
4b.3.2 Process decommissioning chemical flush waste	-	-	-	-	-	-	-	- 00	- 799	- 799	-	-	-	-	-	-	-	-	-	-
4b.3.3 Small tool allowance 4b.3.4 Decommissioning Equipment Disposition	-	638	184	96	-	472	-	96 151	733 903	733 903	-	-	-	7,054	-	-	-	366,237	- 88	-
4b.3 Subtotal Period 4b Collateral Costs	24	638	219	183	-	581	-	302	1,946	1,946	-	-	-	7,362	-	-	-	384,729	148	-
Period 4b Period-Dependent Costs																				
4b.4.1 Decon supplies	1,013	-	-	-	-	-	-	253	1,267	1,267	-	-	-	-	-	-	-	-	-	-
4b.4.2 Insurance	-	-	-	-	-	-	1,368	137	1,504	1,504	-	-	-	-	-	-	-	-	-	-
4b.4.3 Property taxes	-	-	-	-	-	-	1,351	135	1,486	1,486	-	-	-	-	-	-	-	-	-	-
4b.4.4 Health physics supplies 4b.4.5 Heavy equipment vertal	-	4,007	-	-	-	-	-	1,002	5,009 6,682	5,009	-	-	-	-	-	-	-	-	-	-
4b.4.5 Heavy equipment rental 4b.4.6 Disposal of DAW generated	-	5,810	152	- 78	-	429	-	872 134	6,682 793	6,682 793	-	-	-	6,704		•		134,081	219	-
4b.4.7 Plant energy budget	-	-	102	-	-	- 448	3,556	533	4,090	4,090	-	-	-	-				104,001	-	-
4b.4.8 NRC Fees	-	-	-	-	-		1,132	113	1,246	1,246	-	-	-	-	-		-	-	-	-
4b.4.9 Site O&M Cost	-	-	-	-	-	-	446	67	513	513	-	-	-	-	-	-	-	-	-	-
4b.4.10 Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,084	163	1,247	1,247	-	-	-	-	-	-	-	-	-	-
4b.4.11 Security Staff Cost	-	-	-	-	-	-	10,515	1,577	12,092	12,092	-	-	-	-	-	-	-	-	-	176,250
4b.4.12 DOC Staff Cost	-	-	-	-	-	-	31,109	4,666	35,776	35,776	-	-	-	-	-	-	-	-	-	377,880
4b.4.13 Utility Staff Cost 4b.4 Subtotal Period 4b Period-Dependent Costs	1,013	9,818	152	78	-	429	50,609 101,171	7,591 17,244	58,201 129,904	58,201 129,904	-	-	-	6,704	-	-	-	134,081	219	665,520 1,219,650
4b.0 TOTAL PERIOD 4b COST	6,609	42,268	5,023	3,218	-		107,053	33,706		205,633	-	6,926	-	225,443		-	_	11,869,460	538,141	1,231,152

Table D-2
Braidwood Nuclear Power Station Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111)	ousunus	oi 2014 Dollar	.5)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 4f -	License Termination																				
Period 4f Direc	ct Decommissioning Activities																				
	ISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
	eminate license ototal Period 4f Activity Costs	-	-	-	-	-	-	172	52	a 224	224	-	-	-	-	-	-	-	-	-	-
Period 4f Addi	tional Costs																				
	ense Termination Survey ototal Period 4f Additional Costs	-	-	-	-	-	-	9,744 9,744	2,923 2,923	$12,667 \\ 12,667$	12,667 12,667	-	-	-	-	-	-	-	-	132,123 132,123	
Period 4f Colla																					
f.3.1 DO f.3 Sub	C staff relocation expenses ototal Period 4f Collateral Costs	-	-	-	-	-	-	1,163 1,163	175 175	1,338 1,338	1,338 1,338	-	-	-	-	-	-	-	-	-	-
eriod 4f Perio	od-Dependent Costs																				
	urance	-	-	-	-	-	-	381	38	419		-	-	-	-	-	-	-	-	-	-
	perty taxes alth physics supplies	-	703	-		-		376	38 176	414 879		-	-		-	-	-	-	-	-	-
	posal of DAW generated	-	-	8	4	-	21		7	40	40	-	-	-	335	-	-	-	6,698	11	
	nt energy budget	-	-	-	-	-	-	264	40	304	304	-	-	-	-	-	-	-	-	-	-
	C Fees e O&M Cost	-		-	-	-		302 124	30 19	333 143	333 143	-	-	-					-	-	
	curity Staff Cost	-	-	-	-	-	-	722	108	830	830	-	-	-	-	-	-	-	-	-	11,78
	C Staff Cost	-	-	-	-	-	-	3,870	580	4,450		-	-	-	-	-	-	-	-	-	46,78
	lity Staff Cost ototal Period 4f Period-Dependent Costs	-	703	- 8	4	-	21	4,733 $10,773$	$710 \\ 1,745$	5,443 $13,255$	5,443 13,255	-		-	- 335	-	-	-	6,698	11	56,96 115,50
0 TO	TAL PERIOD 4f COST		703	8	4	-	21	21,853	4,895	27,484	27,484		-	-	335	-	-	-	6,698	132,134	118,62
ERIOD 4 TO	OTALS	7,184	78,340	22,092	11,518	-	58,113	189,188	75,730	442,166	427,994	-	14,172	-	477,429	1,127	393	2,217	26,394,600	992,436	2,048,00
ERIOD 5b -	Site Restoration																				
eriod 5b Dire	ect Decommissioning Activities																				
	Remaining Site Buildings																				
	actor x Feedwater-Steam Tunnel/Penetr. Area	-	8,057 795	-	-	-	-	-	1,209	9,266	-	-	9,266	-	-	-	-	-	-	69,546	
	x reedwater-steam Tunner renetr. Area xiliary Building	-	7,062	-	-	-	-	-	119 1,059	914 8,121	-	-	914 8,121	-		-	-		-	5,187 62,064	
.1.1.4 Blo	wdown Outfall Structure	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	295	
	tled Gas Storage	-	31	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	340	
	culating Water Discharge tehouse and Extension		265 397		-		-		40 60	305 457	-	-	305 457	-					-	2,887 4,193	
	trument Maintenance Building	-	112	-	-	-	-	-	17	129		-	129	-	-	-	-	-	-	1,190	
	ke Screen House	-	1,788	-	-	-	-	-	268	2,056	-	-	2,056	-	-	-	-	-	-	15,283	
	ke-up Demineralizer Area scellaneous Warehouses	-	764 2,333	-	-	-	-	-	115 350	878 2,683	-	-	878 2,683	-	-	-	-	-	-	8,158 26,794	
	scellaneous Yard Structures	-	1,517	-	-	-	-	-	228	1,744	-	-	1,744	-					-	14,701	
1.1.13 Rad	dwaste/Service Building	-	4,681	-	-	-	-	-	702	5,383	-	-	5,383	-	-	-	-	-	-	45,685	-
	eiving Building	-	218	-	-	-	-	-	33	250	-	-	250	-	-	-	-	-	-	2,293	
	rueling Water Storage Tank er Screen House	-	1,234 726	-	-	-	-	-	185 109	1,419 835	-	-	1,419 835	-	-	-	-	-	-	11,692 6,844	
	er Screen House eurity Modifications	-	1,084	-	-	-	-	-	163	1,246	-	-	1,246	-	-				-	6,939	
1.1.18 Sew	vage Treatment Plant	-	124	-	-	-	-	-	19	143		-	143	-	-	-	-	-	-	1,330	
	h Support Center & Cond Cleanup Bldg	-	594	-	-	-	-	-	89	683		-	683	-	-	-	-	-	-	6,095	
	bine Building	-	6,833	-	-	-	-	-	1,025	7,858		-	7,858 1,872	-	-	-	-	-	-	70,342	
	bine Pedestal ste Treatment Building	-	1,627 122	-					244 18	1,872 141		-	1,872		-	-	-	-		12,628 1,265	
.1.1.23 Fue	el Handling Building	-	3,632	-	-	-		-	545	4,177	-	-	4,177	-	-	-	-	-	-	33,245	-
.1.1 Tot	als	-	44,032	-	-	-	-	-	6,605	50,637	-	-	50,637	-	-	-	-	-	-	408,996	-
te Closeout A	Activities nove Rubble	_	294	_	_	-	_	_	44	339	_	_	339	_	_	_	_	_	-	1,367	_
o.1.3 Gra	ide & landscape site	-	986	-	-				148	1,134		-	1,134		-	-	-	-		1,942	-
b.1.4 Fin	al report to NRC	-	-	-	-	-	-	83	12	95	95	-	-	-	-	-	-	-	-	-	668
5b.1 Sub	ototal Period 5b Activity Costs	-	45,312	-	-	-	-	83	6,809	52,204	95	-	52,109	-	-	-	-	-	-	412,305	668

Table D-2 **Braidwood Nuclear Power Station Unit 2** Delayed DECON Decommissioning Cost Estimate (Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial`	Volumes		Burial/		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Powind 5h A	dditional Costs																				
	Site Restoration ISFSI	_	625	_	_		_	28	98	751	_	_	751		_	_	_	_	_	6,273	80
	Concrete Crushing		1,120	-	-	_	-	6	169	1,295	-	_	1,295	-	-	-	-	-	-	4,730	-
	Cofferdam Construction and Teardown		889	_	_	_	_	-	133	1,023	-	_	1,023	-	-	_	-	-	_	7,391	_
	Subtotal Period 5b Additional Costs	-	2,634	-	-	-	-	34	400	3,068	-	-	3,068	-	-	-	-	-	-	18,394	80
Period 5b Co	ollateral Costs																				
	Small tool allowance		581	_	_	_	_	_	87	668	-	_	668	-	-	_	-	_	_	_	_
	Subtotal Period 5b Collateral Costs	-	581	-	-	-	-	-	87	668	-	-	668	-	-	-	-	-	-	-	-
Period 5b Pe	eriod-Dependent Costs																				
	nsurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2 P	Property taxes	-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
	Heavy equipment rental	-	7,568	-	-	-	-	-	1,135	8,704	-		8,704	-	-	-	-	-	-	-	-
	Plant energy budget	-	-	-	-	-	-	435	65	500	-	-	500	-	-	-	-	-	-	-	-
	Site O&M Cost	-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
	Security Staff Cost	-	-	-	-	-	-	2,128	319	2,447	-	-	2,447	-	-	-	-	-	-	-	34,287
	OOC Staff Cost		-	-	-	-	-	11,846	1,777	13,623	-	-	13,623	-	-	-	-	-	-	-	137,043
	Jtility Staff Cost	-	-	-	-	-	-	5,797	869	6,666	-	-	6,666	-	-	-	-	-	-	-	67,229
5b.4 S	Subtotal Period 5b Period-Dependent Costs	-	7,568	-	-	-	-	21,853	4,351	33,773	-	-	33,773	-	-	-	-	-	-	-	238,558
5b.0 T	COTAL PERIOD 5b COST	-	56,096	-	-	-	-	21,970	11,648	89,713	95	-	89,618	-	-	-	-	-	-	430,699	239,306
PERIOD 5	TOTALS	-	56,096	-	-	-	-	21,970	11,648	89,713	95	-	89,618	-	-	-	-	-	-	430,699	239,306
TOTAL CO	ST TO DECOMMISSION	14,969	145,531	22,588	12,390	-	59,611	715,084	163,499	1,133,671	711,318	317,892	104,462	-	488,457	1,127	393	2,217	26,725,460	1,511,547	6,598,296

TOTAL COST TO DECOMMISSION WITH 16.85% CONTINGENCY:	\$1,133,671	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 62.74% OR:	\$711,318	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 28.04% OR:	\$317,892	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 9.21% OR:	\$104,462	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	489,977	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	Cubic Feet
TOTAL SCRAP METAL REMOVED:	74,045	Tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,511,547	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

APPENDIX E

DETAILED COST ANALYSIS

SAFSTOR

	Page
Braidwood Nuclear Power Station, Unit 1	E-2
Braidwood Nuclear Power Station, Unit 2	E-12

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Achardes								(Th	ousands o	of 2014 Dollar	rs)											
Free Free Free Free Free Free Free Free	Activity Index	Activity Description					Processing	Disposal				Lic. Term.	Management	Restoration	Volume		Class B	Class C		Processed		Utility and Contractor Manhours
New Journal Assertation of Assertati		•		0000	00000	0000	0000	00000	0000	contingency	0000	0000	00000	0.000	04,1000	04,100	04,100	0411000	04,100	110, 200	namour p	namour b
18. 18.		_																				
Mail May was inflament was intermediated with the manufacture of t																						
10.1 September 1.			-	-	-	-		-					-		-	-	-	-	-	-	-	1,300
Act	1a.1.3 Notification	of Cessation of Operations							101		a	100										1,000
1-10 1-10	1a.1.5 Notification of	of Permanent Defueling																				
1.1. 1.1.			_						248	37		285										2.000
1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	1a.1.8 Review plant	t dwgs & specs.	-	-	-	-	-	-			185		-		-	-	-	-	-	-	-	1,300
1-11 1-			-	-	-	-	-	-	124	19		142	-		-	-	-	-	-		-	1,000
12-11 10-11	1a.1.11 End product	description	-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	1,000
Act	1a.1.13 Define major	work sequence	-	-					124	19	142	142	-	-	-		-	-	-		-	1,000
Service Servic			-	-	-	-	-	-					-	-	-	-	-	-	-	-		3,100 5,000
13.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.									-													-,
18.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		at and facilities for SAFSTOR	-	-	-	-	-	-	610	91	701	701	-	-	-	-	-	-	-	-	-	4,920
1.1. 1.1.			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	4,167
Second	1a.1.16.4 Waste manag	gement	-	-	-	-	-	-	248	37	285	285	-	-	-	-	-	-	-	-		2,000
18.1.17 19.1.17 19.1.17 19.1.17 19.1.18 19.1	1a.1.16.5 Facility and a 1a.1.16 Total	site dormancy	-	-	-	-		-							-		-	-				2,000 16,207
18.1.17 19.1.17 19.1.17 19.1.17 19.1.18 19.1	Datailed Work Procedur	TAR.																				
14.1.1.4 Ford	1a.1.17.1 Plant system	ıs	-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	1,183
1.1 1.1	1a.1.17.2 Facility close 1a.1.17 Total	out & dormancy	-	-	-		-	-					-		-		-			-		1,200 2,383
1.1 1.1	1a 1 18 Progues vogu	uum dwing system							19	9	1.4	1.4										100
1.1 1.1	1a.1.19 Drain/de-ene	ergize non-cont. systems	_		_	_		_	12	2	a	11	-	-		-	_	-	_	_	_	100
Subtail Period In Activity Costs																						
Period la Additional Costs									4 027	911		5 73Q										35 800
1.2 SFSI Expansion			-	-		-		-	4,321	011	0,700	5,750				-	-	-	-	-		55,650
Period Ia Calistran Costs			-	-	-	-	-	-	4,800	720	5,520		5,520		-	-	-	-	-		-	
18.3 Spent Fuel Capital and Transfer 1.0	1a.2 Subtotal Per	iod 1a Additional Costs	-	-	-	-	-	-	4,800	720	5,520	-	5,520	-	-	-	-	-	-	-	-	-
Same Subtral Period Collateral Costs Subtral Period									= 000	4.400	0.444		0.444									
1a.4.1 Insurance 1.8.1 1.996 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999			-	-		-		-								-	-	-	-	-	-	
1a.4.1 Insurance 1.8.1 1.996 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999 1.999	Period 1a Period-Depen	dent Costs																				
1a.4.3 Health physics supplies 527 - - 132 658 658 -	1a.4.1 Insurance		-										-				-		-	-		-
1a.4.4 Heavy equipment rental 565 - - 85 649 649 -			-			-	-	-	-				-	-	-	-	-	-	-	-		-
1a.4.6 Plant energy budget	1a.4.4 Heavy equip	ment rental	-		-	-	-	-	-	85	649	649	-	-	-	-	-	-	-			-
1a.4.7 NRC Fees - - 1,181 118 1,299 1,299 -			-	-	14	7	7 -	39					-	-	-	610	-	-	-	12,190		-
1a.4.8 Emergency Planning Fees - - 2,188 219 2,407 - 2,407 -<		buaget	-		-	-	-	-					-	-	-	-		-		-		-
1a.4.10 Spent Fuel Pool O&M	1a.4.8 Emergency F		-	-	-	-	-	-	2,188	219	2,407	-	2,407	-	-	-	-	-	-		-	-
1a.4.11 ISFSI Operating Costs -			-	-	-	-	-	-		25				-	-	-	-	-	-	-	-	-
1a.4.12 Security Staff Cost -<	1a.4.10 Spent Fuel P	ool O&M	-	-	-	-	-	-		59				-	-	-	-	-	-	-	-	
1a.4.13 Utility Staff Cost - - - - - - - 4.809 36,873 36,873 -			-		-	-	-							-	-		-		-	-	-	12,264
1a.4 Subtotal Period 1a Period-Dependent Costs - 1,091 14 7 - 39 40,280 6,011 47,443 44,526 2,917 610 12,190 20 435,664	1a.4.13 Utility Staff	Cost	-	-	-	-	-			4,809		36,873		-	-	-	-		-	-	-	423,400
1a.0 TOTAL PERIOD 1a COST - 1,091 14 7 - 39 57,930 8,731 67,812 50,264 17,548 610 12,190 20 471,55-	1a.4 Subtotal Peri	iod 1a Period-Dependent Costs	-	1,091	14	7	7 -	39	40,280			44,526	2,917	-	-	610	-	-	-	12,190	20	435,664
	1a.0 TOTAL PER	IOD 1a COST	-	1,091	14	7	7 -	39	57,930	8,731	67,812	50,264	17,548	-	-	610	-	-	-	12,190	20	471,554

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

1								(111)	ousanus (of 2014 Dollar	5)											
Second Content							Processing	Disposal				Lic. Term.	Management	Restoration	Volume		Class B	Class C		Processed		Contractor
Second Content	PERIOD	O 1b - SAFSTOR Limited DECON Activities																				
1. 1. 1. 1. 1. 1. 1. 1.	Period 1b	b Direct Decommissioning Activities																				
1. 1. 1. 1. 1. 1. 1. 1.	Decontar	mination of Site Buildings																				
1.0 1.0				-	-	-	-	-	-				-	-	-	-	-	-	-	-		-
1	1b.1.1.2 1b.1.1.3			-	-		-		-				-	-		-		-				-
March Marc	1b.1.1.4	Steam Generator Storage Facility	67	-	-	-	-	-	-	33	100	100	-	-	-	-	-	-	-	-	887	
Part					-	-	-	-	-				-	-	-	-	-	-	-	-		-
Math	1b.1	Subtotal Period 1b Activity Costs	3,221	-	-	-	-	-	-	1,610	4,831	4,831	-	-	-	-	-	-	-	-	42,591	-
Math Property of the Company and the property of the Company and the Compa			0.47							140	1.000	1 000										
1.0. 1.0.	1b.3.1 1b.3.2				127	321		400					-	-		1,139		-				-
1.65 1.65	1b.3.3				-	-	-	-	-				-	-	-	-	-	-	-			-
Second Primal Deformation Primal	1b.3.4 1b.3.5			- 56			-		1.975				2.271	-		-	-	-	-			-
Section Sect	1b.3			56		321	-	400						-	-	1,139	-	-	-			-
Sect Control											0.50	OF-										
Section Sect	1b.4.1 1b.4.2	* *		-	-		-		342				-	-				-	-	-		-
Mary Component words	1b.4.3	Property taxes	-	-	-	-	-	-		306	3,367	3,367	-	-	-	-	-	-	-	-	-	-
Section Designation Desi	1b.4.4		-			-	-	-	-				-	-	-	-	-	-	-	-	-	-
1.64 1.65	1b.4.6		-	-		6	-	34		11	63	63	-	-		529			-	10,586	17	-
Marganey Planning Proc	1b.4.7		-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
1.4. 1.4.	1b.4.8 1b.4.9		-		-		-						600	-					-	-		-
1.1.1 1.1.2 1.1.	1b.4.10	Site O&M Cost	-	-	-	-	-	-		6				-	-	-	-	-	-	-	-	-
Security Staff Cost	1b.4.11 1b 4 12		-	-	-		-	-						-		-		-	-	-		-
Sakshide Period Dependent Costa 687 481 12 6 34 12871 2013 16.104 15.376 727 529 1.088 10.868 17 108.618 10.08	1b.4.13	Security Staff Cost	-	-	-	-	-	-	167	25	193	193	-	-	-	-	-	-	-	-	-	
To To To To English Co ST To To To La De Richo Di Co ST To To To La De Richo Di Co ST To To To La De Richo Di Co ST To To La De Richo Di Co ST To To To La De Richo Di Co ST To To To La De Richo Di Co ST To To To La De Richo Di Co ST To To To La De Richo Di Co ST To T	1b.4.14		- 687	- 481	- 19	- 6	-	- 3/						-		- 529	-	-		10.586		
Proper Section 1 Proper						_														ŕ		
Period			5,034	991	139	327	-	434	14,846	4,321	29,638	22,639	2,999	-	-	1,668	-	-	-	78,898	42,830	108,618
Prepare support equipment for storage																						
Secondary Seco	Period 1c	c Direct Decommissioning Activities																				
1	1c.1.1		-			-	-	-	-				-	-		-	-	-	-	-		-
Secretary Secr	1c.1.2 1c.1.3		-	- -	-		-						-	-					-	-		
Subtoal Period Ic Coltareral Costs	1c.1.4	Secure building accesses							=0													***
Process decommissioning water waste			-	-	-	-	-	-					-	-	-	-	-	-	-	-		
C.3.1 Process decommissioning water waste 142 - 100 252 314 - 197 1,06 1,06	1c.1	Subtotal Period 1c Activity Costs	-	572	-	-	-	-	805	317	1,694	1,694	-	-	-	-	-	-	-	-	14,574	583
C.3.2 Process decommissioning chemical flush waste C.3.3 Small tool allowance C.3.4 Spent Fuel Capital and Transfer C.3.4 Spent Fuel Capital and Transfer C.3.5 Subtoatl Period Le Collateral Costs Ceriod-Dependent Costs C.4.1 Insurance C.4.2 Property taxes C.4.3 Health physics supplies C.4.4 Heavy equipment rental C.4.5 Disposal of DAW generated C.4.5 Disposal of DAW generated C.4.6 Plant energy budget C.4.7 NC Fees C.4.7 NC Fees C.4.8 Fees C.4.8 Fees C.4.9 Fees C.4.9 Fees C.4.1 Fees C.4.1 Fees C.4.2 Property taxes C.4.3 Fees C.4.4 Heavy equipment rental C.4.5 Disposal of DAW generated C.4.6 Plant energy budget C.4.7 NC Fees C.4.7 NC Fees C.4.8 Fees C.4.8 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.1 Fees C.4.1 Fees C.4.2 Fees C.4.3 Fees C.4.4 Fees C.4.5 Fees C.4.6 Fees C.4.7 NC Fees C.4.7 NC Fees C.4.8 Fees C.4.8 Fees C.4.8 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.1 Fees C.4.1 Fees C.4.1 Fees C.4.2 Fees C.4.3 Fees C.4.4 Fees C.4.5 Fees C.4.6 Fees C.4.7 NC Fees C.4.7 NC Fees C.4.8 Fees C.4.8 Fees C.4.8 Fees C.4.8 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.1 Fees C.4.1 Fees C.4.1 Fees C.4.2 Fees C.4.3 Fees C.4.4 Fees C.4.5 Fees C.4.5 Fees C.4.7 NC Fees C.4.7 NC Fees C.4.8 Fees C.4.8 Fees C.4.8 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.1 Fees C.4.1 Fees C.4.1 Fees C.4.2 Fees C.4.3 Fees C.4.4 Fees C.4.5 Fees C.4.5 Fees C.4.7 NC Fees C.4.7 NC Fees C.4.8 Fees C.4.8 Fees C.4.8 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.9 Fees C.4.1 Fees C.4.1 Fees C.4.1 Fees C.4.1 Fees C.4.2 Fees C.4.3 Fees C.4.4 Fees C.4.5 Fees C.4.7 Fees C.4.8 Fees C.4.9 Fees C.4.1 Fees C.4.2 Fees C.4.1 Fees C.4.1 Fees C.4.2 Fees C.4.1 Fees C.4.2 Fees C.4.1 Fees C.4.1 Fees C.4.			149	_	100	989		21.4	_	107	1 006	1 006	_	_	_	808	_	_	_	52 710	175	_
c.3.4 Spent Fuel Capital and Transfer	1c.3.2	Process decommissioning chemical flush waste											-	-					-			-
c.3 Subtal Period 1c Collateral Costs Period 1c Period 2c Collateral Costs Control 2c Control 2c Collateral Control 2c Collat	1c.3.3									_				-	-		-	-	-			
c.4.1 Insurance c.4.2 Property taxes c.4.2 Property taxes c.4.3 Health physics supplies c.4.4 Heavy equipment rental c.4.4 Heavy equipment rental c.4.5 Disposal of DAW generated c.4.6 Plant energy budget c.4.7 NRC Fees c.4.7 NRC Fees c.4.8 Fees c.4.8 C.4.9 C	1c.3.4 1c.3													-	-		-	-	-			
c.4.2 Property taxes		•																				
c.4.3 Health physics supplies	1c.4.1			-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
c.4.4 Heavy equipment rental - 141 21 162 162	1c.4.2 1c.4.3	Health physics supplies					-	-	,	51	254	254	-	-		-	-	-		-	-	
c.4.6 Plant energy budget 437 66 503 503	1c.4.4			141		-	-	-	-	21			-	-	-	180	-	-	-			-
c.4.7 NRC Fees	1c.4.5 1c.4.6			-	- 3	- 2		10					-	-			-	-		,		
c.4.8 Emergency Planning Fees 546 55 600 - 600	1c.4.7	NRC Fees	-	-	-	-	-	-	172	17	189	189		-	-	-	-	-	-	-	-	-
	1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	546	55	600	-	600	-	-	-	-	-	-	-	-	-

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(222)	, asamas (oi 2014 Dollar	٠,											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 1c	c Period-Dependent Costs (continued)																				
1c.4.9	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	99	15	113	-	113	-	-	-	-	-	-	-	-	-
1c.4.11 1c.4.12	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	12 167	$\frac{2}{25}$	14 193	- 193	14	-	-	-	-	-	-	-		3,058
1c.4.12 1c.4.13	Utility Staff Cost	-	-	-	-	-	-	7,994	1,199	9,193	9,193	-		-	-		-		-	-	105,560
1c.4	Subtotal Period 1c Period-Dependent Costs	-	344	3	2	-	10		1,800	15,029	14,302	727	-	•	152	-	-	-	3,039	5	
1c.0	TOTAL PERIOD 1c COST	142	922	104	254	-	324	15,651	2,610	20,006	17,008	2,999	-	-	1,048	-	-	-	56,788	14,753	109,201
PERIOD	O 1 TOTALS	5,176	2,550	257	588	-	797	88,426	15,662	113,456	89,911	23,545	-	-	3,325	-	-	-	147,877	57,603	689,372
PERIOD	2a - SAFSTOR Dormancy with Wet Spent Fuel Storage																				
	a Direct Decommissioning Activities																				
2a.1.1	Quarterly Inspection									a											
2a.1.2 2a.1.3	Semi-annual environmental survey Prepare reports									a a											
2a.1.3 2a.1.4	Bituminous roof replacement							26	4	30	30										
2a.1.5	Maintenance supplies	_	_	-	-	_	-	719		899	899	_	-	_	-	_	_	_	-	_	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	745	184	929	929	-	-	-	-	-	-	-	-	-	-
	a Collateral Costs																				
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	41,002	6,150	47,152	-	47,152	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	41,002	6,150	47,152	-	47,152	-	-	-	-	-	-	-	-	-
Period 2a 2a.4.1	a Period-Dependent Costs Insurance							3,488	349	3,837	2,879	958	_								_
2a.4.1	Property taxes	-	-	-	-	-	-	21,299	2,130	23,429	23,429	-	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	954	-	-	-	-	,	239	1,193	1,193	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	22	11	-	63	-	20	117	117	-	-	-	991	-	-	-	19,825	32	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	1,815	272	2,087	1,044	1,044	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	1,498	150	1,647	1,647	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	9,826 854	983 128	10,809 982	982	10,809	-	-	-	-	-	-	-	-	-
2a.4.8 2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	2,047	307	2,354	982	2,354	-	-		-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	_	_	-	-	_	-	247	37	284	-	284	-	_	-	_	_	_	-	_	-
2a.4.11	Utility Staff Cost	-	-	-	-	-	-	13,924	2,089	16,012	5,611	10,401	-	-	-	-	-	-	-	-	80,957
2a.4	Subtotal Period 2a Period-Dependent Costs	-	954	22	11	-	63	54,998	6,702	62,752	36,902	25,850	-	-	991	-	-	-	19,825	32	80,957
2a.0	TOTAL PERIOD 2a COST	-	954	22	11	-	63	96,745	13,036	110,833	37,831	73,002	-	-	991	-	-	-	19,825	32	80,957
PERIOD	O 2b - SAFSTOR Dormancy with Dry Spent Fuel Storage																				
Period 2b 2b.1.1	b Direct Decommissioning Activities Quarterly Inspection																				
2b.1.1	Semi-annual environmental survey									a a											
2b.1.3	Prepare reports									a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	130	20	150	150	-	-	-	-	-	-	-	-	-	-
2b.1.5	Maintenance supplies	-	-	-	-	-	-	3,550	887	4,437	4,437	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	3,680	907	4,587	4,587	-	-	-	-	-	-	-	-	-	-
	b Collateral Costs							0.010	1.005	10 500		10.500									
2b.3.1 2b.3	Spent Fuel Capital and Transfer Subtotal Period 2b Collateral Costs				-	-	-	9,313 9,313	1,397 1,397	10,709 10,709	-	10,709 10,709					-			-	-
		-	-	-	-		-	3,313	1,557	10,703	-	10,703	•		-	-	-	-	-	•	•
Period 2b 2b.4.1	b Period-Dependent Costs Insurance	-	_			_	_	12,926	1,293	14,219	14,219	_	-	_	_	-	_	_	-	_	_
2b.4.2	Property taxes	-	-	-	-	-	-	12,769	1,277	14,046	14,046	-	-	-	-				-	-	-
2b.4.3	Health physics supplies	-	2,490	-	-	-	-	-	622	3,112	3,112	-	-	-	-	-	-	-	-	-	-
2b.4.4	Disposal of DAW generated	-	-	60	31	-	169	4 401	53	312	312	-	-	-	2,640	-	-	-	52,796	86	-
2b.4.5	Plant energy budget	-	-	-	-	-	-	4,481 7,053	672	5,153	5,153	-	-	-	-	-	-	-	-	-	-
2b.4.6 2b.4.7	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	7,053 $48,524$	705 4,852	7,758 53,376	7,758	53,376	-	-					-	-	-
2b.4.7 2b.4.8	Site O&M Cost	-	-	-	-	-	-	4,216	632	4,848	4,848	-	-	-		-	-		-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	1,220	183	1,403	-	1,403	-	-	-				-	-	-

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(III	usanus	of 2014 Dollar	5)											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhour
eriod 2b Period-Depen	dent Costs (continued)																				
b.4.10 Security Stat	ff Cost	-	-	-	-	-	-	43,478	6,522	50,000	29,842	20,158	-	-	-	-		-	-	-	719,58
b.4.11 Utility Staff b.4 Subtotal Per	Cost iod 2b Period-Dependent Costs	-	2,490	60	31	-	160	39,625 $174,293$	5,944 22,756	45,569 199,798	27,708 107,000	17,861 92,798	-	-	2,640	-	-	-	52,796	- 86	533,02 1,252,63
		-				-					,	ŕ	-	-	ŕ	-	-	-			
	IOD 2b COST	-	2,490	60	31	-	169	187,285	25,059	215,094	111,587	103,507	-	-	2,640	-	-	-	52,796	86	1,252,6
	R Dormancy without Spent Fuel Storage																				
eriod 2c Direct Decom: e.1.1 Quarterly In										a											
.1.2 Semi-annual	environmental survey									a											
.1.3 Prepare repo	rts roof replacement							104	16	a 119	119										
.1.5 Maintenance		-	-	-	-	-		2,826	707	3,533	3,533	-	-	-					-	-	
.1 Subtotal Per	iod 2c Activity Costs	-	-	-	-	-	-	2,930	722	3,652	3,652	-	-	-	-	-	-	-	-	-	
riod 2c Period-Depen	dent Costs						_	10,292	1,029	11,321	11,321										
4.1 Insurance 4.2 Property tax	es	-		-	-	-		10,232	1,025	11,184	11,184	-	-	-					-	-	
4.3 Health physi	cs supplies	-	1,921	-	-	-		-	480	2,401	2,401	-	-	-		-		-	-	-	
4.4 Disposal of I 4.5 Plant energy	AW generated	-	-	46	23	-	129	3,568	40 535	238 4,103	238 4,103	-	-	-	2,013	-	-	-	40,262	66	
4.6 NRC Fees	budget	-		-	-	-		5,366 $5,162$	516	5,678	5,678	-	-			-			-	-	
4.7 Site O&M Co		-	-	-	-	-	-	3,357	504	3,860	3,860	-	-	-	-	-	-	-	-	-	
4.8 Security Stat 4.9 Utility Staff		-	-	-	-	-	-	20,661 19,184	3,099 2,878	23,760 22,062	23,760 22,062	-	-	-	-	-	-	-		-	318,3 270,
	iod 2c Period-Dependent Costs	-	1,921	46	23	-	129		10,098	84,607	84,607	-	•	-	2,013	-	-	-	40,262	66	
TOTAL PER	IOD 2c COST	-	1,921	46	23	-	129	75,321	10,820	88,259	88,259	-	-	-	2,013	-	-	-	40,262	66	589,0
RIOD 2 TOTALS		-	5,365	128	65	-	361	359,351	48,916	414,186	237,677	176,509	-	-	5,644	-	-	-	112,884	184	1,922,6
ERIOD 3a - Reactiv	ate Site Following SAFSTOR Dormancy																				
	missioning Activities																				
	iminary decommissioning cost dwgs & specs.	-	-	-	-	-	-	161 570	24 85	185 655	185 655	-	-	-	-	-	-	-	-	-	1,5 4,6
	illed rad survey	-	-	-	-	-	•	570	89	a	055	-	-	-		•	•	•	-	-	4,0
1.4 End product	description	-	-	-	-	-	-	124	19	142	142	-	-	-	-	-	-	-	-	-	1,
	oroduct inventory work sequence	-	-	-	-	-	-	161 929	24 139	185 1,069	185 1,069	-	-	-	-	-	-	-	-	-	1, 7,
.1.7 Perform SEF		-	-	-	-	-		384	58	442	442	-	-	-					-	-	3,
.1.8 Perform Site	-Specific Cost Study	-	-	-	-	-	-	619	93	712	712	-	-	-	-	-	-	-	-	-	5,
	nit License Termination Plan approval of termination plan	-	-	-	-	-	-	507	76	584 a	584	-	-	-	-	-	-	-	-	-	4,0
ivity Specifications																					
1.11.1 Re-activate p 1.11.2 Plant system	plant & temporary facilities	-	-	-	-		-	913 516	137 77	1,050 594	945 534	-	105 59	-	-	-		-	-	-	7, 4,
1.11.2 Frant system 1.11.3 Reactor inter		-		-	-	-		880	132	1,012	1,012	-	-	-					-	-	7,
1.11.4 Reactor vess	el	-	-	-	-	-	-	805	121	926	926	-	-	-	-	-	-	-	-	-	6,
1.11.5 Biological sh 1.11.6 Steam gener		-	-	-	-	-		62 387	9 58	71 445	71 445	-	-	-	-	-		-	-	-	3,
1.11.7 Reinforced of		-		-	-	-		198	30	228	114	-	114	-					-	-	1,0
1.11.8 Main Turbin		-	-	-	-	-		50	7	57	-	-	57	-		-		-	-	-	
1.11.9 Main Conder 1.11.10 Plant structu		-	-	-	-		-	50 387	7 58	57 445	- 222	-	57 222	-	-	-	-	-		-	3,:
1.11.10 Flant structo		-		-	-	-		570	85	655	655	-	-			-			-	-	4,6
.1.11.12 Facility & sit .1.11 Total	e closeout	-	-	-	-	-	-	112 4,928	17 739	128 5,667	64 4,988	-	64 679	-	-	-	-	-	-	-	9 39,7
anning & Site Prepar	ations							•			•										,
.1.12 Prepare disn	nantling sequence	-		-	-	-	-	297	45	342	342	-	-		-	-	-	-	-		2,
1.13 Plant prep. &		-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	1.
.1.14 Design water .1.15 Rigging/Cont	r clean-up system z. Cntrl Envlps/tooling/etc.	-	-			-	-	173 2,300	$\frac{26}{345}$	199 2,645	199 2,645	-	-		-		-	-		-	1,4
a.1.16 Procure cask	s/liners & containers	-	-	-	-	-	-	152	23	175	175	-	-	-	-	-	-	-		-	1,2
a.1 Subtotal Per	iod 3a Activity Costs	-	-	-	-	-	-	14,307	2,146	16,453	15,775	-	679	-	-	-	-	-	-	-	72,70

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

									or 2014 Donar												
Activity		Decon		Packaging		Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	Period-Dependent Costs																				
3a.4.1 3a.4.2	Insurance Property taxes	-	-	-		-		506 500	51 50	556 550	556 550	-	-	-	-	-	-	-	-		-
3a.4.3	Health physics supplies	-	460	-	-	-		-	115	575	575	-	-	-					-	-	-
3a.4.4	Heavy equipment rental	-	565	-	-	-	-		85	649	649	-	-	-	-		-		-	-	-
3a.4.5 3a.4.6	Disposal of DAW generated Plant energy budget	-	-	12	6	-	33	- 1,753	10 263	61 2,016	61 2,016	-	-	-	514		-		10,287	17	-
3a.4.6 3a.4.7	NRC Fees	-	-	-	-	-		378	265 38	416	416	-	-	-					-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	3,888	583	4,472	4,472	-	-	-	-	-	-	-	-	-	65,17
3a.4.10 3a.4	Utility Staff Cost Subtotal Period 3a Period-Dependent Costs	-	1,025	12	- 6	-	33	19,542 26,732	2,931 4,151	22,473 31,958	22,473 31,958	-	-		514	-	-	-	10,287	17	258,62 323,80
3a.0	TOTAL PERIOD 3a COST	-	1,025	12	6	-		41,039	6,297	48,411	47,733	-	679	-	514	-	-	_	10,287		
	3b - Decommissioning Preparations		1,020					11,000	0,201	10,111	11,100		0.0		011				10,201		300,31
	Direct Decommissioning Activities																				
	Work Procedures Plant systems	_	_	_	_	_	_	586	88	674	607	_	67	_	_	_	_	_	_	_	4,733
	Reactor internals	-	-	-	-	-		310	46	356	356	-	-	-					-	-	2,500
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	167	25	192	48	-	144	-	-	-	-	-	-	-	1,350
	CRD cooling assembly	-	-	-	-	-	-	124	19 19	142	142	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5 3b.1.1.6	CRD housings & ICI tubes Incore instrumentation	-	-	-	-	-	-	$\frac{124}{124}$	19	142 142	142 142	-	-	-					-	-	1,000 1,000
	Reactor vessel	-	-	-	-	-	-	450	67	517	517	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	149	22	171	85	-	85	-	-	-	-	-	-	-	1,200
3b.1.1.9	Missile shields Biological shield	-	-	-	-	-	-	56 149	$\begin{array}{c} 8 \\ 22 \end{array}$	64 171	64 171	-	-	-	-				-	-	450 1,200
	Steam generators	-	-	-	-	-	-	570	85	655	655	-	-	-	-	-	-	-	-	-	4,600
	Reinforced concrete	-	-	-	-	-	-	124	19	142	71	-	71	-	-	-	-	-	-	-	1,000
	Main Turbine Main Condensers	-	-	-	-	-	-	193 193	29 29	222 222	-	-	222 222	-	-	-	-	-	-	-	1,560 1,560
	Auxiliary building		-	-		-		338	51	389	350	-	39	-						-	2,730
3b.1.1.16	Reactor building	-	-	-	-	-	-	338	51	389	350	-	39	-	-	-	-	-	-	-	2,730
3b.1.1 3b.1	Total Subtotal Period 3b Activity Costs	-	-	-	-	-	-	3,995 3,995	599 599	4,594 4,594	3,703 3,703	-	891 891	-	-	-	-	-	-	-	32,243 32,243
	Additional Costs							-,,,,,		-,00	-,										
3b.2.1	Site Characterization	-	-	-	-	_		6,480	1,944	8,424	8,424	_	_	_					_	30,500	10,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	6,480	1,944	8,424	8,424	-	-	-	-	-	-	-	-	30,500	
	Collateral Costs	0.45							4.40		4.000										
3b.3.1 3b.3.2	Decon equipment DOC staff relocation expenses	947				-	-	1,163	142 175	1,089 1,338	1,089 1,338		-	-						-	
3b.3.3	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-				-	-	-
3b.3	Subtotal Period 3b Collateral Costs	947	1,100	-	-	-	-	1,163	482	3,692	3,692	-	-	-	-	-	-	-	-	-	-
Period 3b 3b.4.1	Period-Dependent Costs Decon supplies	29		-	_				7	36	36			_	_		_	_	_	_	_
3b.4.1 3b.4.2	Insurance	-	-	-		-	-	254	25		279	-	-		-	-	-	-	-		-
3b.4.3	Property taxes	-	-	-		-	-	251	25	276	276	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	254 283	-	-	-	-	-	64	318 326	318 326	-	-	-	-	-	-	-	-	-	-
3b.4.5 3b.4.6	Heavy equipment rental Disposal of DAW generated	-	283	7	3		19	-	42 6	326 34	326 34	-	-		292	-	-	-	5,834	10	-
3b.4.7	Plant energy budget	-	-	- '	-	-	-	879	132	1,011	1,011	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	190	19	208	208	-	-	-	-	-	-	-	-	-	-
3b.4.9 3b.4.10	Site O&M Cost Security Staff Cost	-	-	-		-		83 1,950	12 292	95 2,242	95 $2,242$	-	-		-	-	-		-		32,679
3b.4.11	DOC Staff Cost	-	-		-	-	-	5,002	750	5,752	5,752	-	-	-	-	-	-	-	-	-	58,560
3b.4.12 3b.4	Utility Staff Cost Subtotal Period 3b Period-Dependent Costs	29	- 537	- 7	- -	-	- 19	9,798 18,405	1,470 2,845	11,267 $21,845$	11,267 $21,845$	-	-	-	- 292	-	-	-	- 5,834	10	129,669 220,90°
3b.0	TOTAL PERIOD 3b COST	976	1,637	7	3	-		30,043	5,870	38,554	37,664	-	891	-	292		-		5,834	30,510	
	3 TOTALS				9	-						-	1,569	-		-	-	-	,		
LEKIOD	O TOTALS	976	2,662	18	9	-	52	71,082	12,167	86,966	85,396	-	1,569	-	806	-	-	-	16,121	30,526	660,512

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

A		D	D 1	D. I. d.	TD	Off-Site	LLRW	0.1	m 1	/D - 4 - 1	NRC	Spent Fuel	Site	Processed	C1		Volumes	СТСС	Burial /	G 6	Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contracto Manhours
PERIOD 4a - Large Com	nponent Removal																				
eriod 4a Direct Decommis	issioning Activities																				
luclear Steam Supply Sys	stem Removal																				
a.1.1.1 Reactor Coolant		54	186	39	40	-	271	-	151	742	742	-	-	-	1,838	-	-	-	210,083	3,290	-
a.1.1.2 Pressurizer Reli a.1.1.3 Reactor Coolant	lief Tank it Pumps & Motors	9 32	34 121	7 85	8 198		47 1,390	-	27 432	132 2,259	132 $2,259$	-	-	-	329 4,796	-	•	-	36,553 780,540	596 2,726	- 8
a.1.1.4 Pressurizer	it rumps & Motors	14	79	370	105	-	879	-	299	1,746	1,746	-	-	-	3,033				240,915	1,532	7
a.1.1.5 Steam Generate	tors	109	4,584	2,883	3,734	-	11,075	-	4,818	27,202	27,202	-	-	-	67,463	-		-	3,820,664	20,508	4,5
	Generator Units		-	1,659	2,955	-	10,309	-	3,187	18,110	18,110	-	-	-	62,044	-	-	-	3,098,576	10,800	2,2
a.1.1.7 CRDMs/ICIs/Se a.1.1.8 Reactor Vessel l	ervice Structure Removal	26 104	315 2,920	219 6,538	43 1,091		141 4,329	292	155 6,357	899 21,631	899 21,631	-	-		2,843 2,461	501	393	-	109,650 328,507	4,745 $27,350$	1,2
	nals GTCC Disposal	104	2,320	-	1,031	-	12,062	-	1,809	13,872	13,872	-	-	-	2,401	-	-	2,217	433,180	21,550	1,2
a.1.1.10 Reactor Vessel		129	5,095	2,175	1,159	-	2,832	292	6,179	17,862	17,862	-	-	-	9,331			-,	960,579	27,350	1,2
a.1.1 Totals		477	13,334	13,975	9,332	-	43,337	585	23,414	104,454	104,454	-	-	-	154,138	501	393	2,217	10,019,250	98,898	10,0
emoval of Major Equipme			60°	0.00	1.000		9.900		1 500	10.000	10.000				*0 ***				0.040.01	0.015	
a.1.2 Main Turbine/G a.1.3 Main Condense		-	695 1,368	3,385 1,965	1,093 1,020	-	3,399 5,039	-	1,526 1,951	10,098 11,344	10,098 11,344	-	-	-	58,555 75,240	-	-	-	3,040,215 3,906,532	9,317 18,250	-
ascading Costs from Clea	an Building Demolition																				
a.1.4.1 Reactor		-	1,397	-	-	-	-	-	210	1,607	1,607	-	-	-	-	-	-	-	-	12,130	-
1.1.4.2 Auxiliary Build		-	771	-	-	-	-	-	116	887	887	-	-	-	-	-	-	-	-	6,782	-
.1.4.3 Refueling Water .1.4.4 Steam Generate	er Storage Tank for Storage Facility	-	137 57	-	-	-	-		21	158 66	158 66	-	-	-	-				-	1,299 507	-
.1.4 Totals	of Storage Pacifity	-	2,363	-	-	-	-	-	354	2,717	2,717	-	-	-	-	-	-	-	-	20,718	-
sposal of Plant Systems	•																				
1.5.1 Auxiliary Feedv		-	92	-	-	-	-	-	14	106	-	-	106	-	-	-	-	-	-	1,244	-
1.5.2 Auxiliary Steam 1.5.3 Auxiliary Steam		-	82 153	24	11	-	- 54	-	12 56	95 298	298	-	95	-	805	-	•	-	42,068	1,126	-
1.5.3 Auxiliary Steam 1.5.4 Boric Acid Proce		-	578	137	79	-	392	-	268	1,454	1,454	-	-	-	6,102	-			303,638	1,984 8,026	
1.5.5 CO2 & H2	3000mg		31	-	-	-	-	-	5	35		-	35	-	-				-	419	
1.5.6 CO2 & H2 RCA		-	44	5	2	-	11	-	15	77	77	-	-	-	159	-	-	-	8,312	583	
1.5.7 Chemical Feed 1.5.8 Chilled Water		-	68 85	-	-	-	-	-	10 13	78 98	-	-	78 98	-	-	-	-	-	-	934	
1.5.8 Chilled Water 1.5.9 Circulating Wat	ater		375	-					56	432	-		432					-		1,142 5,174	
1.5.10 Condensate			443	-	-	-	-	-	66	509	-	-	509	-	-				-	6,023	
1.5.11 Condensate Boo		•	399	-	-	-	-	-	60	459	-	-	459	-	-	-	-	-	-	5,428	
.1.5.12 Condensate Cle		-	78	-		-		-	12	90	-	-	90	-	-	-	-	-	-	1,060	
.1.5.13 Containment Sp .1.5.14 Diesel Fuel Oil		•	294 120	88	47	-	233	-	148 18	810 138	810	-	138	-	3,481	-	-	-	180,655	3,897 1,615	
.1.5.15 Essential Service		-	280	-	-	-	-	-	42	322	_	-	322	_	-	-	-	_	-	3,837	
1.5.16 Extraction Stea		-	223	-	-	-	-	-	33	257	-	-	257	-	-	-	-	-	-	3,089	-
.1.5.17 Feedwater		-	372	-	-	-	-	-	56	428	-	-	428	-	-	-	-	-	-	5,142	
1.5.18 Feedwater Drai 1.5.19 Gland Steam	ins	-	891 67	-	-	-	-	-	134 10	1,025 77	-	-	1,025 77	-	-	-	•	-	-	12,366 932	
1.5.20 Gland Water		-	59	-	-	-	-	-	9	68	-	-	68	-	-	-			-	932 828	
1.5.21 Main Steam			380	-	-	-	-	-	57	437	-	-	437	-	-				-	5,216	
1.5.22 Main Steam RC	CA	•	59	17	10	-	49	-	30	164	164	-	-	-	726	-	-	-	37,727	769	
1.5.23 Nitrogen	a . w.	-	4	1	1	-	3	-	2	10	10	-	-	-	49	-	-	-	2,447	50	-
1.5.24 Non-Essential S 1.5.25 Non-Essential S		-	210 107	34	19	-	94		32 56	242 310	310	-	242	-	1,400				72,790	2,916 1,358	
1.5.26 Off Gas	bervice water item	-	650	135	73	-	360	-	277	1,494	1,494	-	-	_	5,352	-	-	_	278,775	8,689	
1.5.27 Process Radiation	ion Monitoring	-	48	3	1	-	7	-	14	74	74	-	-	-	109	-		-	5,726	671	-
1.5.28 Process Samplin	ing	-	139	14	8	-	40	-	47	248	248	-	-	-	590	-	-	-	30,697	1,947	-
1.5.29 Screen Wash		-	59 36	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	821	-
1.5.30 Station Air 1.5.31 Station Heating	g	-	36 130	-	-	-		-	5 19	42 149	-	-	42 149		-	-		-	-	498 1,771	
1.5.32 Switchgear Hea		-	10	-	-	-		-	2	12	-	-	12		-	-	-	-	-	139	
1.5.33 Turbine Bldg E	Equip Drains	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	17	-
1.5.34 Turbine Genera	ator	-	67	-	-	-	-	-	10	77	-	-	77		-	-	-	-	-	901	-
1.5.35 Turbine Oil 1.5.36 Waste Oil Sump	ang.	-	103 35	-	-	-	-	-	15 5	118	-	-	118	-	-	-	-	-	-	1,399	-
1.5.50 waste on sump	ıhə	-	6,772	457	251	-	1,242	-	5 1,617	41 10,340	4,939	-	41 5,401	-	18,774	-	-	-	962,836	483 92,492	-

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							`		or zorr Donar	,											
				n	m	Off-Site	LLRW	0.1	m . 1	m . 1	NRC	Spent Fuel	Site	Processed			Volumes	amaa	Burial/	G 6	Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
4a.1.6	Scaffolding in support of decommissioning		1,242	9	5	_	24	_	318	1,598	1,598	_		_	359	_	_	_	18,654	18,101	
				_	_	-		-				_	_	_		-	-	-			-
4a.1	Subtotal Period 4a Activity Costs	477	25,774	19,792	11,701	-	53,042	585	29,182	140,552	135,151	-	5,401	-	307,066	501	393	2,217	17,947,480	257,777	10,032
	a Additional Costs																				
4a.2.1 4a.2.2	Remedial Action Surveys Asbestos Abatement	-	-	-	-	-		1,976 50	593 8	2,569 58	2,569 58	-	-	-		-	-	-		31,151	-
4a.2.3	Operational Tools and Equipment	-	-	9	52	-	189		56	306	306	-	-	-	5,855	-	-	-	146,375	16	
4a.2	Subtotal Period 4a Additional Costs	-	-	9	52	-	189	2,026	656	2,933	2,933	-	-	-	5,855	-	-	-	146,375	31,167	-
Period 4a	a Collateral Costs																				
4a.3.1	Process decommissioning water waste Process decommissioning chemical flush waste	5		9	24	-	30	-	15	83	83	-	-	-	85	-	-	-	5,091	17	-
4a.3.2 4a.3.3	Small tool allowance	-	323	-	-	-	-		49	372	- 335	-	37	-	-			-			-
4a.3	Subtotal Period 4a Collateral Costs	5	323	9	24	-	30	-	63	455	418	-	37		85	-	-	-	5,091	17	-
Period 4a	a Period-Dependent Costs																				
4a.4.1	Decon supplies	87	-	-	-	-	-	-	22	108	108	-	-	-	-	-	-	-	-	-	-
4a.4.2 4a.4.3	Insurance Property taxes	- -	-	-	-		-	758 749	76 75	834 824	834 741	- -	- 82	-	-	-	-	-		-	-
4a.4.4	Health physics supplies	-	2,188	-	-	-	-	-	547	2,734	2,734	-	-	-	-	-			-	-	-
4a.4.5	Heavy equipment rental	-	3,253	-	-	-	-	-	488	3,740	3,740	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	83	43	-	236	2,496	74 374	435 2,871	435 2,871	-	-	-	3,680	-	-	-	73,605	120	-
4a.4.7 4a.4.8	Plant energy budget NRC Fees	-	-	-	-	-		2,496	90	2,871 995	2,871 995	-	-	-					-	-	-
4a.4.9	Site O&M Cost	-	-	-	-	-	-	247	37	284	284	-	-	-	-	-	-	-	-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	601	90	691	691	-	-	-	-	-		-	-	-	-
4a.4.11 4a.4.12	Security Staff Cost DOC Staff Cost	-	-	-	-	-	-	5,827 17,700	874 2,655	6,701 $20,355$	6,701 $20,355$	-	-	-	-				-	-	97,679 215,674
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	29,528	4,429	33,957	33,957	-	-	-	-	-			-	-	390,714
4a.4	Subtotal Period 4a Period-Dependent Costs	87	5,440	83	43	-	236	58,812	9,831	74,531	74,449	-	82	-	3,680	-	-	-	73,605	120	704,067
4a.0	TOTAL PERIOD 4a COST	568	31,538	19,894	11,820	-	53,496	61,422	39,732	218,471	212,950	-	5,521	-	316,686	501	393	2,217	18,172,550	289,080	714,099
PERIOI	O 4b - Site Decontamination																				
	Direct Decommissioning Activities																				
4b.1.1	Remove spent fuel racks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	of Plant Systems																				
4b.1.2.1 4b.1.2.2	Chemical & Volume Control Chilled Water RCA	-	1,265 360	171 116	85 62	-	419 304	-	451 187	2,391 1,028	2,391 1,028	-	-	-	6,236 4,527	-	-	-	324,551 235,699	16,476 4,956	-
4b.1.2.3		-	760	209	112	-	553	-	366	1,999	1,999	-	-	-	8,239				428,586	10,074	-
	Electrical	-	3,573	-	-	-	-	-	536	4,109	-	-	4,109	-	-	-	-	-	-	48,490	-
4b.1.2.5 4b.1.2.6		-	1,289 2,162	137 372	87 227	-	430 1,123	-	457 892	2,400 4,776	2,400 4,776	-	-	-	6,418 16,763	-	-	-	333,233 870,329	17,294 29,753	-
4b.1.2.7		-	152	-	-	-	1,123		23	175	4,776	-	175	-	10,705					2,066	-
4b.1.2.8	Essential Service Water RCA	-	342	120	67	-	333	-	191	1,053	1,053	-	-	-	4,958	-	-		257,885	4,643	-
4b.1.2.9		-	146	-	- 14	-	- 00	-	22	168	-	-	168	-	1 000	-	-	-	- E0 200	1,984	-
	Fire Protection RCA HVAC-Auxiliary Building	-	206 572	30 104	14 65	-	68 323	-	$74 \\ 244$	391 1,309	391 1,309	-	-	-	1,002 4,827	-			52,396 250,668	2,641 7,298	-
	HVAC-Diesel Generator Room	-	50	-	-	-	-		8	58	-	-	58	-	-,021				-	682	-
	HVAC-Miscellaneous	-	48		-	-	-	-	7	56		-	56	-		-	-	-		656	-
	HVAC-Primary Containment HVAC-Turbine Building	-	692 219	218	138	-	683	-	386 33	2,118 252	2,118	-	- 252	-	10,197	-	-	-	529,451	8,908 3,177	-
	Instrument Air Supply	-	54	-	-	-	-		8	62	-	-	62		-				-	760	-
4b.1.2.17	Instrument Air Supply RCA	-	84	11	5	-	24	-	29	153	153	-	-	-	354	-	-	-	18,493	1,096	-
	Miscellaneous Drains Primary Containment Purge	-	44	7	4	-	20	-	17	93	93	-	-	-	299 5 614	-	-	-	15,562	594	-
	Primary Containment Purge Primary Water	-	318 69	138 7	76 3		377 15	-	199 22	1,109 116	1,109 116	-	-		5,614 218	-	-		292,306 11,425	4,509 924	-
4b.1.2.21	Radioactive Waste Disposal	-	1,052	171	90	-	446	-	405	2,164	2,164	-	-	-	6,808	-	-	-	345,754	14,349	-
	Reactor Building Equipment Drains	-	112		9	-	47	-	43	229	229	-	-	-	695	-	-	-	36,107	1,451	-
	Reactor Building Floor Drains Reactor Coolant	-	52 195	7 23	4 11		18 55		19 67	99 351	99 351	-	-	-	265 812	-	-	-	13,801 42,440	686 2,529	-
	Residual Heat Removal	-	220	52	30		147		101	550	550	-	-		2,184	-	-	-	113,636	2,985	-
4b.1.2.26	Safety Injection	-	1,008	247	140	-	694	-	471	2,561	2,561	-	-	-	10,622	-	-	-	537,761	13,820	-

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1ne	ousanus c	of 2014 Dollar	s)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Disposal of Plant	t Systems (continued)																				
4b.1.2.27 Statio		_	41	5	2	_	11	-	14	74	74	_		-	169		_	-	8,811	531	_
4b.1.2.28 Statio		-	138	33	16	-	81	-	61	330	330	-	-	-	1,209	-	-	-	63,061	1,826	_
	e Oil Sumps RCA	-	8	1	1	-	3	-	3	17	17	-	-	-	50	-	-	-	2,602	95	
4b.1.2 Totals	s	-	15,233	2,199	1,249	-	6,172	-	5,334	30,188	25,309	-	4,879	-	92,465	-	-	-	4,784,556	205,253	-
4b.1.3 Scaffo	olding in support of decommissioning	-	1,863	14	7	-	36	-	477	2,398	2,398	-	-	-	539	-	-	-	27,981	27,151	-
	n of Site Buildings																				
4b.1.4.1 Reac		2,264	1,625	233	346	-	1,358		1,953	7,781	7,781	-	-	-	24,850	-	-	-	1,271,843	50,420	
	liary Building	226	123	21	17	-	69		166	622	622	-	-	-	1,101	-	-	-	63,292	4,575	
	eling Water Storage Tank	412	480 0	41 0	18 0	-	83		354	1,388	1,388	-	-	-	1,240	-	-	-	67,350	11,972	
4b.1.4.4 Steam 4b.1.4 Totals	m Generator Storage Facility	67 2,969	2,228	296	381		0 1,510		34 2,506	101 9,892	101 9,892	-	-	-	27,192	-	-	-	46 1,402,531	888 67,855	
40.1.4 Total	is .	2,303	2,220	230	561	-	1,010	-	2,500	3,032	3,032	-	-	•	21,132	•	•	-	1,402,551	07,000	-
4b.1 Subto	otal Period 4b Activity Costs	2,969	19,324	2,509	1,638	-	7,719	-	8,318	42,478	37,599	-	4,879	-	120,196	-	-	-	6,215,068	300,260	-
Period 4b Additi																					
	se Termination Survey Planning	-	-	-	-	-	-	983	295	1,278	1,278	-	-	-	-	-	-	-	-	-	6,240
	edial Action Surveys	-	-	-	-	-	-	2,923	877	3,800	3,800	-	-	-	-	-	-	-	-	46,072	
	stos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	- 14 740	-	-	-	- 1 150 000	- 11 500	-
	ase Termination ISFSI erground Services Excavation	-	498 554	207	324	-	893	1,816	935 83	4,674 637	4,674 637	-	-	-	14,549	-	-	-	1,178,830	11,786 2,755	
	otal Period 4b Additional Costs	-	1,052	207	324	-	893	5,773	2,197	10,447	10,447	-	-		14,549	-		-	1,178,830	60,612	
			,					,	•	,	,				,					,	ŕ
Period 4b Collate 4b.3.1 Proce	eral Costs ess decommissioning water waste	6	_	12	30		37		18	104	104				107				6,394	21	
	ess decommissioning water waste	Ü	-	12	30	-	31	-	-	104	104	-		-	107	-	-	-	0,554	21	-
	l tool allowance		397	-	-		-		60	457	457				-				-	-	-
	mmissioning Equipment Disposition	_	-	184	96	-	472	-	151	903	903			_	7,054			_	366,237	88	
4b.3 Subto	otal Period 4b Collateral Costs	6	397	196	126	-	510		229	1,464	1,464	-	-	-	7,160	-	-	-	372,631	109	
Period 4h Period	d-Dependent Costs																				
	n supplies	801	_	_	_	_	_	_	200	1,001	1,001	_	_	_	_	_	_	_	_	_	_
4b.4.2 Insur		-			-		-	1,121	112	1,233	1,233						-	-	-		-
	erty taxes	-	-	-	-	-	-	1,107	111	1,218	1,218	-	-	-	-	-	-	-	-	-	-
	th physics supplies	-	2,794	-	-	-	-		699	3,493	3,493	-	-	-	-	-	-	-	-	-	-
	y equipment rental	-	4,762	-	-	-	-	-	714	5,477	5,477	-	-	-	-	-	-	-	-	-	-
4b.4.6 Dispo	osal of DAW generated	-	-	98	50	-	277	-	86	511	511	-	-	-	4,321	-	-	-	86,419	141	-
	t energy budget	-	-	-	-	-	-	2,915	437	3,352	3,352	-	-	-	-	-	-	-	-	-	-
4b.4.8 NRC		-	-	-	-	-	-	1,338	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
	O&M Cost	-	-	-	-	-	-	366	55	420	420	-	-	-	-	-	-	-	-	-	-
	d Radwaste Processing Equipment/Services	-	-	-	-	-	-	889	133	1,022	1,022	-	-	-	-	-	-	-	-	-	- 07 400
	rity Staff Cost Staff Cost	-	-	-	-	-		1,394 16,403	209 2,460	1,603 18,864	1,603 18,864	-	-	-	-	-	-	-	-		25,426 $217,274$
	ty Staff Cost	-	-	-	-	-	-	27,793	4,169	31,962	31,962	-		-	-	-	-	-	-	-	388,320
	otal Period 4b Period-Dependent Costs	801	7,557	98	50	-	277	53,325	9,520	71,627	71,627	-	-		4,321	-		-	86,419	141	
4b.0 TOTA	AL PERIOD 4b COST	3,777	28,330	3,011	2,138	-	9,398	59,098	20,264	126,016	121,137		4,879	-	146,227	-	-	-	7,852,947	361,122	642,630
PERIOD 4e - D	Delay before License Termination																				
Pariod to Poriod	l-Dependent Costs																				
4e.4.1 Insur		-	-	-	-	-	-	754	75	829	829	-	-	-	-	-	-		-	-	-
	erty taxes	-	-	-	-	-	-	745	74	819	819	-	-	-	-		-		-	-	-
	th physics supplies	-	141	-	-	-	-	-	35	177	177	-	-	-	-	-	-	-	-	-	-
	osal of DAW generated	-	-	3	2	-	10	-	3	18	18	-	-	-	149	-	-	-	2,971	5	-
	t energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4e.4.6 NRC		-	-	-	-	-	-	378	38	416	416	-	-	-	-	-	-	-	-	-	-
	O&M Cost	-	-	-	-	-	-	246	37	283	283	-	-	-	-	-	-	-	-	-	-
	ty Staff Cost	-	-	-	-	-	-	1,464	220	1,683	1,683	-	-	-	-	-	-	-	-		21,760
4e.4 Subto	otal Period 4e Period-Dependent Costs	-	141	3	2	-	10	3,586	482	4,225	4,225	-	-	-	149	-	-	-	2,971	5	21,760
4e.0 TOTA	AL PERIOD 4e COST	-	141	3	2	-	10	3,586	482	4,225	4,225	-	-	-	149	-	-	-	2,971	5	21,760
										, -									* *		,

Table E-1
Braidwood Nuclear Power Station Unit 1
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Ruriol'	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport		Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet		Cu. Feet	Cu. Feet		Manhours	
ERIOD 4f - Li	icense Termination																				
	Decommissioning Activities																				
	E confirmatory survey inate license	•	-	-	-	-	-	172	52	224 a	224	-	-	-	-	-	-	-	-	-	-
	otal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
eriod 4f Additio																					
	se Termination Survey	-	-	-	-	-	-	7,331	2,199	9,530	9,530	-	-	-	-	-	-	-	-	97,452	
.2 Subto	otal Period 4f Additional Costs	-	-		-	-	-	7,331	2,199	9,530	9,530	-	-	-	-	-	-	-	-	97,452	3,1
eriod 4f Collate	eral Costs staff relocation expenses					-		1,163	175	1,338	1,338								_	_	_
	otal Period 4f Collateral Costs	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-				-	-	-
								,		,	,										
f.4.1 Insur	-Dependent Costs	_	_	_	_	_	_	381	38	419	419	_	_	_	-	_		_	_	_	_
	erty taxes	-	-	-	-	-	-	376	38	414	414	-		-	-				-	-	-
.4.3 Healt	th physics supplies	-	600	-	-	-	-	-	150	750	750	-	-	-	-	-	-		-	-	-
	osal of DAW generated	-	-	8	4	-	21	-	7	40	40	-	-	-	335	-	-	-	6,698	11	-
	energy budget	-	-	-	-	-	-	264	40	304	304	-	-	-	-	-	-	-	-	-	-
f.4.6 NRC		-	-	-	-	-	-	455	46	501	501	-	-	-	-	-	-	-	-	-	-
	O&M Cost rity Staff Cost	•	-	-	-	-	-	$\frac{124}{722}$	19 108	143 830	143 830	-	-	-	-	-	-	-	-	-	11,7
	Staff Cost	-	-	-	-	-	-	3,870	580	4,450	4,450	-	-	-	-	-	-	-	-	-	46,78
	cy Staff Cost		-			-	-	4,733	710	5,443	5,443								-	-	56,9
	otal Period 4f Period-Dependent Costs	-	600	8	4	-	21	10,926	1,735	13,294	13,294	•	-	-	335	-	-	-	6,698	11	
f.0 TOTA	AL PERIOD 4f COST	-	600	8	4	-	21	19,592	4,160	24,385	24,385	-	-	-	335	-	-	-	6,698	97,463	118,62
PERIOD 4 TOT	TALS	4,345	60,609	22,916	13,964	-	62,925	143,699	64,639	373,097	362,697	-	10,400	-	463,396	501	393	2,217	26,035,170	747,670	1,497,10
PERIOD 5b - Si	ite Restoration																				
Period 5b Direct	Decommissioning Activities																				
	emaining Site Buildings																				
b.1.1.1 Reac		-	8,057	-	-	-	-	-	1,209	9,266	-	-	9,266	-	-	-	-	-	-	69,546	
	liary Building	-	6,941	-	-	-	-	-	1,041	7,982	-	-	7,982	-	-	-	-	-	-	61,038	
	eling Water Storage Tank n Generator Storage Facility	•	1,234 516	-	-	-	-	-	185 77	1,419 593	-	-	1,419 593	-	-	-	-	-	-	11,692 4,559	
	ine Building		6,833	-					1,025	7,858			7,858							70,342	
	ine Pedestal	-	1,627	_	_	-	_	_	244	1,872		-	1,872	-	-	-	-	-	-	12,628	
b.1.1 Totals		-	25,209	-	-	-	-	-	3,781	28,990	-	-	28,990	-	-	-	-	-	-	229,806	
ite Closeout Ac																					
	e & landscape site	-	986	-	-	-	-	-	148	1,134	-	-	1,134	-	-	-	-	-	-	1,942	
	report to NRC	-	-	-	-	-	-	193	29	222	222	-	-	-	-	-	-	-	-	-	1,56
	otal Period 5b Activity Costs	-	26,195	-	-	-	-	193	3,958	30,346	222	-	30,124	-	-	-	-	-	-	231,748	1,56
eriod 5b Addition b.2.1 Site F	onal Costs Restoration ISFSI		1,147					28	176	1,351	-	_	1,351							13,036	8
	rete Crushing	-	1,147	-	-	-	-	28 4	100	766	-	-	766	-					-	2,798	
	otal Period 5b Additional Costs	-	1,809	-		-	-	31	276	2,116		-	2,116	-	-	-	-	-	-	15,833	
eriod 5b Collate																					
b.3.1 Small	l tool allowance otal Period 5b Collateral Costs	-	335	-	-	-	-	-	50 50	385 385	-	-	385 385	-	-	-	-	-	-	-	-
			335					_													

Table E-1 **Braidwood Nuclear Power Station Unit 1** SAFSTOR Decommissioning Cost Estimate (Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	Period-Dependent Costs																				
5b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	7,568	-	-	-	-	-	1,135	8,704	-	-	8,704	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	435	65	500	-	-	500	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Cost		-	-	-	-		409	61	470	-	-	470	-	-	-	-	-	-		-
5b.4.6	Security Staff Cost		-	_				2,128	319	2,447			2,447	_	-	-	-	-	_		34,287
5b.4.7	DOC Staff Cost		_	-	-	_	-	11,846	1,777	13,623	_		13,623	_	-	_	_	-	-	-	137,043
5b.4.8	Utility Staff Cost	_	_	_	_	_	_	5,797	869	6,666	_	_	6,666	_	_	_	_	_	_	-	67,229
5b.4	Subtotal Period 5b Period-Dependent Costs	_	7,568	-	-		-	21,853	4,351	33,773	-	_	33,773	-	-	-	-	-	-	-	238,558
			.,					,	-,	,			,								,
5b.0	TOTAL PERIOD 5b COST		35,907	-	-	_	-	22,078	8,636	66,621	222	_	66,399	-	-	_	_	-	-	247,581	240,198
00.0	TOTAL TEMOD OF CODI		00,001					22,010	0,000	00,021			00,000							211,001	210,100
PERIOD	5 TOTALS		35,907		_	_	_	22,078	8,636	66,621	222	_	66,399	_	_	_	_	_	-	247,581	240,198
LLINOD	0.10.11110		30,001					22,010	0,000	30,021	222		00,000							211,001	210,100
TOTAL (COST TO DECOMMISSION	10,497	107,095	23,319	14,626	-	64,134	684,636	150,020	1,054,326	775,905	200,054	78,368	-	473,171	501	393	2,217	26,312,050	1,083,564	5,009,833

TOTAL COST TO DECOMMISSION WITH 16.59% CONTINGENCY:	\$1,054,326	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 73.59% OR:	\$775,905	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 18.97% OR:	\$200,054	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 7.43% OR:	\$78,368	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	474,064	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	Cubic Feet
TOTAL SCRAP METAL REMOVED:	54,939	Tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,083,564	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 E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(o ubullub c	01 2014 Dollar	~,											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet		Cu. Feet					Manhour
ERIOD 1a - Shutdo	wn through Transition																				
eriod 1a Direct Decom	nmissioning Activities																				
	ite characterization survey	-	-	-	-		-	481	144	625	625	ē	•	-		-	-	-	-	-	
	liminary decommissioning cost of Cessation of Operations	-	-	-	-	-	-	69	10	79 a	79	-	-	-	-	-	-	•	-	-	
.1.4 Remove fuel	& source material									n/a											
	of Permanent Defueling plant systems & process waste									a											
	submit PSDAR	-	-	-	-	-	-	106	16	a 122	122	-	-	-	-	-	-	-			
.1.8 Review plan	t dwgs & specs.	-	-	-	-	-	-	69	10	79	79	-	-	-	-	-	-	-	-	-	
	ailed rad survey -product inventory					_		53	8	a 61	61								_		
1.11 End product		-	-	-		-	-	53	8	61	61	-	-			-	-	-	-	-	
	product inventory	-	-	-	-	-	-	80	12	91	91	-	-		-	-	-	-	-	-	
1.13 Define major 1.14 Perform SEI	r work sequence R and EA	-	-	-		-		53 164	8 25	61 189	61 189	-	-	-		-	-	-	-		1,
	e-Specific Cost Study	-	-	-	-	-	-	265	40	305	305	-	-	-	-	-	-	-	-	-	2,
tivity Specifications																					
1.16.1 Prepare plan 1.16.2 Plant system	nt and facilities for SAFSTOR	-	-	-	-	-	-	$\frac{261}{221}$	39 33	300 254	$\frac{300}{254}$	-	-	-	-	-	-	-	-		2, 1,
1.16.2 Plant system		-		-		-		165	25	190	190	-	-	-					-	-	1
1.16.4 Waste mana		•		-		-	-	106	16	122	122	-	-	-	-	-	-		-	-	
1.16.5 Facility and 1.16 Total	site dormancy	-	-	-	-	-	-	106 859	16 129	122 988	122 988	-	-	-	-	-	-	-	-	-	6,
ailed Work Procedu	res																				
1.17.1 Plant systen	ns	-	-	-	-	-	-	63	9	72	72	-	-	-	-	-	-	-	-	-	
1.17.2 Facility close	eout & dormancy	-	-	-	-	-	-	64 126	10 19	73	73	-	-	-	-	-	-	-	-	-	1
1.17 Total		-	-	-	•	-	-	120	19	145	145	-	-	-	-	-	-	-	-	-	1,
	uum drying system	-	-	-	-	-	-	5	1	6	6	-	-	-	-	-	-	-	-	-	
1.19 Drain/de-ene 1.20 Drain & dry	ergize non-cont. systems									a a											
	ergize contaminated systems									a											
	e contaminated systems							0.004	400	a	0.010										
	riod 1a Activity Costs	-	-	-	-	-	-	2,384	430	2,813	2,813	-	-	-	-	-	-	-	-	-	15,
riod 1a Additional Co 2.1 ISFSI Expan				_		_		4,800	720	5,520	_	5,520									
	riod 1a Additional Costs	-	-	-		-	-	4,800	720	5,520	-	5,520	-			-	-	-	-	-	
iod 1a Collateral Co																					
	sts Capital and Transfer	_		-		_		9,633	1,445	11,078	-	11,078	_	_	_	_	_		_	_	
	riod 1a Collateral Costs	-	-	-	-	-	-	9,633	1,445	11,078	-	11,078	-	-	-	-	-	-	-	-	
iod 1a Period-Deper	ndent Costs																				
4.1 Insurance 4.2 Property tax	TO S	-	-	-	-		-	1,815	181	1,996	1,996	-	-	-	-		-	-	-	-	
4.3 Health phys		-	528			-			132	660	660	-	-	-					-	-	
4.4 Heavy equip	oment rental	-	566	-	-	-	-	-	85	651	651	-	-	-	-	-	-	-	-		
1.5 Disposal of I 1.6 Plant energy	DAW generated	-	-	14	7	-	39	1,758	12 264	72 2,022	72 2,022	-	-	-	611	-	-	•	12,224	20	
4.6 Flant energy 4.7 NRC Fees	y Duuget	-	-	-	-	-	-	1,758	264 84	920	920	-	-	-	-	-	-				
4.8 Emergency l	Planning Fees	-	-	-	-	-	-	2,194	219	2,413	-	2,413	-	-	-	-	-	-	-	-	
4.9 Site O&M C 4.10 Spent Fuel I		-		-	-		-	165 397	25 59	190 456	190	- 456	-		-	-	-			-	
I.11 ISFSI Opera		-		-		-	-	48	7	55	-	55	-		-		-				
4.12 Security Sta	ff Cost	-	-	-	-	-	-	8,971	1,346	10,317	10,317	-	-	-	-	-	-	-	-	-	157
4.13 Utility Staff 4 Subtotal Per	Cost riod 1a Period-Dependent Costs	-	1,094	14	- 7	7 -	- 39	32,151 48,335	4,823 7,237	36,974 56,727	36,974 53,802	2,925	-	-	611	-	-	-	12,224	20	424, 582,
		-	,		,			ŕ					-	-		-	-	-			
a.0 TOTAL PER	RIOD 1a COST	-	1,094	14	7	7 -	39	65,152	9,832	76,138	56,616	19,522	_		611			-	12,224	20	597,8

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(111)	Jusanus	of 2014 Dollar	3)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOI	0 1b - SAFSTOR Limited DECON Activities																				
Period 1h	Direct Decommissioning Activities																				
1b.1.1.1	Auxiliary Building Radwaste/Service Building Refueling Water Storage Tank	2,496 287 187 411 1,174 4,555	- - - - -	:	- - - -	:		- - - - -	1,248 144 94 205 587 2,277	3,744 431 281 616 1,760 6,832	3,744 431 281 616 1,760 6,832	: : : :		:	- - - - -	- - - -	- - - - -	- - - -	- - - - -	33,093 3,829 2,506 5,322 15,238 59,989	
1b.1	Subtotal Period 1b Activity Costs	4,555	-	-	-	-	-	-	2,277	6,832	6,832	-	-	-	-	-	-	-	-	59,989	-
Period 1b.3.1 1b.3.2 1b.3.3 1b.3.4 1b.3.5 1b.3	Decon equipment Process decommissioning water waste Process decommissioning chemical flush waste Small tool allowance Spent Fuel Capital and Transfer Subtotal Period 1b Collateral Costs	947 200 - - - - 1,146	- - - 80 - 80	- 141 - - - 141	- 355 - - - - 355	- - - - -	- 443 - - - - 443	- - 2,395	142 278 - 12 359 791	1,089 1,417 - 92 2,754 5,352	1,089 1,417 - 92 - 2,598	- - - - 2,754 2,754	- - - - -		1,262 - - - 1,262	- - - - -	- - - - -	- - - - -	75,708 - - - - 75,708	246 - - - 246	- - - -
Period 18 1b.4.1 1b.4.2 1b.4.3 1b.4.4 1b.4.5 1b.4.6 1b.4.7 1b.4.8 1b.4.9 1b.4.10 1b.4.11 1b.4.12 1b.4.13	Deriod-Dependent Costs Decon supplies Insurance Property taxes Health physics supplies Heavy equipment rental Disposal of DAW generated Plant energy budget NRC Fees Emergency Planning Fees Site O&M Cost Spent Fuel Pool O&M ISFSI Operating Costs Security Staff Cost Utility Staff Cost Subtotal Period 1b Period-Dependent Costs	871 	425 141	13	7	- - - - - - - - - - - - - - - - - - -	37 	229 3,069 - - - 437 116 546 41 99 12 2,231 7,994	218 23 307 106 21 12 66 12 55 6 15 2 335 1,199 2,375	1,089 252 3,376 531 162 69 503 128 600 47 113 14 2,565 9,193	1,089 252 3,376 531 162 69 503 128 - 47 - 2,565 9,193 17,916	- - - - - - - 600 - 113 14 - - - 727							11,699	19	39,260 105,560
1b.0	TOTAL PERIOD 1b COST	6,573	646	154	362	-	480	17,168	5,444	30,827	27,346	3,481	-	-	1,847	-	-	-	87,408	60,254	144,820
PERIOI	1c - Preparations for SAFSTOR Dormancy																				
Period 1	e Direct Decommissioning Activities																				
1c.1.1 1c.1.2 1c.1.3 1c.1.4 1c.1.5	Prepare support equipment for storage Install containment pressure equal. lines Interim survey prior to dormancy Secure building accesses Prepare & submit interim report	- - -	517 55 -	- - -				- - 733 31	78 8 220	595 64 953 a 36	595 64 953	- - -	- - -	- - -					- - -	3,000 700 10,874	- - - 250
1c.1	Subtotal Period 1c Activity Costs		572	-	_	-	-	764	310	1,647	1,647			_	-	-	_	-	-	14,574	250
	e Additional Costs Spent fuel pool isolation Subtotal Period 1c Additional Costs	-	-	-	- -	- -	-	10,813 10,813	1,622 1,622	12,434 12,434	12,434 12,434	- -		- -	- -	- -	-	-	- -	-	-
Period 1c 1c.3.1 1c.3.2 1c.3.3 1c.3.4 1c.3	Collateral Costs Process decommissioning water waste Process decommissioning chemical flush waste Small tool allowance Spent Fuel Capital and Transfer Subtotal Period 1c Collateral Costs	236 - - - - 236	- - 5 - 5	167 - - - 167	421 - - - 421	- - - -	525 - - - - 525	- - 2,395	329 - 1 359 689	1,679 6 2,754 4,439	1,679 6 - 1,685	- - - 2,754		- - - - -	1,496 - - - - 1,496	- - - -	- - - -	- - - -	89,742 - - 89,742	- - -	- - - -
Period 1c 1c.4.1 1c.4.2 1c.4.3	e Period-Dependent Costs Insurance Property taxes Health physics supplies	- - -	- - 204	- - -	- - -	:	- - -	229 3,069 -	23 307 51	252 3,376 255	252 3,376 255		- - -	- - -	- - -		- - -		- - -	- - -	

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	ousanus c	of 2014 Dollar	5)											
Activity		Decon	Removal		Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Period 1c Pe	Period-Dependent Costs (continued)																				
	Heavy equipment rental	-	141			-		-	21	162	162	-	-	-	-	-	-	-			-
	Disposal of DAW generated	-	-	3	2	-	10	437	3 66	18 503	18 503	-	-	-	152	-	-	-	3,039	5	-
	Plant energy budget NRC Fees	-	-	-		-	-	116	12	128	128	-	-	-	-	-			-	-	-
	Emergency Planning Fees	-	-	-	-	-	-	546	55	600	-	600	-	-	-	-			-	-	-
	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
	Spent Fuel Pool O&M	-	-	-	-	-	-	99	15	113	-	113	-	-	-	-	-	-	-	-	-
	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	$\frac{12}{2,231}$	2 335	$\frac{14}{2,565}$	2,565	14	-	-	-		-		-	-	39,260
	Utility Staff Cost	-	-			-	-	7,994	1,199	9,193	9,193	-	-	-	-			-		-	105,560
1c.4	Subtotal Period 1c Period-Dependent Costs	-	345	3	2	-	10	14,773	2,093	17,226	16,498	727	-	-	152	-	-	-	3,039	5	144,820
1c.0	TOTAL PERIOD 1c COST	236	922	171	423	-	535	28,744	4,715	35,746	32,265	3,481	-	-	1,648		-	-	92,781	14,870	145,070
PERIOD 1	TOTALS	6,809	2,663	339	792	-	1,054	111,064	19,990	142,711	116,226	26,485	-	-	4,106	-	-	-	192,413	75,144	887,713
PERIOD 2	a - SAFSTOR Dormancy with Wet Spent Fuel Storage																				
	Direct Decommissioning Activities																				
	Quarterly Inspection									a											
	Semi-annual environmental survey Prepare reports									a a											
	Bituminous roof replacement	_	-	-	-	-	_	286	43	329	329	-	_	_	-				-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	556	139	695	695	-	-	-	-	-		-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	842	182	1,024	1,024	-	-	•	-	-	-	-	-	-	-
	Collateral Costs							00.450	* = 00												
	Spent Fuel Capital and Transfer Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	38,452 $38,452$	5,768 5,768	44,220 44,220	-	44,220 44,220	-	-	-	-	-	-	-	-	-
		•	-	-	•	•	-	56,452	5,766	44,220	•	44,220	•	•	•	-	-	-	•	-	-
	Period-Dependent Costs Insurance							3,121	312	3,433	2,227	1,206									
	Property taxes	_	-	-	_	-	-	20,696	2,070	22,765	22,765	1,200	-	_	_	-			_	-	-
	Health physics supplies	-	845	-	-	-	-	-	211	1,057	1,057	-	-	-	-	-	-	-	-	-	-
	Disposal of DAW generated	-	-	21	11	-	59	-	18	109	109	-	-	-	921	-	-	-	18,419	30	-
	Plant energy budget NRC Fees	-	-	-	-	-	-	1,404 1,064	211 106	1,614 1,170	807 1,170	807	-	-	-	-	-	-	-	-	-
	Emergency Planning Fees	-	-	-	-	-	-	7,600	760	8,360	1,170	8,360	-	-	-				-	-	-
	Site O&M Cost	-	-	-	-	-	-	660	99	759	759	-	-	-	-	-		-	-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	1,583	237	1,821	-	1,821	-	-	-	-	-	-	-	-	-
	ISFSI Operating Costs	-	-	-	-	-	-	191	29	220	4.074	220	-	-	-	-	-	-	-	-	444 501
	Security Staff Cost Utility Staff Cost					-		25,631 $26,351$	3,845 3,953	29,475 30,303	4,674 4,340	24,801 25,963							-		444,561 329,769
	Subtotal Period 2a Period-Dependent Costs	-	845	21	11	-	59		11,851	101,088	37,909	63,179		-	921	-	-	-	18,419	30	
2a.0	TOTAL PERIOD 2a COST	-	845	21	11	-	59	127,595	17,801	146,331	38,933	107,399	-	-	921	-	-	-	18,419	30	774,330
PERIOD 2	b - SAFSTOR Dormancy with Dry Spent Fuel Storage																				
	Direct Decommissioning Activities																				
	Quarterly Inspection									a											
	Semi-annual environmental survey Prepare reports									a											
	Prepare reports Bituminous roof replacement		_	-	_	-	_	1,825	274	a 2,099	2,099	-	-				_	_	-		_
2b.1.5	Maintenance supplies	-	-	-	-	-	-	3,550	887	4,437	4,437	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	5,375	1,161	6,536	6,536	-	-	-	-	-	-	-	-	-	-
	Collateral Costs							0.010	1 005	10.700		10.500									
	Spent Fuel Capital and Transfer Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	9,313 9,313	1,397 1,397	10,709 10,709	-	10,709 10,709	-	-	-	-	-	-	-	-	-
Period 2b P	Period-Dependent Costs																				
2b.4.1 I	Insurance	-	-	-	-	-	-	12,926	1,293	14,219	14,219	-	-	-	-	-	-	-	-	-	-
	Property taxes	-	- 0.400	-	-	-	-	12,769	1,277	14,046	14,046	-	-	-	-	-	-	-	-	-	-
	Health physics supplies Disposal of DAW generated		2,490	60	31	-	169	-	622 53	3,112 312	3,112 312	-	-		2,640		-	-	52,796	- 86	-
	Plant energy budget			-	-	-	-	4,481	672	5,153	5,153	-	-		2,040		-	-	52,796	-	-
	0 / 							-, -0-	U.2	3,130	0,100										

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Mary																						
Marches Marc	Activity		Decon	Removal	Packaging	Transport			Other	Total	Total					Class A			GTCC		Craft	Utility and Contractor
Math		Activity Description	Cost												Cu. Feet			Cu. Feet				
Math	Period 2b P	Period-Dependent Costs (continued)																				
14.1 1.0	2b.4.6	NRC Fees	-	-	-	-	-	-				7,190		-	-	-	-	-	-	-	-	-
Section Sect			-	-	-	-	-	-						-	-	-	-	-	-	-	-	-
1			-	-	-	-	-	-						-	-	-	-	•	-	-	-	-
1			-	-	-	-	-	-							-	-	-	-	-	-		
Mathematical Content			-	-	-		-	-						-	-	-	-	-	-	-	-	
Part	2b.4	Subtotal Period 2b Period-Dependent Costs	-	2,490	60	31	-	169	173,776	22,704	199,229	106,432	92,798	-	-	2,640	-	-	-	52,796	86	1,252,617
Part	2b.0	TOTAL PERIOD 2b COST	-	2,490	60	31	-	169	188,463	25,262	216,474	112,967	103,507	-	-	2,640	-	-	-	52,796	86	1,252,617
Section Sect	PERIOD 2	c - SAFSTOR Dormancy without Spent Fuel Storage																				
Size of Section Contention Server Ser	Period 2c D	Firect Decommissioning Activities																				
Seminary	2c.1.1	Quarterly Inspection									a											
1. 1. 1. 1. 1. 1. 1. 1.																						
2.15 2.15									1 594	990		1 759										
Salteral Foundame Careering Careerin			-	-	-	-	-	-							-	-	-	-	-	-	-	-
Second S					-		-	-					-	-		-						-
Second S	Dania d Oa Da	anial Danas last Casts																				
1.00 1.00			_	_	-	_	_	-	10.798	1.080	11.877	11.877	_	-	_	-	-		-	_	-	-
1			-	-	-		_	-					_	-	_	-	-	-	-	_	_	-
Part	2c.4.3 I	Health physics supplies	-	2,015	-	-	-		· -	504	2,519	2,519	-	-	-	-	-	-	-	-	-	-
Act			-	-	48	25	-						-	-	-	2,112	-	-	-			-
Sile Old Cost			-	-	-	-		-					-	-	-	-	-	-	-	-		
2.4.8 Security Staff Cota			-	-	-	-	-	-					-	-	-	-	_		-	-		
2.4 Subtro Sharf Coat			-	_	-	-	_	-					_	-	_	-	-	-	-	_		
2.0 TOTAL FERIOD 2 COST 2.01 48 25 18 807 11.34 80.07			-	-	-	-	-	-					-	-	-	-				-		284,074
Period 2 TOTALS	2c.4	Subtotal Period 2c Period-Dependent Costs	-	2,015	48	25	-	135	75,789	10,578	88,590	88,590	-	-	-	2,112	-	-	-	42,241	69	618,017
Period Direct Decommissioning Activities Section Decommissioning Activities Section	2c.0	TOTAL PERIOD 2c COST	-	2,015	48	25	-	135	80,279	11,548	94,049	94,049	-	-	-	2,112	-	-	-	42,241	69	618,017
Period 3a Direct Decommissioning Activities 1.5	PERIOD 2	TOTALS	-	5,350	128	66	-	363	396,336	54,611	456,855	245,949	210,906	-	-	5,673	-	-	-	113,456	185	2,644,964
Sail Pegare preliminary decommissioning cost Signature Sig	PERIOD 3	a - Reactivate Site Following SAFSTOR Dormancy																				
1.10 1.10																						
1-1-1			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	556
1.1.1 2.1.1 3.1.			-	-	-	-	-	-	244	37		281	-	-	-	-	-		-	-	-	1,969
Sal. Detailed by-product inventory 69 10 79 79 79 79 79 79 79 7					_	_			53	8		61				_	_				_	198
3a.1 Peform SER and EA 164 25 189 18			-	-	-		_	-		10			_	-	_	-	-	-	-	_	_	556
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	3,210
3a.1.9 Pepares whmit License Termination Plan 217 33 250 250			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	1,327
Activity Specifications Activity Specifications 391 59 449 404 45 .			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			-	-	-	-	-	-	217	33	250 a	250	-	-	-	-	-	-	-	-	-	1,700
3a.1.1.1.2 Plant systems 221 33 254 229 25 1,785 3a.1.1.1.3 Reactor internals 376 56 433 433 - - 2,935 3a.1.1.4 Reactor vessel 345 52 396 396 - - 2,785 3a.1.1.1.5 Biological shield 27 4 30 30 - - 21 3a.1.1.1.7 Reinforced concrete 85 13 98 49 49 - - 17 3a.1.1.1.9 Main Condensers 21 3 24 - 24 - 24 - 17 3a.1.1.1.1 Waste management 24 37 281 281 281 - - 1,96 3a.1.1.1.1 Facility & site closeout 48 7 55 27 27 - - 38																						
3a.1.1.3 Reactor internals 			-	-	-	-	-	-					-		-	-	-	-	-	-	-	3,154
3a.1.1.4 Reactor vessel 4 Reactor vessel 396 <td></td> <td></td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td>25</td> <td>-</td> <td>-</td> <td>-</td> <td></td> <td></td> <td>-</td> <td>-</td> <td></td>			-	-	-	-	-	-					-	25	-	-	-			-	-	
3a.1.1.5 Biological shield - - 27 4 30 30 - - - - 21 3a.1.1.6 Steam generators - - 165 25 190 190 - - - - - 1,33 3a.1.1.7 Reinforced concrete - - - 85 13 98 49 - 49 - - - 68 3a.1.1.1.9 Main Turbine - - 21 3 24 - - 24 - - - 171 3a.1.1.1.0 Plant structures & buildings - - - 165 25 190 95 - 95 - - - 1,33 3a.1.1.1.1 Waste management - - 165 25 190 95 - 95 - - - 1,96 3a.1.1.1.1 Facility & site closeout - - 48 7 55 27 - 27 - - - - - 1,96			-	-	-	-	-	-					-	-	-	-	-		-	-	-	
3a.1.11.6 Steam generators - - - 165 25 190 190 - - - - 1,335 3a.1.11.7 Reinforced concrete - - - 85 13 98 49 - 49 - - - 685 3a.1.11.8 Main Turbine - - - 21 3 24 - 24 - - - 177 3a.1.11.10 Plant structures & buildings - - - 165 25 190 95 - 24 - - - 1,335 3a.1.11.11 Waste management - - - 165 25 190 95 - 95 - - - 1,966 3a.1.11.12 Facility & site closeout - - - 48 7 55 27 - 27 - - - - 1,336			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	214
3a.1.1.8 Main Turbine - - - 21 3 24 - - - - - 171 3a.1.1.1.9 Main Condensers - - - - 21 3 24 - - - - - - 173 3a.1.1.1.10 Plant structures & buildings -<	3a.1.11.6 S	Steam generators	-	-	-	-	-	-	165				-	-	-	-	-	-	-	-	-	1,335
3a.1.1.19 Main Condensers			-	-	-	-	-	-					-		-	-	-	-	-	-	-	685
3a.1.1.1.0 Plant structures & buildings 165 25 190 95 - 95 1,335 a.1.1.1.1 Waste management 1,365 a.1.1.1.1 Waste management 1,365 a.1.1.1.1 Facility & site closeout			-	-	-	-	-	-		-					-	-	-			-	-	
3a.1.11.11 Waste management 244 37 281 1,965 3a.1.11.12 Facility & site closeout 3885 38.1.11.12 Facility & site closeout			-			-	-						-		-					-	-	
3a.1.11.12 Facility & site closeout			-	-	-	-	-						-		-		-		-	-		1,969
3a.1.11 Total 2,109 316 2,426 2,135 - 290 17,024	3a.1.11.12 I	Facility & site closeout	-	-	-	-	-	-	48	7	55	27	-		-	-	-	-	-	-	-	385
	3a.1.11	Total	-	-	-	-	-	-	2,109	316	2,426	2,135	-	290	-	-	-	-	-	-	-	17,024

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	ousanus (of 2014 Dollar	3)											
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Planning & S	Site Preparations																				
	repare dismantling sequence	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,027
	lant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
	Design water clean-up system Digging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	74 2,300	11 345	85 $2,645$	85 2,645	-	-	-	-	-	-	-	-	-	599 -
	rocure casks/liners & containers		-	-	-	-	-	2,300	10	75	75	-	-	-	-		-		-	-	526
	ubtotal Period 3a Activity Costs	-	-	-	-	-	-	9,155	1,373	10,528	10,238	-	290	-	-	-	-	-	-	-	31,117
Period 3a Col 3a.3 Su	ollateral Costs ubtotal Period 3a Collateral Costs	-		-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-
	eriod-Dependent Costs																				
	nsurance	-	-	-	-	-	-	506 500	51 50	556 550	556 550	-	-	-	-	-	-	-	-	-	-
	roperty taxes lealth physics supplies		437					500	109	546	546						-			-	
	leavy equipment rental		565	_	-	_	-	-	85	649	649		-	_	-		_	-	-	-	-
	Disposal of DAW generated		-	11	(-	31	-	10	57	57	-	-	-	481	-	-	-	9,613	16	-
	lant energy budget	-	-	-	-	-	-	1,753	263	2,016	2,016	-	-	-	-	-	-	-	-	-	-
	IRC Fees ite O&M Cost	-	-	-	-	-	-	332 165	33 25	366 190	366 190	-	-	-		-	-		-	-	-
	ecurity Staff Cost		-					343	51	394	394						-			-	6,257
	Itility Staff Cost		_	_	-	_	-	14,264	2,140	16,404	16,404		-	_	-		_	-	-	-	200,229
	ubtotal Period 3a Period-Dependent Costs	-	1,002	11	(-	31		2,816	21,728	21,728	-	-	-	481	-	-	-	9,613	16	
3a.0 T0	OTAL PERIOD 3a COST	-	1,002	11	(-	31	27,018	4,189	32,256	31,966	-	290	-	481	-	-	-	9,613	16	237,603
PERIOD 3b	o - Decommissioning Preparations																				
Period 3b Dia	rect Decommissioning Activities																				
	rk Procedures																				
3b.1.1.1 Pl		-	-	-	-	-	-	251	38	289	260	-	29	-	-	-	-	-	-	-	2,026
	eactor internals Semaining buildings	-	-	-	-	-	-	133 72	20 11	152 82	152 21	-	62	-	-	-	-	-	-	-	1,070 578
	RD cooling assembly	-	-	-	-	-	-	53	8	61	61		- 02	-	-				-	-	428
	RD housings & ICI tubes	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	428
	ncore instrumentation	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	428
	leactor vessel	-	-	-	-	-	-	192 64	29 10	221 73	221	-	- 37	-	-	-	-	-	-	-	1,554
3b.1.1.9 M	acility closeout							64 24	10	73 27	37 27		37							-	514 193
	Siological shield		_	_	-	_	-	64	10	73	73		-	_	-		_	-	-	-	514
3b.1.1.11 St	team generators	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	-	1,969
	einforced concrete	-	-	-	-	-	-	53	8	61	30	-	30	-	-	-	-	-	-	-	428
3b.1.1.13 M	lain Turbine Iain Condensers	-	-	-	-	-	-	83 83	12 12	95 95	-	-	95 95	-	-	-	-	-	-	-	668 668
	uxiliary building		-	-	-	-	-	145	22	166	- 150	-	17	-	-		-		-		1,168
	eactor building	-	-	-	-	-	-	145	22	166	150	-	17	-	-		-		-	-	1,168
3b.1.1 To		-	-	-	-	-	-	1,710	256	1,966	1,585	-	381	-	-	-	-	-	-	-	13,800
3b.1 St	ubtotal Period 3b Activity Costs	-	-	-	-	-	-	1,710	256	1,966	1,585	-	381	-	-	-	-	-	-	-	13,800
	lditional Costs ite Characterization		_					2,771	831	3,602	3,602									13,042	4,640
	ubtotal Period 3b Additional Costs	-	-	-	-	-	-	2,771	831	3,602	3,602	-	-	-	-	-	-	-	-	13,042	
	ollateral Costs																				
	Decon equipment	947		-	-	-	-	1 100	142	1,089	1,089	-	-	-	-	-	-	-	-	-	-
	OCC staff relocation expenses lipe cutting equipment	-	1,100			-	-	1,163	175 165	1,338 1,265	1,338 1,265	-	-	-	-	-	-	-	-		-
3b.3 St	ubtotal Period 3b Collateral Costs	947	1,100		-	-	-	1,163	482	3,692	3,692	-	-	-	-	-	-	-	-	-	-
	eriod-Dependent Costs																				
	econ supplies	29	-	-	-	-	-	-	7	36	36	-	-	-	-	-	-	-	-	-	-
	nsurance Property taxes	-	-	-	-	-	-	$255 \\ 252$	25 25	280 277	280 277	-	-	-	-	-	-	-	-	-	-
	roperty taxes lealth physics supplies	-	238	-	-	-	-	292	25 59	297	297	-	-	-		-	-	-	-	-	-
3b.4.5 He	leavy equipment rental	-	285	-	-	-	-	-	43	327	327	-	-	-	-	-	-	-	-	-	-
3b.4.6 Di	Disposal of DAW generated	-	-	6	5	-	17		5	32	32	-	-	-	267	-	-	-	5,344	9	-
3b.4.7 Pl	lant energy budget	-	-	-	-	-	-	884	133	1,017	1,017	-	-	-	-	-	-	-	-	-	-

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Part								(1110	usanus	oi 2014 Dollar	.5)											
Part			ъ	D 1	D 1 :	m .			0.1	m . 1	TD + 1		-			- Cl			CTCC	_	C e	
Section Sect		Activity Description					_	_														
1	Period 3b Period-Dep	pendent Costs (continued)																				
Marice M			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
Section Sect			-		-	-	-						-	-		-				-	-	3,154
14	3b.4.11 DOC Staff	f Cost	-	-	-	-	-	-	3,382	507	3,889	3,889	-	-	-	-	-	-	-	-	-	43,109
Property			29	522	- 6	3	-	17					-		-	267	-	-	-			
Provision	3b.0 TOTAL Pl	ERIOD 3b COST	976	1,622	6	3	-	17	18,031	3,508	24,163	23,782	-	381	-	267	-	-	-	5,344	13,051	165,640
No.	PERIOD 3 TOTALS	S	976	2,624	17	9	-	48	45,049	7,698	56,420	55,748	-	672	-	748	-	-	-	14,956	13,066	403,242
Part	PERIOD 4a - Large	e Component Removal																				
Backer Conten Progres	Period 4a Direct Deco	ommissioning Activities																				
March December December Parage Meters 9 36 7 8 47 75 12 12 12 12 12 12 12 1																						
March Colombe Policy & Moreon 12 13 15 15 15 15 15 15 15							-						-	-								
Same Conversions 18 4 456 1,166 2.075 1,1070 4 4.087 2.070 4.007				121	85		-	1,390					-	-				-				80
Challe Climber Climb													-	-	-		-	-		,		
6.1.1.1 Worder New Parly March 19						,							-	-								
March Marc	4a.1.1.7 Reactor Ve	essel Internals	104	2,920		1,091	-	4,352	292	6,368			-	-	-			393		328,507		
A-1 Trab Proper Trab Proper			- 199										-	-								
Main TenyimenSenementer 1,50		66561		,									-	-	-							
Act																						
4.1.1.4			•											-	-		-	-	-			
An-14 Ancellary Building 755	Cascading Costs from	n Clean Building Demolition																				
Au-1.4 Roles stocks for Building 1.0		D.:14:	Ē		-	-	-	-	-				-	-	-	-	-	-	-	-		
A-1.1 A-1.			-		-	-	-						-	-		-				-		
Part	4a.1.4.4 Refueling	Water Storage Tank	-		-	-	-	-	-	21			-	-	-	-	-	-	-	-	1,299	-
As 1.5.1 Auxiliary Flowarm 1.5.2 1.3.3 97 1.7.5 1.1.43 1.1.54 1.		dling Building	-		-	-	-	-	-				-		-	-	-	-	-	-		
4a.1.5.2 Auxiliary Steam 1.53 - 23 176 - 1.76 - 2,107 - 4.1.5.4 Auxiliary Steam RCA 4.0 7 183 161 864 8.4 - 2,714 114,467 5,387 - 4a.1.5.6 1.00 1.120 1.120 - 3,611 184,114 7,055 - 4a.1.5.6 1.00 4a.1.2.6 4a.1.2.6 4a.1.2.6 4a.1	Disposal of Plant Sys	stems																				
Au. 1.5.1 Au. Stailbary Steam RCA 10 74 37 183 181 864 864			-		-	-	-		-				-		-	-	-	-	-			
4a.1.5.4 Sofe Acid Processing 536 88 48 238 238 239 1,120			-			37	-		-				-	176		2.714	-	-				
An 1.6 CO 2.6 ERCA 39 7 4 18 16 84 84 - 27 - 26 14 04 92 - 26 14 14 15 15 16 16 18 18 16 84 84 - 27 - 26 14 15 15 15 15 15 15 15	4a.1.5.4 Boric Acid	Processing	-	536			-		-	209	1,120		-				-	-	-		7,055	-
An.L.5. Chemical Feed at Intake 194			-		- 7	- 1	-		-	-			-		-		-	-	-			
4a.1.5.9 Chilled Water 1.07			-		- '		-	-	-				-			-	-	-	-	-		
4a.1.5.10 Circulating Water 641			-		-	-	-		-	4			-		-	-	-	-	-	-		
4a.1.5.1.1 Condensate Booster					-	-	-		-			-	-			-	-	-	-	-		
4a.1.5.13 Condensate Cleanup 214 - - 32 246 - 246 - - 3,000 - 4a.1.5.14 Containment Spray 289 87 47 231 146 800 800 - 3,455 - 19,291 3,839 - 4a.1.5.16 Dissel Fuel Oil 212 - - - 32 244 - 244 - - 4.41 - 2,848 - - - 2,848 - - - 2,848 - - - 2,848 - - - - 2,848 - - - - 2,848 - - - 2,848 - - - - - 2,44 - - 244 - - - - - 809 - <td>4a.1.5.11 Condensat</td> <td>te</td> <td>-</td> <td></td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td></td> <td></td> <td>-</td> <td>-</td> <td>450</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>5,317</td> <td>-</td>	4a.1.5.11 Condensat	te	-		-	-	-	-	-			-	-	450	-	-	-	-	-	-	5,317	-
4a.1.5.14 Containment Spray			-		-	-	-	-	-			-	-		-	-	-	-	-			
4a.1.5.16 Essential Service Water 368 - - 55 423 - 423 - 5,049 - 4a.1.5.17 Extraction Steam 263 - - 39 302 - 302 - - 4,025 - 4a.1.5.18 Feedwater 357 - - 53 410 - - 4,025 - - 4,025 - - 4,025 - - 4,025 - - 4,025 - - 4,025 - - 4,025 - - 4,025 - - - 4,025 - - - 4,025 - - - 4,025 -			-			47	-	231	-				-			3,455	-	-	-			
4a.1.5.17 Extraction Steam 4a.1.5.18 Feedwater 4a.1.5.19 Feedwater Drains 4a.1.5.19 Feedwater Drains 4a.1.5.20 Gland Steam 4a.1.5.21 Gland Water 4a.1.5.21 Gland Water 4a.1.5.22 Main Steam 4a.1.5.23 Main Steam RCA 4a.1.5.24 Make-up Demineralizer 4a.1.5.25 Nitrogen 4a.1.5.25 Nor-Essential Service Water 4a.1.5.25 Nor-Essential Service Water 4a.1.5.26 One Agent Annual Steam 4a.1.5.27 Strogen 4a.1.5.28 Strogen 4a.1.5.29 Strogen 4a.1.5.29 Strogen 4a.1.5.20 Strogen 4a.1.5.20 Strogen 4a.1.5.21 Strogen 4a.1.5.22 Strogen 4a.1.5.23 Strogen 4a.1.5.24 Main Steam 4a.1.5.24 Strogen 4a.1.5.25 Nor-Essential Service Water 4a.1.5.26 Strogen 4a.1.5.26 Strogen 4a.1.5.27 Strogen 4a.1.5.28 Strogen 4a.1.5.29 Strogen 4a.1.5.29 Strogen 4a.1.5.20 St			-		-	-	-	-	-				-		-	-	-	-	-	-		
4a.1.5.18 Feedwater Feedwater 357 - - - 53 410 - 410 - - - 4,925 - - 4,925 - - 4,925 - - - 4,925 - - - 4,925 - - - - 4,925 - - - - - 1,719 - - - - - 1,719 -			-		-		-		-				-			-	-	-		-		
4a.1.5.20 Gland Steam 4a.1.5.21 Gland Water 4a.1.5.22 Gland Water 4a.1.5.22 Gland Water 4a.1.5.23 Main Steam RCA 4a.1.5.24 Make-up Demineralizer 4a.1.5.25 Nitrogen 4a.1.5.25 Nor-Essential Service Water 4a.1.5.26 Service Water 4a.1.5.26 Service Water 4a.1.5.26 Service Water 4a.1.5.27 Service Water 4a.1.5.26 Service Water 4a.1.5.27 Service Water 4a.1.5.28 Service Water 4a.1.5.29 Service Water 4a.1.5.20 Service Water 4a.1.5.20 Service Water 4a.1.5.21 Service Water 4a.1.5.22 Service Water 4a.1.5.25 Service Water 4a.1.5.26 Service Water 4a.1.5.27 Service Water 4a.1.5.28 Service Water 4a.1.5.29 Service Water 4a.1.5.29 Service Water 4a.1.5.20 Service Water	4a.1.5.18 Feedwater	r	-	357	-	-		-	-	53	410	-	-	410	-	-	-	-	-	-	4,925	-
4a.1.5.21 Gland Water 33 - - - 5 37 - - 37 - - - 458 - 4a.1.5.22 Main Steam - 363 - - - - 54 417 - - 417 - - - 4,979 - 4a.1.5.24 Main Steam RCA - 96 23 13 - 64 - 44 240 240 - - 947 - - 49,262 1,292 - 4a.1.5.25 Nitrogen - 183 - - - 27 210 - - - - 2,595 - 4a.1.5.25 Nitrogen - 1 -			-			-	-	-	-			-	-		-	-	-	-	-	-		
4a.1.5.23 Main Steam RCA - 96 23 13 - 64 - 44 240 240 - - 947 - - 49,262 1,292 - 4a.1.5.24 Make-up Demineralizer - 183 - - - - 27 210 - - - - - 2,595 - 4a.1.5.25 Nitrogen - 1 - - - - 0 1 - - 1 - - 18 - 4a.1.5.26 Non-Essential Service Water - 426 - - - 64 490 - - 490 - - - - 5,993 -	4a.1.5.21 Gland Wa	ter	-	33					-	5	37	-	-	37	-	-	-	-	-		458	-
4a.1.5.24 Make-up Demineralizer - 183 - - - - 27 210 - - 10 - - - 2,595 - 4a.1.5.25 Nitrogen - 1 - - - - - - 1 - - - - - 188 - 4a.1.5.26 Non-Essential Service Water - 426 - - - - - 490 - - - - 5,903 -			-			. 10	•	-	-				-		-	- 0.45	-	-	-	40.000		
4a.1.5.25 Nitrogen - 1 - - - - 18 - 4a.1.5.26 Non-Essential Service Water - 426 - - - - 490 - - - 5,903 -			-			- 13		64	-				-			947	-		-			
	4a.1.5.25 Nitrogen		-	1		-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	18	-
			-			- #1	-		-				-	490			-	-	-			

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

						(1110	, asamas (oi 2014 Dollar	5)											
					Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activity Index Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Disposal of Plant Systems (continued)																				
4a.1.5.28 Off Gas	-	768	176	97	-	478	-	344	1,862	1,862	-	-	-	7,112	-	-	-	370,343	10,290	-
4a.1.5.29 Potable Water	-	6			-		-	1	7		-	7	-	-	-	-	-		75	-
4a.1.5.30 Process Radiation Monitoring	-	76 168	4 15	2	-	9 41	-	22 55	113 287	113 287	-	-	-	134 615	-	-	-	7,021	1,093	-
4a.1.5.31 Process Sampling 4a.1.5.32 Screen Wash	-	168 53	10	8	-	41	-	99 8	61	281	-	- 61	-	619	-	-		31,992	2,368 740	-
4a.1.5.33 Station Air	_	51	_	-	_	_		8	59	_	_	59	-	_	-	_		_	705	_
4a.1.5.34 Station Heating	-	174	-	-	-	-	-	26	200	-	-	200	-	-	-	-	-	-	2,391	-
4a.1.5.35 Steam Humidification	-	8	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	115	-
4a.1.5.36 Switchgear Heat Removal	-	38 91	-	-	-	-	-	6	44 104	-	-	44 104	-	-	-	-	-	-	519	-
4a.1.5.37 Turbine Bldg Equip Drains 4a.1.5.38 Turbine Bldg Floor Drains		155			-			14 23	179			179	-			-			1,235 2,117	-
4a.1.5.39 Turbine Oil	_	98	-	-	_	_	-	15	112	_	_	112	-	_	-	_		_	1,359	-
4a.1.5.40 Turbine-Generator Auxilaries	-	65	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	884	-
4a.1.5.41 Waste Oil Sumps	-	38	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	517	-
4a.1.5.42 Well Water	-	92	-	-	-	-	-	14	106	-	-	106	-	-	-	-	-	-	1,247	-
4a.1.5 Totals	-	8,775	560	307	-	1,512	-	2,055	13,209	6,093	-	7,116	-	22,603	-	-	-	1,171,887	119,622	-
4a.1.6 Scaffolding in support of decommissioning	-	1,829	15	8	-	37	-	469	2,357	2,357	-	-	-	556	-	-	-	28,884	26,661	-
4a.1 Subtotal Period 4a Activity Costs	476	29,223	16,956	8,190	-	42,210	585	26,295	123,934	116,818	-	7,116	-	242,559	501	393	2,217	14,290,530	290,852	5,532
Period 4a Additional Costs																				
4a.2.1 Remedial Action Surveys	-	-	-	-	-	-	1,976	593	2,569	2,569	-	-	-	-	-	-	-	-	31,151	-
4a.2.2 Asbestos Abatement	•	-		-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
4a.2.3 Operational Tools and Equipment 4a.2 Subtotal Period 4a Additional Costs	-	-	9	52 52	-	189 189	2,026	56 656	306 2,933	306 2,933	-	-	-	5,855 5,855	-	-	-	146,375 146,375	16 31,167	-
	-	-	9	52	-	100	2,026	656	2,955	2,333	•	-	-	5,655	-	•	-	140,575	31,107	-
Period 4a Collateral Costs	_																			
4a.3.1 Process decommissioning water waste	5	-	10	24	-	30	-	15	85	85	-	-	-	86	-	-	-	5,186	17	-
4a.3.2 Process decommissioning chemical flush waste 4a.3.3 Small tool allowance		380	-					- 57	437	- 393		44	-					-	-	
4a.3 Subtotal Period 4a Collateral Costs	5	380	10	24	-	30	-	72	521	478	-	44	-	86	-	-	-	5,186	17	-
Period 4a Period-Dependent Costs																				
4a.4.1 Decon supplies	87	_	_	-	_	-		22	108	108	-	-	_	-	_	_	-	_	-	_
4a.4.2 Insurance	-	-	-	-	-	-	758	76	834	834	-	-	-	-	-	-		-	-	-
4a.4.3 Property taxes	-	-	-	-	-	-	749	75	824	741	-	82	-	-	-	-	-	-	-	-
4a.4.4 Health physics supplies	-	2,349	-	-	-	-	-	587	2,936	2,936	-	-	-	-	-	-	-	-	-	-
4a.4.5 Heavy equipment rental 4a.4.6 Disposal of DAW generated	-	3,253	- 84	43	-	239	-	488 75	3,740 441	3,740 441	-	-	-	- 3 720	-	-	-	74.572	122	-
4a.4.7 Plant energy budget	-	-	- 04	- 40	-	200	2,496	374	2,871	2,871	-		-	5,725	-	-	-	14,512	122	-
4a.4.8 NRC Fees	-	-	-	-	-	-	628	63	690	690	-	-	-	-	-	-		-	-	-
4a.4.9 Site O&M Cost	-	-	-	-	-	-	247	37	284	284	-	-	-	-	-	-	-	-	-	-
4a.4.10 Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	601	90	691	691	-	-	-	-	-	-	-	-	-	
4a.4.11 Security Staff Cost 4a.4.12 DOC Staff Cost	•	-	-	-	-	-	4,211 $17,700$	632 2,655	4,842 $20,355$	4,842 $20,355$	-	•	-	-	-	-	-	-	-	71,047 $215,674$
4a.4.12 DOC Staff Cost 4a.4.13 Utility Staff Cost	-	-	-	-	-	-	29,528	4,429	33,957	33,957	-		-	-	-	-		-		390,714
4a.4 Subtotal Period 4a Period-Dependent Costs	87	5,601	84	43	-	239	56,918	9,602	72,575	72,493	-	82	-	3,729	-	-	-	74,572	122	677,436
4a.0 TOTAL PERIOD 4a COST	568	35,205	17,059	8,310	-	42,667	59,529	36,625	199,964	192,721	-	7,242	-	252,229	501	393	2,217	14,516,670	322,158	682,968
PERIOD 4b - Site Decontamination																				
Period 4b Direct Decommissioning Activities																		<u>.</u>		
4b.1.1 Remove spent fuel racks	1,277	139	369	143	-	705	-	908	3,541	3,541	-	-	-	10,524	-	-	-	546,426	2,174	-
Disposal of Plant Systems 4b.1.2.1 Chemical & Volume Control	_	1,209	164	82	_	407	_	433	2,296	2,296		_	_	6,063	_	_	_	315,292	15,801	_
4b.1.2.2 Chilled Water RCA	-	742	180	95	-	470		335	1,823	1,823	-	-		7,000				364,517	9,521	-
4b.1.2.3 Component Cooling	-	790	224	122	-	600	-	388	2,123	2,123	-	-	-	8,936	-	-	-	464,778	10,502	-
4b.1.2.4 Electrical	-	4,890		-	-		-	734	5,624		-	5,624	-		-	-	-		66,259	-
4b.1.2.5 Electrical - Contaminated	-	1,953	194	123	-	608	-	678	3,557	3,557	-	-	-	9,079	-	-	-	471,393	26,007	-
4b.1.2.6 Electrical - RCA 4b.1.2.7 Emergency Diesel Generator	-	2,815 111	454	278	-	1,372	-	1,134 17	6,054 127	6,054	-	- 127	-	20,491	-	-	-	1,063,899	38,351 1,514	-
4b.1.2.8 Essential Service Water RCA	-	385	209	122	-	601	-	286	1,603	1,603	-	127	-	8,972	-	-	-	466,273	1,514 5,336	-
4b.1.2.9 Fire Protection	-	362	-	-	-	-	-	54	416	-	-	416	-	- 0,512	-	-	-	400,276	4,983	
4b.1.2.10 Fire Protection RCA	-	597	153	85	-	419	-	282	1,537	1,537	-	-		6,243	-	-	-	324,808	7,672	-

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							•			•											
		_				Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C Cu. Feet	GTCC	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	ou. reet	Cu. reet	ou. reet	Cu. Feet	Cu. Feet	Wt., Lbs.	Mannours	Mannours
Disposal of Plant S																					
	ndling Bldg Equip Drains	-	186	34	18	-	91	-	75	405	405	-	-	-	1,386		-	-	70,185	2,442	-
	ndling Bldg Equip Drains (Unit 1)	-	33	4	2	-	9		11	58	58	-	-	-	129	-	-	-	6,739	429	-
	ndling Bldg Floor Drains	-	190	33	17	-	82	-	74	395	395	-	-	-	1,241	-	-	-	63,725	2,480	-
	ndling Bldg Floor Drains (Unit 1)	•	132	23	12	-	58	-	52	277 567	277	-	•	-	874		-	-	44,626	1,769	-
	ol Cooling & Cleanup	•	$252 \\ 234$	49 46	27 25	-	133	-	105 98	528	567 528	-	-	-	1,989	-	-	-	103,404	3,329	-
4b.1.2.17 HVAC-A	ol Cooling & Cleanup (Unit 1)	•	623	116	29 73	-	124 361	-	269	1,442	1,442	-	-	-	1,857 5,390	-	-	-	96,476 279,889	3,103 8,029	-
	Control Room HVAC	•	9	110	10	-	901	-	209	1,442	1,442	-	10	-	5,530	-	-	-	219,009	127	-
	Diesel Generator Room		51						8	58	-		58							686	
4b.1.2.20 HVAC-I			23						3	27	-		27							315	_
4b.1.2.21 HVAC-N		_	21	_	_	_	_	_	3	24	_	_	24	_	_	_	_	_	_	297	-
4b.1.2.22 HVAC-N			128	-	-	_	-	-	19	148	-	_	148	_	_	-	_	-	_	1,769	-
	Primary Containment		692	218	139	_	683	-	386	2,119	2,119	_	-	_	10,197	-	_	-	529,451	8,908	_
4b.1.2.24 HVAC-F			20		-	_	-	-	3	23	-,	_	23	_	,	_	_	-	-	275	-
4b.1.2.25 HVAC-F		_	358	68	43	_	213	-	156	838	838	_		_	3,177	_	_	-	164,931	4,412	_
4b.1.2.26 HVAC-T			218	-	-	_		-	33	250		-	250	-	-		-	-	-	3,158	
4b.1.2.27 Instrum			85			-			13	97		-	97			-	-	-	-	1,197	
	ent Air Supply RCA		276	31	14	-	68		91	480	480	-			1,002	-	-	-	52,414	3,630	
4b.1.2.29 Miscella		-	84	15	8	-	40	-	34	181	181	-	-	-	592	-	-	-	30,841	1,125	-
4b.1.2.30 Primary	Containment Purge		336	138	76	-	375	-	203	1,128	1,128	-	-	-	5,582	-	-	-	290,664	4,721	-
4b.1.2.31 Primary	Water	-	939	234	136	-	670	-	446	2,424	2,424	-	-	-	10,451	-	-	-	519,324	12,918	-
4b.1.2.32 Radioact	tive Waste Disposal	-	3,117	523	282	-	1,391	-	1,222	6,535	6,535	-	-	-	21,101	-	-	-	1,078,202	40,671	-
4b.1.2.33 Reactor	Bldg Equipment Drains	-	122	25	14	-	67	-	52	279	279	-		-	997	-	-	-	51,818	1,605	-
	Building Floor Drains		46	6	3	-	16	-	17	89	89	-	-	-	245	-	-	-	12,768	604	-
4b.1.2.35 Reactor	Coolant		186	22	10	-	51	-	63	332	332	-	-	-	763	-	-	-	39,871	2,413	-
4b.1.2.36 Residua		-	213	51	29	-	143	-	98	534	534	-	-	-	2,129	-	-	-	110,771	2,894	-
4b.1.2.37 Safety In	njection	-	980	241	137	-	676	-	459	2,493	2,493	-	-	-	10,357	-	-	-	523,998	13,451	-
4b.1.2.38 Station		-	65	8	4	-	19	-	22	118	118	-	-	-	283		-	-	14,808	833	-
4b.1.2.39 Station		-	281	60	32	-	156	-	120	648	648	-	-	-	2,315		-	-	120,573	3,664	-
4b.1.2.40 Tritium		-	427	110	64	-	316		206	1,123	1,123	-	-	-	4,948		-	-	245,163	5,864	-
4b.1.2.41 Waste O		-	29	4	2	-	10	-	10	56	56	-	-	-	149	-	-	-	7,762	370	-
4b.1.2.42 Waste W	Vater Treatment	-	105	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	1,464	-
4b.1.2 Totals		-	24,315	3,638	2,075	-	10,229	-	8,709	48,965	42,040	-	6,926	-	153,939	-	-	-	7,929,364	324,897	-
4b.1.3 Scaffold	ing in support of decommissioning	-	2,743	22	11	-	56	-	704	3,536	3,536	-	-	-	834	-	-	-	43,325	39,992	-
Decontamination of	f Site Buildings																				
4b.1.4.1 Reactor	•	2,264	1,625	233	347	-	1,358	-	1,953	7,782	7,782	-	-	-	24,850	-	-	-	1,271,843	50,420	-
4b.1.4.2 Auxiliar	y Building	265	138	22	20	-	75	-	191	710	710	-	-	-	1,209	-	-	-	72,597	5,258	-
4b.1.4.3 Radwast	te/Service Building	174	54	9	12	-	38	-	112	399	399	-	-	-	686	-	-	-	42,196	2,958	-
	g Water Storage Tank	412	480	41	18	-	83	-	354	1,388	1,388	-	-	-	1,240	-	-	-	67,350	11,972	-
	ndling Building	1,180	1,321	110	53	-	236	-	998	3,898	3,898	-	-	-	3,552		-	-	198,847	33,507	-
4b.1.4 Totals		4,295	3,619	415	450	-	1,790	-	3,609	14,177	14,177	-	-	-	31,536	-	-	-	1,652,832	104,115	-
4b.1 Subtotal	Period 4b Activity Costs	5,572	30,816	4,445	2,679	-	12,779	-	13,929	70,220	63,294	-	6,926	-	196,834	-	-	-	10,171,950	471,178	-
Period 4b Additiona	al Costs																				
	Termination Survey Planning	-	-	-	-	-	-	983	295	1,278	1,278	-	-	-	-	-	-	-	-	-	6,24
	al Action Surveys	-	-	-	-	-	-	3,566	1,070	4,636	4,636	-	-	-	-	-	-	-	-	56,209	-
4b.2.3 Asbestos	s Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
4b.2.4 License	Termination ISFSI	-	498	207	324	-	893	1,816	935	4,674	4,674	-	-	-	14,549	-	-	-	1,178,830	11,786	5,370
4b.2.5 Undergr	ound Services Excavation		554	-	-	-	-	-	83	637	637	-	-	-	-	-	-	-	-	2,755	-
4b.2 Subtotal	Period 4b Additional Costs	-	1,052	207	324	-	893	6,416	2,390	11,283	11,283	-	-	-	14,549	-	-	-	1,178,830	70,749	11,610
Period 4b Collatera	l Costs																				
	decommissioning water waste	15	-	29	72	-	90	-	44	250	250			-	257	-	-	-	15,400	50	-
	decommissioning chemical flush waste		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4b.3.3 Small to	ol allowance	-	638	-	-	-	-	-	96	734	734	-	-	-	-	-	-	-	-	-	-
	nissioning Equipment Disposition	-	-	184	96	-	472		151	903	903	-	-	-	7,054		-	-	366,237	88	-
4b.3 Subtotal	l Period 4b Collateral Costs	15	638	213	168	-	563	-	291	1,888	1,888	-	-	-	7,310	-	-	-	381,637	138	-

Table E-2
Braidwood Nuclear Power Station Unit 2
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

							(1110	usanus (oi 2014 Dollar	3)											
A. at ta		D	D1	D. I. dan	T	Off-Site	LLRW	0.1	/D. 4 . 1	/D 1	NRC	Spent Fuel	Site	Processed	CI A		Volumes	CTTCC	Burial /	C C	Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 4b Period-De																					
4b.4.1 Decon su		1,013	-	-	-	-	-	1 000	253	1,267	1,267	-	-	-	-	-	-	-	-	-	-
4b.4.2 Insurance 4b.4.3 Property			-		-	-		1,368 1,351	137 135	1,504 1,486	1,504 1,486			-						-	-
	physics supplies		4,028	-	-	-	_		1,007	5,034	5,034	-	-	_	_		-	-	-	-	-
4b.4.5 Heavy ed	quipment rental	-	5,810	-	-	-	-	-	872	6,682	6,682	-	-	-	-	-	-	-	-	-	-
	of DAW generated	-	-	152	78	-	429	-	134	793	793	-	-	-	6,704	-	-	-	134,081	219	-
	ergy budget	-	-	-	-	-	-	3,556	533	4,090	4,090	-	-	-	-	-	-	-	-	-	-
4b.4.8 NRC Fee 4b.4.9 Site O&I			-	-	-	-	-	1,132 446	113 67	1,246 513	1,246 513			-	-	-	-	-	-	-	-
	adwaste Processing Equipment/Services	-	-	-	-	-	-	1,084	163	1,247	1,247	-	-	-	-	-	-	-	-	-	-
	Staff Cost	-	-	-	-	-	-	10,515	1,577	12,092	12,092	-	-	-	-	-	-	-	-	-	176,250
4b.4.12 DOC Sta		-	-	-	-	-	-	31,109	4,666	35,776	35,776	-	-	-	-	-	-	-	-	-	377,880
4b.4.13 Utility S 4b.4 Subtotal	rtaff Cost Period 4b Period-Dependent Costs	1,013	9,838	152	78	-	429	50,609 101,171	7,591 17,249	58,201 129,929	58,201 129,929	-	-	-	6,704		-		134,081	219	665,520 1,219,650
	•	,	ŕ			-						-		-	,	-	-	_			
4b.0 TOTAL	PERIOD 4b COST	6,601	42,344	5,017	3,249	-	14,664	107,587	33,859	213,320	206,394	-	6,926	-	225,397	-	-	-	11,866,490	542,284	1,231,260
PERIOD 4f - Lice	nse Termination																				
	commissioning Activities							150	*0	224	22.4										
	onfirmatory survey te license	-	-	-	-	-	-	172	52	224 a	224	-	-	-	-	•	-	-	-	-	-
	Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
Period 4f Additiona	l Costs																				
4f.2.1 License	Termination Survey	-	-	-	-	-	-	9,744	2,923	12,667	12,667	-	-	-	-	-	-	-	-	132,123	
4f.2 Subtotal	Period 4f Additional Costs	-	-	-	-	-	-	9,744	2,923	12,667	12,667	-	-	-	-	-	-	-	-	132,123	3,120
Period 4f Collateral																					
4f.3.1 DOC sta 4f.3 Subtotal	ff relocation expenses Period 4f Collateral Costs	•	-	-	-	-	-	1,163 1,163	175 175	1,338 1,338	1,338 1,338	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	1,105	175	1,556	1,330	-	-	-	-	-	-	-	•	•	•
Period 4f Period-De 4f.4.1 Insurance								381	38	419	419										
4f.4.2 Property		-	-	-	-	-	-	376	38	414	414	-	-	-	-	-	-		-	-	-
	physics supplies	-	703	-	-	-	-	-	176	879	879	-	-	-	-	-	-	-	-	-	-
	of DAW generated	-	-	8	4	-	21	-	7	40	40	-	-	-	335	-	-	-	6,698	11	-
	ergy budget	-	-	-	-	-	-	264	40	304	304	-	-	-	-	-	-	-	-	-	-
4f.4.6 NRC Fee 4f.4.7 Site O&I		-	-	-	-	-	-	$302 \\ 124$	30 19	333 143	333 143	-	-	-	-	-	-	-	-		-
	Staff Cost	-	-	-	-	-	-	722	108	830	830	-	-	-	-	-	-		-	-	11,786
4f.4.9 DOC Sta		-	-	-	-	-	-	3,870	580	4,450	4,450	-	-	-	-	-	-	-	-	-	46,750
4f.4.10 Utility S		-	-	-	-	-	-	4,733	710	5,443	5,443	-	-	-	-	-	-	-	-	-	56,964
4f.4 Subtotal	Period 4f Period-Dependent Costs	-	703	8	4	-	21	10,773	1,745	13,255	13,255	-	-	-	335	-	-	-	6,698	11	115,500
4f.0 TOTAL	PERIOD 4f COST	-	703	8	4	-	21	21,853	4,895	27,484	27,484	-	-	-	335	-	-	-	6,698	132,134	118,620
PERIOD 4 TOTAL	LS	7,169	78,252	22,084	11,563	-	57,353	188,968	75,379	440,767	426,599	-	14,168	-	477,961	501	393	2,217	26,389,860	996,575	2,032,848
PERIOD 5b - Site	Restoration																				
Period 5b Direct De	ecommissioning Activities																				
Demolition of Rema	tining Site Buildings																				
5b.1.1.1 Reactor		-	8,057	-	-	-	-	-	1,209	9,266	-	-	9,266	-	-	-	-	-	-	69,546	
	dwater-Steam Tunnel/Penetr. Area	-	795	-	-	-	-	-	119	914	-	-	914	-	-	-	-	-	-	5,187	
	y Building yn Outfall Structure	-	7,062 35	-	-	-	-	-	1,059 5	8,121 40	-	-	8,121 40		-	-	-	-	-	62,064 295	
	Gas Storage		31	-	-	-		-	5	36	-	-	36			-	-	-	-	340	
5b.1.1.6 Circulati	ing Water Discharge	-	265	-	-	-	-	-	40	305	-	-	305	-	-	-	-	-	-	2,887	-
	se and Extension	-	397	-	-	-	-	-	60	457	-	-	457	-	-	-	-	-	-	4,193	
	ent Maintenance Building	-	112	-	-	-	-	-	17	129	-	-	129	-	-	-	-	-	-	1,190	
	reen House o Demineralizer Area	-	1,788 764	-	-	-	-	-	268 115	2,056 878		-	2,056 878		-	-	-	-	-	15,283 8,158	
5b.1.1.10 Make-up 5b.1.1.11 Miscella		-	2,333	-	-	-			350	2,683	-	-	2,683		-	-	-	-	-	26,794	
5b.1.1.12 Miscella	neous Yard Structures	-	1,517	-	-	-	-	-	228	1,744	-	-	1,744	-	-	-	-	-	-	14,701	-
5b.1.1.13 Radwast	ce/Service Building	-	4,681	-	-	-	-	-	702	5,383	-	-	5,383	-	-	-	-	-	-	45,685	-

Table E-2 **Braidwood Nuclear Power Station Unit 2 SAFSTOR Decommissioning Cost Estimate** (Thousands of 2014 Dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activity		Decon		Packaging	-		Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Demolition of Remai	ning Site Buildings (continued)																				
5b.1.1.14 Receiving			218	_	_		_	-	33	250	_		250	_	-	_	-	_	-	2,293	_
	Water Storage Tank		1,234	-	-	-	-	-	185	1,419			1,419		-	-	-			11,692	
b.1.1.16 River Scr	een House		726		-				109	835			835				-	-	-	6,844	
b.1.1.17 Security I	Modifications		1,084		-		_	-	163	1,246		_	1,246	-	-	_	-	_	-	6,939	
b.1.1.18 Sewage T			124		-				19	143			143				-	-	-	1,330	
.1.1.19 Tech Sup	port Center & Cond Cleanup Bldg		594		-				89	683			683				-	-	-	6,095	
.1.1.20 Turbine E	Building		6,833		-				1,025	7,858			7,858				-	-	-	70,342	
.1.1.21 Turbine F	Pedestal		1,627		-				244	1,872			1,872				-	-	-	12,628	-
0.1.1.22 Waste Tre	eatment Building		122		-				18	141			141				-	-	-	1,265	
.1.1.23 Fuel Han	dling Building		3,632		-				545	4,177			4,177				-	-	-	33,245	-
o.1.1 Totals		-	44,032	-	-	-	-	-	6,605	50,637	-	-	50,637	-	-	-	-	-	-	408,996	-
te Closeout Activit	ies																				
.1.2 Remove R	Rubble	-	294	-	-	-	-	-	44	339	-	-	339	-	-	-	-	-	-	1,367	-
.1.3 Grade & l	landscape site	-	986	-	-	-	-	-	148	1,134	-	-	1,134	-	-	-	-	-	-	1,942	-
.1.4 Final repo	ort to NRC	-	-	-	-	-	-	83	12	95	95	-		-	-	-	-	-	-		66
1 Subtotal l	Period 5b Activity Costs	-	45,312	-	-	-	-	83	6,809	52,204	95	-	52,109	-	-	-	-	-	-	412,305	66
riod 5b Additional	l Costs																				
.2.1 Site Resto	oration ISFSI		1,147	-	-	-	-	28	176	1,351	-	-	1,351	-	-	-	-	-	-	13,036	80
2.2 Concrete	Crushing	-	1,120	-	-	-	-	6	169	1,295	-	-	1,295	-	-	-	-	-	-	4,730	-
2.3 Cofferdan	n Construction and Teardown	-	889	-	-	-	-	-	133	1,023	-	-	1,023	-	-	-	-	-	-	7,391	-
2 Subtotal l	Period 5b Additional Costs	-	3,156	-	-	-	-	34	478	3,668	-	-	3,668	-	-	-	-	-	-	25,156	8
riod 5b Collateral																					
.3.1 Small too	l allowance		589	-	-	-	-	-	88	677	-	-	677	-	-	-	-	-	-	-	-
.3 Subtotal l	Period 5b Collateral Costs	-	589	-	-	•	-	-	88	677	-	-	677	-	-	-	-	-	-	-	-
riod 5b Period-Dep	pendent Costs																				
.4.1 Insurance	e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.4.2 Property		-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
	uipment rental	-	7,568	-	-	-	-	-	1,135	8,704	-	-	8,704	-	-	-	-	-	-	-	-
	ergy budget	-	-	-	-	-	-	435	65	500	-	-	500	-	-	-	-	-	-	-	-
.4.5 Site O&M		-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
.4.6 Security S		-	-	-	-	-	-	2,128	319	2,447	-	-	2,447	-	-	-	-	-	-	-	34,28
.4.7 DOC Staf		-	-	-	-	-	-	11,846	1,777	13,623	-	-	13,623	-	-	-	-	-	-	-	137,043
.4.8 Utility St		-	-	-	-	-	-	5,797	869	6,666	-	-	6,666	-	-	-	-	-	-	-	67,229
.4 Subtotal l	Period 5b Period-Dependent Costs	-	7,568	-	-	-	-	21,853	4,351	33,773	-	-	33,773	-	-	-	-	-	-	-	238,558
.0 TOTAL P	PERIOD 5b COST	-	56,625	-	-	-	-	21,970	11,727	90,322	95	-	90,227	-	-	-	-	-	-	437,462	239,306
PERIOD 5 TOTALS	s	-	56,625	-	-	-	-	21,970	11,727	90,322	95	-	90,227	-	-	-	-	-	-	437,462	239,306
TOTAL COST TO I	DECOMMISSION	14,953	145,514	22,568	12,430	_	58,818	763,388	169,405	1.187.075	844,618	237.391	105.067	_	488,487	501	393	2,217	26,710,680	1,522,432	6.208.073

TOTAL COST TO DECOMMISSION WITH 16.65% CONTINGENCY:	\$1,187,075	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 71.15% OR:	\$844,618	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 20% OR:	\$237,391	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 8.85% OR:	\$105,067	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	489,381	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	Cubic Feet
TOTAL SCRAP METAL REMOVED:	74,045	Tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,522,432	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

APPENDIX F

ISFSI DECOMMISSIONING

	<u>Page</u>
DECON and SAFSTOR Alternative	F-2
Delayed DECON Alternative	F-3

Table F-1 Braidwood Nuclear Power Station ISFSI Decommissioning Cost Estimate DECON and SAFSTOR Decommissioning Alternatives

(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	451	451	-	-	1,288
Decontamination (activated overpack disposition)	401	415	649	1,787	19	3,270	29,098	4,234	
License Termination (radiological surveys)	-	-	-	-	2,329	2,329	-	19,338	-
Subtotal	401	415	649	1,787	2,800	6,051	29,098	23,572	1,288
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	384	384	-	-	776
Insurance					124	124			
Property Taxes					326	326			
Plant Energy Budget					-	_			
Security Staff Cost					295	295			4,937
Oversight Staff Cost					299	299			3,740
Subtotal	-	-	-	-	1,428	1,428	-	-	9,453
Total (w/o contingency)	401	415	649	1,787	4,227	7,478	29,098	23,572	10,741
Total (w/25% contingency)						9,348			

The application of contingency (25%) is consistent with the evaluation criteria referenced by the NRC in NUREG-1757 ("Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. NRC's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Vol. 3, Rev. 1, February 2012)

Table F-2 Braidwood Nuclear Power Station ISFSI Decommissioning Cost Estimate Delayed DECON Decommissioning Alternative

(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	273	273	-	-	1,072
Decontamination (activated overpack disposition)	291	415	557	1,786	19	3,068	29,086	3,368	
License Termination (radiological surveys)	-	-	-	-	1,440	1,440	-	11,896	-
Subtotal	291	415	557	1,786	1,732	4,781	29,086	15,264	1,072
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	384	384	-	-	776
Insurance					124	124			
Property Taxes					326	326			
Plant Energy Budget					-	-			
Security Staff Cost					295	295			4,937
Oversight Staff Cost					299	299			3,740
Subtotal	-	-	-	-	1,428	1,428	-	-	9,453
Total (w/o contingency)	291	415	557	1,786	3,160	6,208	29,086	15,264	10,525
Total (w/25% contingency)						7,761			

The application of contingency (25%) is consistent with the evaluation criteria referenced by the NRC in NUREG-1757 ("Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. NRC's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Vol. 3, Rev. 1, February 2012)

ATTACHMENT 2

Byron Station, Units 1 and 2 Decommissioning Cost Estimate

DECOMMISSIONING COST ANALYSIS $\label{eq:formula} \text{for the}$ BYRON NUCLEAR POWER STATION



 $prepared\ for$

Exelon Generation Company LLC

prepared by

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September 2014

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REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
0 1		09-05-2014 09-15-2014	Section 6 text	Original Issue Clarification to Comparison of the 2009 and 2014 Estimates; specifically on Property Taxes and Decommissioning and Demolition

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the Byron Nuclear Power Station (Byron) for the selected decommissioning scenarios following a scheduled cessation of plant operations. The updated estimates are designed to provide Exelon Generation Company LLC (Exelon) with the information to assess its current decommissioning liability, as it relates to the nuclear station.

The analysis relies upon site-specific, technical information, developed in an evaluation in 2009,^[1] and updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a comprehensive engineering evaluation, but presents estimates prepared in advance of the detailed planning required to execute the decommissioning of the nuclear units. It may also not reflect the actual plan to decommission Byron; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

The 2009 inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis. No substantive changes were identified to the configuration of the station or site facilities (that would impact decommissioning).

The costs to decommission Byron for the scenarios evaluated are tabulated at the end of this section. Costs are reported in 2014 dollars and include monies anticipated to be spent for radiological remediation and operating license termination, spent fuel management, and site restoration activities.

A complete discussion of the assumptions relied upon in this analysis is provided in Section 3, along with schedules of annual expenditures for each scenario. A sequence of significant project activities is provided in Section 4 with a timeline for each scenario. Detailed cost reports used to generate the summary tables contained within this document are provided in Appendices C, D and E.

[&]quot;Decommissioning Cost Analysis for the Byron Nuclear Power Station," Document No. E16-1555-013, Rev. 0, TLG Services, Inc., September 2009

Consistent with the 2009 analysis, the current cost estimates assume that the shutdown of the nuclear station is a scheduled and pre-planned event (e.g., there is no delay in transitioning the plant and workforce from operations or in obtaining regulatory relief from operating requirements, etc.). The estimates incorporate a minimum cooling period of approximately five and one-half years for the spent fuel in the storage pool at the cessation of Unit 2 operations. In the DECON and SAFSTOR scenarios, any residual fuel remaining in the pool after the cooling period is relocated to an on-site independent spent fuel storage installation (ISFSI) to await transfer to a Department of Energy (DOE) facility (the fuel present in the spent fuel pools or reactors is assumed to remain in the storage pool for the Delayed DECON scenario and transferred directly from the pool to DOE). The estimates also include the dismantling of non-essential structures and limited restoration of the site.

<u>Alternatives and Regulations</u>

The U.S. 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.

<u>DECON</u> 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]

<u>SAFSTOR</u> 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.

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

³ Ibid. Page FR24022, Column 3

⁴ Ibid.

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." 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 viable option. The resulting evaluation provided recommendations, however, rulemaking has been deferred based upon several factors (e.g., 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 amended its decommissioning regulations 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 amendments 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 estimates is also consistent with the recommendations of Regulatory Guide 1.202, issued in February 2005. [7]

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will

⁵ Ibid. Page FR24023, Column 2

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

[&]quot;Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, U.S. Nuclear Regulatory Commission, February 2005

become a legacy site. [8] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details are included in this analysis, including the ISFSI decommissioning estimate (Appendix F).

Decommissioning Scenarios

The following scenarios were evaluated and are representative of the alternatives available to the owner. The scenarios assume that the units operate for 60 years, followed by a planned and scheduled shutdown.

- 1. DECON: The first scenario assumes that the two units are promptly decommissioned as an integrated activity. Spent fuel is relocated from the wet storage pool to the ISFSI so as to facilitate decontamination and dismantling activities within the fuel handling building. Spent fuel storage operations continue at the site, independent of decommissioning operations, until the transfer of the fuel to the DOE is complete, assumed for purposes of this study to be in the year 2070. At that time, the ISFSI is decommissioned and the site released for alternative use.
- 2. Delayed DECON: In the second scenario, the units are prepared for an abbreviated period of safe-storage. The spent fuel resident in the fuel handling building's storage pool, remains in the pool until it can be transferred to the DOE (i.e., the ISFSI is not used to off-load the pool following the cessation of operations). Spent fuel placed at the ISFSI during operations remains in storage until the pool is emptied at which time the ISFSI is also emptied. Decommissioning is scheduled to commence once the transfer of the fuel to the DOE is complete (i.e., in the year 2070).
- 3. SAFSTOR: The units are also placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent permitted by the current regulations. Similar to the DECON alternative, the spent fuel in the wet storage pool is relocated to the ISFSI for interim storage. The units remain in protective storage following the removal

⁸ U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011

of spent fuel from the site. Decommissioning operations commence such that license termination is completed within the required 60-year period. As with the first two scenarios, decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling process.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines [9] 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.

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

Contingency

Consistent with standard cost estimating practice, contingencies are applied to the decontamination and dismantling costs 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 the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

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

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

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

<u>Low-Level Radioactive Waste Disposal</u>

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] and its Amendments of 1985,^[12] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

With the exception of Texas, no new compact facilities have been successfully sited, licensed, and constructed. The Texas Compact disposal facility is now operational and waste is being accepted from generators within the Compact by the operator, Waste Control Specialists (WCS). The facility is also able to accept limited quantities of non-Compact waste.

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to Exelon. The majority of the low-level radioactive waste designated for direct disposal (Class A^[13]) can be sent to EnergySolutions' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon Exelon's Life of Plant Agreement with EnergySolutions. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. For purposes of this analysis, GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner to, and at a cost equivalent to that envisioned for the spent fuel. The GTCC is either stored on site with

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

¹² "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986

Waste is classified in accordance with U.S. Code of Federal Regulations, Title 10, Part 61.55

the spent fuel or shipped directly to a DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act" (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 DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008. The current administration has cut the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle ... and make recommendations for a new plan."[14] Towards this goal, the administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[0]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[15]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on nuclear waste disposal. Two of the recommendations that may impact decommissioning planning are:

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"[16]
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[17]

Blue Ribbon Commission on America's Nuclear Future Charter, http://cybercemetery.unt.edu/archive/brc/20120620215336/http://brc.gov/index.php?q=page/charter

¹⁵ Ibid.

[&]quot;Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf, p. 32, January 2012

¹⁷ <u>Ibid</u>., p.27

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[18]

"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."[19]

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013) [20] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in

¹⁸ "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013

¹⁹ Ibid., p.2

United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, August 2013

 $[\]underline{http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB}\\18/\$file/11-1271-1451347.pdf$

which it was discharged from the reactor.^[21] With a large fleet of reactors, Exelon may be able to re-assign allocations between its units to minimize on-site storage costs.

Assuming a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (based upon the proposed timeline for the availability of the larger interim storage facility), the assemblies generated from Byron operations are projected to be shipped from the Byron site in the years 2066 through 2070 (assuming the cessation of plant operations in 2044 and 2046 for Units 1 and 2, respectively). This equates to 94 multi-purpose canisters (at 32 assemblies per canister), in addition to the 61 on the pad from operations.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[22]), has been constructed to support continued plant operations. This analysis assumes that the facility can be expanded to support decommissioning operations (in the DECON and SAFSTOR scenarios).

The spent fuel in the wet storage pools at the cessation of plant operations is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios) within the first five and one-half years following shutdown. Once the wet storage pool is emptied, the fuel handling building can be either decontaminated and dismantled or prepared for long-term storage. The pool is kept operational in the Delayed DECON scenario until the spent fuel stored in the pools can be transferred to the DOE.

Exelon's strongly held position is that the DOE has a contractual obligation to accept Byron's fuel in a timely manner and 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 the DOE has not met its contractual obligation to take the fuel.

U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV – Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) ... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such materials from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance ..."

U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites."

Site Restoration

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

This estimate assumes that some site features will remain following the decommissioning project. These include the existing electrical switchyard, which is assumed to remain functional in support of the regional electrical distribution system.

Consequently, this analysis assumes that non-essential site structures within the restricted access area are removed to a nominal depth of three feet below the local grade level wherever possible. The site is then graded and stabilized.

Summary

The costs to decommission Byron were evaluated for several decommissioning scenarios, incorporating the attributes of both the DECON and SAFSTOR decommissioning alternatives. Regardless of the timing of the decommissioning activities, the estimates assume the eventual removal of all the contaminated and activated plant components and structural materials, such that the facility operator may then have unrestricted use of the site with no further requirement for an operating license. Delayed decommissioning is initiated after the spent fuel has been removed from the site and 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 can be completed. Once the transfer is complete, the storage facilities are also decommissioned.

The scenarios analyzed for the purpose of generating the estimates are 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 Appendices C, D, and E. Cost summaries for the various scenarios are provided at the end of this section for the major cost components.

The cost elements in the estimates for the DECON and SAFSTOR alternatives are assigned to one of three subcategories: NRC License Termination (radiological remediation), 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 §50.75). The cost reported for this subcategory is generally sufficient to terminate the operating license(s), recognizing that there may be some additional cost impact from spent fuel management. The License Termination cost subcategory also includes costs to decommission the ISFSI (as required by 10 CFR §72.30). Section 3.5.1 provides the basis for the ISFSI decommissioning cost.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pool to the ISFSI for interim storage or directly to the DOE, as well as the transfer of the spent fuel in storage at the ISFSI. Costs are included for the operation of the storage pool and the management of the ISFSI until such time that the transfer is complete. It does not include any spent fuel management expenses incurred prior to the cessation of plant operations, nor does it include any costs related to the final disposal of the spent fuel.

"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 below grade 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., Asset Retirement Obligation 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.

As noted within this document, the estimates were developed and costs are presented in 2014 dollars. As such, the estimates do not reflect the escalation of costs (due to inflationary and market forces) over the remaining operating life of the station or during the decommissioning period.

SUMMARY OF DECOMMISSIONING COST ELEMENTS DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	15,331	23,038	38,368
Removal	123,116	169,939	293,055
Packaging	31,386	30,130	61,516
Transportation	18,769	16,350	35,119
Waste Disposal	92,380	85,612	177,992
Off-site Waste Processing	0	0	0
Program Management [1]	260,099	295,868	555,968
Security	40,382	86,575	126,957
Spent Fuel Pool Isolation	0	12,434	12,434
Spent Fuel Management [2]	144,255	140,851	285,106
Insurance and Regulatory Fees	18,777	15,633	34,410
Energy	11,752	12,320	24,072
Characterization and Licensing Surveys	25,084	24,530	49,614
Property Taxes	50,959	49,851	100,810
Miscellaneous Equipment	6,639	6,958	13,598
Site O&M	4,975	4,593	9,568
Total [3]	843,904	974,682	1,818,587

Cost Element			
NRC License Termination	560,921	666,303	1,227,223
Spent Fuel Management	203,244	199,840	403,084
Site Restoration	79,740	108,540	188,280
Total [3]	843,904	974,682	1,818,587

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS DELAYED DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	13,137	19,289	32,426
Removal	126,306	171,327	297,633
Packaging	26,060	25,073	51,133
Transportation	16,793	14,045	30,837
Waste Disposal	81,682	74,749	156,431
Off-site Waste Processing	0	0	0
Program Management [1]	361,785	372,600	734,385
Security	102,701	112,798	215,500
Spent Fuel Pool Isolation	0	12,434	12,434
Spent Fuel Management [2]	87,175	81,936	169,111
Insurance and Regulatory Fees	35,732	31,928	67,659
Energy	23,002	23,120	46,122
Characterization and Licensing Surveys	26,173	$25,\!272$	51,444
Property Taxes	56,104	54,993	111,097
Miscellaneous Equipment	12,236	12,605	24,841
Site O&M	6,852	6,469	13,321
Total [3]	975,737	1,038,639	2,014,375

Cost Element			
NRC License Termination	592,143	722,840	1,314,983
Spent Fuel Management	304,536	208,046	512,582
Site Restoration	79,057	107,752	186,810
Total [3]	975,737	1,038,639	2,014,375

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS SAFSTOR ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	13,120	19,258	32,378
Removal	127,990	173,043	301,033
Packaging	26,060	25,066	51,125
Transportation	16,852	14,086	30,939
Waste Disposal	80,307	73,346	153,653
Off-site Waste Processing	0	0	0
Program Management [1]	347,085	358,289	705,374
Security	83,256	128,599	211,854
Spent Fuel Pool Isolation	0	12,434	12,434
Spent Fuel Management [2]	142,353	137,114	279,466
Insurance and Regulatory Fees	57,984	54,026	112,010
Energy	24,939	25,077	50,016
Characterization and Licensing Surveys	26,173	25,272	51,444
Property Taxes	70,609	69,499	140,108
Miscellaneous Equipment	16,978	17,719	34,697
Site O&M	11,861	11,478	23,339
Total [3]	1,045,566	1,144,306	2,189,872

Cost Element			
NRC License Termination	776,133	834,580	1,610,713
Spent Fuel Management	189,729	201,327	391,055
Site Restoration	79,704	108,399	188,103
Total [3]	1,045,566	1,144,306	2,189,872

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

1. INTRODUCTION

This report presents estimates of the cost to decommission the Byron Nuclear Power Station (Byron) for the selected decommissioning scenarios following a scheduled cessation of plant operations. The updated estimates are designed to provide Exelon Generation Company LLC (Exelon) with the information to assess its current decommissioning liability, as it relates to the nuclear station.

The analysis relies upon site-specific, technical information, developed in an evaluation in 2009,^[1] * and updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a comprehensive engineering evaluation, but presents estimates prepared in advance of the detailed planning required to execute the decommissioning of the nuclear unit. It may also not reflect the actual plan to decommission Byron; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the cost to decommission Byron, to provide a sequence or schedule for the associated activities, and to develop waste stream projections from the decontamination and dismantling activities. Operating licenses were issued on October 31, 1984, for Unit 1 and November 6, 1986, for Unit 2. A sixty year operating lifetime has been assumed for the purpose of this study. As such, the cessation of operations would then be October 31, 2044, for Unit 1 and November 6, 2046, for Units 1 and 2, respectively. These dates were used to schedule the decommissioning activities.

1.2 SITE DESCRIPTION

Byron is located in northern Illinois. The site is situated in a predominately agricultural area approximately 3.7 miles southwest of the city of Byron and

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

2.2 miles east of Rock River, in Ogle County. The station is comprised of two essentially identical pressurized water reactors with supporting facilities.

The primary coolant system for each unit consists of a pressurized water reactor system designed by the Westinghouse Corporation. The reactor coolant system is comprised of the reactor vessel and four heat transfer loops. Each loop contains a reactor coolant pump, steam generator, and associated piping and valves. In addition, the system includes a pressurizer, a pressurizer relief tank, interconnected piping, and instrumentation necessary for operational control. Components of the reactor coolant system are located in the containment building. The design reactor thermal power level is 3,645 Megawatts thermal (MWth). The corresponding electrical outputs are approximately 1,295 Megawatts electric (MWe) and 1,265 MWe for Units 1 and 2, respectively.

The containment structure at Byron Station is a prestressed concrete shell structure made up of a cylinder with a shallow dome roof and a flat foundation slab. The entire structure is lined on the inside with steel plate, which acts as a leaktight membrane. The containment completely encloses the entire primary coolant system, including portions of the auxiliary and engineered safety features systems.

Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of steam produced in the reactor into mechanical shaft power and then into electrical energy. The main turbine consists of one double-flow, high-pressure turbine and three double-flow, low-pressure turbines. The generator is driven at 1800 rpm and is rated at 1300 MVA. The exhaust steam from the turbine is condensed and deaerated in the main condenser. The heat rejected to the main condenser is removed by the circulating water system.

The essential service water system provides the heat sink required for removal of waste heat in the power plant's thermal cycle. The system has the principal function of removing heat by absorbing this energy in the main condenser. Water is withdrawn from Rock River by the circulating water pumps via the intake pipes. After passing through the plant condensers, the heat added to the circulating water is the rejected to a natural draft cooling tower.

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 these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the 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. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some, if not most, reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments. However, the NRC's staff has recommended that rulemaking be deferred, based upon several factors, e.g., 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.

The NRC published amendments to its decommissioning regulations in 1996.^[6] When the regulations were originally 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 applications to the NRC to terminate the license, which will include a License Termination Plan (LTP).

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site. The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial

reporting and assurances. These additional details, including an ISFSI decommissioning estimate, are included in this analysis.

1.3.1 <u>High-Level Radioactive Waste Management</u>

Congress passed the "Nuclear Waste Policy Act" (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 DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008. The current administration has cut the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle ... and make recommendations for a new plan." Towards this goal, the administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed." [9]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on nuclear waste disposal. Two of the recommendations that may impact decommissioning planning are:

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[10]

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission

and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[11]

"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013)^[12] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. [13] With a large fleet of reactors, Exelon may be able to re-assign allocations between its units to minimize onsite storage costs.

Assuming a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (based upon the proposed timeline for the availability of the larger interim storage facility), the assemblies generated from Byron operations are projected to be shipped from the

Byron site in the years 2066 through 2070 (assuming the cessation of plant operations in 2044 and 2046 for Units 1 and 2, respectively). This equates to 94 multi-purpose canisters (at 32 assemblies per canister), in addition to the 61 on the pad from operations.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[14]), has been constructed to support continued plant operations. This analysis assumes that the facility can be expanded to support decommissioning operations (in the DECON and SAFSTOR scenarios).

The spent fuel in the wet storage pools at the cessation of plant operations is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios) within the first five and one-half years following shutdown. Once the wet storage pool is emptied, the fuel handling building can be either decontaminated and dismantled or prepared for long-term storage. The spent fuel pool is kept operational in the Delayed DECON scenario until the transfer of spent fuel from the pool to the DOE can be completed.

Exelon's strongly held position is that the DOE has a contractual obligation to accept Byron's fuel in a timely manner and 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 the DOE has not met its contractual obligation to take the fuel.

1.3.2 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,^[15] and its Amendments of 1985,^[16] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. It was expected that groups of states would combine together to jointly deal with their radioactive wastes; these organizations are referred to as waste disposal compacts.

With the exception of Texas, no new compact facilities have been successfully sited, licensed, and constructed. The Texas Compact disposal facility is now operational and waste is being accepted from generators within the Compact by the operator, Waste Control Specialists (WCS). The facility is also able to accept limited quantities of non-Compact waste.

All options and services currently available to Exelon for disposition of the various waste streams produced by the decommissioning process were considered. The majority of the low-level radioactive waste designated for direct disposal (Class A^[17]) can be sent to Energy *Solutions*' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon Exelon's *Life of Plant Agreement* with Energy *Solutions*. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. For purposes of this analysis, GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner to, and at a cost equivalent to that envisioned for the spent fuel. The GTCC is either stored on site with the spent fuel or shipped directly to a DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination," [18] amending 10 CFR §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 estimates for Byron assume that the site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). [19] An additional limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water. [20]

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)^[21] 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 ALTERNATIVES

Detailed cost estimates were developed to decommission Byron for three variations of the approved decommissioning alternatives: DECON and SAFSTOR. Although the scenarios differ with respect to technique, process, cost, and schedule, they attain the same result: the ultimate release of the site for unrestricted use.

The following scenarios were evaluated and are representative of the alternatives available to the owner. The scenarios assume that the units operate for 60 years, followed by a planned and scheduled shutdown.

- 1. DECON: The first scenario assumes that the two units are promptly decommissioned as an integrated activity. Spent fuel in the wet storage pool is relocated to the ISFSI so as to facilitate decontamination and dismantling activities within the fuel handling building. Spent fuel storage operations continue at the site, independent of decommissioning operations, until the transfer of the fuel to the DOE is complete, assumed for purposes of this study to be in the year 2070. At that time, the ISFSI is decommissioned and the site released for alternative use.
- 2. Delayed DECON: In the second scenario, the units are prepared for an abbreviated period of safe-storage. The spent fuel resident in the fuel handling building's storage pool, remains in the pool until it can be transferred to the DOE (i.e., the ISFSI is not used to off-load the pool following the cessation of operations). Spent fuel placed at the ISFSI during operations remains in storage until the pool is emptied at which time the ISFSI is also emptied. Decommissioning is scheduled to commence once the transfer of the fuel to the DOE is complete (i.e., in the year 2070).
- 3. SAFSTOR: The units are also placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent permitted by the current regulations. Similar to the DECON alternative, the spent fuel in the wet storage pool is relocated to the ISFSI for interim storage. The units remain in protective storage following the removal of spent fuel from the site. Decommissioning operations commence such that license termination is completed within the required 60-year period. As with the first two scenarios, decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling process.

The following sections describe the basic activities associated with each 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 facilitate deactivation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

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

2.1 DECON

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." This study does not address the cost to dispose of the spent fuel residing at the site; such costs are funded through a surcharge on electrical generation. However, the study does estimate the costs incurred with the interim on-site storage of the fuel pending shipment by the DOE to an off-site disposal facility.

2.1.1 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.

Engineering and Planning

The PSDAR, required within two years of the notice of cessation of a description of the licensee's planned operations. provides 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 meeting to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure (10 CFR §50.59 establishes the conditions under which licensees may make changes to the facility or procedures and conduct test or experiments, i.e., without prior 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 §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

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

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

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

Site Preparations

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

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), internal piping, and biological shield cores.
- Isolation of 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 areas to optimize the overall project schedule. The fuel is transferred to the ISFSI as it decays to the point that it meets the heat load criteria of the containers. Consequently, it is assumed that the fuel pool remains operational for approximately five and one-half years following the cessation of Unit 2 operations.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and nonmetallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.2 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 §50 operating license. Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. 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 fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Removal of control rod drive housings and the head service structure from reactor vessel head. Segmentation of the vessel closure head.
- Removal and segmentation of the upper internals assemblies. Segmentation will maximize the loading of the shielded transport casks (i.e., by weight and activity). The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly and segmentation of the remaining reactor internals, including the core former and lower core support assembly. Some material is expected to exceed Class C disposal requirements. As such, the segments will be packaged in modified fuel storage canisters for geologic disposal.

- Segmentation of 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.
- Removal of the activated portions of the concrete biological shield and
 accessible contaminated concrete surfaces. If dictated by the steam
 generator and pressurizer removal scenarios, those portions of the
 associated steam generator cubicles necessary for access and
 component extraction are removed.
- Removal of the steam generators and pressurizer for material recovery and controlled disposal. These components can serve as their own burial containers provided that all penetrations are properly sealed and the internal contaminants are stabilized (e.g., with lightweight grout). Steel shielding is added, as necessary, to those external areas of the package to meet transportation limits and regulations.
- Transfer of the spent fuel from the storage pool to the ISFSI pad for interim storage.
- Expansion of the ISFSI and transfer of the spent fuel from the storage pool to the ISFSI pad for interim storage. Spent fuel storage operations continue throughout the active decommissioning period. Fuel transfer is expected to begin in 2066 and to be completed by the end of the year 2070.

At least two years prior to the anticipated date of license termination, an LTP is required. Submitted as a supplement to the Final Safety Analysis Report (FSAR) or its 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 meeting. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from the refueling canal, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/ contaminated concrete.
- Surveys of the decontaminated areas of the containment structures.
- Removal of the contaminated equipment and material from the auxiliary and fuel buildings, and any other contaminated facility. Use radiation and contamination control techniques until radiation surveys 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 will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.
- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).
- Routing of material removed during 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 for 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)."[22] 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 amend the operating license when 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 property (exclusive of the ISFSI) is suitable for release.

2.1.3 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 and auxiliary buildings. Under certain circumstances, verifying that subsurface radionuclide concentrations meet NRC site release requirements will require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The effort 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.

2.1.4 ISFSI Operations and Decommissioning

The ISFSI will continue to operate under the general license provisions of 10 CFR §72 following the amendment of the §50 operating license to release the adjacent (power block) property. Assuming the DOE starts accepting fuel in 2025, transfer of spent fuel from Byron is anticipated to begin in 2066 and continue through the year 2070.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the Part 50 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. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

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

2.2 SAFSTOR and DELAYED DECON

The NRC defines SAFSTOR 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." The facility is left intact (during the dormancy period), with structures maintained in a sound condition. Systems not required to operate in support of the spent fuel pool or site surveillance and security are drained, de-energized, and secured. Minimal cleaning/removal of loose contamination and/or fixation and sealing of remaining contamination are performed. Access to contaminated areas is secured to provide controlled access for inspection and maintenance.

The engineering and planning requirements are similar to those for the DECON alternative. Site preparations are also similar to those for the DECON alternative. However, with the exception of the required radiation surveys and site characterizations, the mobilization and preparation of site facilities is less extensive.

The following discussion is appropriate for both the SAFSTOR and Delayed DECON scenarios, the primary differences being in the length of the dormancy period. In the Delayed DECON scenario, the fuel in the spent fuel pool remains in the fuel handling building's storage pool until such time that the transfer to a DOE facility is complete. Decommissioning operations are assumed to begin once fuel is off site. By contrast, in the SAFSTOR scenario, the spent fuel is relocated to the ISFSI. The plant remains in safe-storage even after the fuel is removed from site. Decommissioning operations are initiated such that the license is terminated within the required 60-year time period.

2.2.1 Period 1 - Preparations

Preparations for long-term storage include the planning for permanent defueling of the reactors, revision of technical specifications appropriate to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

The process of placing the plant in safe-storage includes, but is not limited to, the following activities:

• Isolation of the spent fuel storage services and fuel handling systems located in the fuel handling building so that safe-storage operations may commence on the balance of the plant. This activity may be

carried out by plant personnel in accordance with existing operating technical specifications.

- Draining and de-energizing of the non-contaminated systems not required to support continued site operations or maintenance.
- Disposing of contaminated filter elements and resin beds not required for processing wastes from layup activities for future operations.
- Draining of the reactor vessel, with the internals left in place and the vessel head secured.
- Draining and de-energizing non-essential systems, decontaminating them as required for future maintenance and inspection.
- Preparing lighting and alarm systems whose continued use is required; de-energizing portions of fire protection, electric power, and HVAC systems whose continued use is not required.
- Cleaning of the loose surface contamination from building access pathways.
- Performing an interim radiation survey of plant, posting warning signs where appropriate.
- Erecting physical barriers and/or securing all access to radioactive or contaminated areas, except as required for inspection and maintenance.
- Installing security and surveillance monitoring equipment and relocating security fence around secured structures, as required.

2.2.2 Period 2 - Dormancy

The second phase identified by the NRC in its rule addresses licensed activities during a storage period and is applicable to the dormancy phase of the deferred decommissioning alternatives. Dormancy activities include a 24-hour security force, preventive and corrective maintenance on security systems, area lighting, general building maintenance, heating and ventilation of buildings, routine radiological inspections of contaminated structures, maintenance of structural integrity, and a site and radiation monitoring environmental program. maintenance personnel perform equipment maintenance, inspection activities, routine services to maintain safe conditions, adequate lighting, heating, and ventilation, and periodic preventive maintenance on essential site services.

An environmental surveillance program is carried out during the dormancy period to ensure that releases of radioactive material to the environment are prevented and/or detected and controlled. Appropriate emergency procedures are established and initiated for potential releases that exceed prescribed limits. The environmental surveillance program constitutes an abbreviated version of the program in effect during normal plant operations.

Security during the dormancy period is conducted primarily to prevent unauthorized entry and to protect the public from the consequences of their own actions. The security fence, sensors, alarms, and other surveillance equipment provide security. Fire and radiation alarms are also monitored and maintained. While remote surveillance is an option, it does not offer the immediate response time of a physical presence.

The transfer of the spent fuel to a DOE facility continues during this period until complete. Fuel is shipped exclusively from the ISFSI in the SAFSTOR scenario and from both the pool and the ISFSI in the Delayed DECON scenario.

After an optional period of storage (such that license terminations are accomplished within 60 years of final shutdown of Unit 1), it is required that the licensee submit applications to terminate the license, along with an LTP (described in Section 2.1.2), thereby initiating the third phase.

2.2.3 Periods 3 and 4 - Delayed Decommissioning

Prior to the commencement of decommissioning operations, preparations are undertaken to reactivate site services and prepare for decommissioning. Preparations include engineering and planning, a detailed site characterization, and the assembly of a decommissioning management organization. Final planning for activities and the writing of activity specifications and detailed procedures are also initiated at this time.

Much of the work in developing a termination plan is relevant to the development of the detailed engineering plans and procedures. The activities associated with this phase and the follow-on decontamination and dismantling processes are detailed in Sections 2.1.1 and 2.1.2. The primary difference between the sequences anticipated for the DECON and deferred scenarios is the absence, in the latter, of any constraint on

the availability of the fuel storage facilities located within the fuel handling building for decommissioning.

Variations in the length of the dormancy period are expected to have little effect upon the quantities of radioactive wastes generated from system and structure removal operations. Given the levels of radioactivity and spectrum of radionuclides expected from sixty years of plant operation, no plant process system identified as being contaminated upon final shutdown will become releasable due to the decay period alone (i.e., there is no significant reduction in the waste generated from the decommissioning activities). However, due to the lower activity levels, a greater percentage of the waste volume can be designated for off-site processing and recovery.

The delay in decommissioning also yields lower working area radiation levels. As such, the estimates for the delayed scenarios incorporate reduced ALARA controls for the lower occupational exposure potential.

Although the initial radiation levels due to ⁶⁰Co will decrease during the dormancy period, the internal components of the reactor vessel will still exhibit sufficiently high radiation dose rates to require remote sectioning under water due to the presence of long-lived radionuclides such as ⁹⁴Nb, ⁵⁹Ni, and ⁶³Ni. Therefore, the dismantling procedures described for the DECON alternative would still be employed during deferred scenarios. Portions of the biological shield will still be radioactive due to the presence of activated trace elements with long half-lives (¹⁵²Eu and ¹⁵⁴Eu). Decontamination will require controlled removal and disposal. It is assumed that radioactive corrosion products on inner surfaces of piping and components will not have decayed to levels that will permit unrestricted use or allow conventional removal. These systems and components will be surveyed as they are removed and disposed of in accordance with the existing radioactive release criteria.

2.2.4 Period 5 - Site Restoration

Following completion of decommissioning operations, site-restoration activities can begin. If the site structures are to be dismantled, dismantling as a continuation of the decommissioning process is clearly the most appropriate and cost-effective option, as described in Section 2.1.3. The basis for the dismantling cost in the deferred scenarios is consistent with that described for DECON, removal of structures and

site facilities to a nominal depth of three feet below grade and limited restoration of the site.

3. COST ESTIMATE

The cost estimates prepared for decommissioning Byron consider the unique features of the site, including the NSSS, power generation systems, support services, site buildings, and ancillary facilities. The basis of the estimates, 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 ESTIMATE

The estimates were developed with site-specific, technical information developed in an evaluation prepared for Exelon in 2009. The information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluation 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 Commercial Nuclear Power Plant Decommissioning "Decommissioning Handbook."[24] Estimates,"[23] and the DOE documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal (\$/cubic yard), steel removal (\$/ton), and cutting costs (\$/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.^[25]

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, San

Onofre-1, Crystal River and Vermont Yankee nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units.

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

Work Difficulty Factors

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

•	Access Factor	10% to 20%
•	Respiratory Protection Factor	10% to 50%
•	Radiation/ALARA Factor	10% to 40%
•	Protective Clothing Factor	10% 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 radiologically controlled areas. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities are 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 resulting cost estimate.

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 estimates do 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 (~ 43%).
- Segmenting the reactor vessel and internals will require the use of special equipment. 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. This permits sharing of the segmentation equipment between the two units.
- 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. Trying to complete the final status survey of Unit 1, while Unit 2 still has ongoing radiological remediation work and waste handling in process is considered impractical. As such, the transfer of

the spent fuel from the storage pool and subsequent decontamination of the fuel handling building is coordinated so as to synchronize the final status survey for the station.

- 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 emergency response fees, regulatory agency fees, corporate overhead, 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, i.e., license termination and site restoration.

3.4.1 <u>Contingency</u>

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.

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^[26] 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, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a "safety factor issue." Safety factors provide additional security and address situations that may never occur. Contingency funds are expected to be fully expended throughout the program. They also provide assurance that sufficient funding is available to accomplish the intended tasks. An estimate without contingency, or from which contingency has been removed, can disrupt the orderly progression of events and jeopardize a successful conclusion to the decommissioning process.

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

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

operation of highly specialized tooling, field conditions, and water clarity.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies ranged from 10% to 75%, depending on the degree of difficulty judged to be appropriate from TLG's actual decommissioning experience. The contingency values used in this study are as follows:

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

Operations and Maintenance Expenses	15%
ISFSI Decommissioning	25%

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each estimate. For example, the composite contingency values reported for the DECON alternative are 17.5% and 17.5% for Units 1 and 2, respectively. Values for the other alternatives are delineated within the detailed cost tables in Appendices D and E.

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:

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.
- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.
- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.
- Regulatory changes (e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal).

- Policy decisions altering national commitments (e.g., in the ability to accommodate certain waste forms for disposition or in the timetable for such, for example, in the start and rate of acceptance of spent fuel by the DOE).
- Pricing changes for basic inputs, such as labor, energy, materials, and burial.

This cost study does not add any additional cost 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 will 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 impacts of the considerations identified below are included in this cost study.

3.5.1 Spent Fuel Management

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

The total inventory of assemblies that will require handling during decommissioning is based upon several assumptions. The pickup of commercial fuel is assumed to begin in the year 2025. The maximum rate at which the fuel is removed from the commercial sites is based upon an annual capacity at the geologic repository of 3,000 metric tons of uranium (MTU). 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 all three scenarios, the ISFSI will continue to operate until such time that the transfer of spent fuel to the DOE can be completed. Assuming that the DOE commences repository operation in 2025, fuel is projected to be removed from the Byron site by the year 2070. In the Delayed DECON scenario, the ISFSI is only used to store fuel placed during plant operations. Spent fuel off-loaded from the reactors after operations cease, remains in the pool during the transfer period. The inventory of fuel assemblies located in the spent fuel pool is preferentially off-loaded as the allocations permit.

Operation and maintenance costs for the storage facilities (the ISFSI and the pool for the Delayed DECON scenario) are included within the estimates and address the cost for staffing the facilities, as well as security, insurance, and licensing fees. The estimates include the costs to purchase (DECON and SAFSTOR scenarios), load, and transfer the fuel storage canisters. Costs are also provided for the final disposition of the facilities once the transfer is complete.

Repository Startup

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. With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that could result in an interim storage facility being available by 2025.

Spent Fuel Management Model

The Exelon nuclear fleet consists of 26 units at 14 sites in Illinois, Pennsylvania, New Jersey, New York and Maryland, including the inactive units at Dresden, Peach Bottom and Zion (Zion is still included in the spent fuel analysis model since the fuel transfer to DOE will be done as part of the Exelon allocation). The ability to complete the decommissioning of these units, particularly for the DECON and Delayed DECON alternatives, is highly dependent upon when the DOE is assumed to remove spent fuel from the sites.

The DOE's repository program assumes that spent fuel will be accepted for disposal from the nation's commercial nuclear plants in the order (the "queue") in which it was removed from service ("oldest fuel first"). A

computer model developed by Exelon Nuclear was used to determine when the DOE would provide allocations in the queue for removal of spent fuel from the individual sites. Repository operations were based upon annual industry-wide receipt of 400 Metric Tons Heavy Metal (MTHM) in the first year of operation, a total of 3,800 MTHM in years 2 through 4 and 3,000 MTHM for year 5 and beyond. [27]

ISFSIs are constructed as necessary to maintain full-core discharge capability at the individual sites. Once the DOE begins repository operations, spent fuel shipments are managed across the fleet to optimize spent fuel storage.

Canister Design

The design and capacity of the ISFSI is based upon a Holtec HI-STORM vertical cask system, with a 32-fuel assembly capacity. This is also the basis for future cask acquisitions. The DOE is assumed to provide the MPC for fuel transferred directly from the pool to the DOE at no cost to the owner.

Canister Loading and Transfer

An average cost of \$250,000 is used for the labor to load/transport the spent fuel from the pool to the ISFSI pad, based upon Exelon experience. For estimating purposes, 50% of this cost is used to estimate the cost to transfer the fuel from the ISFSI to the DOE.

Operations and Maintenance

Annual costs (excluding labor) of approximately \$792,000 and \$96,000 are used for operation and maintenance of each spent fuel pool and the ISFSI, respectively.

ISFSI Decommissioning

A multi-purpose (storage and transport) dry shielded storage canister with a vertical, reinforced concrete storage module is used as a basis for the cost analysis. The final core off load from each unit, equivalent to 14 total casks, are assumed to have some level of neutron-induced activation as a result of the long-term storage of the fuel (i.e., to levels exceeding free-release limits). The cost of the disposition of this material is included in the estimate. Appendix F details the costs

necessary to survey, decontaminate, and terminate the NRC license on the ISFSI facility. The estimates in Appendices C through E also include the costs for the demolition of the ISFSI facility following NRC license termination (as a Site Restoration expense).

3.5.2 <u>Reactor Vessel and Internal Components</u>

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

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

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal (i.e., GTCC). Although the material is not classified as high-level waste, federal regulations under the LLRW Policy Amendments Act specifies the GTCC LLWR is designated a federal responsibility under Section 3(b)(1)(D). However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has been packaged and disposed of in the same manner as high-level waste, at a cost equivalent to that envisioned for the spent fuel. This is consistent with the concept that the generator of GTCC waste will bear all reasonable costs of disposing of such wastes. [28]

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 would remain in storage at the Byron site.

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. 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 Byron ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, the study assumes the reactor vessel will require segmentation, as a bounding condition.

3.5.3 Primary System Components

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

A trolley crane will be 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, will be removed to create sufficient laydown space for processing these large components.

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

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

Byron Unit 1 has replaced its original set of steam generators; this original set is still on site, stored within a concrete protective structure. The cost for transportation and disposal of this original set of Unit 1 steam generators has been included in this analysis.

3.5.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condensers will also be disassembled and moved to a laydown area. Clean material is released on site as scrap metal; radioactive or potentially radioactive material is then prepared for transportation to an off-site recycling facility where it will be surveyed and designated for either decontamination or volume reduction, conventional disposal, or controlled disposal. Components will

be packaged and readied for transport in accordance with the intended disposition.

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.^[29] 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 §71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Transport of the highly activated metal, produced in the segmentation of the reactor vessels 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. Truck transport costs were estimated using published tariffs from Tri-State Motor Transit.^[30]

3.5.6 Low-Level Radioactive Waste Disposal

The mass of radioactive waste generated during the various decommissioning activities is reported by line-item in Appendices C, D and E, and summarized in Section 5. The Section 5 waste summaries are consistent with 10 CFR §61 classifications. Commercially available steel containers are 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 waste volumes are calculated on the exterior package dimensions for

containerized material or a dimensional calculation for components serving as their own waste containers.

The more highly activated reactor components are transported in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume, with surcharges added for the special handling requirements and the radiological characteristics 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 calculated using current disposal agreements, with surcharges added for the highly activated components, such as those 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 Exelon's current disposal agreement with Energy *Solutions* for its facility in Clive, Utah.

EnergySolutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the reactor vessel and segmentation of the components closest to the core. As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. This material is packaged in the same multipurpose canisters used for spent fuel storage/transport and designated for geologic disposal.

3.5.7 Site Conditions Following Decommissioning

The NRC will terminate (or amend) the site license when it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the

next step in the decommissioning process, as well as the owner's own future plans for the site.

Non-essential structures or buildings severely damaged in decontamination process are removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities is processed and made available as clean fill. The excavations will be regraded such that the power block area will have a final contour consistent with adjacent surroundings.

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

3.6 ASSUMPTIONS

The following are the major assumptions made in the development of the estimates for decommissioning the site.

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

Exelon, 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 Exelon. 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.

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

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

Staffing levels are assigned for each unit by sub-period and functional area. Economies of a multi-unit decommissioning are recognized by establishing a primary and a secondary staff level. The unit assigned the primary staff will include common supervisory positions and positions that may be shared across both units. The types of positions and staffing levels are adjusted based upon the type of activity occurring in each sub-period.

A profile of the staffing level for the two-unit decommissioning, including contractors and craft, is provided in Figures 3.1 through 3.3 for the DECON, Delayed DECON, and SAFSTOR scenarios, respectively. Utility staffing levels will gradually decrease after completing the removal of physical systems at each of the units.

Staffing levels and management support will vary based upon the amount and type of decommissioning work. Craft manpower levels decrease after systems removal and structures decontamination and drop substantially during the delay period and the license termination survey period. However, craft staff levels increase again during the site restoration period due to the work associated with structures demolition.

3.6.3 <u>Design Conditions</u>

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

The curie contents of the vessel and internals at final shutdown are derived from those listed in NUREG/CR-3474.^[31] Actual estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the Byron components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from CR-0130^[32] and CR-0672,^[33] and benchmarked to the long-lived values from CR-3474.

It is anticipated that there will be control element assemblies (CEAs) in the spent fuel pool at the cessation of operations, including those CEAs from the final core. This analysis assumes that the CEAs can be disposed of along with the spent fuel at no additional cost (in accordance with Appendix E of the Standard Contract)

Activation of the reactor building structures is confined to the biological shield.

3.6.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by Exelon and its subcontractors. The plant's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale.
- Processes operating waste inventories, i.e., the estimates do not address the disposition of any legacy wastes; 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. Exelon will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG 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 possible salvage 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 estimates do not include the additional cost for size reduction and preparation to meet "furnace ready" conditions. For example, the recovery of copper from electrical cabling may require the removal and disposition of any contaminated insulation, an added expense. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. This assumption is an implicit recognition of scrap value in the disposal of clean metallic waste at no additional cost to the project.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other property will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other facilities. Spare parts will also be 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. Replacement power costs are used for the cost of energy consumption during decommissioning for tooling, lighting, ventilation, and essential services.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums throughout the decommissioning process are based upon guidance provided by Exelon.

<u>Taxes</u>

Property taxes are included for all decommissioning periods. Exelon provided a schedule of decreasing tax payments against the current tax assessment. These reductions continue until reaching a minimum property tax payment of \$1 million per year for the site; this level is maintained for the balance of the decommissioning program.

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

A schedule of expenditures for each scenario is provided in Tables 3.1 through 3.3. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2014 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure. The annual expenditures are based upon the detailed activity costs reported in Appendices C through E, along with the schedules discussed in Section 4.

TABLE 3.1a BYRON NUCLEAR POWER STATION, UNIT 1 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2044	9,687	1,784	347	8	2,031	13,858
2045	60,404	13,191	2,393	1,758	14,086	91,832
2046	69,389	30,431	2,655	27,890	27,628	157,992
2047	65,000	31,957	1,931	35,754	28,617	163,259
2048	43,705	15,527	1,538	5,165	10,581	76,516
2049	43,585	15,485	1,534	5,150	10,552	76,307
2050	15,357	5,167	504	1,699	5,977	28,704
2051	1,531	113	0	8	3,737	5,389
2052	1,535	113	0	8	3,747	5,403
2053	25,853	2,803	351	27	3,957	32,992
2054	19,502	8,932	205	0	3,387	32,026
2055	19,502	8,932	205	0	3,387	32,026
2056	7,093	2,398	55	0	3,369	12,915
2057	2,528	0	0	0	3,350	5,879
2058	2,528	0	0	0	3,350	5,879
2059	2,528	0	0	0	3,350	5,879
2060	2,535	0	0	0	3,359	5,895
2061	2,528	0	0	0	3,350	5,879
2062	2,528	0	0	0	3,350	5,879
2063	2,528	0	0	0	3,350	5,879
2064	2,535	0	0	0	3,359	5,895
2065	2,528	0	0	0	3,350	5,879
2066	2,726	593	0	0	3,350	6,669
2067	3,175	1,941	0	0	3,350	8,466
2068	3,182	1,941	0	0	3,359	8,482
2069	3,175	1,941	0	0	3,350	8,466
2070	3,175	1,941	0	0	3,350	8,466
2071	1,883	1,564	35	1,117	16,600	21,199
Total	422,227	146,752	11,752	78,584	184,588	843,904

TABLE 3.1b BYRON NUCLEAR POWER STATION, UNIT 2 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	9,193	1,611	314	7	1,772	12,898
2047	62,082	12,342	2,353	1,427	17,200	95,403
2048	74,766	28,402	2,701	21,724	34,387	161,980
2049	74,618	31,151	1,937	28,081	26,159	161,946
2050	68,148	17,029	1,534	7,057	11,221	104,989
2051	68,148	17,029	1,534	7,057	11,221	104,989
2052	52,091	9,831	1,067	5,171	$8,\!522$	76,681
2053	31,719	4,050	380	175	3,908	40,232
2054	25,734	13,240	205	0	3,388	42,567
2055	25,734	13,240	205	0	3,388	42,567
2056	8,766	3,555	55	0	3,370	15,745
2057	2,528	0	0	0	3,350	5,879
2058	2,528	0	0	0	3,350	5,879
2059	2,528	0	0	0	3,350	5,879
2060	2,535	0	0	0	3,359	5,895
2061	2,528	0	0	0	3,350	5,879
2062	2,528	0	0	0	3,350	5,879
2063	2,528	0	0	0	3,350	5,879
2064	2,535	0	0	0	3,359	5,895
2065	2,528	0	0	0	3,350	5,879
2066	2,726	593	0	0	3,350	6,669
2067	3,175	1,941	0	0	3,350	8,466
2068	3,182	1,941	0	0	3,359	8,482
2069	3,175	1,941	0	0	3,350	8,466
2070	3,175	1,941	0	0	3,350	8,466
2071	1,883	1,564	35	1,117	16,600	21,199
Total	541,081	161,399	12,320	71,816	188,066	974,682

TABLE 3.2a BYRON NUCLEAR POWER STATION, UNIT 1 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

		Equipment &				
Year	Labor	Materials	Energy	Burial	Other	Total
2044	7,408	231	347	8	1,093	9,088
2045	45,380	3,169	2,045	408	9,590	60,593
2046	20,297	2,347	947	588	11,829	36,009
2047	7,922	411	409	17	5,493	14,253
2048	7,944	412	410	17	5,508	14,292
2049	7,922	411	409	17	5,493	14,253
2050	7,922	411	409	17	5,493	14,253
2051	7,922	411	409	17	5,493	14,253
2052	7,944	412	410	17	5,508	14,292
2053	7,922	411	409	17	5,493	14,253
2054	7,922	411	409	17	5,493	14,253
2055	7,922	411	409	17	5,493	14,253
2056	7,944	412	410	17	5,508	14,292
2057	7,922	411	409	17	5,493	14,253
2058	7,922	411	409	17	5,493	14,253
2059	7,922	411	409	17	5,493	14,253
2060	7,944	412	410	17	5,508	14,292
2061	7,922	411	409	17	5,493	14,253
2062	7,922	411	409	17	5,493	14,253
2063	7,922	411	409	17	5,493	14,253
2064	7,944	412	410	17	5,508	14,292
2065	7,922	411	409	17	5,493	14,253
2066	8,713	2,783	409	17	5,493	17,415
2067	10,510	8,173	409	17	5,493	24,603
2068	7,944	412	410	17	5,508	14,292
2069	5,534	1,678	272	11	4,331	11,826
2070	4,341	2,232	205	8	3,762	10,548
2071	43,033	1,767	2,045	41	1,735	48,622
2072	61,002	17,520	1,999	18,398	12,208	111,128
2073	60,202	22,953	1,938	36,306	22,430	143,831

TABLE 3.2a (continued) BYRON NUCLEAR POWER STATION, UNIT 1 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
20=4	0 7 004	0 = 00	4 201	- 000	~ 0.40	
2074	35,381	6,582	1,534	5,308	5,943	54,747
2075	35,381	6,582	1,534	5,308	5,943	54,747
2076	8,191	1,443	315	1,097	2,491	13,537
2077	9,165	453	127	17	1,714	11,475
2078	21,798	5,564	295	16	1,342	29,015
2079	17,625	9,037	205	0	830	27,696
2080	16,273	8,343	189	0	767	$25,\!572$
2074	35,381	6,582	1,534	5,308	5,943	54,747
2075	35,381	6,582	1,534	5,308	5,943	54,747
2076	8,191	1,443	315	1,097	2,491	13,537
2077	9,165	453	127	17	1,714	11,475
2078	21,798	5,564	295	16	1,342	29,015
2079	17,625	9,037	205	0	830	27,696
2080	16,273	8,343	189	0	767	25,572
Total	568,812	109,082	23,002	67,886	206,954	975,736

TABLE 3.2b BYRON NUCLEAR POWER STATION, UNIT 2 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	7.694	209	314	7	928	0.000
2046	7,624	3,238		-		9,082
2047	52,823	· · · · · · · · · · · · · · · · · · ·	2,045	404	8,816	67,326
2048	25,057	2,956	979	917	24,668	54,577
2049	7,932	414	409	17	5,603	14,374
2050	7,932	414	409	17	5,603	14,374
2051	7,932	414	409	17	5,603	14,374
2052	7,953	415	410	17	5,618	14,413
2053	7,932	414	409	17	5,603	14,374
2054	7,932	414	409	17	5,603	14,374
2055	7,932	414	409	17	5,603	14,374
2056	7,953	415	410	17	5,618	14,413
2057	7,932	414	409	17	5,603	14,374
2058	7,932	414	409	17	5,603	14,374
2059	7,932	414	409	17	5,603	14,374
2060	7,953	415	410	17	5,618	14,413
2061	7,932	414	409	17	5,603	14,374
2062	7,932	414	409	17	5,603	14,374
2063	7,932	414	409	17	5,603	14,374
2064	7,953	415	410	17	5,618	14,413
2065	7,932	414	409	17	5,603	14,374
2066	7,932	414	409	17	5,603	14,374
2067	7,932	414	409	17	5,603	14,374
2068	10,541	8,178	410	17	5,618	24,763
2069	6,334	4,053	272	11	4,353	15,023
2070	4,351	2,235	205	8	3,741	10,540
2071	2,232	291	205	8	1,587	4,322
2072	26,780	1,732	2,036	38	1,688	32,274
2073	48,200	15,162	1,995	13,691	10,543	89,591
2074	61,164	22,194	1,938	27,640	19,596	132,532
2075	54,289	7,593	1,534	6,633	5,854	75,902

TABLE 3.2b (continued) BYRON NUCLEAR POWER STATION, UNIT 2 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2076	54,437	7,614	1,538	6,651	5,870	76,110
2077	47,105	5,670	1,186	4,590	4,587	63,138
2078	27,065	8,036	295	16	1,243	36,656
2079	23,857	13,345	205	0	831	38,237
2080	22,027	12,321	189	0	767	35,304
Total	624,669	122,693	23,120	60,954	207,203	1,038,639

TABLE 3.3a BYRON NUCLEAR POWER STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2044	7,767	1,308	347	8	2,031	11,461
2045	47,492	9,505	2,045	408	14,164	73,614
2046	20,046	8,683	947	588	14,204	44,468
2047	6,514	6,747	409	17	9,055	22,742
2048	6,532	6,765	410	17	9,080	22,804
2049	6,514	6,747	409	17	9,055	22,742
2050	6,514	6,747	409	17	9,055	22,742
2051	6,514	6,747	409	17	9,055	22,742
2052	4,678	2,520	276	11	5,599	13,085
2053	3,695	291	205	8	3,762	7,960
2054	3,695	291	205	8	3,762	7,960
2055	3,695	291	205	8	3,762	7,960
2056	3,705	292	205	8	3,772	7,982
2057	3,695	291	205	8	3,762	7,960
2058	3,695	291	205	8	3,762	7,960
2059	3,695	291	205	8	3,762	7,960
2060	3,705	292	205	8	3,772	7,982
2061	3,695	291	205	8	3,762	7,960
2062	3,695	291	205	8	3,762	7,960
2063	3,695	291	205	8	3,762	7,960
2064	3,705	292	205	8	3,772	7,982
2065	3,695	291	205	8	3,762	7,960
2066	3,892	884	205	8	3,762	8,751
2067	4,341	2,232	205	8	3,762	10,548
2068	4,352	2,233	205	8	3,772	10,570
2069	4,341	2,232	205	8	3,762	10,548
2070	4,341	2,232	205	8	3,762	10,548
2071	2,223	287	205	8	1,594	4,317
2072	2,229	288	205	8	1,598	4,328
2073	2,223	287	205	8	1,594	4,317

TABLE 3.3a (continued) **BYRON NUCLEAR POWER STATION, UNIT 1** SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
0074	0.000	907	205	0	1 704	4.017
2074	2,223	287	205	8	1,594	4,317
2075	2,223	287	205	8	1,594	4,317
2076	2,229	288	205	8	1,598	4,328
2077	2,223	287	205	8	1,594	4,317
2078	2,223	287	205	8	1,594	4,317
2079	2,223	287	205	8	1,594	4,317
2080	2,229	288	205	8	1,598	4,328
2081	2,223	287	205	8	1,594	4,317
2082	2,223	287	205	8	1,594	4,317
2083	2,223	287	205	8	1,594	4,317
2084	2,229	288	205	8	1,598	4,328
2085	2,223	287	205	8	1,594	4,317
2086	2,223	287	205	8	1,594	4,317
2087	2,223	287	205	8	1,594	4,317
2088	2,229	288	205	8	1,598	4,328
2089	2,223	287	205	8	1,594	4,317
2090	2,223	287	205	8	1,594	4,317
2091	2,223	287	205	8	1,594	4,317
2092	2,229	288	205	8	1,598	4,328
2093	2,223	287	205	8	1,594	4,317
2094	2,223	287	205	8	1,594	4,317
2095	2,223	287	205	8	1,594	4,317
2096	2,229	288	205	8	1,598	4,328
2097	27,827	1,216	1,359	29	1,683	32,113
2098	54,323	9,481	2,032	4,550	4,354	74,740
2099	60,370	23,017	1,943	35,798	22,511	143,639
2100	44,701	12,716	1,686	16,538	12,307	87,948
2101	35,396	6,598	1,534	5,099	6,247	54,873
2102	21,325	3,933	903	3,007	4,334	33,502
2103	1,155	113	0	8	1,593	2,869

TABLE 3.3a (continued) BYRON NUCLEAR POWER STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2104	23,486	2,465	343	27	1,762	28,083
2105	17,841	9,081	205	0	830	27,957
2106	17,841	9,081	205	0	830	27,957
2107	5,523	2,811	63	0	257	8,655
Total	549,528	157,358	24,939	66,511	247,230	1,045,566

TABLE 3.3b BYRON NUCLEAR POWER STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	8,067	1,537	314	7	1,772	11,698
2047	55,709	11,897	2,045	404	13,491	83,546
2048	30,256	11,637	979	917	28,544	72,334
2049	14,338	9,072	409	17	11,522	35,358
2050	14,338	9,072	409	17	11,522	35,358
2051	14,338	9,072	409	17	11,522	35,358
2052	7,385	3,325	276	11	6,438	17,434
2053	3,704	294	205	8	3,741	7,952
2054	3,704	294	205	8	3,741	7,952
2055	3,704	294	205	8	3,741	7,952
2056	3,714	295	205	8	3,752	7,974
2057	3,704	294	205	8	3,741	7,952
2058	3,704	294	205	8	3,741	7,952
2059	3,704	294	205	8	3,741	7,952
2060	3,714	295	205	8	3,752	7,974
2061	3,704	294	205	8	3,741	7,952
2062	3,704	294	205	8	3,741	7,952
2063	3,704	294	205	8	3,741	7,952
2064	3,714	295	205	8	3,752	7,974
2065	3,704	294	205	8	3,741	7,952
2066	3,901	887	205	8	3,741	8,743
2067	4,351	2,235	205	8	3,741	10,540
2068	4,361	2,236	205	8	3,752	10,561
2069	4,351	2,235	205	8	3,741	10,540
2070	4,351	2,235	205	8	3,741	10,540
2071	2,232	291	205	8	1,587	4,322
2072	2,238	291	205	8	1,592	4,334
2073	2,232	291	205	8	1,587	4,322
2074	2,232	291	205	8	1,587	4,322

TABLE 3.3b (continued) BYRON NUCLEAR POWER STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
1001	Labor	THATCHAIS	2110193	Barrar	001101	
2075	2,232	291	205	8	1,587	4,322
2076	2,238	291	205	8	1,592	4,334
2077	2,232	291	205	8	1,587	4,322
2078	2,232	291	205	8	1,587	4,322
2079	2,232	291	205	8	1,587	4,322
2080	2,238	291	205	8	1,592	4,334
2081	2,232	291	205	8	1,587	4,322
2082	2,232	291	205	8	1,587	4,322
2083	2,232	291	205	8	1,587	4,322
2084	2,238	291	205	8	1,592	4,334
2085	2,232	291	205	8	1,587	4,322
2086	2,232	291	205	8	1,587	4,322
2087	2,232	291	205	8	1,587	4,322
2088	2,238	291	205	8	1,592	4,334
2089	2,232	291	205	8	1,587	4,322
2090	2,232	291	205	8	1,587	4,322
2091	2,232	291	205	8	1,587	4,322
2092	2,238	291	205	8	1,592	4,334
2093	2,232	291	205	8	1,587	4,322
2094	2,232	291	205	8	1,587	4,322
2095	2,232	291	205	8	1,587	4,322
2096	2,238	291	205	8	1,592	4,334
2097	2,232	291	205	8	1,587	4,322
2098	17,714	1,199	1,359	27	1,648	21,948
2099	35,559	7,561	2,033	3,348	3,885	52,386
2100	60,939	22,099	1,943	26,864	19,533	131,378
2101	56,793	13,042	1,687	14,114	11,140	96,775
2102	54,301	7,599	1,534	6,453	6,096	75,983
2103	54,301	7,599	1,534	6,453	6,096	75,983
2104	31,825	3,920	465	539	1,952	38,700

TABLE 3.3b (continued) BYRON NUCLEAR POWER STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Equipment &

Year	Labor	Materials	Energy	Burial	Other	Total
2105	24,073	13,389	205	0	831	38,498
2106	24,073	13,389	205	0	831	38,498
2107	7,453	4,145	63	0	257	11,918
Total	641,259	171,059	25,077	59,551	247,360	1,144,306

FIGURE 3.1 DECON SCENARIO BYRON NUCLEAR POWER STATION MANPOWER LEVELS

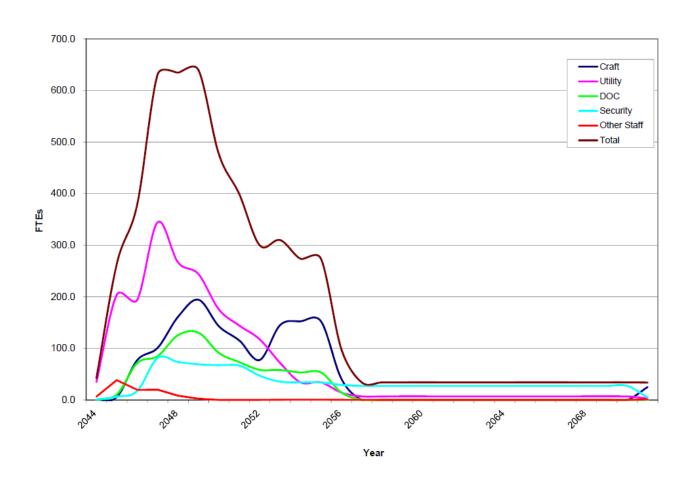


FIGURE 3.2 DELAYED DECON SCENARIO BYRON NUCLEAR POWER STATION MANPOWER LEVELS

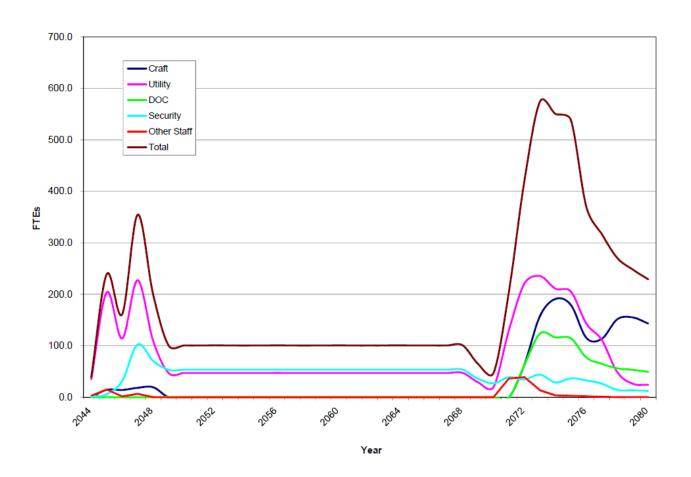
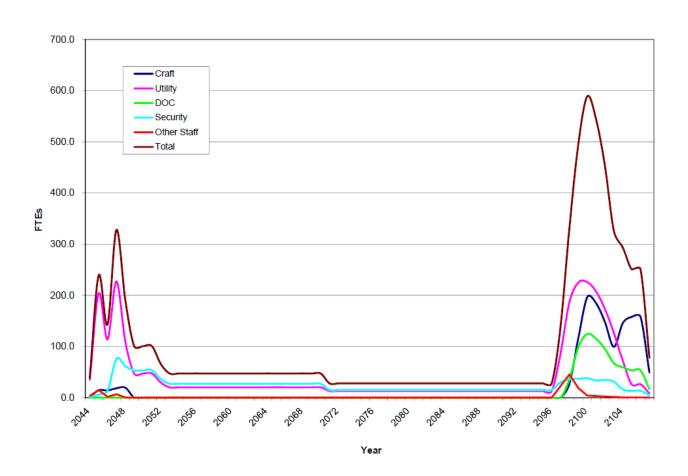


FIGURE 3.3 SAFSTOR SCENARIO BYRON NUCLEAR POWER STATION MANPOWER LEVELS



4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this study follow 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 plans described in Section 3.5.1.

A schedule or sequence of activities is presented in Figure 4.1 for the DECON decommissioning alternative. The schedule is also representative of the work activities identified in the delayed dismantling scenarios, absent any spent fuel constraints. The scheduling sequence assumes that fuel is removed from the spent fuel pool within the first five and one-half years after operations cease at Unit 2. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost tables, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2010" computer software. [34]

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 tables, 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 DECON decommissioning schedule:

- The fuel handling building is isolated until such time that all spent fuel has been discharged to the ISFSI (DECON and SAFSTOR) or to the DOE (Delayed DECON). Decontamination and dismantling of the storage pool are initiated once the transfer of spent fuel to the ISFSI or DOE 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 the detailed cost tables are based upon the durations developed in the schedule for decommissioning Byron. 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 also shown for the spent fuel cooling period, which determines the release of the fuel handling building for final decontamination.

Project timelines are provided in Figures 4.2 through 4.4; the milestone dates are based on this same shutdown date. The start of decommissioning activities in the Delayed Decommissioning scenario is concurrent with the end of the fuel transfer activity (i.e. to an off-site DOE facility).

FIGURE 4.1 DECON ACTIVITY SCHEDULE

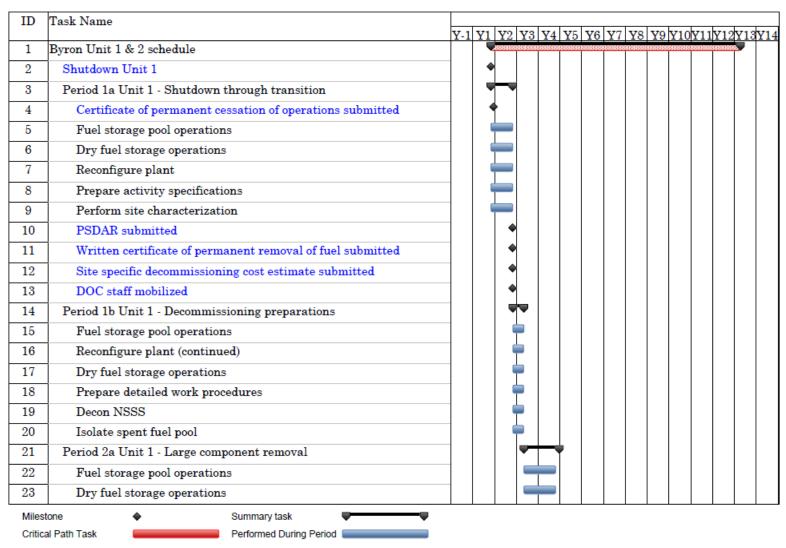


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

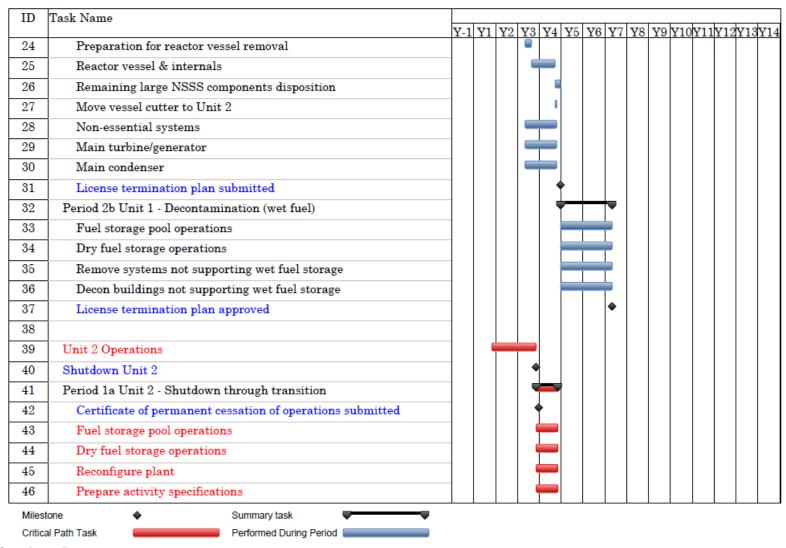


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

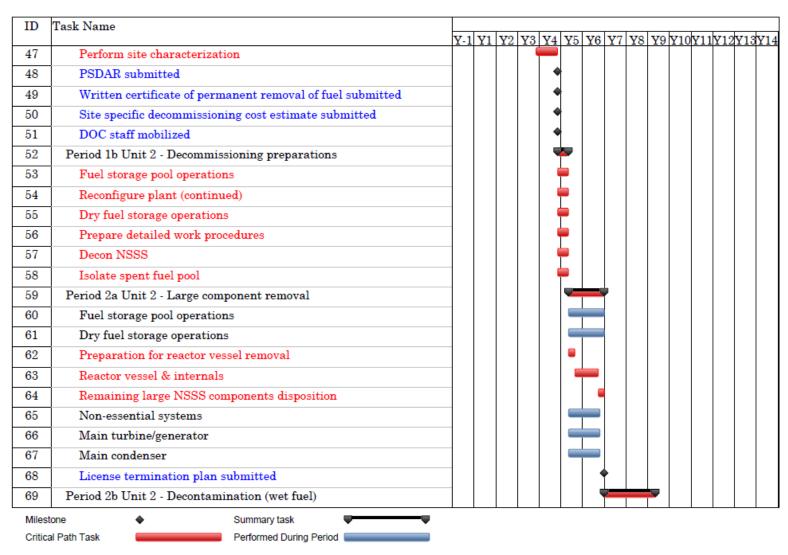


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

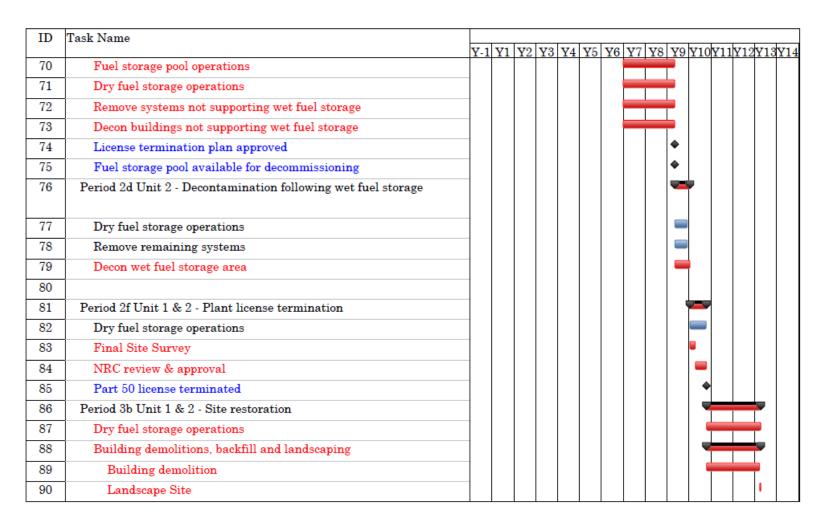


FIGURE 4.2 DECOMMISSIONING TIMELINE DECON

(not to scale)

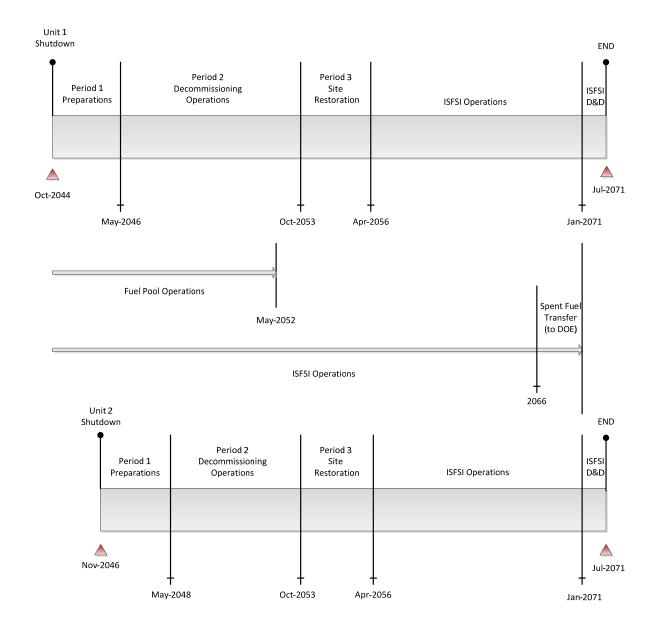


FIGURE 4.3 DECOMMISSIONING TIMELINE DELAYED DECON

(not to scale)

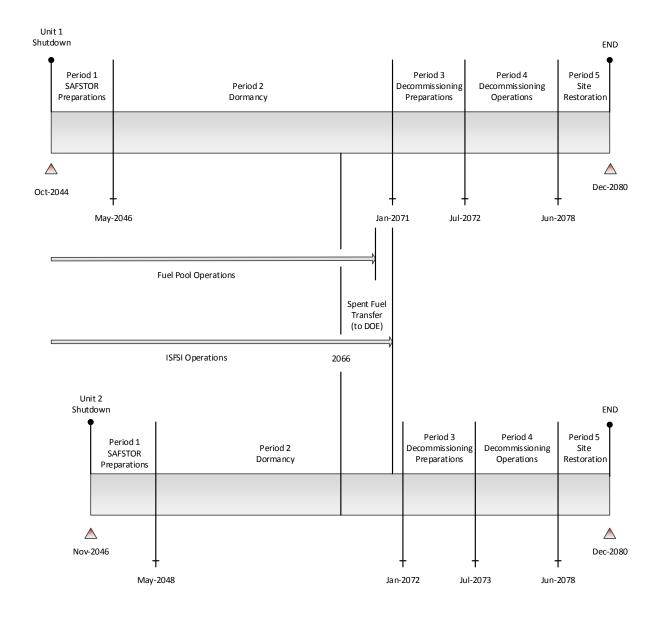
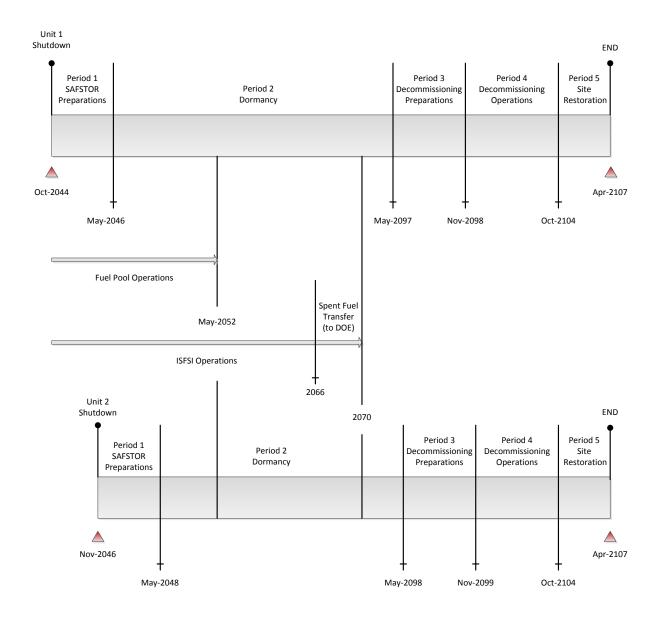


FIGURE 4.4 DECOMMISSIONING TIMELINE SAFSTOR

(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act, [35] 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, §71 defines radioactive material as it pertains to packaging and transportation and §61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR §173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3, as defined in subpart 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 destinations for the various waste streams from decommissioning are identified in Figures 5.1 and 5.2. The volumes of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in Appendices C, D, and E and summarized in Tables 5.1 through 5.3. The quantified waste volume summaries shown in these tables are consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material 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 $^{137}\mathrm{Cs}$ will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of Byron is primarily generated during Period 2 of the DECON alternative and Period 4 of the deferred alternatives. All radioactive waste is sent offsite for controlled disposal.

Disposal fees are calculated using current disposal agreements, 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 Exelon's current disposal agreement with Energy *Solutions* for its facility in Clive, Utah.

Energy Solutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the reactor vessel and segmentation of the components closest to the core. As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

FIGURE 5.1 RADIOACTIVE WASTE DISPOSITION

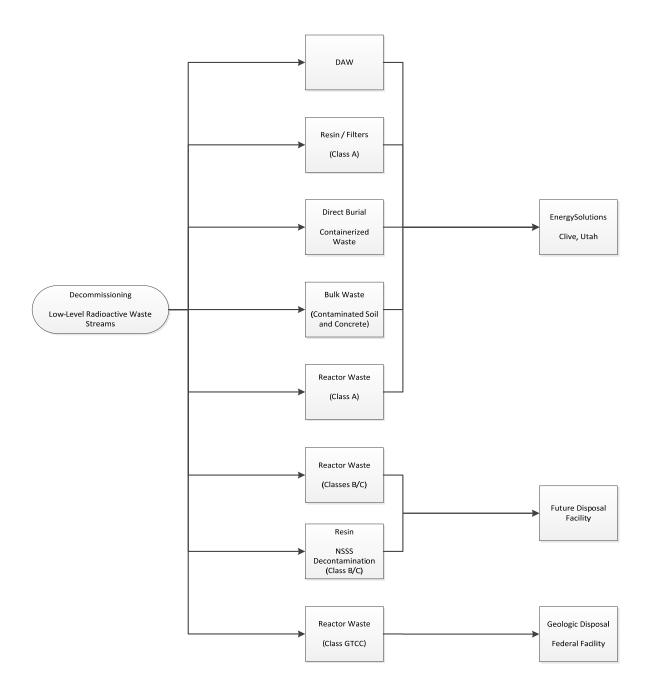
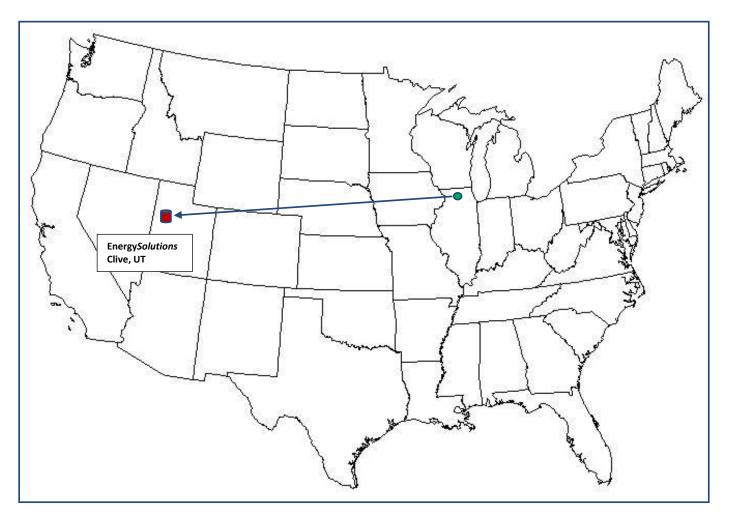


FIGURE 5.2 DECOMMISSIONING WASTE DESTINATIONS RADIOLOGICAL



The figure indicates the destinations for the low-level radioactive waste designated for direct disposal (Class A at Energy *Solutions*).

Disposition of the Class B and C low-level radioactive waste will be at a future disposal facility (to be determined). For estimating purposes, the facility is located (for capturing transportation costs) at a distance equivalent to the Energy Solutions facility and the disposal cost is based upon the currently operating Barnwell Low-Level Radioactive Waste Disposal Facility in South Carolina.

Disposal options (and destinations) for GTCC are still being evaluated.

TABLE 5.1 DECOMMISSIONING WASTE SUMMARY DECON

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	899,025	49,347,140
disposal)	EnergySolutions			
	Bulk	A	55,624	3,186,782
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	3,691	403,221
	Future LLRW			
	Disposal Facility			
	(Proxy)	С	785	94,822
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,433	866,361
Total [2]			963,558	53,898,326
- 5002			222,330	20,200,00
Scrap Metal				255,644,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

TABLE 5.2 DECOMMISSIONING WASTE SUMMARY DELAYED DECON

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
TY dole	Cost Basis	Class	(cusic rect)	(pourius)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	896,145	48,597,270
disposal)	EnergySolutions			
	Bulk	A	61,234	3,110,905
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	2,254	213,522
	Future LLRW			
	Disposal Facility			
	(Proxy)	С	785	94,822
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,433	866,361
Total [2]			964,851	52,882,880
			,	
Scrap Metal				255,568,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

TABLE 5.3 DECOMMISSIONING WASTE SUMMARY SAFSTOR

			Waste Volume	Mass
Waste	Cost Basis	Class [1]	(cubic feet)	(pounds)
vvaste	Cost Dasis	Class [2]	(cubic feet)	(pourius)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	871,998	47,760,770
disposal)	EnergySolutions			
	Bulk	A	71,570	3,900,172
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	1,002	100,508
	Future LLRW			
	Disposal Facility			
	(Proxy)	\mathbf{C}	785	94,822
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,433	866,361
Total [2]			949,788	52,722,633
10tal 1-1			040,100	02,122,000
Scrap Metal				255,568,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

6. RESULTS

The analysis to estimate the costs to decommission Byron relied upon the site-specific, technical information developed for a previous analysis prepared in 2009. While not an engineering study, the estimates provide Exelon with sufficient information to assess its financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenarios assume continued operation of the plant's spent fuel pool for a minimum of five and one-half years following the cessation of operations for continued cooling of the assemblies. For the DECON and SAFSTOR scenarios, the ISFSI is expanded to accommodate the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository. The spent fuel in the storage pools and reactors at the cessation of operations remains in the storage pools in the Delayed-DECON alternative.

The cost projected to promptly decommission (DECON) Byron is estimated to be \$1.82 billion. The majority of this cost (approximately 67.4%) is associated with the physical decontamination and dismantling of the nuclear units so that the licenses can be terminated. Another 22.2% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 10.4% is for the demolition of the designated structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 through 6.3, 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. This analysis assumes that Exelon 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. However, once the operating license is terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel (for the DECON alternative).

As described in this report, the spent fuel pool will remain operational for a minimum of five and one-half years following the cessation of operations. The pool will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the pool areas. Over the five and one-half year period, the spent fuel will be packaged into transportable steel canisters for future loading into a DOE-provided transport cask (DECON and SAFSTOR alternatives). The canisters will be stored in concrete overpacks at the ISFSI until the DOE is able to receive them. Dry storage of the fuel provides additional flexibility in the event the DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the majority of the radioactive material is at EnergySolutions facility in Clive, Utah or some alternative facility. Highly activated components, requiring additional isolation from the environment, are packaged for geologic disposal. Disposal of these components is based upon a cost equivalent for spent fuel.

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 union wages. Non-radiological demolition is a natural extension of the decommissioning process. 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, e.g., 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.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling,

isotopic analysis, and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also require confirmation and will add to the expense of surveying the facilities alone.

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.

Comparison of the 2009 and 2014 Estimates

For illustrative purposes, the estimates for the 2009 and 2014 DECON scenarios are compared, with the cost difference for the major cost elements shown in Table 6.4. The 2009 cost elements are inflated using the CPI, Services index to 2014 dollars to remove the effect of financial escalation from the comparison. The cost difference between the escalated 2009 estimate (increased approximately 8.6%) and the 2014 estimate is approximately \$351 million. Unless otherwise noted, all cost values and percentages reflect 2009 estimate costs adjusted for inflation.

Spent Fuel Management

Approximately \$94 million, or 27% of the total cost difference, is directly attributable to the additional 8 years of post-dismantling ISFSI operation reflected in the 2014 estimate. The cost of ISFSI operations (including plant staff, security, insurance, property taxes, fees, and other operating costs) during this timeframe is approximately \$5.88 million per year per unit (2014 estimate \$s). The increased residence time was based upon Exelon's revised projections for fleet-wide DOE spent fuel acceptance, and with consideration of an additional delay in DOE startup (first acceptance of commercial spent fuel) from 2018 to 2025.

Spent Fuel Management (Direct Costs)

This cost category increased approximately \$107 million. It includes the costs for the dry storage casks and loading campaign costs, as well as emergency planning fees while fuel is on site. The principal contributor to the increase was from emergency planning fees, which represents approximately \$101 million or 94% of the increase. In 2009, a nominal emergency planning fee allowance was used. The 2014 estimate incorporates an annual state emergency planning fee of \$3.8 million (for the station) while spent fuel was on site. An increase (14%) in the capital cost of the dry storage system was responsible for the remainder of the increase in this cost category from years 2009 to 2014.

There was also a slight increase in the number of dry storage overpacks and canisters required (92 in 2009 to 94 in 2014) and a reduction in the costs to expand the ISFSI (from a nominal cost of \$200 thousand per cask in 2009 dollars to a nominal cost of \$100 thousand per slot in 2014 dollars).

Security

The majority of the increase in security costs (64%) was due to the longer spent fuel site residence time as described previously. Contributing to the increase was a 22% increase in average personnel costs.

Property Taxes

Property taxes for the 1st four years following unit shut down changed substantially. This was due to the method by which the Exelon schedule of property taxes was applied in the two estimates. Property taxes are assumed to be paid in arrears; therefore the tax payment in the year following shutdown is actually for the final year of operations, and therefore is not included in either the 2009 or 2014 estimates. In 2009 the cost model assumed that this first year (which as not included) was part of the reduction in tax payments; the 2014 estimate does not make this assumption. The 2009 estimate also assumed that the second year of payment was already reduced to 67% of the operations level; the 2014 estimate begins property tax payments at the operations level for the second year. The total impact of the change was that the 2009 estimate paid the equivalent of one year of operations-level taxes before beginning the \$1 million per year level payments; the 2014 estimate paid the equivalent of approximately two years of operations-level taxes prior to the \$1 million per year level payments. The increase in the spent fuel site residence time (13 years) also contributed to the increased in costs.

Decommissioning and Demolition

Plant system and structural commodity "Removal" costs increased as a result of an 7% increase in craft labor over the five year period (used to perform physical plant dismantling) and a 14% increase in health physics personnel (used to support work crew activities, perform interim radiological assessments, and license termination surveys). The 2014 "Removal" cost also includes the perimeter excavation of the power blocks for removing underground services. This was added in 2014 based upon industry experience.

In the 2009 cost estimate, a significant portion of the contaminated waste stream was designated for off-site processing, volume reduction and recovery. This included

the secondary side of the steam generators. In the 2014 estimate, he LLRW strategy changed such that metal material was sent directly to the LLRW burial facility, where is can be separated for burial or processing by the waste vendor consistent with recent industry practice. This results in a single rate for burial or processing of waste metals. With the low direct disposal rate, third-party off-site processing was not utilized in the 2014 estimate. As a result of the change:

- The packaging cost increased, since direct disposal of contaminated metals incorporates the mass and volume of the waste package, as well as the cost of the one-time use waste package. Off-site processing typically uses reusable containers that do not contribute substantially to the packaging cost. "Packaging" costs also increased with the addition (in 2014) of four spent fuel multi-purpose canisters and storage overpacks for GTCC waste (2 per unit at a nominal cost of \$1.2 million for each canister and transfer costs). The additional packages resulted from a payload constraint being applied on the storage canisters, as a result of industry experience.
- 2) Shipping costs increased for three reasons, the greater distance to the waste disposal site v. the off-site waste processing site, the increased number of waste packages weight, and a 2014 price for diesel fuel being 46% higher than in 2009.
- 3) In 2014 low-level waste disposal costs increased relative to the combination of waste disposal and processing cost in 2009 principally because the 2014 cost of waste disposal for system components (using a single waste stream) is substantially larger than 2009 cost for disposal (which used separate waste streams for direct burial and off-site waste processing). Also contributing to the change was a 10% increase in the large component disposal rate (applied to large primary system components such as steam generators and the reactor vessel. This cost increase was offset to a limited extent by a decrease in the on-site decontamination of systems.

Characterization and Licensing Surveys

Characterization and surveys increased by \$15.5 million (45%). The majority of the increase in this cost category (96%) is associated with the addition (in 2014) of remedial action survey personnel during the active decontamination and dismantling periods. These teams are used to assess, process, and identify areas of concerns, and confirm that the desired remediation results have been achieved. This activity has been added based on industry experience.

Other

Additional costs were realized in the 2014 cost model from an updated "Insurance" model and "Site O&M" charges provided by Exelon (combined with the longer spent fuel site residence time). "Energy" costs increased 80% percent since the 2009 estimate. This is commensurate with the 91% increase in the price of electricity used in the 2014 estimate and the model that adjusts energy consumption based on reactor thermal rating (Byron had a power uprate between the 2009 and 2014 studies).

TABLE 6.1 SUMMARY OF DECOMMISSIONING COST ELEMENTS DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	38,368	2.1
Removal	293,055	16.1
Packaging	61,516	3.4
Transportation	35,119	1.9
Waste Disposal	177,992	9.8
Off-site Waste Processing	0	0.0
Program Management [1]	555,968	30.6
Security	126,957	7.0
Spent Fuel Pool Isolation	12,434	0.7
Spent Fuel Management [2]	285,106	15.7
Insurance and Regulatory Fees	34,410	1.9
Energy	24,072	1.3
Characterization and Licensing Surveys	49,614	2.7
Property Taxes	100,810	5.5
Miscellaneous Equipment	13,598	0.8
Site O&M	9,568	0.5
Total [3]	1,818,587	100.0

Cost Element	Total	Percentage
NRC License Termination	1,227,223	67.4
Spent Fuel Management	403,084	22.2
Site Restoration	188,280	10.4
Total [3]	1,818,587	100.0

^[1] Includes security and engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.2 SUMMARY OF DECOMMISSIONING COST ELEMENTS DELAYED DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	32,426	1.6
Removal	297,633	14.8
Packaging	51,133	2.5
Transportation	30,837	1.5
Waste Disposal	156,431	7.8
Off-site Waste Processing	0	0.0
Program Management [1]	734,385	36.5
Security	215,500	10.7
Spent Fuel Pool Isolation	12,434	0.6
Spent Fuel Management [2]	169,111	8.4
Insurance and Regulatory Fees	67,659	3.4
Energy	46,122	2.3
Characterization and Licensing Surveys	51,444	2.6
Property Taxes	111,097	5.5
Miscellaneous Equipment	24,841	1.2
Site O&M	13,321	0.7
Total [3]	2,014,375	100.0

Cost Element	Total	Percentage
NRC License Termination	1,314,983	65.3
Spent Fuel Management	512,582	25.5
Site Restoration	186,810	9.3
Total [3]	2,014,375	100.0

^[1] Includes security and engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.3 SUMMARY OF DECOMMISSIONING COST ELEMENTS SAFSTOR ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	32,378	1.5
Removal	301,033	13.8
Packaging	51,125	2.3
Transportation	30,939	1.4
Waste Disposal	153,653	7.0
Off-site Waste Processing	0	0.0
Program Management [1]	705,374	32.2
Security	211,854	9.7
Spent Fuel Pool Isolation	12,434	0.6
Spent Fuel Management [2]	279,466	12.8
Insurance and Regulatory Fees	112,010	5.1
Energy	50,016	2.3
Characterization and Licensing Surveys	51,444	2.4
Property Taxes	140,108	6.4
Miscellaneous Equipment	34,697	1.6
Site O&M	23,339	1.1
Total [3]	2,189,872	100.0

Cost Element	Total	Percentage
NRC License Termination	1,610,713	73.6
Spent Fuel Management	391,055	17.9
Site Restoration	188,103	8.6
Total [3]	2,189,872	100.0

^[1] Includes security and engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.4 SUMMARY COMPARISON DECON ALTERNATIVE

(thousands of dollars)

Cost Element	2009 Estimate (dollars)	2009 Escalated to 2014 ^[1] (dollars)	2014 Estimate (dollars)	Delta ^[2]
Decontamination	99.761	20.049	20.200	1 701
	33,761	36,648	38,368	1,721
Removal	242,355	263,078	293,055	29,977
Packaging	29,594	32,124	61,516	29,391
Transportation	20,501	22,254	35,119	12,865
Waste Disposal	119,478	129,694	177,992	48,297
Off-site Waste Processing	8,002	8,686	0	-8,686
Program Management	516,437	560,596	555,968	-4,628
Security	73,840	80,154	126,957	46,803
Spent Fuel Pool Isolation	11,143	12,096	12,434	339
Spent Fuel Management (Direct Costs)	163,436	177,411	285,106	107,695
Insurance and Regulatory Fees	22,834	24,786	34,410	9,624
Energy	12,320	13,373	24,072	10,699
Characterization/Licensing Surveys	31,452	34,141	49,614	15,472
Property Taxes	48,613	52,770	100,810	48,040
Miscellaneous Equipment	12,886	13,988	13,598	-390
Site O&M	5,087	5,522	9,568	4,046
Total	1,351,739	1,467,322	1,818,587	351,265

NRC License Termination	969,616	1,052,525	1,227,223	174,699
Spent Fuel Management	226,513	245,881	309,028	63,146
Additional 8 Years of ISFSI Ops [3]			94,056	94,056
Site Restoration	155,609	168,915	188,280	19,365
Total	1,351,738	1,467,321	1,818,587	351,266

^[1] Escalated by CPI, Services for comparative purposes

^[2] "2014 Estimate" value minus "2009 Escalated to 2014" value

^[3] Based upon average annual cost of \$5.88 million per unit for 8 years

- 1. "Decommissioning Cost Analysis for the Byron Nuclear Power Station," Document No. E16-1555-013, Rev. 0, TLG Services, Inc., September 2009
- 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, 53 Fed. Reg., 24018-, June 27, 1988
- 3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," Rev. 2, October 2011
- 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, 66 Fed. Reg. 52551, 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, 61 Fed. Reg. 39278, July 29, 1996.
- 7. U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011
- 8. "Nuclear Waste Policy Act of 1982," 42 U.S. Code 10101, et seq. http://pbadupws.nrc.gov/docs/ML1327/ML13274A489.pdf#page=419
- 9. Blue Ribbon Commission on America's Nuclear Future Charter, http://cybercemetery.unt.edu/archive/brc/20120620215336/http://brc.gov/index.php?q=page/charter
- 10. "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/, January 2012.
- 11. "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013.

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- 12. United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, Et Al., August 2013, http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD9852 57BC6004DEB18/\$file/11-1271-1451347.pdf
- 13. U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) "... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such materials from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance ..."
- 14. U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites"
- 15. "Low Level Radioactive Waste Policy Act," Public Law 96-573, 1980
- 16. "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986
- 17. U.S. Code of Federal Regulations, Title 10, Part 61.55 "Waste Classification"
- 18. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Final Rule, Radiological Criteria for License Termination," 62 Fed. Reg. 39058, July 21, 1997
- 19. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," EPA Memorandum OSWER No. 9200.4-18, August 22, 1997
- 20. U.S. Code of Federal Regulations, Title 40, Part 141.16, "Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems."
- 21. "Memorandum of Understanding Between the Environmental Protection Agency and the Nuclear Regulatory Commission: Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites," OSWER 9295.8-06a, October 9, 2002

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- 22. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG/CR-1575, Rev. 1, EPA 402-R-97-016, Rev. 1, August 2000
- 23. T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986
- 24. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980.
- 25. "Building Construction Cost Data 2014," Robert Snow Means Company, Inc., Kingston, Massachusetts
- 26. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984
- 27. Civilian Radioactive Waste Management System Waste Acceptance System Requirements Document," Revision 5, ICN01 (DOE/RW-0351) effective March 10, 2008
- 28. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995.
- 29. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178.
- 30. Tri-State Motor Transit Company Radioactive Materials Tariff
- 31. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, August 1984.
- 32. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, June 1978.

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- 33. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1980
- 34. "Microsoft Project 2010," Microsoft Corporation, Redmond, WA, 2003
- 35. "Atomic Energy Act of 1954," (68 Stat. 919)

APPENDIX A UNIT COST FACTOR DEVELOPMENT

APPENDIX A UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

Act ID	Activity Description	Activity Duration (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)
\mathbf{f}	Rig for removal	30	30
g	Unbolt from mounts	30	30
h	Remove contamination controls	15	15
i	Remove, wrap, send to waste processing area	<u>60</u>	<u>60</u>
	Totals (Activity/Critical)	355	255
Dura	tion adjustment(s):		
$+ \operatorname{Re}$	espiratory protection adjustment (50% of critical dur	ration)	128
+ Ra	diation/ALARA adjustment (37% of critical duration	n)	$\underline{95}$
Adju	sted work duration		478
	otective clothing adjustment (30% of adjusted durat uctive work duration	tion)	$\frac{143}{621}$
	ork break adjustment (8.33 % of productive duration work duration (minutes)	n)	$\frac{52}{673}$

*** Total duration = 11.217 hr ***

^{*} Alpha designators indicate activities that can be performed in parallel

APPENDIX A (Continued)

3. LABOR REQUIRED

Crew	Number	Duration (Hours)	Rate (\$/hr)	Cost	
Laborers	3.00	11.217	57.33	1,929.21	
Craftsmen	2.00	11.217	69.16	1,551.54	
Foreman	1.00	11.217	71.41	801.01	
General Foreman	0.25	11.217	75.35	211.30	
Fire Watch	0.05	11.217	57.33	32.15	
Health Physics Technician	1.00	11.217	63.44	711.61	
Total labor cost 4. EQUIPMENT & CONS	SUMABLES	COSTS		\$5,236.82	
Equipment Costs				none	
Consumables/Materials Costs					
 Blotting paper 50 @ \$0.5 	59/sq ft {1}			\$29.50	
 Plastic sheets/bags 50 @ 	\$0.27/sq ft {2	}		\$13.50	
 Gas torch consumables 	1 @ \$18.72 x 1	/hr {3}		\$18.72	
Subtotal cost of equipment and	l materials			\$61.72	
Overhead & profit on equipmen		als @ 16.25 %		\$10.03	
Total costs, equipment & mate	rial			\$71.75	
TOTAL COST:					
Removal of contaminated heat	exchanger <3	3000 pounds:		\$5,308.57	
Total labor cost:				\$5,236.82	
Total equipment/material costs	s:			\$71.75	
Total craft labor man-hours red	quired per un	it:		81.88	

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the Atomic Industrial Forum's (now NEI) program to standardize nuclear decommissioning cost estimates and are delineated in Volume 1, Chapter 5 of the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.
- References for equipment & consumables costs:
 - 1. <u>www.mcmaster.com</u> online catalog, McMaster Carr Spill Control (7193T88)
 - 2. R.S. Means (2014) Division 01 56, Section 13.60-0600, page 23
 - 3. R.S. Means (2014) Division 01 54 33, Section 40-6360, page 698
- Material and consumable costs were adjusted using the regional indices for Rockford, Illinois.

Unit Cost Factor	Cost/Unit
Removal of clean instrument and sampling tubing, \$/linear foot	0.61
Removal of clean pipe 0.25 to 2 inches diameter, \$/linear foot	6.62
Removal of clean pipe >2 to 4 inches diameter, \$/linear foot	9.33
Removal of clean pipe >4 to 8 inches diameter, \$/linear foot	17.92
Removal of clean pipe >8 to 14 inches diameter, \$/linear foot	34.88
Removal of clean pipe >14 to 20 inches diameter, \$/linear foot	45.36
Removal of clean pipe >20 to 36 inches diameter, \$/linear foot	66.73
Removal of clean pipe >36 inches diameter, \$/linear foot	79.28
Removal of clean valve >2 to 4 inches	118.90
Removal of clean valve >4 to 8 inches	179.25
Removal of clean valve >8 to 14 inches	348.77
Removal of clean valve >14 to 20 inches	453.60
Removal of clean valve >20 to 36 inches	667.33
Removal of clean valve >36 inches	792.84
Removal of clean pipe hanger for small bore piping	41.27
Removal of clean pipe hanger for large bore piping	148.59
Removal of clean pump, <300 pound	302.78
Removal of clean pump, 300-1000 pound	832.26
Removal of clean pump, 1000-10,000 pound	3,298.22
Removal of clean pump, >10,000 pound	6,380.28
Removal of clean pump motor, 300-1000 pound	347.89
Removal of clean pump motor, 1000-10,000 pound	1,370.33
Removal of clean pump motor, >10,000 pound	3,083.23
Removal of clean heat exchanger <3000 pound	1,769.79
Removal of clean heat exchanger >3000 pound	4,457.34
Removal of clean feedwater heater/deaerator	12,574.09
Removal of clean moisture separator/reheater	25,860.89
Removal of clean tank, <300 gallons	389.43
Removal of clean tank, 300-3000 gallon	1,227.18
Removal of clean tank, >3000 gallons, \$/square foot surface area	10.22

Unit Cost Factor	Cost/Unit
Removal of clean electrical equipment, <300 pound	164.15
Removal of clean electrical equipment, 300-1000 pound	566.40
Removal of clean electrical equipment, 1000-10,000 pound	1,132.80
Removal of clean electrical equipment, >10,000 pound	2,677.18
Removal of clean electrical transformer < 30 tons	1,859.26
Removal of clean electrical transformer > 30 tons	5,354.36
Removal of clean standby diesel generator, <100 kW	1,899.07
Removal of clean standby diesel generator, 100 kW to 1 MW	4,238.85
Removal of clean standby diesel generator, >1 MW	8,775.30
Removal of clean electrical cable tray, \$/linear foot	15.43
Removal of clean electrical conduit, \$/linear foot	6.74
Removal of clean mechanical equipment, <300 pound	164.15
Removal of clean mechanical equipment, 300-1000 pound	566.40
Removal of clean mechanical equipment, 1000-10,000 pound	1,132.80
Removal of clean mechanical equipment, >10,000 pound	2,677.18
Removal of clean HVAC equipment, <300 pound	198.50
Removal of clean HVAC equipment, 300-1000 pound	680.56
Removal of clean HVAC equipment, 1000-10,000 pound	1,356.38
Removal of clean HVAC equipment, >10,000 pound	2,677.18
Removal of clean HVAC ductwork, \$/pound	0.65
Removal of contaminated instrument and sampling tubing, \$/linear foot	1.92
Removal of contaminated pipe 0.25 to 2 inches diameter, \$/linear foot	25.69
Removal of contaminated pipe >2 to 4 inches diameter, \$/linear foot	44.62
Removal of contaminated pipe >4 to 8 inches diameter, \$/linear foot	70.38
Removal of contaminated pipe >8 to 14 inches diameter, \$/linear foot	139.47
Removal of contaminated pipe >14 to 20 inches diameter, \$/linear foot	168.04
Removal of contaminated pipe >20 to 36 inches diameter, \$/linear foot	233.45
Removal of contaminated pipe >36 inches diameter, \$/linear foot	276.32
Removal of contaminated valve >2 to 4 inches	541.40
Removal of contaminated valve >4 to 8 inches	651.50

Unit Cost Factor	Cost/Unit
Removal of contaminated valve >8 to 14 inches	1,344.70
Removal of contaminated valve >14 to 20 inches	1,712.55
Removal of contaminated valve >20 to 36 inches	2,284.48
Removal of contaminated valve >36 inches	2,713.21
Removal of contaminated pipe hanger for small bore piping	178.40
Removal of contaminated pipe hanger for large bore piping	583.47
Removal of contaminated pump, <300 pound	1,161.24
Removal of contaminated pump, 300-1000 pound	2,671.55
Removal of contaminated pump, 1000-10,000 pound	8,765.13
Removal of contaminated pump, >10,000 pound	21,354.30
Removal of contaminated pump motor, 300-1000 pound	1,124.22
Removal of contaminated pump motor, 1000-10,000 pound	3,554.32
Removal of contaminated pump motor, >10,000 pound	7,979.82
Removal of contaminated heat exchanger <3000 pound	5,308.57
Removal of contaminated heat exchanger >3000 pound	15,357.89
Removal of contaminated tank, <300 gallons	1,926.66
Removal of contaminated tank, >300 gallons, \$/square foot	37.68
Removal of contaminated electrical equipment, <300 pound	904.59
Removal of contaminated electrical equipment, 300-1000 pound	$2,\!176.43$
Removal of contaminated electrical equipment, 1000-10,000 pound	4,190.50
Removal of contaminated electrical equipment, >10,000 pound	8,154.87
Removal of contaminated electrical cable tray, \$/linear foot	43.78
Removal of contaminated electrical conduit, \$/linear foot	20.44
Removal of contaminated mechanical equipment, <300 pound	1,006.91
Removal of contaminated mechanical equipment, 300-1000 pound	2,405.64
Removal of contaminated mechanical equipment, 1000-10,000 pound	4,624.37
Removal of contaminated mechanical equipment, >10,000 pound	8,154.87
Removal of contaminated HVAC equipment, <300 pound	1,006.91
Removal of contaminated HVAC equipment, 300-1000 pound	2,405.64
Removal of contaminated HVAC equipment, 1000-10,000 pound	4,624.37

Unit Cost Factor	Cost/Unit
Removal of contaminated HVAC equipment, >10,000 pound	8,154.87
Removal of contaminated HVAC ductwork, \$/pound	2.61
Removal/plasma arc cut of contaminated thin metal components, \$/linear in	. 4.78
Additional decontamination of surface by washing, \$/square foot	10.03
Additional decontamination of surfaces by hydrolasing, \$/square foot	41.93
Decontamination rig hook up and flush, \$/ 250 foot length	8,532.64
Chemical flush of components/systems, \$/gallon	18.99
Removal of clean standard reinforced concrete, \$/cubic yard	165.62
Removal of grade slab concrete, \$/cubic yard	223.42
Removal of clean concrete floors, \$/cubic yard	430.13
Removal of sections of clean concrete floors, \$/cubic yard	1,289.00
Removal of clean heavily rein concrete w/#9 rebar, \$/cubic yard	276.49
Removal of contaminated heavily rein concrete w/#9 rebar, \$/cubic yard	2,546.64
Removal of clean heavily rein concrete w/#18 rebar, \$/cubic yard	349.54
Removal of contaminated heavily rein concrete w/#18 rebar, \$/cubic yard	3,370.98
Removal heavily rein concrete w/#18 rebar & steel embedments, \$/cubic yard	d 534.15
Removal of below-grade suspended floors, \$/cubic yard	430.13
Removal of clean monolithic concrete structures, \$/cubic yard	1,079.83
Removal of contaminated monolithic concrete structures, \$/cubic yard	2,541.92
Removal of clean foundation concrete, \$/cubic yard	848.60
Removal of contaminated foundation concrete, \$/cubic yard	2,368.28
Explosive demolition of bulk concrete, \$/cubic yard	36.47
Removal of clean hollow masonry block wall, \$/cubic yard	122.47
Removal of contaminated hollow masonry block wall, \$/cubic yard	408.71
Removal of clean solid masonry block wall, \$/cubic yard	122.47
Removal of contaminated solid masonry block wall, \$/cubic yard	408.71
Backfill of below-grade voids, \$/cubic yard	33.87
Removal of subterranean tunnels/voids, \$/linear foot	139.46
Placement of concrete for below-grade voids, \$/cubic yard	130.21
Excavation of clean material, \$/cubic yard	3.53

Unit Cost Factor	Cost/Unit
Excavation of contaminated material, \$/cubic yard	48.35
Removal of clean concrete rubble (tipping fee included), \$/cubic yard	26.96
Removal of contaminated concrete rubble, \$/cubic yard	31.19
Removal of building by volume, \$/cubic foot	0.36
Removal of clean building metal siding, \$/square foot	1.64
Removal of contaminated building metal siding, \$/square foot	5.53
Removal of standard asphalt roofing, \$/square foot	2.87
Removal of transite panels, \$/square foot	2.56
Scarifying contaminated concrete surfaces (drill & spall), \$/square foot	14.90
Scabbling contaminated concrete floors, \$/square foot	9.44
Scabbling contaminated concrete walls, \$/square foot	25.27
Scabbling contaminated ceilings, \$/square foot	87.02
Scabbling structural steel, \$/square foot	7.58
Removal of clean overhead crane/monorail < 10 ton capacity	782.51
Removal of contaminated overhead crane/monorail < 10 ton capacity	2,220.77
Removal of clean overhead crane/monorail >10-50 ton capacity	1,878.04
Removal of contaminated overhead crane/monorail >10-50 ton capacity	5,328.91
Removal of polar crane > 50 ton capacity	7,805.00
Removal of gantry crane > 50 ton capacity	33,464.69
Removal of structural steel, \$/pound	0.24
Removal of clean steel floor grating, \$/square foot	5.56
Removal of contaminated steel floor grating, \$/square foot	16.19
Removal of clean free standing steel liner, \$/square foot	15.32
Removal of contaminated free standing steel liner, \$/square foot	44.12
Removal of clean concrete-anchored steel liner, \$/square foot	7.66
Removal of contaminated concrete-anchored steel liner, \$/square foot	51.44
Placement of scaffolding in clean areas, \$/square foot	16.62
Placement of scaffolding in contaminated areas, \$/square foot	29.50
Landscaping with topsoil, \$/acre	25,057.45
Cost of CPC B-88 LSA box & preparation for use	2,070.88

Unit Cost Factor	Cost/Unit
Cost of CPC B-25 LSA box & preparation for use	1,896.83
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,551.35
Cost of CPC B-144 LSA box & preparation for use	10,441.07
Cost of LSA drum & preparation for use	217.98
Cost of cask liner for CNSI 8 120A cask (resins)	12,455.91
Cost of cask liner for CNSI 8 120A cask (filters)	9,035.60
Decontamination of surfaces with vacuuming, \$/square foot	0.97

APPENDIX C

DETAILED COST ANALYSIS

DECON

	Page
Byron Nuclear Power Station, Unit 1	
Byron Nuclear Power Station, Unit 2	

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							`		5 01 2014 uona	,											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	1a - Shutdown through Transition																				
	Direct Decommissioning Activities								25	100	100										1.000
1a.1.1 1a.1.2	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	166	25	190 a	190	-	-	-	-	-	-	-	-	-	1,300
1a.1.3	Remove fuel & source material									n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5 1a.1.6	Deactivate plant systems & process waste Prepare and submit PSDAR	_		_		_		255	38	a 293	293	_	_	_			_			_	2,000
1a.1.7	Review plant dwgs & specs.	-		-	-	-		586	88	674	674	-	-	-					-	-	4,600
1a.1.8	Perform detailed rad survey									a											ŕ
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,000
1a.1.10 1a.1.11	End product description Detailed by-product inventory		-	-	-			127 166	19 25	146 190	146 190	-	-	-					-	-	1,000 1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	955	143	1,098	1,098	-	-	-		-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	395	59	454	454	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study Prepare/submit License Termination Plan	-	-	-	-	-	-	637 522	95 78	732 600	732 600	-	-	-	-	-	-	-	-	-	5,000 4,096
1a.1.15 1a.1.16	Receive NRC approval of termination plan	-	-		-	-	-	522	10	a	600	•		•	-	-	-	•	-	•	4,096
Activity Sp	pecifications																				
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	626	94	720	648	-	72	-	-	-	-	-	-	-	4,920
1a.1.17.2		-	-	-	-	-	-	531	80	610	549	-	61	-	-	-	-	-	-	-	4,167
1a.1.17.3 1a.1.17.4	NSSS Decontamination Flush Reactor internals	-	-	-	-	-	-	64 904	10 136	73 1,040	73 1,040	-	-	-	-	-	-	-	-	-	500 7,100
1a.1.17.4 1a.1.17.5		-	-	-	-	-		828	124	952	952	-	-	-					-	-	6,500
1a.1.17.6		-	-	-	-	-		64	10	73	73	-	-	-		-			-	-	500
1a.1.17.7		-	-	-	-	-	-	397	60	457	457	-	-	-	-	-	-	-	-	-	3,120
	Reinforced concrete Main Turbine	-	-	-	-	-	-	204 51	31 8	234 59	117	-	117 59	-	-	-	-	-	-	-	1,600 400
	Main Condensers	-	-	-	-	-	-	51	8	59 59	-	-	59 59	-					-	-	400
	Plant structures & buildings	-	-	-	-	-	-	397	60	457	228	-	228	-		-	-	-	-	-	3,120
	Waste management	-	-	-	-	-	-	586	88	674	674	-	-	-	-	-	-	-	-	-	4,600
	Facility & site closeout Total	-	-	-	-	-	-	115	$\frac{17}{722}$	132 5,539	66 4,877	-	66 662	-	-	-	-	-	-	-	900 37,827
1a.1.17	Total	-	-	-	-	-	-	4,816	122	9,959	4,011	-	002	-	-	-	-	-	-	-	51,621
Planning &	& Site Preparations																				
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	306	46	351	351	-	-	-	-	-	-	-	-	-	2,400
1a.1.19 1a.1.20	Plant prep. & temp. svces Design water clean-up system	-	-	-	-	-	-	3,000 178	$\frac{450}{27}$	3,450 205	3,450 205	-	-	-	-	-	-	-	-	-	1,400
1a.1.20	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-		2,300	345	2,645	2,645	-	-	-					-	-	1,400
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	157	23	180	180	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,690	2,204	16,894	16,232	-	662	-	-	-	-	-	-	-	73,753
Period 1a	Additional Costs																				
1a.2.1	ISFSI Expansion	-	-	-	-	-	-	4,800	720	5,520	-	5,520	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	4,800	720	5,520	-	5,520	-	-	-	-	-	-	-	-	-
Period 1a	Collateral Costs																				
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	10,038	1,506	11,544	-	11,544	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	•	-	-	-	10,038	1,506	11,544	-	11,544	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
1a.4.1	Insurance	-	-	-	-	-	-	1,855	185	2,040	2,040	-	-	-	-	-	-	-	-	-	-
1a.4.2 1a.4.3	Property taxes Health physics supplies	-	493	-	-	-	-		123	616	616	-	-		-	-	-	-	-		-
1a.4.5 1a.4.4	Heavy equipment rental	-	529	-		-	-		79	608	608	-	-						-		-
1a.4.5	Disposal of DAW generated	-	-	13	7	-	39		12	71	71	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,778	267	2,045	2,045	-	-	-	-	-	-	-	-	-	-
1a.4.7 1a.4.8	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	1,181 2,171	118 217	1,299 2,388	1,299	2,388	-	-	-	-	-	-	-	-	-
1a.4.8 1a.4.9	Site O&M Cost	-		-	-	-	-	165	25	2,388	190	2,388	-			-		-	-		
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	396	59	455	-	455	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1a.4.12 1a.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	640 32,279	96 4,842	736 37,121	736 37,121	-	-	-	-	-	-	-	-	-	12,264 423,400
18.4.10	Ounty Stan Cost	•	-	-	-	-	-	54,419	4,042	01,141	51,121	-	-	-	-	-	-	-	-	-	425,400

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(6.	nousanu	s of 2014 dolla	13)											
Activity Index		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	Class A Cu. Feet	Burial Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,022	13	7	-	39	40,512	6,031	47,624	44,727	2,898	-	-	610	-	-	-	12,190	20	435,664
1a.0	TOTAL PERIOD 1a COST	-	1,022	13	7	-	39	70,041	10,460	81,582	60,959	19,962	662	-	610	-	-	-	12,190	20	509,417
PERIOD	1b - Decommissioning Preparations																				
Period 1b	Direct Decommissioning Activities																				
	Work Procedures																				
1b.1.1.1	Plant systems	-	-	-	-	-	-	603	90	693	624	-	69	-	-	-	-	-	-	-	4,733
1b.1.1.2 1b.1.1.3	NSSS Decontamination Flush Reactor internals	-	-	-	-	-	-	127 318	19 48	146 366	146 366	-	-	-	-	-	-	-	-	-	1,000 2,500
1b.1.1.4	Remaining buildings	-		-	-	-	-	172	26	198	49	-	148	-	-	-			-	-	1,35
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-			-	-	1,000
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,00
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	462	69	531	531	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9 1b.1.1.10	Facility closeout Missile shields	-	-	-	-	-	-	153 57	23	176 66	88 66	-	88	-	-	-	-	-	-	-	1,200 450
1b.1.1.10 1b.1.1.11		-	-	-	-	-	-	153	23	176	176		-	-	-	-	-	-	-	-	1,200
1b.1.1.12		-	_	-	_	-	-	586	88	674	674	_	_	-	-	-	-	_	-	-	4,600
1b.1.1.13		-	-	-	-	-	-	127	19	146	73	-	73	-	-	-	-	-	-	-	1,000
	Main Turbine	-	-	-	-	-	-	199	30	228	-	-	228	-	-	-	-	-	-	-	1,560
1b.1.1.15		-	-	-	-	-	-	199	30	228	-	-	228	-	-	-	-	-	-	-	1,560
1b.1.1.16		-	-	-	-	-	-	348 348	52	400 400	360 360	-	40 40	-	-	-	-	-	-	-	2,730
1b.1.1.17 1b.1.1	Reactor building Total	-	-	-	-	-	-	4,232	52 635	4,867	3,952		915	-	-	-	-	-	-	-	2,730 33,248
1b.1.2 1b.1	Decon primary loop Subtotal Period 1b Activity Costs	753 753		-	-	-	-	- 4,232	377 1,011	1,130 5,997	1,130 5,082	-	- 915	-	-	-	-	-	-	1,067 1,067	33,243
Period 1b	Additional Costs																				
1b.2.1	Site Characterization	-	-	-	-	-	-	6,444	1,933	8,377	8,377		-	-	-	-	-	-	-	30,500	10,852
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	6,444	1,933	8,377	8,377	-	-	-	-	-	-	-	-	30,500	10,852
	Collateral Costs	202							100		1.010										
1b.3.1 1b.3.2	Decon equipment DOC staff relocation expenses	886	-	-	-	-	-	1,080	133 162	1,019 1,242	1,019 1,242	•	-	-	-	-	-	-	-	-	-
1b.3.2 1b.3.3	Process decommissioning water waste	52	-	34	91	-	115	1,060	72	364	364	-	-	-	328	-	-		19,686	64	-
1b.3.4	Process decommissioning water waste	2		92		-	3,918	-	1,042	5,403	5,403	-	_	-	-	926	-	_	98,699	173	
1b.3.5	Small tool allowance	-	2	-	-	-	´-	-	0	2	2	-	-	-	-	-	-	-	´-	-	-
1b.3.6	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,500		-	-	-	-	-	225	1,725	1,725		-	-	-	-	-	-	-	-	-
1b.3.8 1b.3	Spent Fuel Capital and Transfer Subtotal Period 1b Collateral Costs	2,440	1,102	126	439	-	4,034	5,033 6,113	755 $2,554$	5,788 16,808	11,020	5,788 5,788	-	-	328	926	-	-	118,386	237	
Period 1b	Period-Dependent Costs																				
1b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	704	70	774	774	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	8,248	825	9,072	9,072	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	278	-	-	-	-	-	69	347	347	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental Disposal of DAW generated	-	265	- 0	- 4	-	23	-	40	305 42	305 42	-	-	-	358	-	-	-	7,159	- 10	-
1b.4.6 1b.4.7	Plant energy budget	-			- 4	-	43 -	1,783	267	2,051	2,051	-	-	-	- -	-	-	-	7,109	12	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381		-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,088	109	1,197	-	1,197	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	83	12	95	95	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	198	30	228	-	228	-	-	-	-	-	-	-	-	-
1b.4.12 1b.4.13	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	24 321	4 48	28 369	369	28	-	-	-	-	-	-	-	-	- C 140
1b.4.13 1b.4.14	DOC Staff Cost	-	-	-	-	-	-	5,535	48 830	6,365	6,365	-	-	-		-	-	-	-	-	6,149 63,789
1b.4.14 1b.4.15	Utility Staff Cost	-	-	-	-	-	-	16,249	2,437	18,687	18,687	-	-	-		-			-	-	213,320
1b.4	Subtotal Period 1b Period-Dependent Costs	27	543	8	4	-	23	34,579	4,791	39,974	38,521	1,453	-	-	358	-	-	-	7,159		
1b.0	TOTAL PERIOD 1b COST	3,221	1,645	134	443	-	4,056	51,368	10,289	71,156	63,000	7,241	915	-	686	926	-	-	125,545	31,816	327,358
PERIOD	1 TOTALS	3,221	2,667	147	450	-	4,095	121,409	20,750	152,739	123,959	27,203	1,577	-	1,296	926		-	137,735	31,836	836,775
		-, ==	,				,	,	-,	,	- /	.,	,-,-		,				,	- ,- ,-	,

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

									s of 2014 dolla	,											
Activity	,	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V	olumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet		Cu. Feet		Cu. Feet	Wt., Lbs.	Manhours	Manhours
PERIOD	2a - Large Component Removal																				
Period 2a	Direct Decommissioning Activities																				
Nuclear S	team Supply System Removal																				
2a.1.1.1	Reactor Coolant Piping	211	178	35	51	-	263	-	227	965	965	-	-	-	1,783	-	-	-	203,843	5,830	-
2a.1.1.2	Pressurizer Relief Tank Reactor Coolant Pumps & Motors	38 120	34 122	7 146	10 213	-	47 1,390	-	41 485	$\frac{176}{2,476}$	176 2,476	-	-	-	329 4,796	-	-	-	36,553 780,540	1,072 4,291	100
2a.1.1.3 2a.1.1.4	Pressurizer	56	69	532	116		879		336	1,988	1,988	-	-	-	3,033			-	284,696	2,482	93
2a.1.1.5	Steam Generators	451	4,496	3,888	3,749	-	11,272	-	5,119	28,975	28,975	-	-	-	68,143	-	-	-	4,044,803	23,233	5,75
2a.1.1.6	Retired Steam Generator Units	-	-	1,671	2,916	-	10,319	-	3,184	18,089	18,089	-	-	-	62,044	-	-	-	3,098,576	10,800	2,25
2a.1.1.7 2a.1.1.8	CRDMs/ICIs/Service Structure Removal Reactor Vessel Internals	188 168	343 3,171	230 8,521	60 1,751	-	188 8,240	327	$258 \\ 9,199$	1,266 31,377	1,266 31,377	-	-	-	3,881 1,878	963	393	-	145,494 329,968	7,976 31,267	1,38
2a.1.1.9	Reactor Vessel	134	5,347	2,459	1,176	-	2,847	327	6,458	18,747	18,747	_	_	_	9,361	-	-	-	960,884	31,267	1,38
2a.1.1	Totals	1,365	13,759	17,489	10,041	-	35,444	654	25,307	104,061	104,061	-	-	-	155,248	963	393	-	9,885,355	118,218	11,80
	of Major Equipment		co=	9.150	1.004		9 900		1 700	0.041	0.041				F0 FFF				2.040.015	10.564	
2a.1.2 2a.1.3	Main Turbine/Generator Main Condensers	-	695 1,344	3,150 1,828	1,094 998		3,399 5,039	-	1,503 $1,928$	9,841 11,138	9,841 11,138	-	-	-	58,555 $75,240$	-	-	-	3,040,215 3,906,532	$10,564 \\ 20,428$	
Cascading	g Costs from Clean Building Demolition																				
2a.1.4.1	Reactor	-	1,250	-	-	-	-	-	188	1,438	1,438	-	-	-	-	-	-	-	-	12,130	-
2a.1.4.2 2a.1.4.3	Auxiliary Building Refueling Water Storage Tank	-	692 122	-	-	-	-	-	104 18	796 140	796 140	-	-	-	-	-	-	-	-	6,810 1,299	-
2a.1.4.5 2a.1.4	Totals	-	2,065	-	-	-	-	-	310	2,374	2,374	-	-	-	-	-	-	-	-	20,238	-
	of Plant Systems																				
2a.1.5.1	Auxiliary Feedwater	-	80	-	-	-	-	-	12	92	-	-	92	-	-	-	-	-	-	1,244	-
2a.1.5.2 2a.1.5.3	Auxiliary Steam Auxiliary Steam RCA	-	72 138	22	11	-	- 54	-	11 52	83 276	276	-	83	-	805	-	-		42,068	1,126 1,984	
2a.1.5.4	Boric Acid Processing	529	573	127	78	-	392	-	530	2,230	2,230	-	-	-	6,102				303,638	16,061	-
2a.1.5.5	CO2 & H2	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	419	-
2a.1.5.6	CO2 & H2 RCA	-	40	5	2	-	11	-	13	71	71	-	-	-	159	-	-	-	8,312	583	-
2a.1.5.7 2a.1.5.8	Chemical Feed Chilled Water	-	59 74	-	-	-	-	-	9 11	68 85	-	-	68 85	-	-	-	-	-	-	934 1,142	-
2a.1.5.9	Circulating Water	-	323	-	-	-	-	-	48	372		-	372	-	-				-	5,150	-
2a.1.5.10	~	-	386	-	-	-	-	-	58	444	-	-	444	-	-	-	-	-	-	6,023	-
2a.1.5.11	Condensate Booster	-	347	-	-	-	-	-	52	400	-	-	400	-	-	-	-	-	-	5,428	-
2a.1.5.12 2a.1.5.13	Condensate Cleanup Containment Spray	-	68 264	82	46	-	233	-	10 139	79 765	765	-	79	-	3,481	-		-	180,655	1,060 3,897	-
2a.1.5.14	Diesel Fuel Oil	-	105	- 02	-	-	-	-	16	120	-	-	120	-					100,000	1,615	-
2a.1.5.15	Essential Service Water	-	244	-	-	-	-	-	37	280	-	-	280	-	-	-	-	-	-	3,837	-
2a.1.5.16		-	194	-	-	-	-	-	29	223	-	-	223	-	-	-	-	-	-	3,089	-
2a.1.5.17 2a.1.5.18	Feedwater Feedwater Drains	-	324 776	-	-	-	-	-	49 116	372 892	-	-	372 892	-	-	-		-	-	5,142 12,366	-
2a.1.5.19		-	58	-	-	-	_	-	9	67	-	-	67	-	-	-		-	_	932	_
2a.1.5.20	Gland Water	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	828	-
2a.1.5.21	Main Steam	-	331	-	-	-	-	-	50	380		-	380	-	-	-	-	-	-	5,216	-
	Main Steam RCA Nitrogen		53 3	16 1	10	-	49	-	28	155 10	155 10	-	-	-	726 49	-		-	37,727 $2,447$	769 50	-
2a.1.5.24	Non-Essential Service Water	-	183	-	-	-	-	-	27	211	-	-	211	-	-	-		-	2,111	2,916	_
2a.1.5.25	Non-Essential Service Water RCA	-	96	32	19	-	94	-	53	294	294	-	-	-	1,400	-	-	-	72,790	1,358	-
2a.1.5.26	Off Gas	-	645	125	71	-	360	-	274	1,476	1,476	-	-	-	5,352	-	-	-	278,775	9,696	-
2a.1.5.27 2a.1.5.28	Process Radiation Monitoring Process Sampling	-	48 140	3 13	1	-	7 40	-	14 47	$\frac{74}{247}$	$\frac{74}{247}$	-	-	-	109 590	-	-	-	5,726 30,697	753 2,183	-
2a.1.5.29	Station Air	-	31	-	-	-	-		5	36	-	-	36	-	-			-	50,697	498	-
2a.1.5.30	Station Heating	-	113	-	-	-	-	-	17	130	-	-	130	-	-	-	-	-	-	1,771	-
2a.1.5.31	Switchgear Heat Removal	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	139	-
2a.1.5.32 2a.1.5.33	Turbine Bldg Equip Drains Turbine Generator	-	1 58	-	-	-	-	-	0	1 67	-	-	1 67	-	-	-	-	-	-	17 901	-
2a.1.5.33 2a.1.5.34	Turbine Generator Turbine Oil	-	58 89	-	-	-		-	13	103	-	-	103		-	-	-		-	1,399	
2a.1.5.35	Waste Oil Sumps	-	31	-	-	-			5	35	-	-	35	-	-	-	-	-	-	483	
2a.1.5	Totals	529	6,033	426	246	-	1,242	-	1,759	10,235	5,597	-	4,638	-	18,774	-	-	-	962,836	101,007	-
2a.1.6	Scaffolding in support of decommissioning	-	1,134	9	5	-	24	-	291	1,463	1,463	-	-	-	359	-	-	-	18,654	18,871	-
2a.1	Subtotal Period 2a Activity Costs	1,895	25,030	22,902	12,384	-	45,149	654	31,098	139,112	134,473	-	4,638	-	308,175	963	393	-	17,813,590	289,326	11,808

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(,	nousanu	s of 2014 dolla	a1 5)											
Activity	,	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial /	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet					Wt., Lbs.	Manhours	Manhours
Period 2a	Additional Costs																				
2a.2.1	Remedial Action Surveys	-	-	-	-	-		2,161	648	2,809		-	-		-	-	-		-	34,055	-
2a.2.2	Asbestos Abatement	-	-	-	-	-	-	50	8	58		-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,211	656	2,866	2,866	-	-	-	-	-	-	-	-	34,055	-
Period 2a	Collateral Costs																				
2a.3.1	Process decommissioning water waste	167	-	111	297	-	377	-	233	1,186		-	-	-	1,074	-	-	-	64,421	209	-
2a.3.2 2a.3.3	Process decommissioning chemical flush waste Small tool allowance	0	316	12	44	-	73	-	26 47	155 363		-	36	-	117				12,475	22	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	_	16,446	2,467	18,913		18,913	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	167	316	123	341	-	450	16,446	2,774	20,617	1,668	18,913	36	-	1,191	-	-	-	76,896	231	-
Period 2a	Period-Dependent Costs																				
2a.4.1	Decon supplies	89	-	-	-	-	-	-	22	111	111	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,737	174	1,911	1,911	-		-	-	-	-	-	-	-	-
2a.4.3 2a.4.4	Property taxes Health physics supplies	-	2,305	-	-	-	-	20,314	2,031 576	22,345 2,881	20,110 2,881	-	2,234	-	-	-	-	-	-	-	-
2a.4.4 2a.4.5	Heavy equipment rental	-	3,329	-	-	-			499	3,829	3,829	-	-	-					-	-	-
2a.4.6	Disposal of DAW generated	-	-	96	52	-	293	-	91	532	532	-	-	-	4,574	-	-	-	91,471	149	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,768	415	3,183		-	-	-	-	-	-	-	-	-	-
2a.4.8 2a.4.9	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	1,026 3,111	103 311	1,128 3,422		3,422	-	-	-	-	-	-	-	-	-
2a.4.10	Site O&M Cost	-	-	-	-	-	-	270	41	311	311	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	648	97	745		745	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12	90		90	-	-	-	-	-	-	-	-	10.704
2a.4.13 2a.4.14	Security Staff Cost DOC Staff Cost	-	-	-	-	-	-	982 21,774	147 3,266	1,129 25,040		-	-	-	-	-	-	-	-	-	18,794 259,703
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	37,088	5,563	42,651	42,651	-	-	-	-	-	-	-	-	-	483,526
2a.4	Subtotal Period 2a Period-Dependent Costs	89	5,634	96	52	-	293	89,795	13,348	109,308	102,816	4,257	2,234	-	4,574	-	-	-	91,471	149	762,023
2a.0	TOTAL PERIOD 2a COST	2,151	30,979	23,121	12,777	-	45,892	109,107	47,876	271,903	241,823	23,170	6,909	-	313,939	963	393	-	17,981,960	323,761	773,826
PERIOD	2b - Site Decontamination																				
	f Plant Systems																				
2b.1.2.1	Chemical & Volume Control	966	1,254	159	83		419	-	930	3,811	3,811 970	-	-	-	6,236	-	-	-	324,551	31,161	-
2b.1.2.2 2b.1.2.3	Chilled Water RCA Component Cooling RCA	-	322 682	108 194	60 110		304 553		176 345	970 1,884	1,884	-	-	-	4,527 8,239	-	-	-	235,699 428,586	4,956 10,074	-
2b.1.2.4	Electrical	-	3,113	-	-	-	-	-	467	3,580	-	-	3,580	-	-	-		-	-	48,490	-
2b.1.2.5	Electrical - Contaminated	-	1,287	128	85		430		455	2,384	2,384	-	-	-	6,418		-	-	333,233	19,322	-
2b.1.2.6 2b.1.2.7	Electrical - RCA Emergency Diesel Generator	-	1,940 132	347	222	-	1,123	-	834 20	4,466 152	,	-	152	-	16,763	-	-	-	870,329	29,753 2,066	-
2b.1.2.7 2b.1.2.8	Essential Service Water RCA	-	306	112	66	-	333		181	998		-	-	-	4,958		-		257,885	4,643	-
2b.1.2.9	Fire Protection	-	127	-	-	-	-	-	19	146		-	146	-	-	-	-	-	-	1,984	-
2b.1.2.10	Fire Protection RCA	-	185	28	13		68	-	68	363	363	-	-	-	1,002	-	-	-	52,396	2,641	-
2b.1.2.11 2b.1.2.12	HVAC-Auxiliary Building HVAC-Diesel Generator Room	-	575 44	97	64	-	323	-	244	1,303 50	1,303	-	50	-	4,827	-	-	-	250,668	8,352 682	-
2b.1.2.13	HVAC-Miscellaneous	-	42	-	-	-	-	-	6	49		-	49	-	-	-		-	-	656	-
2b.1.2.14	HVAC-Primary Containment	-	696	203	135	-	683	-	385	2,102		-	-	-	10,197	-	-	-	529,451	10,184	-
2b.1.2.15 2b.1.2.16	HVAC-Turbine Building Instrument Air Supply	-	190 47	-	-	-	-	-	28	218 54		-	218 54	-	-	-	-	-	-	3,177 760	-
2b.1.2.16 2b.1.2.17	Instrument Air Supply Instrument Air Supply RCA	-	76	10	5	-	24	-	27	141	141	-	- 54	-	354	-	-		18,493	1,096	-
2b.1.2.18	Miscellaneous Drains	-	44	7	4	-	20	-	17	92	92	-	-	-	299	-	-	-	15,562	663	
2b.1.2.19	Primary Containment Purge	-	317	128	75		377	-	198	1,095		-	-	-	5,614	-	-	-	292,306	5,019	-
2b.1.2.20 2b.1.2.21	Primary Water Radioactive Waste Disposal	503	69 1,049	6 159	3 88		15 446		22 655	115 2,900		-	-	-	218 6,808		-	-	11,425 $345,754$	1,032 22,518	-
2b.1.2.22	Reactor Building Equipment Drains	97	111	17	9		47	-	91	372	372	-	-	-	695	-	-	-	36,107	2,758	
2b.1.2.23	Reactor Building Floor Drains	21		7	4	-	18		29	131		-	-	-	265		-	-	13,801	1,040	-
2b.1.2.24 2b.1.2.25	Reactor Coolant Residual Heat Removal	- 175	194 218	22 49	11 29		55 147		66 188	347 805		-	-	-	812 2,184		-	-	42,440 113,636	2,826 4,279	-
2b.1.2.26	Safety Injection	175	999	230	137		694		188 467	2,527	2,527	-	-		10,622		-		537,761	15,372	
2b.1.2.27	Station Air RCA	-	37	5	2	-	11		13	68	68	-	-	-	169	-	-	-	8,811	531	-
2b.1.2.28	Station Heating RCA	-	124	31	16	-	81	-	57	309		-	-	-	1,209		-	-	63,061	1,826	-
2b.1.2.29 2b.1.2	Waste Oil Sumps RCA Totals	1,763	$\frac{7}{14,240}$	$\frac{1}{2,048}$	1 1,223	-	6,172	-	6,003	15 31,448		-	4,250	-	50 92,465		-	-	2,602 4,784,556	95 237,956	
														-			-	-			
2b.1.3	Scaffolding in support of decommissioning	-	1,701	13	7	-	36	-	437	2,194	2,194	-	-	-	539	-	-	-	27,981	28,306	-

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Activity																					
Index		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	Class A Cu. Feet	Burial V Class B Cu. Feet	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Decontami	nation of Site Buildings																				
2b.1.4.1	Reactor	2,249	1,735	219	357	-	1,399	-	1,983	7,942	7,942	-	-	-	25,577	-	-	-	1,334,819	57,983	
2b.1.4.2	Auxiliary Building Perfecting Woter Storage Tenk	226 413	144 494	20 39	22 19	-	82 87	-	175 358	670 1,410	670	-	-	-	1,329 1,304	-	-	-	83,048 72,865	5,420 13,643	
2b.1.4.3 2b.1.4	Refueling Water Storage Tank Totals	2,888	2,373	278	399	-	1,568	-	2,517	10,022	1,410 10,022	-	-		28,210				1,490,731	77,045	
2b.1	Subtotal Period 2b Activity Costs	4,651	18,314	2,339	1,628	-	7,776	-	8,956	43,664	39,414	-	4,250	-	121,214	-	-	-	6,303,268	343,308	
Period 2b A	Additional Costs																				
2b.2.1	License Termination Survey Planning	-	-	-	-	-	-	993	298	1,291	1,291	-	-	-	-	-	-	-	-	-	6,240
2b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,114	934	4,049	4,049	-	-	-	-	-	-	-	-	49,090	
2b.2.3 2b.2.4	Asbestos Abatement Underground Services Excavation	-	506	-	-	-	-	50	8 76	58 581	58 581	-	-	-	-	-	-	-	-	2,755	-
2b.2.4 2b.2.5	Operational Tools and Equipment	-	500	9	51	-	189	-	56	304	304			-	5,855	-	-		146,375	2,755	
2b.2	Subtotal Period 2b Additional Costs	-	506	9	51	-	189	4,158	1,371	6,283	6,283	-	-	-	5,855	-	-	-	146,375	51,861	
	Collateral Costs																				
2b.3.1	Process decommissioning water waste	135	-	92	246	-	312	-	191	976	976	-	-	-	889	-	-	-	53,334	173	
2b.3.2 2b.3.3	Process decommissioning chemical flush waste Small tool allowance	3	370	107	405	-	672	-	241 55	1,427 425	1,427	-	-	-	1,077	-	-	-	114,790	202	-
2b.3.4	Decommissioning Equipment Disposition	-	570	- 171	94	-	472		149	887	425 887		-		7,054	-			366,237	- 88	
2b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-		23,707	3,556	27,263	-	27,263	-	_		-	_	-		-	_
2b.3	Subtotal Period 2b Collateral Costs	137	370	371	745	-	1,456	23,707	4,193	30,978	3,715	27,263	-	-	9,020	-	-	-	534,361	463	-
	Period-Dependent Costs																				
2b.4.1	Decon supplies	765	-	-	-	-	-	1 000	191	956	956	-	-	-	-	-	-	-	-	-	-
2b.4.2 2b.4.3	Insurance Property taxes	-	-	-	-	-	-	1,232 7,140	123 714	1,355 7,854	1,355 7,854	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,882	-	-	-	-	7,140	720	3,602	3,602	-	-	-	-	-	-		-	-	-
2b.4.5	Heavy equipment rental	-	4,751	_	_	-	-	-	713	5,464	5,464	-	_	_	-	-	-	-	-	-	_
2b.4.6	Disposal of DAW generated	-	-	102	55	-	310	-	96	563	563	-	-	-	4,843	-	-	-	96,855	158	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	3,150	472	3,622	3,622	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,479	148	1,627	1,627	4.000	-	-	-	-	-	-	-	-	-
2b.4.9 2b.4.10	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	4,484 390	448 58	4,932 448	448	4,932	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	934	140	1,074	-	1,074	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	473	71	544	544	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	113	17	130	-	130	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-	-	-	-	-	-	1,415	212	1,627	1,627	-	-	-	-	-	-	-	-	-	27,091
2b.4.15 2b.4.16	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	20,786 $36,157$	3,118 5,424	23,904 $41,581$	23,904 41,581	-	-	-	-	-	-	-	-	-	265,989 495,034
2b.4.16 2b.4	Subtotal Period 2b Period-Dependent Costs	765	7,633	102	- 55	-	310	77,753	12,666	99,284	93,147	6,136	-	-	4,843	-	-	-	96,855	158	
2b.0	TOTAL PERIOD 2b COST	5,553	26,822	2,820	2,479	-	9,731	105,618	27,187	180,209	142,560	33,400	4,250	-	140,932	-	-	-	7,080,860	395,790	794,354
PERIOD 2	2e - Delay before License Termination																				
	Period-Dependent Costs																				
2e.4.1	Insurance	-	-	-	-	-	-	1,412	141	1,554	1,554	-	-	-	-	-	-	-	-	-	-
2e.4.2 2e.4.3	Property taxes Health physics supplies	-	241	-	-	-	-	1,354	135 60	1,489 301	1,489 301	-	-	-	-	-	-	-	-	-	-
2e.4.3 2e.4.4	Disposal of DAW generated	-	∠41 -	- 6	- 3	-	17	-	50 5	301	301	-	-	-	270			-	5,402	- 9	-
2e.4.6	NRC Fees	-	-	-	-	-	-	687	69	756	756	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	5,145	514	5,659	-	5,659	-	-	-	-	-	-	-	-	-
e.4.8	Site O&M Cost	-	-	-	-	-	-	447	67	514	514	·	-	-	-	-	-	-	-	-	-
2e.4.9	ISFSI Operating Costs	-	-	-	-	-	-	129	19	149	1.010	149	-	-	-	-	-	-	-	-	10074
2e.4.10 2e.4.11	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	886 2,721	133 408	1,018 3,129	1,018 3,129	-	-	-	-	-	-	-	-		16,954 39,560
2e.4.11	Subtotal Period 2e Period-Dependent Costs	-	241	6	3	-	17	12,781	1,553	14,601	8,793	5,808	-	-	270	-	-	-	5,402	9	
2e.0	TOTAL PERIOD 2e COST	-	241	6	3	-	17	12,781	1,553	14,601	8,793	5,808	-	-	270	-	-	-	5,402	9	56,514
PERIOD 2	2f - License Termination																				
	Direct Decommissioning Activities																				
2f.1.1 2f.1.2	ORISE confirmatory survey Terminate license	-	-	-	-	-	-	172	52	224 a	224	-	-	-	-	-	-	-	-	-	-

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(*	iio abaiia.	s of 2014 dolla	/											
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
Period 2f A 2f.2.1 2f.2	dditional Costs License Termination Survey Subtotal Period 2f Additional Costs	-	- -	- -	- -		-	6,411 6,411	1,923 1,923	8,334 8,334	8,334 8,334	-		-	-	-	-	-	-	91,892 91,892	
Period 2f C 2f.3.1 2f.3	ollateral Costs DOC staff relocation expenses Subtotal Period 2f Collateral Costs	-	- -	- -	- -	- -	-	1,080 1,080	162 162	1,242 1,242		- -	- -	-	-	-		-	- -	- -	- -
Period 2f P 2f.4.1 2f.4.2	eriod-Dependent Costs Insurance Property taxes	- -			-	-	- -	393 376	39 38	432 414	432 414	:		-	- -	-	- -		-	-	-
2f.4.3 2f.4.4 2f.4.5 2f.4.6	Health physics supplies Disposal of DAW generated Plant energy budget NRC Fees	- - -	548 - - -	7	4	- - -	22 -	268 455	137 7 40 46	685 39 308 501	308 501	- - - -	- - -		337 -	- - -	- - -	- - -	6,734 - -	11 -	- - -
2f.4.7 2f.4.8 2f.4.9 2f.4.10 2f.4.11	Emergency Planning Fees Site O&M Cost ISFSI Operating Costs Security Staff Cost DOC Staff Cost	- - -	- - -	- - -	-		- - -	1,431 124 36 1,578 3,919	143 19 5 237 588	1,574 143 41 1,814 4,507	143 - 1,814 4,507	1,574 - 41 -		-	- - -	- - -	- - -	-	- - -	-	27,893 46,750
2f.4.12 2f.4	Utility Staff Cost Subtotal Period 2f Period-Dependent Costs	-	548	7	4	-	22	5,032 13,611	755 2,053	5,786 16,244	5,786 14,629	1,615	-	- - -	337	-	-	-	6,734	11	60,107 134,750
2f.0	TOTAL PERIOD 2f COST	-	548	7	4	-	22	21,274	4,189	26,044	24,429	1,615	-	-	337	-	-		6,734	91,903	
PERIOD 2 PERIOD 3	TOTALS Bb - Site Restoration	7,703	3 58,590	25,954	15,263	-	55,661	248,780	80,805	492,757	417,605	63,993	11,159	-	455,478	963	393	-	25,074,950	811,463	1,762,565
Period 3b I	Direct Decommissioning Activities																				
3b.1.1.1 3b.1.1.2 3b.1.1.3 3b.1.1.4 3b.1.1.5 3b.1.1.6 3b.1.1.	of Remaining Site Buildings Reactor Auxiliary Building Old Steam Generator Storage Facility Refueling Water Storage Tank Turbine Building Turbine Pedestal Totals	- - - - - -	7,213 6,230 490 1,099 6,069 1,463 22,563			:	- - - - - - -	-	1,082 934 74 165 910 219 3,384	8,294 7,164 564 1,263 6,979 1,682 25,947			8,294 7,164 564 1,263 6,979 1,682 25,947	- - - - -	- - - - - -	- - - - - -	- - - - -			69,541 61,288 4,868 11,688 70,347 12,628 230,359	- - - -
Site Closeo 3b.1.2 3b.1.3 3b.1	ut Activities Grade & landscape site Final report to NRC Subtotal Period 3b Activity Costs	- - -	345 - 22,908	- - -	- - -	- - -	- - -	199 199	52 30 3,466	397 228 26,572		- - -	397 - 26,344	- - -	- - -	- - -	- - -		- - -	869 - 231,229	1,560
Period 3b A 3b.2.1 3b.2.2 3b.2	Additional Costs Concrete Crushing Demolish Cooling Tower Subtotal Period 3b Additional Costs		607 5,877 6,483		-	- -	- - -	4 165 168		702 6,948 7,649	-	- -	702 6,948 7,649		- - -	- - -	- - -	- - -		2,798 73,296 76,093	-
Period 3b (3b.3.1 3b.3	Collateral Costs Small tool allowance Subtotal Period 3b Collateral Costs		301 301	-	-	- -	-	-	45 45	346 346	-	- -	346 346	-	- -	-	-	- -	- -	-	- -
3b.4.1 3b.4.2	Period-Dependent Costs Insurance Property taxes Heavy equipment rental Plant energy budget NRC ISFSI Fees Emergency Planning Fees ISFSI Operating Costs Site O&M Cost Security Staff Cost DOC Staff Cost	- - - - - - -	7,086	: : : : :			- - - - - - -	646 1,239 - 441 314 4,708 118 409 4,955 11,965	65 124 1,063 66 31 471 18 61 743 1,795	711 1,363 8,149 507 346 5,179 136 470 5,699 13,760	- - - - - - 0	711 1,363 - 346 5,179 136 - 4,673	8,149 507 - - 470 1,026 13,760			- - - - - - -					87,294

Table C-1
Byron Nuclear Power Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A		Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	Period-Dependent Costs (continued)																				
3b.4.11 3b.4	Utility Staff Cost Subtotal Period 3b Period-Dependent Costs		7,086	-	-	-	-	7,407 $32,203$	1,111 5,548	8,519 44,838	0	1,619 14,026	6,900 30,812	-	-	-	-	-	-	-	87,294 311,630
3b.0	TOTAL PERIOD 3b COST	-	36,779	-	-	-	-	32,570	10,057	79,406	228	14,026	65,152	-	-	-	-	-	-	307,322	313,190
PERIOD	3c - Fuel Storage Operations/Shipping																				
Period 3c	Direct Decommissioning Activities																				
Period 3c	Collateral Costs																				
3c.3.1 3c.3	Spent Fuel Capital and Transfer Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	9,688 9,688	1,453 $1,453$	11,141 11,141	-	11,141 11,141	-	-	-	-	-	-	-	-	-
		-		-		•	-	3,000	1,400	11,141		11,141	•		-	-	-	-	•		
Period 3c . 3c.4.1	Period-Dependent Costs Insurance	-						3,842	384	4,226		4,226	-	-	-	-			-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	7,366	737	8,103	-	8,103	-	-	-	-	-	-	-	-	-
3c.4.4 3c.4.5	NRC ISFSI Fees Emergency Planning Fees	-	-			-	-	2,423 $27,992$	242 2,799	2,665 30,791		2,665 30,791	-	-	-	-	-				-
3c.4.6	Site O&M Cost	-	-	-	-	-	-	2,432	365	2,797	-	2,797	-	-	-	-	-	-	-	-	-
3c.4.7 3c.4.8	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	704 24,043	106 3,606	809 27,650	-	809 27,650	-	-	-	-	-	-	-	-	415,106
3c.4.9	Utility Staff Cost	-	-	-	-	-	-	8,367	1,255	9,623	-	9,623	-	-	-	-	-	-	-	-	103,930
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	•		77,169	9,494	86,664	-	86,664	-	-	-	-	-	-	-	-	519,036
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	86,857	10,947	97,804	-	97,804	-	-	-	-	-	-	-	-	519,036
PERIOD	3d - GTCC shipping																				
Period 3d	Direct Decommissioning Activities																				
	team Supply System Removal																				
3d.1.1.1 3d.1.1	Vessel & Internals GTCC Disposal Totals	-	-	625 625	-	-	11,996 11,996	-	1,956 1,956	14,577 $14,577$	14,577 14,577	-	-	-	-	-	-	2,217 $2,217$	433,180 433,180	-	-
3d.1.1	Subtotal Period 3d Activity Costs	-	-	625	-	-	11,996	-	1,956	14,577	14,577	-	-	-	-	-	-	2,217	433,180	-	-
Period 3d	Period-Dependent Costs																				
3d.4.1	Insurance	-	-	-	-	-	-	10	1	11	-	11	-	-	-	-	-	-	-	-	-
3d.4.2 3d.4.4	Property taxes Emergency Planning Fees	-		-	-	-		19 73	2 7	21 80	-	21 80	-			-	-		-	-	-
3d.4.5	Site O&M Cost	-	-	-	-	-	-	6	1	7	-	7	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	1.000
3d.4.7 3d.4.8	Security Staff Cost Utility Staff Cost	-	-	-	-	-		63 22	9	72 25	-	72 25	-		-	-	-		-	-	1,080 270
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	194	24	219	-	219	-	-	-	-	-	-	-	-	1,350
3d.0	TOTAL PERIOD 3d COST	-	-	625	-	-	11,996	194	1,980	14,795	14,577	219	-	-	-	-	-	2,217	433,180	-	1,350
PERIOD	3e - ISFSI Decontamination																				
Period 3e	Direct Decommissioning Activities																				
	Additional Costs																				
3e.2.1 3e.2	License Termination ISFSI Subtotal Period 3e Additional Costs	-	207 207	197 197	322 322		893 893	1,503 1,503	781 781	3,903 3,903	3,903 3,903	-	-	-	14,550 $14,550$	-	-	-	1,178,838 1,178,838	11,245 $11,245$	
		-	201	131	522	-	0.50	1,000	701	3,300	0,000	-	-	-	14,000	-	-	-	1,110,000	11,240	1,044
Period 3e 3e.4.1	Period-Dependent Costs Insurance	_	_			_	_	57	14	71	71	_	_	_	_	_			_	_	
3e.4.2	Property taxes	-	-		-	-	-	163	41	204	204	-	-	-	-	-	-	-			-
3e.4.4	Security Staff Cost	-	-	-	-	-	-	144	36	180	180	-	-	-	-	-	-	-	-	-	2,468
3e.4.5 3e.4	Utility Staff Cost Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	155 519	39 130	194 649	194 649	-	-	-	-	-	-	-	-	-	1,870 4,338
3e.0	TOTAL PERIOD 3e COST		207	197	322	_	893	2,022	910		4,552	-			14,550	-		_	1,178,838	11,245	
Je.U	TOTAL FUIOD 96 COST	-	207	197	322	-	093	2,022	910	4,002	4,002	-	-	-	14,000	-	-	-	1,110,038	11,240	0,382

Table C-1 Byron Nuclear Power Station, Unit 1 **DECON Decommissioning Cost Estimate** (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor
PERIOD	3f - ISFSI Site Restoration																				
Period 3f	Direct Decommissioning Activities																				
	Additional Costs		1 100					20	104	1 411			1 411							10 700	00
3f.2.1 3f.2	Site Restoration ISFSI Subtotal Period 3f Additional Costs	-	1,199 1,199	-	-	-	-	28 28	184 184	1,411 1,411	-	-	1,411 1,411	-	-	-	-	-	-	$13,522 \\ 13,522$	80 80
	Collateral Costs																				
3f.3.1 3f.3	Small tool allowance Subtotal Period 3f Collateral Costs	-	18 18	-	-	-	-	-	3	21 21	-	-	21 21	-	-	-	-	-	-	-	-
Period 3f	Period-Dependent Costs																				
3f.4.2	Property taxes	-	-	-	-	-	-	86	9	95	-	-	95	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	109	-	-	-	-		16	125	-	-	125	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	31	5	35	-	-	35	-	-	-	-	-	-	-	-
3f.4.5 3f.4.6	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	76 68	11 10	88 78	-	-	88 78	-	-	-	-	-	-	-	1,307 810
3f.4.6 3f.4	Subtotal Period 3f Period-Dependent Costs		109	-			-	261	51	421	-	-	421		-	-	-	-		-	2,117
3f.0	TOTAL PERIOD 3f COST	-	1,326	-		-	-	288	238	1,852	-		1,852	-	-	-	-	-	-	13,522	2,197
PERIOD	3 TOTALS	-	38,311	822	322	-	12,889	121,932	24,132	198,409	19,357	112,048	67,004	-	14,550	-	-	2,217	1,612,018	332,089	841,156
TOTAL C	COST TO DECOMMISSION	10,924	99,568	26,923	16,035	-	72,646	492,121	125,688	843,904	560,921	203,244	79,740	-	471,323	1,889	393	2,217	26,824,710	1,175,387	3,440,495

TOTAL COST TO DECOMMISSION WITH 17.5% CONTINGENCY:	\$843,904	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 66.47% OR:	\$560,921	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 24.08% OR:	\$203,244	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 9.45% OR:	\$79,740	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	473,605	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	cubic feet
TOTAL SCRAP METAL REMOVED:	56,010	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,175,387	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
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(t	housands	of 2014 dollar	rs)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet		Craft Manhours	Contractor Manhours
PERIOD 1	1a - Shutdown through Transition																				•
Period 1a I	Direct Decommissioning Activities																				
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	71	11	81	81	-	-	-	-	-	-	-	-	-	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 Prepare and submit PSDAR							100	1.0	a	107										050
1a.1.6 1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	$109 \\ 251$	16 38	125 288	125 288	-	-	-	-	-	-	-	-	-	856 1,969
1a.1.7 1a.1.8	Perform detailed rad survey	-	-	-	-	-	-	201	99	200 a	200	-	-	-	-	-	-	-	-	-	1,969
1a.1.9	Estimate by-product inventory							54	8	63	63									_	428
1a.1.10	End product description	_	_	_	-	-	-	54	8	63	63	_	_	_	_	_	_		_	-	428
1a.1.11	Detailed by-product inventory	-	-	-	_	-	-	71	11	81	81	-		-	-	-	-	-	-	-	556
1a.1.12	Define major work sequence	-	-	-	-	-	-	409	61	470	470	-	-	-	-	-	-	-	-	-	3,210
1a.1.13	Perform SER and EA	-	-	-	-	-	-	169	25	194	194	-	-	-	-	-	-	-	-	-	1,327
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	272	41	313	313	-	-	-	-	-	-	-	-	-	2,140
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	223	33	257	257	-	-	-	-	-	-	-	-	-	1,753
1a.1.16	Receive NRC approval of termination plan									a											
Activity Sp	pecifications																				
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	268	40	308	277	-	31	-		-	-	-	-	-	2,106
	Plant systems	-	_	-	-	-	-	227	34	261	235	-	26	-	-	-	-	-	-	-	1,783
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	27	4	31	31	-	-	-	-	-	-	-	-	-	214
1a.1.17.4	Reactor internals	-	-	-	-	-	-	387	58	445	445	-	-	-	-	-	-	-	-	-	3,039
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	354	53	407	407	-	-	-	-	-	-	-	-	-	2,782
	Biological shield	-	-	-	-	-	-	27	4	31	31	-	-	-	-	-	-	-	-	-	214
1a.1.17.7	Steam generators	-	-	-	-	-	-	170	26	196	196	-	-	-	-	-	-	-	-	-	1,335
1a.1.17.8	Reinforced concrete Main Turbine	-	-	-	-	-	-	87	13 3	100 25	50	-	50 25	-	-	-	-	-	-	-	685
1a.1.17.9	Main Condensers	-	-	-	-	-	-	22 22	ა 3	25 25		-	25 25	-	-	-	-	-	-		171 171
	Plant structures & buildings			-	-	-	-	170	26	196	98	-	98	-		-	_		-	-	1,335
	Waste management	-	_	_	_	_	-	251	38	288	288		-	_	_	_	_	-	_	-	1,969
	Facility & site closeout	-	-		-	-	-	49	7	56	28	-	28	-	_	-	-		-	-	385
1a.1.17	Total	-	-	-	-	-	-	2,061	309	2,370	2,087	-	283	-	-	-	-	-	-	-	16,190
Planning &	k Site Preparations																				
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,027
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	76	11	88	88	-	-	-	-	-	-	-	-	-	599
1a.1.21 1a.1.22	Rigging/Cont. Cntrl Envlps/tooling/etc. Procure casks/liners & containers	-	-	-	-	-	-	2,300 67	345 10	2,645 77	2,645 77	-	-	-	-	-	-	-	-		526
1a.1.22 1a.1	Subtotal Period 1a Activity Costs	-	-		-	-	-	9,319	1,398	10,717	10,434	-	283	-	-	-	-		-	-	31,566
								0,010	1,500	10,717	10,101		200								01,000
	Additional Costs							4.800	790	F F00		F F00									
1a.2.1 1a.2	ISFSI Expansion Subtotal Period 1a Additional Costs	-	-	-	-	-	-	4,800 4,800	720 720	5,520 5,520	-	5,520 5,520	-	-	-	-	-		-	-	-
		-		-	-	-	_	4,000	120	0,020	-	5,520	_	-	-	-	_	_	-		
	Collateral Costs																				
1a.3.1 1a.3	Spent Fuel Capital and Transfer Subtotal Period 1a Collateral Costs	-	-	-	-		-	10,066 10,066	1,510 1,510	11,576 11,576	-	11,576 11,576	-	-	-	-	-	-	-	-	
	Period-Dependent Costs																				
1a.4.1	Insurance	_	-	-	_	_		1,855	185	2,040	2,040	_		_		_	_	_		_	_
1a.4.1	Property taxes		-	-	-	-	-	1,000	-	2,040	2,040	-	-	-			-		-	-	-
1a.4.3	Health physics supplies	-	494	4 -	-	-	-	-	124	618	618	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	530		-	-	-	-	80	610	610	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	7	-	39		12	71	71	-	-	-	611	-	-	-	12,224	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,783	267	2,051	2,051	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	836	84	920	920	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,177	218	2,394	-	2,394	-	-	-	-	-	-	-	-	-
1a.4.9	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	- 450	-	-	-	-	-	-	-	-	-
1a.4.10 1a.4.11	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	397 48	59 7	456 55	-	456 55	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-	-	-	-	-	8,569	1,285	9,855	9,855	- -	-	-	-	-	-		-	-	157,903
1a.4.13	Utility Staff Cost	_	_	-	-	_	-	32,368	4,855	37,223	37,223	_		-	_	_	_		-	-	424,560
14.7.10	Comey Dean Cost	•	-	-	-	-	-	52,500	4,000	01,440	01,440	•	-	-	-	-	•	-	-	•	424,0

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

									01 2014 dollar	,											
Activity	T.	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet		Cu. Feet			Manhours	
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,025	13	7	-	39	48,198	7,202	56,483	53,577	2,906	-	-	611	-	-	-	12,224	20	582,463
1a.0	TOTAL PERIOD 1a COST	-	1,025	13	7	-	39	72,383	10,829	84,295	64,011	20,001	283	-	611	-	-	-	12,224	20	614,029
PERIOD	1b - Decommissioning Preparations																				
Period 1b	Direct Decommissioning Activities																				
	Work Procedures							2.50		205	205		20								2.000
1b.1.1.1 1b.1.1.2	Plant systems NSSS Decontamination Flush	-	-	-	-	-	-	258 54	39 8	297 63	267 63	-	30	-					-	-	2,026 428
lb.1.1.3	Reactor internals	-	_	-	-	-	-	136	20	157	157	-	-	-	-	_	-	-	-	-	1,070
lb.1.1.4	Remaining buildings	-	-	-	-	-	-	74	11	85	21	-	63	-	-	-	-	-	-	-	578
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	54	8	63	63	-	-	-	-	-	-	-	-	-	428
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	54	8	63	63	-	-	-	-	-	-	-	-	-	428
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	54	8	63	63	-	-	-	-	-	-	-	-	-	428
1b.1.1.8	Reactor vessel Facility closeout	-	-	-	-	-	-	198 65	30 10	227 75	227 38	-	38	-	-	-	-	-	-	-	1,554
1b.1.1.9 1b.1.1.10	· · · · · · · · · · · · · · · · · · ·	-	-	-	-	-	-	25	4	28	28	-	90	-	-	-	-	-	-	-	514 193
1b.1.1.11	Biological shield	-	-	-				65	10	75	75	-		-	-		-	-		-	514
1b.1.1.12		_	-	-		_	_	251	38	288	288	_	-	-	-	_	-	_	_	_	1,969
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	54	8	63	31	-	31	-	-	-	-	-	-	-	428
1b.1.1.14	Main Turbine	-	-	-	-	-	-	85	13	98	-	-	98	-	-	-	-	-	-	-	668
1b.1.1.15		-	-	-	-	-	-	85	13		-	-	98	-	-	-	-	-	-	-	668
1b.1.1.16		-	-	-	-	-	-	149	22	171	154	-	17	-	-	-	-	-	-	-	1,168
1b.1.1.17 1b.1.1	Reactor building Total	-	-	-	-	-	-	149 1,812	$\frac{22}{272}$	171 2,083	154 1,691	-	17 392	-	-		-		-		1,168 14,228
10.1.1	Total	-	•		-		-	1,012	212	2,000	1,001	-	332	-		•	-	•	•		14,220
1b.1.2 1b.1	Decon primary loop Subtotal Period 1b Activity Costs	694 694	-	-	-	-	-	1,812	347 619	1,040 $3,124$	1,040 $2,732$	-	392	-	-	-	-	-	-	1,067 1,067	14,228
Period 1b	Additional Costs																				
1b.2.1	Site Characterization	-	-	-	-	-	-	2,755	827	3,582	3,582	-	-	-	-	-	-	-	-	13,042	4,640
1b.2.2	Spent Fuel Pool Isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	13,568	2,448	16,016	16,016	-	-	-	-	-	-	-	-	13,042	4,640
	Collateral Costs	200							100	1.010	1.010										
1b.3.1	Decon equipment	886	-	-	-	-	-	1 000	133	1,019	1,019	-	-	-	-	-	-	-	-	-	-
1b.3.2 1b.3.3	DOC staff relocation expenses Process decommissioning water waste	51	-	34	90	-	- 114	1,080	162 71	1,242 360	1,242 360	-	-	-	325	-	-	•	19,489	- 63	-
1b.3.4	Process decommissioning water waste Process decommissioning chemical flush waste	2		84		-	3,550		944	4,895	4,895	-	-	-	-	839	-	-	89,417	157	-
1b.3.5	Small tool allowance		2		-	-	-	-	0		2			-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,500	-	-	-	-	-	-	225	1,725	1,725	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	1 100	-	-	-	-	5,033	755	5,788	-	5,788	-	-	-	-	-	-	100.000	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,440	1,102	117	405	-	3,664	6,113	2,455	16,296	10,508	5,788	-	-	325	839	-	-	108,906	220	-
	Period-Dependent Costs	0.5							-	0.4	9.4										
1b.4.1	Decon supplies	27		-	-	-	-	706	7 71	34 776	34 776	-	-	-	-	-	-	-	-	-	-
1b.4.2 1b.4.3	Insurance Property taxes	-	-	-	-	-	•	8,270	827	9,097	9,097	-	-	-	-	-	-	-	-	-	-
1b.4.3 1b.4.4	Health physics supplies		277	-		-	-	- 0,210	69	347	347		-	-	-	-	-	-		-	-
1b.4.5	Heavy equipment rental	_	265	_	_	_	-		40	305	305	_	-	_	-	_	-	-	-	_	_
1b.4.6	Disposal of DAW generated	-	-	8	4	-	23	-	7	42	42	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	1,783	267	2,051	2,051	-	-	-	-	-	-	-	-	-	-
lb.4.8	NRC Fees	-	-	-	-	-	-	234	23	257	257		-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,088	109	1,197	-	1,197	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	83 198	12 30	95 228	95	-	-	-	-	-	-	-	-	-	-
1b.4.11 1b.4.12	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	198	30 4	228 28		228 28	-	-		-		-	-	-	-
lb.4.12	Security Staff Cost	-	-	-	-	-	-	4,285	643	4,927	4,927	- 20	-	-			-		-	-	78,951
1b.4.14	DOC Staff Cost	-	-	-	-	-	-	5,535	830	6,365	6,365	-	-	-					-		63,789
1b.4.15	Utility Staff Cost	-	-	-	-	-	-	16,249	2,437	18,687	18,687	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	27	543	8	4	-	23	38,455	5,376	44,436	42,983	1,453	-	-	358	-	-	-	7,159	12	
1b.0	TOTAL PERIOD 1b COST	3,160	1,645	125	409	_	3,687	59,947	10,899	79,872	72,239	7,241	392	-	683	839	-	_	116,066	14,341	374,934

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

									s of 2014 dollar												
Activity Index Activit	y 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	Class A	Burial Class B	Class C	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1 TOTALS	•	3,160	2,669	138	416		3,726	132,330	21,728	164,167	136,250	27,242	675	-	1,294	839	-	-	128,289	14,361	988,963
PERIOD 2a - Large Component Re	noval																				
Period 2a Direct Decommissioning Acti	vities																				
Nuclear Steam Supply System Remova 2a.1.1.1 Reactor Coolant Piping 2a.1.1.2 Pressurizer Relief Tank 2a.1.1.3 Reactor Coolant Pumps & 2a.1.1.4 Pressurizer 2a.1.1.5 Steam Generators 2a.1.1.6 CRDMs/ICIs/Service Struct 2a.1.1.7 Reactor Vessel Internals 2a.1.1.8 Reactor Vessel 2a.1.1 Totals	Motors	199 38 120 56 451 188 168 134 1,353	168 34 122 69 4,496 343 3,171 5,347 13,749	34 7 146 532 2,454 230 8,521 2,459 14,383	48 10 213 116 2,958 60 1,751 1,176 6,332	- - - -	252 47 1,390 879 10,512 188 8,242 2,847 24,356	- - - - - - 327 327 654	215 41 485 336 4,667 258 9,200 6,458 21,660	917 176 2,476 1,988 25,538 1,266 31,380 18,747 82,489	917 176 2,476 1,988 25,538 1,266 31,380 18,747 82,489	- - - - - - - -	- - - - - - - - -		1,708 329 4,796 3,033 62,711 3,881 1,878 9,361 87,696	- - - - - 963 - 963	- - - - - 393 - 393		195,190 36,553 780,540 284,696 3,280,862 145,494 329,968 960,884 6,014,187	5,503 1,072 4,291 2,482 23,233 7,976 31,267 31,267 107,091	100 938 3,500 1,383 1,383 7,303
Removal of Major Equipment 2a.1.2 Main Turbine/Generator 2a.1.3 Main Condensers			683 1,344	3,092 1,828	1,094 998	- -	3,337 5,039	-	1,478 1,928	9,684 11,138	9,684 11,138	- -	-	-	57,484 75,240	-	- -	- -	2,984,647 3,906,532	10,371 20,428	- -
Cascading Costs from Clean Building II 2a.1.4.1 Reactor 2a.1.4.2 Auxiliary Building 2a.1.4.3 Radwaste/Service Building 2a.1.4.4 Refueling Water Storage II 2a.1.4.5 Fuel Handling Building 2a.1.4 Totals	3	- - - - -	1,250 702 456 122 360 2,890	: : : :	- - - - -	- - - - -	- - - - -	- - - -	188 105 68 18 54 434	1,438 807 525 140 414 3,324	1,438 807 525 140 414 3,324	- - - - -	- - - - -		- - - - -	- - - - -	- - - -	- - - - -	- - - - -	12,130 6,896 5,060 1,299 3,690 29,074	- - - - -
Disposal of Plant Systems 2a.1.5.1 Auxiliary Feedwater 2a.1.5.2 Auxiliary Steam CA 2a.1.5.3 Auxiliary Steam RCA 2a.1.5.4 Boric Acid Processing 2a.1.5.5 CO2 & H2 RCA 2a.1.5.6 CD2 & H2 RCA 2a.1.5.8 Chilled Water 2a.1.5.9 Circulating Water 2a.1.5.10 Condensate		500 - - - - -	74 134 368 531 18 35 169 94 608	- 69 82 - 7	36 47 - 4		183 238 - 18		11 20 150 458 3 14 25 14 91	85 154 805 1,855 21 78 195 108 700 392	- 805 1,855 - 78 - -	- - - - - - -	85 154 - - 21 - 195 108 700 392		2,714 3,611 276				141,487 184,114 - 14,104 - -	1,143 2,107 5,387 14,498 289 492 2,663 1,454 9,669 5,317	
2a.1.5.10 2a.1.5.11 Condensate Booster 2a.1.5.12 Condensate Cleanup 2a.1.5.13 Containment Spray 2a.1.5.14 Diesel Fuel Oil 2a.1.5.15 Essential Service Water 2a.1.5.16 Extraction Steam 2a.1.5.17 Feedwater 2a.1.5.18 Feedwater Drains 2a.1.5.19 Gland Steam 2a.1.5.20 Gland Water			341 340 186 259 185 320 229 310 736 39 28	81	46 - - - - - - -		231 - - - - - - - -		51 28 138 28 48 48 34 47 110 6	391 214 755 213 368 263 357 846 44	- - 755 - - - - - - -	-	391 214 - 213 368 263 357 846 44		3,455 - - - - - - - -	- - - - - - - -	-		179,291 	5,314 3,000 3,839 2,848 5,049 3,637 4,925 11,719 616 458	
2a.1.5.21 Main Steam 2a.1.5.22 Main Steam RCA 2a.1.5.23 Make-up Demineralizer 2a.1.5.24 Nitrogen 2a.1.5.25 Non-Essential Service Wa 2a.1.5.26 Non-Essential Service Wa 2a.1.5.27 Off Gas		- - - - -	316 87 159 1 370 184 762	21 - - - - 81 163	13 - - - 50 95	- - - - -	64 - - 251 478	- - - - -	47 42 24 0 56 124 340	363 225 183 1 426 690 1,838	225 - - - - 690 1,838	- - - - -	363 - 183 1 426 -	- - - - -	947 - - 3,738 7,112	- - - - -		- - - - -	49,262 - - 194,273 370,343	4,979 1,292 2,595 18 5,903 2,692 11,479	- - - - -
2a.1.5.28 Potable Water 2a.1.5.29 Process Radiation Monitor 2a.1.5.30 Process Sampling 2a.1.5.31 Sewage Treatment Plant 2a.1.5.32 Station Air 2a.1.5.33 Station Heating 2a.1.5.34 Steam Humidification 2a.1.5.35 Switchgear Heat Removal 2a.1.5.36 Turbine Bldg Equip Drain 2a.1.5.37 Turbine Bldg Floor Drains			5 77 169 98 44 151 7 33 79	4 14	2 8 - - - -		9 41	- - - - - -	1 22 55 15 7 23 1 5 12 20	6 114 287 113 51 174 8 38 91	114 287 - - - - -	- - - - - - -	6 - - 113 51 174 8 38 91 156	- - - - - - -	134 615 - - - -	- - - - - - -	- - - - - - -	- - - - - - -	7,021 31,992	75 1,219 2,649 1,579 705 2,391 115 519 1,235 2,117	

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(01 2014 uona	/											
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	Class A Cu. Feet	Burial V Class B	Volumes Class C Cu. Feet	GTCC	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
			0000	00000	00000	00000	00000	COSCS	convingency	00000	00000	0000	0.000	0417000	04.1000	04.1000	04,1000	04,1000	1101, 2001	iii diii dii b	Manifold
Disposal of 2a.1.5.38	f Plant Systems (continued) Turbine Oil	_	85		_				13	98		_	98						_	1,359	_
2a.1.5.39	Turbine-Generator Auxilaries	-	57		-			-	9	66	-	-	66	-		-		-	-	884	-
2a.1.5.40	Waste Oil Sumps	-	33	-	-	-	-	-	5	38	-	-	38	-	-	-	-	-	-	517	-
2a.1.5.41 2a.1.5	Well Water Totals	500	80 7,938	522	299		1,512	-	12 2,163	93 12,934	6,647	-	93 6,286	-	22,603	-	-	-	1,171,887	1,247 129,991	-
2a.1.6	Scaffolding in support of decommissioning	-	1,643	14	7	-	37		422	2,124	2,124	-	-	-	556	-	-	-	28,884	27,326	-
2a.1	Subtotal Period 2a Activity Costs	1,854	28,247	19,839	8,731	-	34,282	654	28,086	121,692	115,406	-	6,286	-	243,579	963	393	-	14,106,140	324,281	7,303
	Additional Costs																				
2a.2.1 2a.2.2	Remedial Action Surveys Asbestos Abatement	-	-	-	-	-		2,161 50	648 8	2,809 58	2,809 58		-			-		-	-	34,055	-
2a.2.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,211	656	2,866	2,866	-	-	-	-	-	-	-	-	34,055	-
Period 2a (Collateral Costs																				
2a.3.1	Process decommissioning water waste	119	-	79	211	-	267	-	166	842	842	-	-	-	762	-	-	-	45,715	149	-
2a.3.2	Process decommissioning chemical flush waste	0	- 363	21	77	-	128	-	46	273 418	273 376	-	42	-	206	-	-	-	21,943	39	-
2a.3.3 2a.3.4	Small tool allowance Spent Fuel Capital and Transfer	-	-	-		-	-	16,446	$ \begin{array}{r} 54 \\ 2,467 \end{array} $	18,913	-	18,913	42			-			-	-	-
2a.3	Subtotal Period 2a Collateral Costs	119	363	100	288	-	396	16,446	2,733	20,446	1,490	18,913	42	-	968	-	-	-	67,658	187	-
Period 2a l	Period-Dependent Costs																				
2a.4.1	Decon supplies	89	-	-	-	-	-		22	111	111	-	-	-	-	-	-	-	-	-	-
2a.4.2 2a.4.3	Insurance Property taxes	-	-	-	-	-		1,737 20,311	174 2,031	1,911 22,342	1,911 20,108	-	2,234	-		-			-	-	-
2a.4.4	Health physics supplies	-	2,464	-	-	-	-	-	616	3,080	3,080	-	-,201	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental Disposal of DAW generated	-	3,329	- 96	- 52	-	- 293	-	499 91	3,829	3,829 531	-	-	-	4,569	-	-	-	01.976	- 140	-
2a.4.6 2a.4.7	Plant energy budget	-	-	-	- 52	-	295	2,768	415	531 3,183	3,183	-	-		4,009				91,376	149	-
2a.4.8	NRC Fees	-	-	-	-	-	-	714	71	785	785	-	-	-	-	-	-	-	-	-	-
2a.4.9 2a.4.10	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	3,111 270	311 41	3,422 311	311	3,422	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	648	97	745	-	745	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	78 11,814	12 1,772	90 13,587	13,587	90	-	-	-	-	-	-	-	-	216,134
2a.4.13 2a.4.14	DOC Staff Cost	-	-	-	-	-		21,774	3,266	25,040	25,040	-	-	-		-	-	-	-	-	259,703
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	37,088	5,563	42,651	42,651	-	-	-	-	-	-	-	-	-	483,526
2a.4	Subtotal Period 2a Period-Dependent Costs	89	5,794	96	52	-	293	100,313	14,982	121,618	115,126	4,257	2,234	-	4,569	-	-	-	91,376	149	959,363
2a.0	TOTAL PERIOD 2a COST	2,061	34,404	20,035	9,072	-	34,970	119,625	46,456	266,622	234,889	23,170	8,562	-	249,116	963	393	-	14,265,170	358,673	966,666
	2b - Site Decontamination Direct Decommissioning Activities																				
	•																				
Disposal of 2b.1.1.1	f Plant Systems Chemical & Volume Control	903	1,199	153	81		407		880	3,622	3,622				6,063		_	-	315,292	29,388	
2b.1.1.1 2b.1.1.2	Chilled Water RCA	-	667	168	93	-	470	-	315	1,713	1,713	-	-	-	7,000	-	-	-	364,517	9,521	-
2b.1.1.3	Component Cooling	-	709	209	119	-	600	-	366	2,002	2,002	-		-	8,936	-	-	-	464,778	10,502	-
2b.1.1.4 2b.1.1.5	Electrical Electrical - Contaminated	-	4,261 1,948	181	120	-	608	-	639 675	4,900 3,533	3,533		4,900		9,079	-		-	471,393	66,259 29,048	-
2b.1.1.6	Electrical - Contaminated	-	2,529	424	272	-	1,372	-	1,058	5,655	5,655	-	-	-	20,491				1,063,899	38,351	-
2b.1.1.7	Emergency Diesel Generator	-	96	-	-	-	-	-	14	111	-	-	111	-	- 0.550	-	-		-	1,514	-
2b.1.1.8 2b.1.1.9	Essential Service Water RCA Fire Protection	-	345 315	195	119	-	601	-	274 47	1,535 362	1,535	-	362		8,972	-	-	-	466,273	5,336 4,983	-
2b.1.1.10	Fire Protection RCA	-	537	143	83	-	419	-	266	1,447	1,447	-	-	-	6,243	-	-	-	324,808	7,672	-
2b.1.1.11 2b.1.1.12	HVAC-Auxiliary Building HVAC-Control Room HVAC	-	626 8	108	72	-	361	-	268	1,435 9	1,435	-	- 9	-	5,390	-	-	-	279,889	9,167 127	
2b.1.1.12 2b.1.1.13	HVAC-Diesel Generator Room	-	44	-			-	-	7	51	-	-	51	-	-	-		-	-	686	-
2b.1.1.14	HVAC-Laboratory	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	315	-
2b.1.1.15 2b.1.1.16	HVAC-Machine Shop HVAC-Primary Containment	-	18 696	203	135		683	-	3 385	$\frac{21}{2,102}$	2,102	-	21	-	10,197	-	-	-	529,451	297 10,184	-
2b.1.1.17	HVAC-Pumphouse	-	18	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	275	-
2b.1.1.18	HVAC-Radwaste	-	361	63	42	-	213	-	156	835	835	-	- 917	-	3,177	-	-	-	164,931	5,099	-
2b.1.1.19	HVAC-Turbine Building	-	189	-	-	-	-	-	28	217	-	-	217	-	-	-	-	-	-	3,158	-

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							`		5 01 2014 dolla.	•											
Activity		Decon		Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Disposal o	of Plant Systems (continued)																				
2b.1.1.20	Instrument Air Supply	-	73	-	-	-	-	-	11	84	-	-	84	-	-	-	-	-	-	1,197	-
2b.1.1.21	Instrument Air Supply RCA	-	249	29	13	-	68	-	84	443	443	-	-	-	1,002	-	-	-	52,414	3,630	-
2b.1.1.22	Miscellaneous Drains	-	84	14	8	-	40	•	34	179	179	-	-	-	592	-	-	-	30,841	1,259	
2b.1.1.23 2b.1.1.24	Primary Containment Purge Primary Water	-	334 929	128 218	74 133	-	375 670	-	201 441	1,113 2,391	1,113 2,391	-	-	-	5,582 $10,451$	-	-	-	290,664 519,324	5,256 14,343	
2b.1.1.24 2b.1.1.25	Radioactive Waste Disposal	2,814	3,053	478	270	-	1,365		2,600	10,580	10,580		-	-	20,695	-	-		1,058,144	83,019	
2b.1.1.26	Reactor Bldg Equipment Drains	123	121	23	13	_	67		113	460	460	_	-	-	997	-	-	-	51,818	2,929	_
2b.1.1.27	Reactor Building Floor Drains	21	46	6	3	-	16	-	27	120	120	-	-	-	245	-	-	-	12,768	948	-
2b.1.1.28	Reactor Coolant	-	184	20	10	-	51	-	62	328	328	-	-	-	763	-	-	-	39,871	2,697	-
2b.1.1.29	Residual Heat Removal	163	211	47	28	-	143	-	179	771	771	-	-	-	2,129	-	-	-	110,771	4,042	
2b.1.1.30	Safety Injection	-	971	224	134	-	676	-	454	2,460	2,460	-	-	-	10,357	-	-	-	523,998	14,960	
2b.1.1.31	Station Air RCA	-	58	8	4	-	19	-	21	110	110	-	-	-	283	-	-	-	14,808	833	
2b.1.1.32 2b.1.1.33	Station Heating RCA Waste Oil Sumps RCA	-	253 26	56 4	31 2	-	156 10	-	112 10	607 52	607 52	-	-	-	2,315 149	-	-	-	120,573 $7,762$	3,664 370	
2b.1.1.34	Waste Water Treatment		91	-			-		14		- 52		105		149		-		1,102	1,464	
2b.1.1	Totals	4,024	21,269	3,101	1,860	_	9,390	-	9,752	49,396	43,492	_	5,904	_	141,109	-	_		7,278,986	372,493	
20.1.1	100010	1,021	21,200	3,101	1,000		0,000		0,102	10,000	10,102		3,001		111,100				1,210,000	0. 2 ,100	
2b.1.2	Scaffolding in support of decommissioning	-	2,054	17	9	-	47	-	528	2,654	2,654	-	-	-	695	-	-	-	36,104	34,158	-
Decontam	ination of Site Buildings																				
2b.1.3.1	Reactor	2,249	1,735	219	357	-	1,399	-	1,983	7,942	7,942	-	-	-	25,577	-	-	-	1,334,819	57,983	-
2b.1.3.2	Auxiliary Building	266	176	21	28	-	94	-	207	792	792	-	-	-	1,545	-	-	-	101,702	6,427	-
2b.1.3.3	Radwaste/Service Building	175	81	9	19	-	55	-	125	464	464	-	-	-	988	-	-	-	68,359	3,692	
2b.1.3.4	Refueling Water Storage Tank	413	494	39	19	-	87	-	358	1,410	1,410	-	-	-	1,304	-	-	-	72,865	13,643	
2b.1.3	Totals	3,103	2,486	288	423	-	1,635	-	2,674	10,608	10,608	-	-	-	29,413	-	-	-	1,577,745	81,745	-
2b.1	Subtotal Period 2b Activity Costs	7,127	25,808	3,406	2,292	-	11,071	-	12,954	62,659	56,754	-	5,904	-	171,217	-	-	-	8,892,835	488,395	-
	Additional Costs																				
2b.2.1	License Termination Survey Planning	-	-	-	-	-	-	993	298	1,291	1,291	-	-	-	-	-	-	-	-	40.022	6,240
2b.2.2 2b.2.3	Remedial Action Surveys Asbestos Abatement	-	-	-	-	-		3,111 50	933 8	4,044 58	4,044 58	-	-	-	-	-	-	-	-	49,033	-
2b.2.3 2b.2.4	Underground Services Excavation	-	506	-	-	-	-	-	76		581	-	-	-	-	-	-		-	2,755	
2b.2.5	Operational Tools and Equipment	_	-	9	51	_	189	-	56	304	304	_	-	-	5,855	-	-		146,375	16	
2b.2	Subtotal Period 2b Additional Costs	-	506	9	51	-	189	4,154		6,279	6,279	-	-	-	5,855	-	-	-	146,375	51,804	
Period 2b	Collateral Costs																				
2b.3.1	Process decommissioning water waste	186	-	128	341	_	432	-	265	1,351	1,351	-		_	1,230	-	-		73,805	240	-
2b.3.2	Process decommissioning chemical flush waste	5	-	195	735	-	1,218	-	437	2,589	2,589	-	-	-	1,954	-	-	-	208,231	366	
2b.3.3	Small tool allowance	-	524	-	-	-	-	-	79	603	603	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	23,680		27,232	-	27,232	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	191	524	322	1,075	-	1,650	23,680	4,332	31,774	4,542	27,232	-	-	3,184	-	-	-	282,036	606	-
Period 2b	Period-Dependent Costs																				
2b.4.1	Decon supplies	840	-	-	-	-	-	-	210	1,050	1,050	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,230		1,353	1,353	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-		-	-	-	-	7,119		7,831	7,831	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	3,644	-	-	-	-	-	911	4,554	4,554	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,746	- 104	- 50	-	400	-	712		5,458	-	-	-	- 0.050	-	-	-	105 505	-	-
2b.4.6 2b.4.7	Disposal of DAW generated Plant energy budget	-	-	134	72	-	409	3,146	$\frac{126}{472}$	742 3,618	742 3,618	-	-	-	6,378	-	-	-	127,567	208	-
2b.4.7 2b.4.8	NRC Fees	-	-	-	-	-	-	1,028		1,131	1,131	-	-	-	-	-	-	-	-	-	-
2b.4.8 2b.4.9	Emergency Planning Fees	-	-	-	-	-		4,479		4,927	1,151	4,927	-	-		-			-	-	-
2b.4.10	Site O&M Cost	-	-	-		-	-	389	58	448	448	-	-	-	-	-	-	-		-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,731	260	1,990	-	1,990	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	473		544	544	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	113		130	-	130	-	-	-	-	-	-	-	-	
2b.4.14	Security Staff Cost	-	-	-	-	-	-	17,010		19,562	19,562	-	-	-	-	-	-	-	-	-	311,190
2b.4.15	DOC Staff Cost	-	-	-	-	-	-	30,085		34,598	34,598	-	-	-	-	-	-	-	-	-	359,160
2b.4.16 2b.4	Utility Staff Cost Subtotal Period 2b Period-Dependent Costs	840	8,389	134	72	-	409	51,315 118,118		59,012 146,947	59,012 139,901	7,046	-	-	6,378	-	-	-	127,567	208	666,660 1,337,010
40.4		640	0,009	134	12	-	409	110,118	10,984	146,947	108,861	7,046	-	-	0,318	-	-	-	141,007	208	1,557,010
2b.0	TOTAL PERIOD 2b COST	8,158	35,227	3,871	3,491	-	13,318	145,952	37,641	247,658	207,476	34,278	5,904	-	186,635	-	-	-	9,448,813	541,013	1,343,250

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(t	housands	s of 2014 dollar	rs)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	2d - Decontamination Following Wet Fuel Storage																				
Period 2d 2d.1.1	Direct Decommissioning Activities Remove spent fuel racks	1,257	123	344	140	-	705	-	891	3,459	3,459	-	-	-	10,524	-	-	-	546,426	2,174	-
Disposal o	f Plant Systems																				
2d.1.2.1 2d.1.2.2	Fuel Handling Bldg Equip Drains Fuel Handling Bldg Equip Drains (Unit 1)	-	184 33		18 2		91 9	-	75 11	399 58	399 58	-	-	-	1,386 129	-	-	-	70,185 6,739	2,721 479	-
2d.1.2.2 2d.1.2.3	Fuel Handling Bldg Floor Drains (Omt 1)		188		16		82	-	73	390	390	-	-		1,241	-	-	-	63,725	2,768	-
2d.1.2.4	Fuel Handling Bldg Floor Drains (Unit 1)	-	132				58		51	273	273	-	-	-	874	-	-	-	44,626	1,978	-
2d.1.2.5 2d.1.2.6	Fuel Pool Cooling & Cleanup Fuel Pool Cooling & Cleanup (Unit 1)	-	250 232		26 25		133 124		104 97	560 521	560 521		-		1,989 1,857	-			103,404 96,476	3,712 3,463	-
2d.1.2.7	HVAC-Miscellaneous	-	112	-	-	-	-	-	17	128	-	-	128		-	-	-	-	-	1,769	-
2d.1.2	Totals	-	1,130	176	98	-	497	-	428	2,330	2,201	-	128	-	7,476	-	-	-	385,156	16,890	-
	ination of Site Buildings																				
2d.1.3.1 2d.1.3	Fuel Handling Building Totals	1,179 1,179				-	$257 \\ 257$	-	1,016 1,016	3,989 3,989	3,989 3,989	-	-		3,927 3,927	-	-	-	231,371 231,371	38,266 38,266	-
20.1.5		1,173			01		201		,		,	-	-	-		-		-			•
2d.1.4	Scaffolding in support of decommissioning	-	411	3	2	-	9	-	106	531	531	-	-	-	139	-	-	-	7,221	6,832	-
2d.1	Subtotal Period 2d Activity Costs	2,436	3,037	626	301	-	1,468	-	2,441	10,308	10,180	-	128	-	22,066	-	-	-	1,170,174	64,161	-
	Additional Costs																				
2d.2.1 2d.2	Remedial Action Surveys Subtotal Period 2d Additional Costs		-	-		-	-	914 914		1,188 1,188	1,188 1,188	-	-	-	-	-	-	-	-	14,408 14,408	-
		-	-	_	-	_	_	314	214	1,100	1,100	-	-	_	-	-	-	_	_	14,400	-
Period 2d 2d.3.1	Collateral Costs Process decommissioning water waste	115	_	80	212		269	_	165	841	841				767				46,017	150	
2d.3.3	Small tool allowance	-	90		-	-	-	-	13	103		-	-		-	-	-	-	-	-	-
2d.3.4 2d.3	Decommissioning Equipment Disposition Subtotal Period 2d Collateral Costs	- 115	90	171 251	94 306		472 742		149 327	887 1,831	887 1,831	-	-	-	7,054 7,821	-	-	-	366,237 $412,254$	88 238	
20.5	Subtotal Feriou 2d Conateral Costs	110	30	201	300	-	142	-	327	1,001	1,001	-	-	•	1,021	-	•	-	412,204	250	-
	Period-Dependent Costs	174							49	917	917										
2d.4.1 2d.4.2	Decon supplies Insurance	174		-	-	-		361	43 36	217 397	217 397	-	-			-			-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	346		381	381	-	-	-	-	-	-	-	-	-	-
2d.4.4 2d.4.5	Health physics supplies Heavy equipment rental	-	670 1,394		-	-		-	168 209	838 1,604	838 1,604		-			-			-	-	-
2d.4.6	Disposal of DAW generated	-	-	32	17	-	97	-	30	175	175	-	-		1,508	-	-	-	30,168	49	-
2d.4.7 2d.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	493 253	74 25	567 279	567 279	-	-	-	-	-	-	-	-	-	-
2d.4.8 2d.4.9	Emergency Planning Fees	-	-	-	-	-		1,316		1,448		1,448	-			-	-	-	-	-	-
2d.4.10	Site O&M Cost	-	-	-	-	-	-	114		132		-	-	-	-	-	-	-	-	-	-
2d.4.11 2d.4.12	Liquid Radwaste Processing Equipment/Services ISFSI Operating Costs	-	-	-		-		278 33		320 38		- 38	-			-	-	-			-
2d.4.13	Security Staff Cost	-	-	-	-	-	-	2,733	410	3,143	3,143	-	-	-	-	-	-	-	-	-	48,070
2d.4.14 2d.4.15	DOC Staff Cost Utility Staff Cost	-	-	-	•	-	-	6,076 11,110	911 1,666	6,987 12,776	6,987 12,776	-	-		-	-	-	-	-	-	72,286 138,066
2d.4.15 2d.4	Subtotal Period 2d Period-Dependent Costs	174		32	17	-	97	23,114	3,803	29,301	27,816	1,486	-	-	1,508	-	-	-	30,168	49	258,421
2d.0	TOTAL PERIOD 2d COST	2,724	5,192	909	624	-	2,306	24,028	6,846	42,629	41,015	1,486	128	-	31,395	-	-	-	1,612,596	78,856	258,421
PERIOD	2f - License Termination																				
Period 2f I	Direct Decommissioning Activities																				
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-		
2f.1.2 2f.1	Terminate license Subtotal Period 2f Activity Costs	-	-	-	-	-	-	172	52	a 224	224	-	-	-	-	-	-	-	-	-	-
Period 2f	Additional Costs																				
2f.2.1	License Termination Survey	-	-	-	-	-	-	8,763		11,392	11,392	-	-	-	-	-	-	-	-	128,776	
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	8,763	2,629	11,392	11,392	-	-	-	-	-	-	-	-	128,776	
	Collateral Costs																				
2f.3.1 2f.3	DOC staff relocation expenses Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,080 1,080		1,242 $1,242$			-	-	-	-	-	-	-	-	-
41.0	Bublotal Feriou 21 Collateral Costs	-	-	-	-	-	-	1,080	102	1,442	1,242	-	-	-	-	-	-	-	-	-	-

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(0.	nousunus	of 2014 dolla	13)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed	-	Burial V			Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet		Craft Manhours	Contractor Manhours
Period 2f	Period-Dependent Costs																				
2f.4.1	Insurance	-	-	-	-	-	-	393	39	432	432	-	-	-	-	-	-	-	-	-	-
2f.4.2 2f.4.3	Property taxes Health physics supplies	-	- 650	-	-	-	-	376	38 163	414 813	414 813	-	-	-	-	-	-	-	-	-	-
2f.4.3 2f.4.4	Disposal of DAW generated		690	7	- 4	-	- 22	-	165 7	39	39			-	337	-			6,734	- 11	
2f.4.5	Plant energy budget	-	-		-	-	-	268	40	308	308	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	302	30	333	333	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	1,431	143	1,574	- 140	1,574	-	-	-	-	-	-	-	-	-
2f.4.8 2f.4.9	Site O&M Cost ISFSI Operating Costs	-	-	-	-	-	-	124 36	19 5	143 41	143	41	-	-	-	-	-	-	-	-	-
2f.4.10	Security Staff Cost	-	_	-	-	-	-	1,578	237	1,814	1,814	-	-	_	_	_	_	-	-	-	27,893
2f.4.11	DOC Staff Cost	-	-	-	-	-	-	3,919	588	4,507	4,507	-	-	-	-	-	-	-	-	-	46,750
2f.4.12	Utility Staff Cost	-	-	-	-	-	-	5,032	755	5,786	5,786		-	-	-	-	-	-	-	-	60,107
2f.4	Subtotal Period 2f Period-Dependent Costs	-	650	7	4	-	22	13,458	2,063	16,204	14,589	1,615	-	-	337	-	-	-	6,734	11	134,750
2f.0	TOTAL PERIOD 2f COST	-	650	7	4	-	22	23,473	4,905	29,062	27,447	1,615	-	-	337	-	-	-	6,734	128,787	137,870
PERIOD	2 TOTALS	12,943	75,473	24,822	13,190	-	50,616	313,078	95,848	585,970	510,826	60,549	14,595	-	467,483	963	393	-	25,333,320	1,107,328	2,706,208
PERIOD	3b - Site Restoration																				
Period 3b	Direct Decommissioning Activities																				
	on of Remaining Site Buildings																				
3b.1.1.1	Reactor Aux Feedwater-Steam Tunnel/Penetr. Area	-	7,213	-	-	-	-	-	1,082	8,294	-	-	8,294	-	-	-	-	-	-	69,541	-
3b.1.1.2 3b.1.1.3	Aux Feedwater-Steam Tunnel/Penetr. Area Auxiliary Building	-	719 6,318		-		-	-	108 948	827 7,266	-		827 7,266	-					-	5,187 62,064	-
3b.1.1.4	Berms, Settling Ponds, and Drying Beds	-	154	-	-	-	-	-	23	178	-	_	178	-	_	-	_	-	-	1,631	-
3b.1.1.5	Circulating Water Pumphouse	-	1,090	-	-	-	-	-	163	1,253	-	-	1,253	-	-	-	-		-	11,861	-
3b.1.1.6	Essential Service Cooling Tower	-	510	-	-	-	-	-	76	586	-	-	586	-	-	-	-	-	-	5,067	-
3b.1.1.7	Make-up Demineralizer Area	-	1,817	-	-	-	-	-	273	2,089	-	-	2,089	-	-	-	-	-	-	20,770	
3b.1.1.8	Miscellaneous Site Structures Radwaste/Service Building	-	1,954 4,166	-	-	-	-	-	293 625	2,247	-	-	2,247	-	-	-	-	-	-	20,544	
3b.1.1.9 3b.1.1.10		-	193	-		-	-	-	29	4,791 222	-		4,791 222	-						45,688 2,294	-
3b.1.1.11		_	1,099	-	-	_	_	-	165	1,263	-	_	1,263	_	_	-	_		-	11,688	
3b.1.1.12	River Screen House	-	591	-	-	-	-	-	89	680	-	-	680	-	-	-	-	-	-	5,869	-
3b.1.1.13		-	1,103	-	-	-	-	-	166	1,269	-	-	1,269	-	-	-	-	-	-	8,636	-
3b.1.1.14		-	6,069	-	-	-	-	-	910	6,979	-	-	6,979	-	-	-	-	-	-	70,347	
3b.1.1.15 3b.1.1.16		-	1,463 2,253	-	-	-	-	-	219 338	1,682 2,591		-	1,682 2,591	-	-	-	-	-	-	12,628 20,857	-
3b.1.1.17			3,242	-	-	-	-	-	486	3,729	-	-	3,729	-	-	-	-		-	33,246	
3b.1.1	Totals	-	39,954	-	-	-	-	-	5,993	45,947	-	-	45,947	-	-	-	-	-	-	407,920	
Site Close	eout Activities																				
3b.1.2	BackFill Site	-	5,114	-	-	-	-	-	767	5,881	-	-	5,881	-	-	-	-	-	-	9,059	
3b.1.3 3b.1.4	Grade & landscape site Final report to NRC	-	345	-	-	-		- 85	52 13	397 98	98	-	397	-	-	-	-	-	-	869	668
3b.1.4 3b.1	Subtotal Period 3b Activity Costs	-	45,413	-	-	-	-	85	6,825	52,322	98	-	52,225	-	-	-	-	-	-	417,849	
	Additional Costs																				
3b.2.1	Concrete Crushing	-	988	-	-	-	-	6	149	1,142	-	-	1,142	-	-	-	-	-	-	4,554	
3b.2.2	Demolish Cooling Tower	-	5,142	-	-	-	-	165	796	6,102	-	-	6,102	-	-	-	-	-	-	18,598	
3b.2.3 3b.2	Cofferdam Construction and Teardown Subtotal Period 3b Additional Costs	-	455 6,584	-	-	-	-	- 170	68 1,013	523 7,768	-	-	523 7,768	-	-	-	-	-	-	3,996 27,148	
		-	0,504		-		-	170	1,013	1,100		-	1,100	-	-	-	-	-		27,140	
Period 3b 3b.3.1	Collateral Costs Small tool allowance		534	_				-	80	614	_	-	614							_	_
3b.3	Subtotal Period 3b Collateral Costs	-	534	-	-	-	-	-	80		-	-	614	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
3b.4.1	Insurance	-	-	-	-	-	-	646	65	711	-	711	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	7.000	-	-	-	-	1,239	124	1,363	-	1,363	- 9.140	-	-	-	-	-	-	-	-
3b.4.3 3b.4.4	Heavy equipment rental Plant energy budget	-	7,086	-	-	-	-	- 441	1,063 66	8,149 507	-	-	8,149 507	-	-	-	-	-	-	-	-
3b.4.4 3b.4.5	NRC ISFSI Fees	-		-	-	-	-	314	31	346	-	346	507	-		-			-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	4,708	471	5,179	-	5,179	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	118	18		-	136	-	-	-	-		-	-	-	

Table C-2
Byron Nuclear Power Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(6	nousanus	s of 2014 dollar	13)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b	Period-Dependent Costs (continued)																				
3b.4.8	Site O&M Cost	-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
3b.4.9 3b.4.10	Security Staff Cost DOC Staff Cost	-	-	-	-	-	-	4,955 $11,965$	743 1,795	5,699 13,760	0	4,673	1,026 13,760	-	-	-	-		-	-	87,294 137,043
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	7,407	1,111	8,519	-	1,619	6,900	-	-	-	-	-	-	-	87,294
3b.4	Subtotal Period 3b Period-Dependent Costs	-	7,086	-	-	-	-	32,203	5,548	44,838	0	14,026	30,812	-	-	-	-	-	-	-	311,630
3b.0	TOTAL PERIOD 3b COST	-	59,617	-	-	-	-	32,459	13,466	105,542	98	14,026	91,418	-	-	-	-	-	-	444,997	312,298
PERIOD	3c - Fuel Storage Operations/Shipping																				
Period 3c	Direct Decommissioning Activities																				
	Collateral Costs							0.000	4.450												
3c.3.1 3c.3	Spent Fuel Capital and Transfer Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	9,688 9,688	1,453 1,453	11,141 11,141	-	11,141 11,141	-	-	-	-	-	-	-	-	-
Period 3c	Period-Dependent Costs																				
3c.4.1	Insurance	-	-	-	-	-	-	3,842	384	4,226	-	4,226	-	-	-	-	-	-	-	-	-
3c.4.2 3c.4.4	Property taxes NRC ISFSI Fees	-	-	-	-	-	-	7,366 2,423	737 242	8,103 2,665		8,103 2,665	-	-				-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	27,992	2,799	30,791	-	30,791		-					-	-	-
3c.4.6	Site O&M Cost	-	-	-	-	-	-	2,432	365	2,797	-	2,797	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	704	106	809	-	809	-	-	-	-	-	-	-	-	-
3c.4.8 3c.4.9	Security Staff Cost Utility Staff Cost	-	-	-	-	-		24,043 8,367	3,606 1,255	27,650 9,623		27,650 9,623	-	-	-	-	-		-	-	415,106 103,930
3c.4.3	Subtotal Period 3c Period-Dependent Costs			-	-	-	-	77,169	9,494	86,664		86,664		-		-	-	-	-	-	519,036
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	86,857	10,947	97,804	-	97,804	-	-	-	-	-	-	-	-	519,036
PERIOD	3d - GTCC shipping																				
Period 3d	Direct Decommissioning Activities																				
	team Supply System Removal			22.			44.000		4.070									0.045	100 100		
3d.1.1.1 3d.1.1	Vessel & Internals GTCC Disposal Totals	-		625 625	-	-	11,996 11,996	-	1,956 1,956	14,577 14,577	14,577 14,577	-	-	-	-	-	-	2,217 2,217	433,180 433,180		-
3d.1.1	Subtotal Period 3d Activity Costs		-	625	-	-	11,996	-	1,956	14,577	14,577		-	-	-	-	-	2,217			-
	Period-Dependent Costs																				
3d.4.1	Insurance	-	-	-	-	-	-	10	1	11	-	11	-	-	-	-	-	-	-	-	-
3d.4.2 3d.4.4	Property taxes Emergency Planning Fees	-	-	-	-	-	-	19 73	2 7	21 80	-	21 80	-	-	-	-	-		-	-	-
3d.4.5	Site O&M Cost	-	-	-	-	-	-	6	1	7	-	7	-	_					-	_	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	63	9	72	-	72	-	-	-	-	-	-	-	-	1,080
3d.4.8 3d.4	Utility Staff Cost Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	22 194	$\frac{3}{24}$	$\frac{25}{219}$	-	25 219		-	-	-	-	-	-	-	270 1,350
3d.0	TOTAL PERIOD 3d COST	-	-	625	-	-	11,996	194	1,980	14,795	14,577	219	-	-	-	-	-	2,217	433,180	-	1,350
PERIOD	3e - ISFSI Decontamination						,		, -		,							* *			,
	Direct Decommissioning Activities																				
	Additional Costs																				
3e.2.1	License Termination ISFSI	-	207	197	322		893		781	3,903	3,903	-	-	-	14,550		-	-	1,178,838		
3e.2	Subtotal Period 3e Additional Costs	-	207	197	322	-	893	1,503	781	3,903	3,903	-	-	-	14,550	-	-	-	1,178,838	11,245	1,044
	Period-Dependent Costs							==	1.4	71	71										
3e.4.1 3e.4.2	Insurance Property taxes	-	-	-	-	-		57 163	14 41	71 204	71 204	-	-						-	-	-
3e.4.4	Security Staff Cost	-	-	-	-	-		144	36	180	180	-	-		-	-	-	-	-	-	2,468
3e.4.5	Utility Staff Cost	-	-	-	-	-	-	155	39	194	194	-	-	-	-	-	-	-	-	-	1,870
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	519	130	649	649	-	-	-	-	-	-	-	-	-	4,338
3e.0	TOTAL PERIOD 3e COST	-	207	197	322	-	893	2,022	910	4,552	4,552	-	-	-	14,550	-	-	-	1,178,838	11,245	5,382

Table C-2 Byron Nuclear Power Station, Unit 2 **DECON Decommissioning Cost Estimate** (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Rurial V	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 3	Bf - ISFSI Site Restoration																				
Period 3f D	Direct Decommissioning Activities																				
Period 3f A 3f.2.1	dditional Costs Site Restoration ISFSI	-	1,199	_	_	_		28	184	1,411	_	-	1,411	_	_	_	_		-	13,522	80
3f.2	Subtotal Period 3f Additional Costs	-	1,199		-	-	-	28	184	1,411	-	-	1,411	-	-	-	-	-	-	13,522	80
Period 3f C 3f.3.1 3f.3	Collateral Costs Small tool allowance Subtotal Period 3f Collateral Costs	-	18 18		-	-	-		3	21 21	-	-	21 21	-	-	-	-		-	-	-
	eriod-Dependent Costs																				
3f.4.2 3f.4.3	Property taxes Heavy equipment rental		109	-	-	-	-	86	9 16	95 125		-	95 125	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	31	5	35	-	-	35	-		-			-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	76	11	88	-	-	88	-	-	-	-	-	-	-	1,307
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	68	10	78	-	-	78	-	-	-	-	-	-	-	810
3f.4	Subtotal Period 3f Period-Dependent Costs	-	109	-	-	-	-	261	51	421	-	-	421	-	-	-	-	-	-	-	2,117
3f.0	TOTAL PERIOD 3f COST	-	1,326	-	-	-	-	288	238	1,852	-	-	1,852	-	-	-	-	-	-	13,522	2,197
PERIOD 3	3 TOTALS	-	61,150	822	322	•	12,889	121,821	27,541	224,545	19,226	112,048	93,270	-	14,550	-	-	2,217	1,612,018	469,764	840,263
TOTAL CO	OST TO DECOMMISSION	16,104	139,292	25,782	13,929	_	67,231	567,228	145,117	974,682	666,303	199,840	108,540	-	483,326	1,802	393	2,217	27,073,620	1,591,452	4,535,434

TOTAL COST TO DECOMMISSION WITH 17.49% CONTINGENCY:	\$974,682	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 68.36% OR:	\$666,303	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 20.5% OR:	\$199,840	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 11.14% OR:	\$108,540	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	485,521	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	cubic feet
TOTAL SCRAP METAL REMOVED:	71,812	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,591,452	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

APPENDIX D

DETAILED COST ANALYSIS

DELAYED DECON

	Page
Byron Nuclear Power Station, Unit 1	D-2
Byron Nuclear Power Station, Unit 2	D-11

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(t	housands	of 2014 dollar	rs)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs			Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C	GTCC Cu. Feet	Processed	Craft Manhours	Contractor Manhours
	•	Cost	Cost	Costs	Costs	Costs	Costs	Costs	contingency	Costs	Costs	Costs	Costs	cu. reet	cu. Feet	cu. Feet	cu. Feet	Cu. Feet	W., 105.	Mannours	Mannours
	1a - Shutdown through Transition																				
Period 1a l	Direct Decommissioning Activities																				
1a.1.1 1a.1.2	SAFSTOR site characterization survey Prepare preliminary decommissioning cost	-	-	-	-	-	-	481 166	$\frac{144}{25}$	625 190	625 190		-	-	-	-	-	-	-	-	- 1,300
1a.1.2 1a.1.3	Notification of Cessation of Operations	-	-	-	-	-	-	100	25	190 a	190	•	-		-	-	-	-		-	1,500
1a.1.4	Remove fuel & source material Notification of Permanent Defueling									n/a											
1a.1.5 1a.1.6	Deactivate plant systems & process waste									a a											
1a.1.7	Prepare and submit PSDAR	-		-	-	-	-	255	38	293	293		-	-	-	-	-	-	-	-	2,000
1a.1.8 1a.1.9	Review plant dwgs & specs. Perform detailed rad survey	-	•	•	-	-	-	166	25	190 a	190	-	-	-	-	-	-	-	-	-	1,300
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	127	19	146	146		-	-	-	-	-	-	-	-	1,000
1a.1.11 1a.1.12	End product description Detailed by-product inventory	-				-	-	127 191	19 29	146 220	146 220		-		-	-	-	-			1,000 1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	127	19	146	146		-	-	-	-	-	-	-	-	1,000
1a.1.14 1a.1.15	Perform SER and EA Perform Site-Specific Cost Study	-	-				-	395 637	59 95	454 732	454 732		-		-	-	-	-			3,100 5,000
																					ŕ
	pecifications Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	626	94	720	720	-	-	-	-	-	-	-	-	-	4,920
	Plant systems	-	-	-	-	-	-	531	80	610	610		-	-	-	-	-	-	-	-	4,167
1a.1.16.3 1a.1.16.4		-			-	-	-	$\frac{397}{255}$	60 38	457 293	457 293		-	-	-	-	-	-		-	3,120 2,000
1a.1.16.5	Facility and site dormancy Total	-	-	-	-	-	-	$255 \\ 2,063$	38 310	293 2,373	293 2,373		-	-	-	-	-	-	-	-	2,000 $16,207$
1a.1.16		-	-	-	-	-	-	2,065	510	2,313	2,313	-	-	-	-	-	-	-		-	16,207
	Vork Procedures Plant systems							151	99	173	179										1,183
		-		-		-	-	151	23 23	176	173 176		-					-	-		1,200
1a.1.17	Total	ē	-	-	-	-	-	303	46	349	349	-	-	-	-	-	-	-	-	-	2,383
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	13	2	15	15	-	-	-	-	-	-	-	-	-	100
1a.1.19 1a.1.20	Drain/de-energize non-cont. systems Drain & dry NSSS									a a											
1a.1.21	Drain/de-energize contaminated systems									a											
1a.1.22	Decon/secure contaminated systems Subtotal Period 1a Activity Costs							5,050	830	a 5,880	5,880										35,890
1a.1		-	-	-	-	-	-	5,050	650	9,000	9,000	-	-	-	-	-	-	-		-	55,690
Period 1a l 1a.4.1	Period-Dependent Costs Insurance							1,855	185	2,040	2,040										
1a.4.2	Property taxes	-				-	-	-	-	2,040	-	-	-		-	-		-			-
1a.4.3 1a.4.4	Health physics supplies Heavy equipment rental	-	493 529		-	-	-	-	123 79	616 608	616 608		-	-	-	-	-	-		-	-
1a.4.5	Disposal of DAW generated	-	-	13	. 7	, -	39		12	71	71		-		610			-	12,190	20	-
1a.4.6 1a.4.7	Plant energy budget NRC Fees	-	-	-	-	-	-	1,778 1,181	267 118	2,045 1,299	2,045 1,299		-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-		-		-		2,171	217	2,388	-	2,388	-					-	-		-
1a.4.9	Site O&M Cost	-	-	-	-	-	-	165 396	25	190	190		-	-	-	-	-	-	-	-	-
1a.4.10 1a.4.11	Spent Fuel Pool O&M ISFSI Operating Costs	-		-		-	-	48	59 7	455 55		455 55						-	-		-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	640	96	736	736		-	-	-	-	-	-	-	-	12,264
1a.4.13 1a.4	Utility Staff Cost Subtotal Period 1a Period-Dependent Costs	-	1,022	13	. 7	, -	- 39	32,279 $40,512$	4,842 6,031	37,121 47,624	37,121 $44,727$		-	-	610	-	-	-	12,190	20	423,400 435,664
1a.0	TOTAL PERIOD 1a COST		1,022	13	. 7		39	45,563	6,861	53,504	50,606	2,898	-		610	-	-	-	12,190	20	471,554
PERIOD	1b - SAFSTOR Limited DECON Activities																				
	Direct Decommissioning Activities																				
	ination of Site Buildings																				
1b.1.1.1	Reactor	2,223	-	-	-	-	-	-	1,111	3,334	3,334	-	-	-	-	-		-	-	33,093	-
	Auxiliary Building Refueling Water Storage Tank	220 366	-	-	-	-	-	-	110	330 549	330 549	-	-	-	-	-	-	-	-	3,289	
1b.1.1.3 1b.1.1	Totals	2,809			-	-	-	-	183 1,404	4,213	4,213		-	-	-	-	-	-	-	5,322 41,705	

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

A -4: 14		D	D 1	De al codo a	M	Off-Site	LLRW	Other	m 1	m-4-1	NRC	Spent Fuel	Site	Processed Volume	Class A		Volumes	CMCC	Burial /	C C	Utility and
Activit Index		Decon Cost	Removal Cost	Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Cu. Feet		Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet		Craft Manhours	Contractor Manhours
1b.1	Subtotal Period 1b Activity Costs	2,809	-	-	-	-	-	-	1,404	4,213	4,213	-	-	-	-	-	-	-	-	41,705	-
Period 1h	Collateral Costs																				
1b.3.1	Decon equipment	886	-	-	-	-	-	-	133	1,019	1,019	-	-	-	-	-		-	-	-	-
1b.3.2	Process decommissioning water waste	180	-	118		-	398	-	248	1,258	1,258	-	-	-	1,135	-	-	-	68,086	221	-
1b.3.4 1b.3	Small tool allowance Subtotal Period 1b Collateral Costs	1,066	46 46	118	314		- 398	-	7 388	53 2,330	53 2,330	-			1,135	-	-	-	68,086	- 221	
D. J. J.11	. Portal Procedure Contr																				
1b.4.1	Period-Dependent Costs Decon supplies	624	_		_	_	_	-	156	780	780		_	_	_	_		_	_	_	
1b.4.2	Insurance	-		-	-	-	-	350	35	385	385	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	4,112	411	4,524	4,524	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	314 132	-	-	-	-	-	79 20	393 152	393 152	-	-	-	-	-	-	-	-	-	-
1b.4.5 1b.4.6	Heavy equipment rental Disposal of DAW generated	-	132	11	- 6	-	- 33		10	60	60	-	-	-	517	-	-		10,338	17	
1b.4.7	Plant energy budget	-		-	-	-	-	443	67	510	510	-	-	-	-	-	-	-		-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	172	17	189	189	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	541	54	595	-	595	-	-	-	-	-	-	-	-	-
1b.4.10 1b.4.11	Site O&M Cost Spent Fuel Pool O&M			-		-	-	41 99	6 15	47 113	47	- 113	-	-			-		-	-	
1b.4.11	ISFSI Operating Costs	-		-	-	-	_	12		14	-	14		-			-		-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	160	24	184	184	-	-	-	-	-	-	-	-	-	3,058
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	8,048	1,207	9,255	9,255	-	-	-		-	-	-	-		105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	624	446	11	6	-	33	13,978	2,102	17,200	16,478	722	-	-	517	-	-	-	10,338	17	108,618
1b.0	TOTAL PERIOD 1b COST	4,498	492	129	320	-	431	13,978	3,895	23,744	23,021	722	-	-	1,652	-	-	-	78,424	41,943	108,618
PERIOD	1c - Preparations for SAFSTOR Dormancy																				
Period 1c	Direct Decommissioning Activities																				
1c.1.1	Prepare support equipment for storage	-	487		-	-	-	-	73	561	561	-	-		-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	48	-	-	-	-	-	7	56	56	-	-	-	-	-	-	-	-	700	
1c.1.3	Interim survey prior to dormancy Secure building accesses	•	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	10,874	-
1c.1.4 1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	74	11	a 85	85	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	536	-	-	-	-	807	311	1,654	1,654	-	-	-	-	-	-	-	-	14,574	583
Period 1c	Collateral Costs																				
1c.3.1	Process decommissioning water waste	142	-	93	248	-	314	-	196	993	993	-	-	-	896	-	-	-	53,749	175	-
1c.3.3	Small tool allowance		4		-	-	-	-	1	5	5	-	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	142	4	93	248	•	314	-	197	998	998	-	-	-	896	-	-	-	53,749	175	-
	Period-Dependent Costs																				
1c.4.1	Insurance	-	-	-	-	-	-	350 $4,112$	35 411	385	385 4,524	-	-	-	-	-	-	-	-	-	-
1c.4.2 1c.4.3	Property taxes Health physics supplies		190		-	-		4,112	411	4,524 238	4,524	-	-	-			-	-	-	-	-
1c.4.4	Heavy equipment rental		132		-	-	-		20	152	152	-	-	-			-	-	-	-	
1c.4.5	Disposal of DAW generated	-	-	3	2	-	10	-	3	18	18	-	-	-	152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	443	67	510	510	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	172 541	17 54	189 595	189	- 595	-	-	-	-	-	-	-	-	-
1c.4.8 1c.4.9	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	541 41	6	595 47	47	- 999	-	-		-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	99	15	113	-	113	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-
1c.4.12	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	160 8,048	1 207	184 9,255	184 9,255	-	-	-	-	-	-	-	-	-	3,058
1c.4.13 1c.4	Subtotal Period 1c Period-Dependent Costs	-	322	3	2	-	10		1,207 1,908	16,223	15,501	722	-	-	152	-	-	-	3,039	5	105,560 108,618
1c.0	TOTAL PERIOD 1c COST	142	862	96	250	-	324	14,785	2,416	18,875	18,153	722	-	-	1,048	-	-	-	56,788	14,753	109,201
PERIOD	0 1 TOTALS	4,640	2,376	238	577	-	795	74,326	13,172	96,123	91,781	4,343		_	3,309	_	-		147,402	56,716	689,372
		,	,					,	-,	-, -	- /	,			-,				- / /=	/	, =

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V Class B	Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet		Cu. Feet			Wt., Lbs.	Manhours	Manhours
PERIOD	2a - SAFSTOR Dormancy with Wet Spent Fuel Storage																				
Period 2a	Direct Decommissioning Activities																				
2a.1.1	Quarterly Inspection									a											
2a.1.2 2a.1.3	Semi-annual environmental survey Prepare reports									a a											
2a.1.3	Bituminous roof replacement	-	-	-	-	-		118	18	136	136	-	-	-	-	-	-		-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	3,197	799	3,996	3,996	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	3,315	817	4,132	4,132	-	-	-	-	-	-	-	-	-	-
	Collateral Costs							11.550	1 500	10 710		10 710									
2a.3.1 2a.3	Spent Fuel Capital and Transfer Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	11,750 $11,750$	1,763 1,763	13,513 13,513	-	13,513 13,513	-	-	-	-	-	-	-	-	
Period 2a	Period-Dependent Costs																				
2a.4.1	Insurance	-	-	-	-	-		12,890	1,289	14,179	-	14,179	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	4.000	-		-	-	36,983	3,698	40,681	40,681	-	-	-	-	-	-	-	-	-	-
2a.4.3 2a.4.4	Health physics supplies Disposal of DAW generated		4,263	102	- 55	-	311	-	1,066 96	5,328 564	5,328 564	-	-		4.852	-	-	-	97,040	- 158	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	8,186	1,228	9,414	-	9,414	-	-		-	-	-	-	-	
2a.4.6	NRC Fees	-	-	-	-	-	-	6,660	666	7,326	7,326	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	43,701 3,797	4,370 570	48,071 4,367	-	48,071 4,367	-	-	-	-	-	-	-	-	-
2a.4.8 2a.4.9	Spent Fuel Pool O&M		-			-		9,104	1,366	10,469	-	4,367 10,469						-	-		
2a.4.10	ISFSI Operating Costs		-	-	-	-		1,099	165	1,264	-	1,264	-	-				-	-	-	-
2a.4.11	Security Staff Cost	-	-	-	-	-	-	70,450	10,567	81,017	-	81,017	-	-	-	-	-	-	-	-	1,278,392
2a.4.12	Utility Staff Cost	-	-	-	-	-	- 011	88,026	13,204	101,230	-	101,230	-	-	-	-	-	-	-	-	1,128,134
2a.4	Subtotal Period 2a Period-Dependent Costs	-	4,263	102	55	-	311	280,896	38,284	323,911	53,900	270,011	-	-	4,852	-	-	-	97,040	158	
2a.0	TOTAL PERIOD 2a COST	-	4,263	102	55	-	311	295,961	40,864	341,556	58,032	283,524	-	-	4,852	-	-	-	97,040	158	2,406,526
PERIOD	2b - SAFSTOR Dormancy with Dry Spent Fuel Storage																				
	Direct Decommissioning Activities																				
2b.1.1 2b.1.2	Quarterly Inspection Semi-annual environmental survey									a											
2b.1.2 2b.1.3	Prepare reports									a a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	9	1	10	10	-	-	-	-	-	-	-	-	-	-
2b.1.5	Maintenance supplies	-	-	-	-	-	-	232	58	290	290	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	241	59	300	300	-	-	-	-	-	-	-	-	-	-
Period 2b 2b.3.1	Collateral Costs Spent Fuel Capital and Transfer							3,813	572	4,384		4,384									
2b.3.1 2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	3,813	572	4,384	-	4,384	-	-	-	-	-	-	-	-	-
Period 2b	Period-Dependent Costs																				
2b.4.1	Insurance	-	-	-	-	-	-	871	87	958	-	958	-	-	-	-	-	-	-	-	-
2b.4.2 2b.4.3	Property taxes Health physics supplies	-	- 152	-	-	-	-	835	84 38	919 191	- 191	919	-	-	-	-	-	-	-	-	-
2b.4.3 2b.4.4	Disposal of DAW generated	-	192	- 4	2	-	11	-	38 3	20	20	-	-	-	173			-	3,453	- 6	-
2b.4.5	Plant energy budget	-	-	-		-	-	297	45	342	-	342	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	461	46	507	507	-	-	-	-	-	-	-	-	-	-
2b.4.7 2b.4.8	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	3,173 276	317 41	3,490 317	-	3,490 317	-	-	-	-	-	-	-	-	-
2b.4.8 2b.4.9	ISFSI Operating Costs	-		-	-	-		80	12	92	-	92	-	-					-	-	-
2b.4.10	Security Staff Cost	-	-	-		-	-	2,726	409	3,134	-	3,134	-	-	-	-	-	-	-	-	47,057
2b.4.11 2b.4	Utility Staff Cost Subtotal Period 2b Period-Dependent Costs	-	- 152	- 4	- 2	-	11	2,638 11,356	396 1,478	3,033 13,004	718	3,033 12,286	-	-	- 173	-	-	-	3,453	- 6	34,857 81,914
	•	-		4	2	-							-	-		-	-	-		0	
2b.0	TOTAL PERIOD 2b COST	-	152	4	2	-	11	15,410	2,109	17,688	1,018	16,670	-	-	173	-	-	-	3,453	6	81,914

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(6)	iousunus	of 2014 dollar	5)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 8	Ba - Reactivate Site Following SAFSTOR Dormancy																				
Period 3a I	Direct Decommissioning Activities																				
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	166	25	190	190		-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs. Perform detailed rad survey	-	-	-	-	-	-	586	88	674	674	-	-	-	-	-	-	-	-	-	4,600
3a.1.3 3a.1.4	End product description	-		-	-	_		127	19	a 146	146	-	-	-					-	-	1,000
3a.1.5	Detailed by-product inventory	-	-	-	-	-	-	166	25	190	190	-	-	-	-	-	-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	955	143	1,098	1,098		-	-	-	-	-	-	-	-	7,500
3a.1.7 3a.1.8	Perform SER and EA Perform Site-Specific Cost Study	-	-	-	-	-		395 637	59 95	454 732	454 732		-	-	-		-	-	-	-	3,100 5,000
3a.1.9	Prepare/submit License Termination Plan	-	-	-	-	-	-	522	78	600	600		-	-	-	-		-	-	-	4,096
3a.1.10	Receive NRC approval of termination plan									a											
Activity Sp	ecifications																				
	Re-activate plant & temporary facilities	-	-	-	-	-	-	938	141	1,079	971	-	108	-	-	-	-	-	-	-	7,370
	Plant systems	-	-	-	-	-	-	531	80	610	549		61	-	-	-	-	-	-	-	4,167
3a.1.11.3 3a.1.11.4	Reactor internals Reactor vessel	-	-	-	-	-	-	904 828	136 124	1,040 952	1,040 952		-		-	-	-	-	-		7,100 6,500
	Biological shield	-	-	-	-	-	-	64	10	73	73		-	-	-	-	-	-	-	-	500
	Steam generators	-	-	-	-	-	-	397	60	457	457		-	-	-	-	-	-	-	-	3,120
	Reinforced concrete Main Turbine	-	-	-	-	-	-	204 51	31 8	234 59	117	-	117 59	-	-	-	-	-	-	-	1,600 400
	Main Condensers	-		-	-	-		51	8	59	-	-	59	-					-	-	400
	Plant structures & buildings	-		-	-	-	-	397	60	457	228		228	-	-			-	-	-	3,120
	Waste management	-		-	-	-	-	586	88 17	674 132	674 66		-	-	-		•	-	-	-	4,600 900
	Facility & site closeout Total		-				-	$115 \\ 5,064$	760	5,824	5,127		66 697	-	-	-	-	-	-		39,777
Planning &	z Site Preparations																				
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	306	46	351	351	-	-	-	-	-	-	-	-	-	2,400
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450		-	-	-	-	-	-	-	-	1 400
3a.1.14 3a.1.15	Design water clean-up system Rigging/Cont. Cntrl Envlps/tooling/etc.		-	-	-	-		178 2,300	27 345	205 $2,645$	205 $2,645$			-			-	-	-	-	1,400
3a.1.16	Procure casks/liners & containers	-		-	-	-	-	157	23	180	180		-	-		-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	14,557	2,183	16,740	16,043	-	697	-	-	-	-	-	-	-	72,703
Period 3a I 3a.4.1	Period-Dependent Costs Insurance							521	52	573	573										
3a.4.1	Property taxes	-		-	-			500	50	550	550		-	-					-	-	-
3a.4.3	Health physics supplies	-	431		-	-	-	-	108	539	539		-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	529		-	-	-	-	79	608	608		-	-	-	-	-	-	-	-	-
3a.4.5 3a.4.6	Disposal of DAW generated Plant energy budget		-	11	6	-	33	1,778	10 267	60 $2,045$	60 2,045			-	514	-	-	-	10,287	17	-
3a.4.7	NRC Fees	-		-	-	-	-	378	38	416	416		-	-		-	-	-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190		-	-	-		-	-	-	-	-
3a.4.9 3a.4.10	Security Staff Cost Utility Staff Cost	-		-	-	-		3,725 $19,668$	559 $2,950$	4,283 22,618	4,283 22,618		-	-	-			-	-		65,179 258,629
3a.4.10	Subtotal Period 3a Period-Dependent Costs		960	11	- 6	-	33		4,138	31,882	31,882		-	-	514	-	-	-	10,287	17	
3a.0	TOTAL PERIOD 3a COST	-	960	11	6	-	33	41,291	6,321	48,622	47,924	-	697	-	514	-	-	-	10,287	17	396,510
PERIOD 8	Bb - Decommissioning Preparations																				
Period 3b I	Direct Decommissioning Activities																				
	ork Procedures																				
	Plant systems	-	-	-	-	-	-	603	90	693	624		69	-	-	-	-	-	-	-	4,733
3b.1.1.2 3b.1.1.3	Reactor internals Remaining buildings	-	-	-	-	-	-	318 172	48 26	366 198	366 49		- 148	•	-	-	-	-	-	•	2,500 1,350
	CRD cooling assembly	-	-	-	-	-		172	26 19	198	146		148	-	-		-	-	-		1,350
	CRD housings & ICI tubes	-	-	-	-	-	-	127	19	146	146		-	-	-	-	-	-	-		1,000
	Incore instrumentation	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	TD									2											
3b.1.1.6 3b.1.1.7 3b.1.1.8	Reactor vessel Facility closeout	-	-	-	-	-	-	462 153	69 23	531 176	531 88		- 88	-	-	-	-	-	-	-	3,630 1,200

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Part								(0.	io abanab	01 2014 u011a1	٥,											
		Activity Description					Processing	Disposal				Lic. Term.	Management	Restoration	Volume		Class B	Class C		Processed		Contractor
Section Sect	Detailed Work Proce	edures (continued)	_	_			_		159		176	176	_	_			_	_	_	_	_	
100 100	3b.1.1.11 Steam g	generators	-	-	-	-	-	-	586	88	674	674	-	73	-	-	-	-	-	-	-	4,600
Authors Authors Control Authors Cont	3b.1.1.13 Main Tu	urbine	-	-	-	-	-	-	199	30	228	-	-	228	-	-	-	-	-	-	-	1,560
Mail	3b.1.1.15 Auxiliar	ry building	-	-	-	-	-	-	348	52	400	360	-	40	-	-	-	-	-	-	-	2,730
Part	3b.1.1 Total	_		-	-	:	-	-	4,105	616	4,721	3,806		915	-	-	-	:		-	-	32,243
Substitute Sub									1,100	010	1,121	5,000		010								02,210
10.1 10.1	3b.2.1 Site Cha	aracterization	-	-	-	-	-	-					-	-	-	-	-	-	-	-		
			886							133	1 019	1 019										
Second Procession Change and Procession Ch	3b.3.2 DOC sta	aff relocation expenses	-		-	-	-	-		162	1,242	1,242	-	-	-	-	-	-	-	-	-	-
Sect of Section Sect					-	-	-	-					-	-	-	-	-	-	-	-	-	-
Sect			27							7	34	34										
1. 1. 1. 1. 1. 1. 1. 1.	3b.4.2 Insuran	ce	-	-	-	-	-	-			287	287	-	-	-	-	-	-	-	-	-	-
As in Paper of PAM generated	3b.4.4 Health		-		-	-		-		60	298	298		-		-	-	-	-	-	-	
Self Plant convery benight			-	265	- 6	- 3	-						-	-		292	-	-	-	5.834		-
Sh. 10 Section Shall Cost 1	3b.4.7 Plant er	nergy budget	-	-	-	-	-	-	892	134	1,025	1,025	-	-	-	-	-	-	-	-	-	-
Section Sect			-										-	-		-			-	-		
Sale 1			-	-	-	-	-	-					-	-	-	-	-	-	-	-		
Perior Total Perior Period Perior Period Perior Period Perior Period Perior Period Pe	3b.4.12 Utility S	Staff Cost	- - 97		- 6	- - -	-	-	9,861	1,479	11,340	11,340		-	-	- - 292	-	-	-	-	-	129,669
PRIOD # CALARGE Component Removal PRIOD # CALARGE COMPONENT RE		-			6	_	-							915	-		-			ŕ		
PRIOD 4a Direct Decommissioning Activities Prior 4 Direct Deco				ŕ																ŕ		
Nuclear Supply System Removal System Removal System Removal System Removal System Removal System Syst			316	2,000	17	3		02	71,400	12,100	01,140	00,000		1,015		000				10,121	50,920	000,812
Au 1.1 Reactor Colonart Pjning																						
4a.1.12 Pressurizer Relief Tank 4a.1.13 Reactor Colant Pumps & Motors 29 108 79 198 139 - 47 2 230 - 478 2 230 - 4796 - 7805.00 2.766 4a.1.14 Pressurizer 12 69 368 106 879 110.75 - 4777 2 6.953 2 230 - 4786 - 30.333 - 3 240.915 1.527 750 4a.1.15 Reactor Colant Pumps & Motors 29 108 79 198 1390 - 4879 2 230 - 4781 1.731 - 30.333 - 3 240.915 1.527 750 4a.1.16 Rector Generators 98 4.496 2.810 3.967 - 110.75 - 4777 2 6.953 2 6.953 - 67.43 - 3 .033 - 3 .240.915 1.527 750 4a.1.16 Retired Steam Generator Units - 1.591 2.916 1.0319 3.176 18.002 18.002 - 62.044 - 3 .308.575 10.800 2.250 4a.1.17 Rector Vessel Internals 93 2.899 6.520 1.058 4.971 2.90 6.644 22.475 2.2475 - 3.881 1.27 3.93 2.247 3.881 - 3.285.007 2.7350 1.226 4a.1.19 Vessel & Internals GTCC Disposal - 1.196 - 1.199 1.3795 1.3795 - 1.1747 1.747				4.00	0.7	20		2.00		400	200	200				4.500				200 040	0.450	
4a.1.1.4 Pressurizer 12 69 368 106 879 . 296 1.731 1.731 . . 3.033 . . . 240.915 1.527 750.000 1.0.115			46 8		35 7								-	-	-		-	-	-			-
4a.1.1.5 Steam Generators 98 4.496 2.810 3.697 - 11.075 - 4.777 26.953 26.953 - 67.463 - 67.463 - 63.892.644 - 63.892.645		•											-	-	-		-	-	-			
41.1.7 CRDMs/CLs/Service Structure Removal 41 301 230 47 188 173 979	4a.1.1.5 Steam C	Generators			2,810	3,697	-	11,075	-	4,777	26,953	26,953	-	-	-	67,463	-	-	-	3,820,664	20,508	4,500
4a.1.1.8 Reactor Vessel Internals 93 2,89 6,50 1,058 - 4,971 290 6,644 22,475 22,475 - 1,835 1,127 393 - 328,607 27,350 1,226 4a.1.1.9 Vessel Reactor Vessel Internals GTCC Disposal - 1,196 -			- 41										-	-					-			
4a.1.1.10 Reactor Vessel 115 5,075 2,149 1,140 - 2,832 290 6,146 17,747 17,747 9,331 960,579 27,350 1,226 4a.1.1 Totals 13,139 13,789 9,207 - 43,960 580 23,600 104,717 104,717 9,331 960,579 27,350 1,226 4a.1.1 Totals 154,495 1,127 393 2,217 10,048,850 99,243 10,032 Removal of Major Equipment	4a.1.1.8 Reactor	Vessel Internals		2,899	6,520	1,058		4,971	290	6,644	22,475	22,475	-	-	-	1,835	1,127	393		328,507	27,350	1,226
4a.1.1 Totals 4d.1 13,139 13,789 9,207 43,960 580 23,600 104,717 104,717 154,495 1,127 393 2,217 10,048,850 99,243 10,032 Removal of Major Equipment 4a.1.2 Main Turbine/Generator - 614 3,150 1,094 3,399 - 1,482 9,739 9,739 58,555 3,040,215 9,317 - 4a.1.3 Main Condensers - 1,204 1,828 998 - 5,039 - 1,893 10,963 10,963 75,240 75,240 3,906,532 18,250 4a.1.4.1 Reactor 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,250 1,2495 1,127 393 2,217 10,048,850 99,243 10,032 Removal of Major Equipment 4a.1.2 Main Turbine/Generator			- 115										-	-					2,217			
4a.1.2 Main Turbine/Generator - 614 3,150 1,094 - 3,399 - 1,482 9,739 9,739 58,555 3,040,215 9,317 - 4a.1.3 Main Condensers - 1,204 1,828 998 - 5,039 - 1,893 10,963 10,963 75,240 75,240 3,040,215 9,317 - 3,04													-	-	-		1,127	393	2,217			
4a.1.3 Main Condensers - 1,204 1,828 998 - 5,039 - 1,893 10,963 10,963 75,240 3,906,532 18,250 - Cascading Costs from Clean Building Demolition 4a.1.4.1 Reactor - 1,250				614	3,150	1,094	-	3,399		1,482	9,739	9,739	-	-	-	58,555	-	-	_	3,040,215	9,317	-
4a.1.4.1 Reactor - 1,250 - - - - 188 1,438 - - - - - - 12,130 - 4a.1.4.2 Auxiliary Building - 692 - - - - - - - - - - - 6,810 - 4a.1.4.3 Refueling Water Storage Tank - 122 - - - 18 140 140 - - - - - - 1,299 -			-										-	-	-			-	-			
4a.1.4.2 Auxiliary Building - 692 - - - - 104 796 - - - - - - 6,810 - 4a.1.4.3 Refueling Water Storage Tank - 122 - - - 18 140 140 - - - - - - 1,299 -				1,250			-		-	188	1,438	1,438				-		-	-	-	12,130	
	4a.1.4.2 Auxiliar	ry Building		692		-	<u>.</u>			104	796	796	-	•			-		-	-	6,810	-
		ig mater brorage rains			-	-	-	-	-					-	-	-	-	-		-		

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							\ -		01 2014 uonai	/											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes	amaa	Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
	of Plant Systems																				
4a.1.5.1	Auxiliary Feedwater	-	80	-	-	-	-	-	12	92	-	-	92	-	-	-	-	-	-	1,244	-
4a.1.5.2 4a.1.5.3	Auxiliary Steam Auxiliary Steam RCA	-	72 138	22	11	-	54	-	11 52	83 276	276	-	83	-	805	-	-	-	42,068	1,126 1,984	-
4a.1.5.4	Boric Acid Processing	-	517	127	78		392	-	252	1,366	1,366				6,102	-			303,638	8,026	
4a.1.5.5	CO2 & H2	_	27	-	-	_	-	-	4	31	-		31	_		-	_	-	-	419	-
4a.1.5.6	CO2 & H2 RCA	-	40	5	2	-	11	-	13	71	71	-	-	-	159	-	-	-	8,312	583	-
4a.1.5.7	Chemical Feed	-	59	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	934	
4a.1.5.8	Chilled Water	-	74	-	-	-	-	-	11	85	-	-	85	-	-	-	-	-	-	1,142	-
4a.1.5.9	Circulating Water	-	323	-	-	-	-	-	48	372	-	-	372	-	-	-	-	-	-	5,150	-
4a.1.5.10 4a.1.5.11		-	386 347	-	-	-	-	-	58 52	444 400	-	-	444 400	-	-	-	-	-	-	6,023 5,428	-
4a.1.5.11		-	68	-	-	-	-	-	10	79	-	-	79	-	-	-	-	-	-	1,060	-
4a.1.5.13	•	_	264	82	46	_	233	-	139	765	765		-	_	3,481	-	_	-	180,655	3,897	-
4a.1.5.14		-	105	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	· -	1,615	-
4a.1.5.15	Essential Service Water	-	244	-	-	-	-	-	37	280	-	-	280	-	-	-	-	-	-	3,837	-
4a.1.5.16		-	194	-	-	-	-	-	29	223	-	-	223	-	-	-	-	-	-	3,089	-
4a.1.5.17		-	324	-	-	-	-	-	49	372	-	-	372	-	-	-	-	-	-	5,142	-
4a.1.5.18		-	776 58	-	-	-	-	-	116 9	892	-	-	892 67	-	-	-	-	-	-	12,366	-
4a.1.5.19 4a.1.5.20		-	58 51	-	-	-	-	-	8	67 59	-	-	67 59	-	-	-	-	-	-	932 828	-
4a.1.5.20 4a.1.5.21			331						50	380			380			-	-			5,216	
4a.1.5.22	Main Steam RCA	_	53	16	10	_	49	-	28	155	155	-	-	_	726	-	-		37,727	769	
4a.1.5.23		-	3	1	1	-	3	-	2	10	10	-	-	-	49	-	-	-	2,447	50	
4a.1.5.24	Non-Essential Service Water	-	183	-	-	-	-	-	27	211	-	-	211	-	-	-	-	-	-	2,916	-
4a.1.5.25	Non-Essential Service Water RCA	-	96	32			94	-	53	294	294	-	-	-	1,400	-	-	-	72,790	1,358	
4a.1.5.26		-	583	125		-	360	-	259	1,398	1,398	-	-	-	5,352	-	-	-	278,775	8,689	-
4a.1.5.27		-	43	3	1	-	7	-	13	68	68	-	-	-	109	-	-	-	5,726	671	-
4a.1.5.28	Process Sampling Station Air	-	125 31	13	8	-	40	-	44 5	228 36	228	-	- 36	-	590	-	-	-	30,697	1,947 498	-
4a.1.5.29 4a.1.5.30			113						17	130			130			-	-			1,771	-
4a.1.5.31	-	_	9	_	_	_	_	-	1	10	-	-	10	_	_	-	-		_	139	_
4a.1.5.32	Turbine Bldg Equip Drains	-	1	-	-	-		-	0	1		-	1	-	-	-	-	-		17	
4a.1.5.33		-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	901	-
4a.1.5.34	Turbine Oil	-	89	-	-	-	-	-	13	103	-	-	103	-	-	-	-	-	-	1,399	-
4a.1.5.35		-	31	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	483	-
4a.1.5	Totals	-	5,894	426	246	-	1,242	-	1,460	9,268	4,630	-	4,638	-	18,774	-	-	-	962,836	91,647	-
4a.1.6	Scaffolding in support of decommissioning	-	1,088	9	5	-	24	-	280	1,406	1,406	-	-	-	359	-	-	-	18,654	18,101	-
4a.1	Subtotal Period 4a Activity Costs	441	24,004	19,201	11,550	-	53,665	580	29,026	138,466	133,828	-	4,638	-	307,423	1,127	393	2,217	17,977,090	256,796	10,032
	Additional Costs																				
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,976	593 8	2,569	2,569	-	-	-	-	-	-	-	-	31,151	-
4a.2.2 4a.2.3	Asbestos Abatement Operational Tools and Equipment	-	-	- 9	51	-	189	50	56	58 304	58 304	-	-	-	5,855	-	-	-	146,375	16	-
4a.2.5 4a.2	Subtotal Period 4a Additional Costs		-	9	51		189	2,026	656	2,931	2,931			-	5,855	-	-	-	146,375	31,167	-
	Collateral Costs																				
4a.3.1	Process decommissioning water waste	11	-	12	33	-	41	-	22	119	119	-	-	-	118	-	-	-	7,064	23	-
4a.3.3 4a.3	Small tool allowance Subtotal Period 4a Collateral Costs	- 11	$\frac{273}{273}$	12	- 33	-	41	-	41 63	314 433	283 402		31 31	-	118	-	-	-	7,064	- 23	-
Pariod 4a	Period-Dependent Costs																				
4a.4.1	Decon supplies	81	-	_	_	-			20	101	101	_	_	_	_	_	_	_		_	
4a.4.1	Insurance	-	-		-	-	-	777	78	855	855	-	-	-	-		-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	745	74	819	737	-	82	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	2,040	-	-	-	-	-	510	2,550	2,550	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	3,029	-	-	-	-	-	454	3,483	3,483	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	78	42	-	239		74	433	433	-	-	-	3,728	-	-	-	74,552	122	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	2,518	378	2,896	2,896	-	-	-	-	-	-	-	-	-	-
4a.4.8 4a.4.9	NRC Fees Site O&M Cost	-	-	-	-			900 246	90 37	990 283	990 283	-	-	-		-	-	-			-
4a.4.3 4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	597	90	687	687	-	-	-	-		-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,551	833	6,384	6,384	-	-	-	-	-	-	-	-	-	97,143
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	17,837	2,676	20,513	20,513	-	-	-	-	-	-	-	-	-	214,491
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	29,578	4,437	34,015	34,015	-	-	-	-	-	-	-	-	-	388,571

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(11	iousanus (oi 2014 dollar	5)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
4a.4	Subtotal Period 4a Period-Dependent Costs	81	5,069	78	42	_	239	58,749	9,750	74,007	73,925	-	82	_	3,728		_	_	74,552	122	700,206
4a.0	TOTAL PERIOD 4a COST	532	29,345	19,301	11,676	-	54,134	61,356	39,494	215,838	211,086	-	4,752	-	317,123	1,127	393	2,217	18,205,080	288,108	710,238
PERIOD	4b - Site Decontamination																				
Disposal	of Plant Systems																				
4b.1.2.1	Chemical & Volume Control	-	1,136	159			419	-	417	2,213	2,213	-	-	-	6,236	-	-	-	324,551	16,476	-
4b.1.2.2	Chilled Water RCA	-	322	108			304	-	176	970	970	-	-	-	4,527	-	-	-	235,699	4,956	-
4b.1.2.3 4b.1.2.4	Component Cooling RCA Electrical	-	682 3,113	194	110	-	553	-	345 467	1,884 3,580	1,884	-	3,580	-	8,239	-	-	-	428,586	10,074 48,490	-
4b.1.2.4 4b.1.2.5	Electrical Electrical - Contaminated	-	1,160	128		-	430		423	2,225	2,225	-	5,560	-	6,418				333,233	17,294	-
4b.1.2.6	Electrical - RCA	-	1,940				1,123		834	4,466	4,466	-	-	-	16,763	-			870,329	29,753	-
4b.1.2.7	Emergency Diesel Generator	-	132	-	-	-	-	-	20	152	-	-	152	-	-	-	-	-	-	2,066	-
4b.1.2.8	Essential Service Water RCA	-	306	112		-	333	-	181	998	998	-	-	-	4,958	-	-	-	257,885	4,643	-
4b.1.2.9 4b.1.2.10	Fire Protection Fire Protection RCA	-	127 189	29	14	-	70	-	19 70	146 371	371	-	146	-	1,032		-	-	53,961	1,984 2,693	-
4b.1.2.11	HVAC-Auxiliary Building	-	518				323		230	1,233	1,233	-	-	-	4,827				250,668	7,298	-
4b.1.2.12		-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	682	-
4b.1.2.13		-	42	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	656	-
4b.1.2.14	HVAC-Primary Containment	-	627	203		-	683	-	368	2,017	2,017	-	-	-	10,197	-	-	-	529,451	8,908	-
4b.1.2.15 4b.1.2.16		-	190 47		-		-		28 7	218 54			218 54						-	3,177 760	-
4b.1.2.17	* * *	_	76	10	5	_	24	-	27	141	141	_	-	-	354	-	-	-	18,493	1,096	_
4b.1.2.18		-	40	7	4	-	20	-	16	87	87	-	-	-	299	-	-	-	15,562	594	-
4b.1.2.19		-	285	128			377	-	189	1,054	1,054	-	-	-	5,614	-	-	-	292,306	4,509	-
4b.1.2.20		-	62	6	0		15	-	20	106	106	-	-	-	218	-	-	-	11,425	924	-
4b.1.2.21 4b.1.2.22	Radioactive Waste Disposal Reactor Building Equipment Drains	-	945 100	159 17			446 47	-	377 40	2,015 213	2,015 213	-	-	-	6,808 695		-	-	345,754 36,107	14,349 1,451	-
4b.1.2.23	~	-	47	7	4		18	-	17	92	92	-	-	-	265		-	-	13,801	686	-
4b.1.2.24		-	175	22	11	-	55	-	61	324	324	-	-	-	812		-	-	42,440	2,529	-
4b.1.2.25		-	197	49			147	-	95	516	516	-	-	-	2,184	-	-	-	113,636	2,985	-
4b.1.2.26		-	902	230			694	-	443	2,405	2,405	-	-	-	10,622	-	-	-	537,761	13,820	-
4b.1.2.27 4b.1.2.28		-	37 124	5 31	_		11 81	-	13 57	68 309	68 309	-	-	-	169 1,209		-	-	8,811 63,061	531 1,826	-
4b.1.2.29			7	1			3	-	37	15	15	-	-	-	50		-	-	2,602	95	-
4b.1.2	Totals	-	13,572	2,048	1,223	-	6,174	-	4,955	27,973	23,724	-	4,250	-	92,495	-	-	-	4,786,121	205,305	-
4b.1.3	Scaffolding in support of decommissioning	-	1,633	13	7	-	36	-	420	2,108	2,108	-	-	-	539	•	-	-	27,981	27,151	-
Decontan	nination of Site Buildings																				
4b.1.4.1	Reactor	2,018		217			1,358	-	1,784	7,169	7,169	-	-	-	24,850	-	-	-	1,271,867	50,421	-
4b.1.4.2	Auxiliary Building	202	110				69	-	150	567	567	-	-	-	1,101	-	-	-	63,260	4,568	-
4b.1.4.3 4b.1.4	Refueling Water Storage Tank Totals	367 2,587	428 1,990	38 275			83 1,510		318 $2,252$	1,253 8,988	1,253 8,988	-	-	-	1,240 $27,192$	-	-	-	67,351 1,402,477	11,972 66,961	-
		,						-					4.050	-		-	-	-			•
4b.1	Subtotal Period 4b Activity Costs	2,587	17,195	2,337	1,603	-	7,721	-	7,627	39,070	34,820	-	4,250	-	120,226	-	-	-	6,216,579	299,417	-
Period 4b 4b.2.1	Additional Costs License Termination Survey Planning							993	298	1,291	1,291										6,240
4b.2.1 4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	2,923	298 877	3,800	3,800	-	-			-		-	-	46,072	6,240
4b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-		-	-	-	-		-
4b.2.4	License Termination ISFSI	-	450			-	893	1,213	757	3,783	3,783	-	-	-	14,543	-	-	-	1,178,711	7,043	7,144
4b.2.5	Underground Services Excavation	-	506		-	-	-	- 150	76	581	581	-	-	-	- 14 740	-	-	-	- 1 150 511	2,755	-
4b.2	Subtotal Period 4b Additional Costs	-	955	197	274	-	893	5,179	2,015	9,513	9,513	-	-	-	14,543	-	-	-	1,178,711	55,869	13,384
	Collateral Costs																				
4b.3.1	Process decommissioning water waste	13	-	15			50	-	26	143	143	-	-	-	142	-	-	-	8,523	28	-
4b.3.3 4b.3.4	Small tool allowance Decommissioning Equipment Disposition	-	329	- 171	94	-	472	-	49 149	379 887	379 887	-	-	-	7,054	-	-	-	- 366,237	- 88	-
4b.3 4b.3	Subtotal Period 4b Collateral Costs	13		186			522	-	225	1,408	1,408		-	-	7,054 7,196	-	-	-	374,761	116	-
Period 4b	Period-Dependent Costs																				
4b.4.1	Decon supplies	730		-	-	-	-		183	913	913	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,155	116	1,271	1,271	-	-	-	-	-	-	-	-	-	-
4b.4.3 4b.4.4	Property taxes Health physics supplies	•	2,591	-	-	-	-	1,107	111 648	1,218 3,238	1,218 3,238		-	-	-	-	-	-	-	-	-
40.4.4	meanin physics supplies	-	∠,591	-	-	-	-	-	048	೨,∠೨ರ	ಎ,∠ಎ8	-	-	-	-	-	-	-	-		-

Table D-1
Byron Nuclear Power Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Caract III	Q: -	D 1		D! . 1 v	Volumes		Burial/		Utility and
Activity	v	Decon	Removal	Packaging	Transport			Other	Total	Total	Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet			Cu. Feet		Manhours	Manhours
Period 4b	Period-Dependent Costs (continued)																				
4b.4.5	Heavy equipment rental	-	4,459	-	-	-	-	-	669	5,128	5,128	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	91	49	-	276	-	85	501	501	-	-	-	4,309	-	-	-	86,182	141	-
4b.4.7	Plant energy budget		-	-	-	-	-	2,956	443	3,400	3,400	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,338	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost	•	-	-	-	-	-	366	55	420	420	-	-	-	-	-	-	-	-	-	-
4b.4.10 4b.4.11	Liquid Radwaste Processing Equipment/Services Security Staff Cost	-	-	-	-	-	-	889 1,328	133 199	1,022 1,527	1,022 1,527	-	-	-	-	-	-	-	-	-	25,426
4b.4.11 4b.4.12	DOC Staff Cost		-	-	-		-	16,578	2,487	19,065	19,065		-	-	-	-	-		-	-	217,274
4b.4.13	Utility Staff Cost		-				-	27,981	4,197	32,178	32,178									-	388,320
4b.4	Subtotal Period 4b Period-Dependent Costs	730	7,050	91	49	-	276	53,698	9,459	71,353	71,353	-	-	-	4,309	-	-	-	86,182	141	631,020
4b.0	TOTAL PERIOD 4b COST	3,330	25,529	2,811	2,059	-	9,412	58,877	19,326	121,344	117,094	-	4,250	-	146,274	-	-	-	7,856,233	355,543	644,404
PERIOD	4e - Delay before License Termination																				
	Period-Dependent Costs																				
4e.4.1	Insurance	-	-	-	-	-	-	775	78	853	853	-	-	-	-	-	-	-	-	-	-
4e.4.2	Property taxes		-	-	-	-	-	743	74	818	818	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	132	-	-	-	-	-	33	165	165	-	-	-	-	-	-	-	-		-
4e.4.4	Disposal of DAW generated	-	-	3	2	-	9	-	3	17	17	-	-	-	148	-	-	-	2,966	5	-
4e.4.6 4e.4.7	NRC Fees Site O&M Cost	-	-	-	-	-	-	$377 \\ 245$	38 37	415 282	415 282	-	-	-	-	-	-	-	-	-	-
4e.4.7 4e.4.8	Utility Staff Cost	•		-	•	-	-	1,494	224	1,718	1,718	•	-	-	-	-	-	•	-	-	21,720
4e.4	Subtotal Period 4e Period-Dependent Costs	-	132	3	2		9	3,635	486	4,268	4,268	-	-	-	148	-		-	2,966	5	
4e.0	TOTAL PERIOD 4e COST	-	132	3	2	-	9	3,635	486	4,268	4,268	-	-	-	148	-	-	-	2,966	5	21,720
PERIOD	4f - License Termination																				
Period 4f	Direct Decommissioning Activities																				
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license									a											
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
	Additional Costs																				
4f.2.1	License Termination Survey	-	-	-	-	-	-	6,411	1,923	8,334	8,334	-	-	-	-	-	-	-	-	91,892	3,120
4f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	6,411	1,923	8,334	8,334	-	-	-	-	-	-	-	-	91,892	3,120
	Collateral Costs																				
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,080	162	1,242	1,242	-	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	•	-	1,080	162	1,242	1,242	-	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs							200	0.0	100	100										
4f.4.1	Insurance	-	-	-	-	-	-	393	39	432	432	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	- = 4C	-	-	-	-	376	38	414 683	414 683	-	-	-	-	-	-	-	-	-	-
4f.4.3 4f.4.4	Health physics supplies Disposal of DAW generated	-	546	- 7	- 1	-	21		137 7	39	39	-	-	-	335	-	-	-	6,698	11	-
4f.4.5	Plant energy budget			. '	-1		- 21	268	40	308	308				-				0,030	- 11	
4f.4.6	NRC Fees		-	_	-	_	_	455	46	501	501	_	_	-	_	_	-		-	-	-
4f.4.7	Site O&M Cost	-	-	-	-	-	-	124	19	143	143	-		-	-	-	-	-	-	-	-
4f.4.8	Security Staff Cost	-		-	-	-	-	684	103	787	787	-	-	-	-	-	-	-	-	-	11,786
4f.4.9	DOC Staff Cost	-	-	-	-	-	-	3,919	588	4,507	4,507	-	-	-	-	-	-	-	-	-	46,750
4f.4.10	Utility Staff Cost	-	-	-	-	-	-	4,776	716	5,493	5,493	-	-	-	-	-	-	-	-	-	56,964
4f.4	Subtotal Period 4f Period-Dependent Costs	-	546	7	4	-	21	10,996	1,731	13,306	13,306	-	-	-	335	-	-	-	6,698	11	115,500
4f.0	TOTAL PERIOD 4f COST	-	546	7	4	-	21	18,659	3,868	23,106	23,106	-	-	-	335	-	-	-	6,698	91,902	118,620
PERIOD	4 TOTALS	3,862	55,553	22,122	13,741	-	63,576	142,527	63,175	364,556	355,555	_	9,001	-	463,880	1,127	393	2,217	26,070,970	735,558	1,494,982

Table D-1 Byron Nuclear Power Station, Unit 1 Delayed DECON Decommissioning Cost Estimate (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial/		Utility and
Activit Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD	5b - Site Restoration																				
Period 5b	Direct Decommissioning Activities																				
Demolitic	on of Remaining Site Buildings																				
5b.1.1.1	Reactor	-	7,213	-	-	-	-	-	1,082	8,294	-	-	8,294	-	-	-	-	-	-	69,541	-
5b.1.1.2	Auxiliary Building	-	6,230	-	-	-	-	-	934	7,164	-	-	7,164	-	-	-	-	-	-	61,288	-
5b.1.1.3	Old Steam Generator Storage Facility	-	490	-	-	-	-	-	74	564	-	-	564	-	-	-	-	-	-	4,868	-
5b.1.1.4	Refueling Water Storage Tank	-	1,099	-	-	-	-	-	165	1,263	-	-	1,263	-	-	-	-	-	-	11,688	-
5b.1.1.5	Turbine Building	-	6,069	-	-	-	-	-	910	6,979	-	-	6,979	-	-	-	-	-	-	70,347	-
5b.1.1.6	Turbine Pedestal	-	1,463	-	-	-	-	-	219	1,682	-	-	1,682	-	-	-	-	-	-	12,628	-
5b.1.1	Totals	-	22,563	-	•	-	-	-	3,384	25,947	-	-	25,947	-	-	-	-	-	•	230,359	-
	eout Activities																				
5b.1.2	Grade & landscape site	-	345	-	-	-	-	-	52	397	-	-	397	-	-	-	-	-	-	869	
5b.1.3	Final report to NRC	-		-	-	-	-	199	30	228	228	-		-	-	-	-	-	-		1,560
5b.1	Subtotal Period 5b Activity Costs	-	22,908	-	-	-	-	199	3,466	26,572	228	-	26,344	-	-	-	-	-	-	231,229	1,560
	Additional Costs																				
5b.2.1	Site Restoration ISFSI	-	645	-	-	-	-	28	101	774	-	-	774	-	-	-	-	-	-	6,477	80
5b.2.2	Concrete Crushing	-	607	-	-	-	-	4	92	702	-	-	702	-	-	-	-	-	-	2,798	-
5b.2.3	Demolish Cooling Tower	-	5,877	-	-	-	-	165	906	6,948	-	-	6,948	-	-	-	-	-	-	73,296	-
5b.2	Subtotal Period 5b Additional Costs	-	7,129	-	-	-	-	196	1,099	8,423	-	-	8,423	-	-	-	-	-	-	82,571	80
Period 5b	Collateral Costs																				
5b.3.1	Small tool allowance	-	308	-	-	-	-	-	46	355	-	-	355	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	308	•	-	-	-	-	46	355	•	-	355		-	-		-	-		-
Period 5b	Period-Dependent Costs																				
5b.4.2	Property taxes	-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	7,086	-	-	-	-	-	1,063	8,149	-	-	8,149	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	441	66	507	-	-	507	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Cost	-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	2,015	302	2,317	-	-	2,317	-	-	-	-	-	-	-	34,287
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	11,965	1,795	13,760	-	-	13,760	-	-	-	-	-	-	-	137,043
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	5,873	881	6,754	-	-	6,754	-	-	-	-	-	-	-	67,229
5b.4	Subtotal Period 5b Period-Dependent Costs	-	7,086	-	-	-	-	21,942	4,292	33,321	-	-	33,321	-	-	-	-	-	-	-	238,558
5b.0	TOTAL PERIOD 5b COST	-	37,431	-	-	-	-	22,337	8,903	68,671	228	-	68,443	-	-	-	-	-	-	313,799	240,198
PERIOD	5 TOTALS	-	37,431	-	-	-	-	22,337	8,903	68,671	228	-	68,443	-	-	-	-	-	-	313,799	240,198
TOTAL	COST TO DECOMMISSION	9,415	102,339	22,482	14,384	-	64,744	621,969	140,403	975,737	592,143	304,536	79,057	-	473,020	1,127	393	2,217	26,334,990	1,136,763	5,573,505

TOTAL COST TO DECOMMISSION WITH 16.81% CONTINGENCY:	\$975,737	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 60.69% OR:	\$592,143	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 31.21% OR:	\$304,536	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 8.1% OR:	\$79,057	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	474,539	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	cubic feet
TOTAL SCRAP METAL REMOVED:	56,010	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,136,763	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 D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							`	ono abana	s of 2014 dollar	- 5)											
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	•	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., LDS.	Mannours	Mannours
PERIOD	1a - Shutdown through Transition																				
Period 1a	Direct Decommissioning Activities																				
la.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	481	144	625	625	-	-	-	-	-	-	-	-	-	-
la.1.2 la.1.3	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	71	11	81 a	81	-	-	-	-	-	-	-	-	-	556
la.1.4	Remove fuel & source material									n/a											
la.1.5 la.1.6	Notification of Permanent Defueling Deactivate plant systems & process waste									a a											
a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	109	16	125	125	-	-	-	-	-	-	-	-	-	85
a.1.8 a.1.9	Review plant dwgs & specs. Perform detailed rad survey	-	-	-	-	-	-	71	11	81 a	81	-	-	-	-	-	-	-	-	-	55
a.1.10	Estimate by-product inventory	-	-	-	-	-	-	54	8	63	63	-	-	-	-	-	-	-	-	-	42
a.1.11 a.1.12	End product description Detailed by-product inventory	-	-	-		-		54 82	8 12	63 94	63 94	-	-		-		-			-	42 64
a.1.12	Define major work sequence	-	-	-		-		54	8	63	63	-	-		-	-	-	-	-	-	42
a.1.14 a.1.15	Perform SER and EA Perform Site-Specific Cost Study	-	-	-	-	-	-	169 272	25 41	194 313	194 313	-	-	-	-	-	-	-	-	-	1,32 2,14
4.1.10	renorm Site-Specific Cost Study	-	-	-	-	-	-	212	41	313	919	-	-	-	-	-	-	-	-	-	2,14
	pecifications Prepare plant and facilities for SAFSTOR							268	40	308	308										2,10
	Plant systems	-		-		-		227	34	261	261	-	-				-	-			1,78
	Plant structures and buildings Waste management	-	-	-	-	-	-	170 109	26 16	196 125	196 125	-	-	-	-	-	-	-	-	-	1,33 85
.1.16.5	Facility and site dormancy	-	-	-		-	-	109	16	125	125	-	-				-	-			85
.1.16	Total	-	-	-	-	-	-	883	132	1,016	1,016	-	-	-	-	-	-	-	-	-	6,93
	Vork Procedures																				
1.17.1 $1.17.2$		-	-	-	-	-	-	64 65	10 10	74 75	74 75	-	-	-	-	-	-	-	-	-	506 514
.1.17	Total	-	-	-	-	-	-	130	19	149	149	-	-	-	-	-	-	-	-	-	1,020
1.18	Procure vacuum drying system	-	-	-	-	-	-	5	1	6	6	-	-	-	-	-	-	-	-	-	45
.1.19 .1.20	Drain/de-energize non-cont. systems Drain & dry NSSS									a a											
.1.21	Drain/de-energize contaminated systems									a											
a.1.22 a.1	Decon/secure contaminated systems Subtotal Period 1a Activity Costs	_	_	_	_	-	-	2,436	438	a 2,874	2,874	_	_	_	_	_	_	_	_	_	15,36
	Period-Dependent Costs							_,		_,	_,										,
erioa 1a 1.4.1	Insurance	-		-		-		1,855	185	2,040	2,040	-	-								
.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.4.3 .4.4	Health physics supplies Heavy equipment rental	-	494 530			-	-	-	124 80	618 610	618 610	-	-	-	-	-	-	-	-	-	-
.4.5	Disposal of DAW generated	-	-	13	7	-	39		12	71	71	-	-	-	611	-	-	-	12,224	20	
i.4.6 i.4.7	Plant energy budget NRC Fees	-	-	-	-	-	-	1,783 836	267 84	2,051 920	2,051 920	-	-	-	-	-	-	-	-		
.4.8	Emergency Planning Fees	-		-	-	-		2,177	218	2,394	-	2,394	-		-	-		-	-		
.4.9	Site O&M Cost	-	-	-	-	-	-	165	25	190	190		-	-	-	-	-	-	-	-	-
.4.10 .4.11	Spent Fuel Pool O&M ISFSI Operating Costs	-		-	-	-	-	397 48	59 7	456 55		456 55	-		-	-	-		-		
.4.12	Security Staff Cost	-	-	-	-	-	-	8,569	1,285	9,855	9,855	-	-	-	-	-	-	-	-	-	157,90
i.4.13 i.4	Utility Staff Cost Subtotal Period 1a Period-Dependent Costs	-	1,025	- 13	7		39	32,368 48,198	4,855 7,202	37,223 56,483	37,223 53,577	2,906	-	-	611	-	-	-	12,224	20	424,56 582,46
.0	TOTAL PERIOD 1a COST		1,025		7		39	,	7,639	59,357	56,451	2,906			611	_	_		12,224		
	1b - SAFSTOR Limited DECON Activities	-	1,020	10	,	-	55	90,004	1,000	93,501	50,401	2,300		-	011	-	-	-	12,224	20	991,02
	Direct Decommissioning Activities																				
	-																				
econtam o.1.1.1	ination of Site Buildings Reactor	2,223			_		_	_	1,111	3,334	3,334	-	_	_	_	_	_	-	_	33,093	_
0.1.1.2	Auxiliary Building	256	-	-	-	-	-	-	128	384	384	-	-	-	-	-	-	-	-	3,830	-
b.1.1.3 b.1.1.4	Radwaste/Service Building Refueling Water Storage Tank	167 366				•		-	83 183	250 549	250 549	-	-	•	-	-	•	-		2,506 5,322	
	Fuel Handling Building	1,046		-	-	-	-	-	523	1,569	1,569	-	-	-	-	-	-	-	-	15,238	

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(t	housand	s of 2014 dolla	rs)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity		Decon	Removal		Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
1b.1.1	Totals	4,058	-		-	-	-	-	2,029	6,086	6,086	-	-		-		-		-	59,990	
11. 1	Subtotal Period 1b Activity Costs	4.050							9.090	C 00C	0.000									50,000	
1b.1	Subtotal Period 16 Activity Costs	4,058	-		-	-	-	-	2,029	6,086	6,086	-	-		-	-	-	-	-	59,990	-
	Collateral Costs	000							100	1.010	1.010										
1b.3.1 1b.3.2	Decon equipment Process decommissioning water waste	886 200	-	131	349	-	443	-	133 276	1,019 1,399	1,019 1,399	-	-	-	1,262	-		-	75,709	246	-
1b.3.4	Small tool allowance	-	67		-	-	-	-	10	77	77	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,086	67	131	349	-	443	-	419	2,495	2,495	-	-	-	1,262	-	-	-	75,709	246	-
Period 1b	Period-Dependent Costs																				
1b.4.1	Decon supplies	816	-	-	-	-	-	-	204	1,020	1,020	-	-	-	-	-	-	-	-	-	-
1b.4.2 1b.4.3	Insurance Property taxes	-	-	-	-	-	-	234 4,112	23 411	258 $4,524$	258 $4,524$	-	-	-	-	-	-	-	-	-	-
1b.4.5 1b.4.4	Health physics supplies	-	398	-	-	-	-	4,112	100	4,524	4,524	-	-	-	-		-	-	-	-	-
1b.4.5	Heavy equipment rental	-	132		-	-	-		20	152	152	-	-	-	-		-		-	-	-
1b.4.6	Disposal of DAW generated	-	-	12	7	-	37	-	12	68	68	-	-	-	585	-	-	-	11,700	19	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	443	67	510	510	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	116	12	128 595	128	-	-	-	-	-	-	-	-	-	-
1b.4.9 1b.4.10	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	541 41	54 6	595 47	47	595	-	-	-		-		-	-	-
1b.4.11	Spent Fuel Pool O&M	-	_	-	-	-	-	99	15	113	-	113	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-		-		-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	2,131	320	2,450	2,450	-	-	-	-	-	-	-	-	-	39,260
1b.4.14	Utility Staff Cost		-	-		-		8,048	1,207	9,255	9,255	-	-	-		-	-	-		-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	816	530	12	7	-	37	15,777	2,451	19,631	18,908	722	-	-	585	-	-	-	11,700	19	144,820
1b.0	TOTAL PERIOD 1b COST	5,960	597	143	356	-	480	15,777	4,899	28,212	27,490	722	-	-	1,847	-	-	-	87,408	60,255	144,820
PERIOD	1c - Preparations for SAFSTOR Dormancy																				
Period 1c l	Direct Decommissioning Activities																				
1c.1.1	Prepare support equipment for storage	-	487	-	-	-	-	-	73	561	561	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	48	-	-	-	-	-	7	56	56	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	10,874	-
1c.1.4 1c.1.5	Secure building accesses Prepare & submit interim report	-		-	-	-		32	5	a 37	37	-	-						-	-	250
			* 0.0					70F	20.5											14 774	250
1c.1	Subtotal Period 1c Activity Costs	-	536	-	•	-	-	765	305	1,606	1,606		•	-		-	-	-	-	14,574	200
Period 1c A	Additional Costs Spent fuel pool isolation	_			_			10,813	1,622	12,434	12,434	_	_								
1c.2.1	Subtotal Period 1c Additional Costs	-		-	-	-		10,813	1,622	12,434	12,434	-	-						-	-	
Davied 1a	Collateral Costs																				
1c.3.1	Process decommissioning water waste	236		155	414	-	525		327	1,658	1,658	-	-	-	1,496				89,742	292	-
1c.3.3	Small tool allowance	-	4	-	-	-	-	-	1	5	5	-	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	236	4	155	414	-	525	-	328	1,663	1,663	-	-	-	1,496	-	-	-	89,742	292	-
Period 1c l	Period-Dependent Costs																				
1c.4.1	Insurance	-	-	-	-	-	-	234	23	258	258	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	101	-	-	-	-	4,112	411	4,524	4,524	-	-	-	-	-	-	-	-	-	-
1c.4.3 1c.4.4	Health physics supplies Heavy equipment rental	-	191 132	-	-	-	-	-	48 20	239 152	239 152	-	-	-	-	-	-	-	-	-	-
1c.4.4 1c.4.5	Disposal of DAW generated	-	132	3	- 2.	-	10	-	3	182	182	-	-	-	152			-	3.039	- 5	-
1c.4.6	Plant energy budget		-	-			-	443	67	510	510	-		-	-	-	-		-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	116	12	128	128	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	541	54	595		595	-	-	-	-	-	-	-	-	-
1c.4.9	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1c.4.10 1c.4.11	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	99 12	15 2	113 14	-	113 14	-	-	-	-	-	-	-	-	-
1c.4.11 1c.4.12	Security Staff Cost	-		-	-	-		2,131	320	2,450	2,450	- 14	-	-				-	-	-	39,260
1c.4.12	Utility Staff Cost	-	-	-	-	-		8,048	1,207	9,255	9,255	-	-	-	-	-		-	-	-	105,560
1c.4	Subtotal Period 1c Period-Dependent Costs	-	323	3	2	-	10		2,187	18,301	17,579	722	-		152	-	-	-	3,039	5	144,820
1c.0	TOTAL PERIOD 1c COST	236	863	158	416	_	535	27,355	4,442	34,004	33,282	722			1,648	-	_		92,781	14,870	145,070
		200	000	100	110		555	,000	1,112	0 1,00 1					1,010				, · 1	11,010	

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						0.66 011	T T DIV				MDC	G IF	G*.	D .		D	57 1		D 11/		TT. *1*.
Activity	7	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
PERIOD	1 TOTALS	6,196	2,484	315	779	-	1,054	93,766	16,980	121,573	117,223	4,351	-	-	4,106	-	-	-	192,413	75,145	887,71
PERIOD	2a - SAFSTOR Dormancy with Wet Spent Fuel Storage	•																			
	Direct Decommissioning Activities																				
2a.1.1	Quarterly Inspection									a											
2a.1.2 2a.1.3	Semi-annual environmental survey Prepare reports									a a											
2a.1.3	Bituminous roof replacement	_	_	-	_	_	_	363	54	417	417	_	_	_	_		_		_	_	_
2a.1.5	Maintenance supplies	-	-	-	-	-	-	2,917	729	3,646	3,646	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	3,279	784	4,063	4,063	-	-	-	-	-	-	-	-	-	-
	Collateral Costs																				
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,750	1,763	13,513	-	13,513	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	•	-	-	11,750	1,763	13,513	-	13,513	•	-	-	-	-	-	•	-	-
	Period-Dependent Costs							19.000	1 207	19 970	19.090	1 997									
2a.4.1 2a.4.2	Insurance Property taxes			-	-	-	-	12,069 35,973	1,207 3,597	13,276 39,570	12,039 39,570	1,237	-	-	-		-	-	-	-	-
2a.4.3	Health physics supplies	-	3,889	-	-	_	-	-	972	4,861	4,861	-	-	-	-		-		-	-	-
2a.4.4	Disposal of DAW generated	-	´-	93	50	-	284	-	88	515	515	-	-	-	4,426	-	-	-	88,527	144	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	7,468	1,120	8,588	4,294	4,294	-	-	-		-	-	-	-	-
2a.4.6 2a.4.7	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	5,581 39,868	558 3,987	6,139 43,854	6,139	43,854	-	-	-	-	-	-	-	-	-
2a.4.7 2a.4.8	Site O&M Cost	-	-	-	-	-	-	3,464	520	3,983	3,983	45,654	-	-	-		-		-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-		-	-	8,305	1,246	9,551	-	9,551	-	-	-		-	-	-		-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	1,002	150	1,153	-	1,153	-	-	-	-	-	-	-	-	-
2a.4.11	Security Staff Cost	-	-	-	-	-	-	64,269	9,640	73,910	23,596	50,314	-	-	-	-	-	-	-	-	1,166,242
2a.4.12 2a.4	Utility Staff Cost Subtotal Period 2a Period-Dependent Costs	-	3,889	93	50		284	80,303 258,303	12,046 35,131	92,349 297,749	22,995 $117,992$	69,354 179,757	-		4,426			-	88,527	- 144	1,029,166 2,195,408
2a.0	TOTAL PERIOD 2a COST	-	3,889	93	50	_	284	273,332	37,677	315,325	122,055	193,270		-	4,426	-	-	-	88,527	144	2,195,408
PERIOD	2b - SAFSTOR Dormancy with Dry Spent Fuel Storage		,					ŕ	,	ŕ	,	,			,				,		, ,
2b.1.1	Direct Decommissioning Activities Quarterly Inspection									a											
2b.1.1	Semi-annual environmental survey									a											
2b.1.3	Prepare reports									a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	29	4	33	33	-	-	-	-	-	-	-	-	-	-
2b.1.5 2b.1	Maintenance supplies Subtotal Period 2b Activity Costs	-	-	-	-	-	-	232 261	58 62	290 323	290 323	-	-	-	-		-		-	-	-
	·	_	_	-	-	_	-	201	02	020	323	-	_		-	-	-	-		-	
	Collateral Costs							0.010	77 0	4.004		4.804									
2b.3.1 2b.3	Spent Fuel Capital and Transfer Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	3,813 3,813	572 572	4,384 4,384	-	4,384 4,384		-	-	-	-	-		-	-
Period 2h	Period-Dependent Costs																				
2b.4.1	Insurance	-		-	-	-	-	871	87	958	958	-	-	-	-	-		-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	835	84	919	919	-	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	152	- 4	-	-	-	-	38	191	191	-	-	-	1.50	-	-	-	- 0.4%0	-	-
2b.4.4 2b.4.5	Disposal of DAW generated Plant energy budget		-	4	2	-	11	- 297	3 45	20 342	20 342	-	-	-	173	-	-	-	3,453	6	-
2b.4.6	NRC Fees			-		-		427	43	470	470	-	-	-					-	-	-
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	3,173	317	3,490	-	3,490	-	-	-	-	-	-	-	-	
2b.4.8	Site O&M Cost	-	-	-	-	-	-	276	41	317	317	-	-	-	-	-	-	-	-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	80 2.726	12	92	1 070	92	-	-	-	-	-	-	-	-	47.05
2b.4.10 2b.4.11	Security Staff Cost Utility Staff Cost			-	-	-	-	2,726 2,638	409 396	3,134 3,033	1,878 1,830	1,256 1,203	-	-	-		-	-	-		47,05 34,85
2b.4.11	Subtotal Period 2b Period-Dependent Costs	-	152	4	2	-	11	11,323	1,475	12,966	6,925	6,042	-		173		-	-	3,453		81,91
2b.0	TOTAL PERIOD 2b COST	_	152	4	2	-	11	15,396	2,109	17,674	7,248	10,426	-	-	173	-	-	-	3,453	6	81,914
			132	-	-			-3,000	-,0	,0.1	.,_ 10	10,120			1.0				3,130	· ·	01,01

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(,	no asana	s of 2014 dolla	,											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	2c - SAFSTOR Dormancy without Spent Fuel Storage																				
Period 2c 2c.1.1 2c.1.2 2c.1.3 2c.1.4 2c.1.5 2c.1	Direct Decommissioning Activities Quarterly Inspection Semi-annual environmental survey Prepare reports Bituminous roof replacement Maintenance supplies Subtotal Period 2c Activity Costs	- -	:	-	-	-	:	17 140 157	3 35 38	a a a 20 175 195	20 175 195	:	:	- - -	:	:		:	-	· ·	:
2c.4.1 2c.4.2 2c.4.3 2c.4.4 2c.4.5 2c.4.6 2c.4.7 2c.4.8 2c.4.9 2c.4	Period-Dependent Costs Insurance Property taxes Health physics supplies Disposal of DAW generated Plant energy budget NRC Fees Site O&M Cost Security Staff Cost Utility Staff Cost Subtotal Period 2c Period-Dependent Costs				1	: : : : : :	6	526 504 - - 179 248 166 985 960 3,568	53 50 22 2 27 25 25 148 144 496	578 554 111 12 206 273 191 1,133 1,104 4,163	578 554 111 12 206 273 191 1,133 1,104 4,163	- - - - - - - - - -		: : : : : : :	100				1,995 - - - - - - - - 1,995	3 - - 3 - - - - 3	15,771 13,416 29,188
2c.0	TOTAL PERIOD 2c COST	-	89	2	1	-	6	3,726	533	4,358	4,358	-	-	-	100	-	-	-	1,995	3	29,188
	2 TOTALS	-	4,130	99	53	-	301	292,454	40,319	337,357	133,661	203,696	-	-	4,699	-	-	-	93,974	153	2,306,509
PERIOD	3a - Reactivate Site Following SAFSTOR Dormancy																				
3a.1.1 3a.1.2 3a.1.3 3a.1.4 3a.1.5 3a.1.6 3a.1.7 3a.1.8 3a.1.9 3a.1.10	Direct Decommissioning Activities Prepare preliminary decommissioning cost Review plant dwgs & specs. Perform detailed rad survey End product description Detailed by-product inventory Define major work sequence Perform SER and EA Perform Site-Specific Cost Study Prepare/submit License Termination Plan Receive NRC approval of termination plan				- - - - - - -			71 251 54 71 409 169 272 223	11 38 8 11 61 25 41 33	81 288 a 63 81 470 194 313 257 a	81 288 63 81 470 194 313 257	- - - - - - -		- - - - - - -					- - - - - - -		556 1,969 428 556 3,210 1,327 2,140 1,753
	pecifications Re-activate plant & temporary facilities							402	60	462	416		46								3,154
3a.1.11.2 3a.1.11.3 3a.1.11.4 3a.1.11.5 3a.1.11.6 3a.1.11.8 3a.1.11.9 3a.1.11.11 3a.1.11.11 3a.1.11.11 3a.1.11.11	Plant systems Reactor internals Reactor vessel Biological shield Steam generators Reinforced concrete Main Turbine Main Condensers Plant structures & buildings Waste management Facility & site closeout Total				-			227 387 354 27 170 87 22 22 170 251 49 2,168	34 58 53 4 26 13 3 3 26 38 7	261 445 407 31 196 100 25 25 196 288 56 2,493	235 445 407 31 196 50 - - 98 288 288 2,194	- - - - - - - - - -	46 26 - - - 50 25 25 25 98 - 28	-							1,783 3,039 2,782 214 1,335 685 171 171 1,335 1,969 385
Planning 3a.1.12 3a.1.13 3a.1.14 3a.1.15 3a.1.16 3a.1	& Site Preparations Prepare dismantling sequence Plant prep. & temp. svces Design water clean-up system Rigging/Cont. Cntrl Envlps/tooling/etc. Procure casks/liners & containers Subtotal Period 3a Activity Costs	- - - - -		- - - - -	- - - - -	- - - - -	- - - - -	131 3,000 76 2,300 67 9,262	20 450 11 345 10 1,389	150 3,450 88 2,645 77 10,651	150 3,450 88 2,645 77 10,353	- - - -	- - - - - 299	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	1,027 - 599 - 526 31,117
Period 3a 3a.4.1 3a.4.2 3a.4.3	Period-Dependent Costs Insurance Property taxes Health physics supplies	-	- - 409	- - -	- - -	- - -	- - -	521 500	52 50 102	573 550 511	573 550 511	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							`		15 01 2014 dolla	,											
		_			_	Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 3a	a Period-Dependent Costs (continued)																				
3a.4.4	Heavy equipment rental	-	529	-	-	-	-	-	79	608	608	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	10	5	-	31	1.770	10	56	56	-	-	-	481	-	-		9,613	16	
3a.4.6 3a.4.7	Plant energy budget NRC Fees	-	-	-	-	-	-	1,778 332	267 33	2,045 366	2,045 366	-	-	-	-		-		-		-
3a.4.8	Site O&M Cost	_	_	_	-	_	-	165		190	190	_	-	-	-		-		-	-	_
3a.4.9	Security Staff Cost	-	-	-	-	-	-	327	49	376	376	-	-	-	-		-		-	-	6,257
3a.4.10	Utility Staff Cost	-	-	-	-	-	-	14,339		16,490	16,490	-	-	-	-	-	-		-	-	200,229
3a.4	Subtotal Period 3a Period-Dependent Costs	-	938	10	5	-	31	17,963	2,818	21,765	21,765	-	•	-	481	-	-	-	9,613	16	206,486
3a.0	TOTAL PERIOD 3a COST	÷	938	10	5	-	31	27,225	4,207	32,416	32,117	-	299	-	481	-	-	-	9,613	16	237,603
PERIOD	3b - Decommissioning Preparations																				
Period 3b	Direct Decommissioning Activities																				
	Work Procedures																				
3b.1.1.1	Plant systems	-	-	-	-	-	-	258		297	267	-	30	-	-	-	-	-	-	-	2,026
3b.1.1.2	Reactor internals	-	-	-	-	-	-	136		157	157	-	-	-	-	-	-	-	-	-	1,070
3b.1.1.3 3b.1.1.4	Remaining buildings CRD cooling assembly	-	-	-	-	-	-	74 54		85 63	21 63	-	63	-	-	-	-	-	-	-	578 428
3b.1.1.5	CRD housings & ICI tubes	-	-	-	-	-	-	54		63	63	-	-	-	-	-	-		-	-	428
3b.1.1.6	Incore instrumentation	-	-	-	-	-	-	54		63	63	-	-	-	-		-		-	-	428
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	198		227	227	-	-	-	-	-	-	-	-	-	1,554
3b.1.1.8	Facility closeout	-	-	-	-	-	-	65		75	38	-	38	-	-	-	-		-	-	514
3b.1.1.9		-	-	-	-	-	-	25		28	28	-	-	-	-	-	-	-	-	-	193
3b.1.1.10 3b.1.1.11	Biological shield Steam generators	-	-	-	-	-	-	65 251	10 38	75 288	75 288	-	-	-	-	-	-	-	-	-	514 1,969
	Reinforced concrete		-	-	-	-	-	54		63	31	-	31	-	-		-			-	428
	Main Turbine	_	-	_	-	_	-	85		98	-	_	98	-	-	-	-		-	_	668
3b.1.1.14		-	-	-	-	-	-	85		98	-	-	98	-	-	-	-		-	-	668
	Auxiliary building	-	-	-	-	-	-	149		171	154	-	17	-	-	-	-	-	-	-	1,168
	Reactor building	-	-	-	-	-	-	149		171	154	-	17	-	-	-	-	-	-	-	1,168
3b.1.1 3b.1	Total Subtotal Period 3b Activity Costs	-	-	-	-	-	-	1,757 1,757		2,021 2,021	1,629 1,629	-	392 392	-	-	-	-	-	-	-	13,800 13,800
	Additional Costs																				
3b.2.1	Site Characterization	_	_	_	_	_	_	2,755	827	3,582	3,582	_					_			13,042	4,640
3b.2	Subtotal Period 3b Additional Costs	-		-	-	-		2,755		3,582	3,582	-	-		-		-		-	13,042	
Period 3b	o Collateral Costs																				
3b.3.1	Decon equipment	886	-	-	-	-	-	-	133	1,019	1,019	_	-	-	-	-			-	_	_
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,080	162	1,242	1,242	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,100		-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	886	3 1,100	-	-	-		1,080	460	3,526	3,526	-	•	-	-	-	-	-	-	-	-
	Period-Dependent Costs Decon supplies	27	,						-	0.4	0.4										
3b.4.1 3b.4.2	Decon supplies Insurance	- 21	-	-	-	-	-	263	26	34 289	34 289	-	-	-			-	-	-		-
3b.4.2 3b.4.3	Property taxes	-	-	-	-	-	-	252		277	277	-	-	-			-		-	-	-
3b.4.4	Health physics supplies	-	222	-	-	-	-	-	56	278	278	-	-	-	-	-	-	-	-	-	
3b.4.5	Heavy equipment rental	-	267	-	-	-	-	-	40	307	307	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	3	-	17	-	5	31	31	-	-	-	267	-	-	-	5,344	9	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	896		1,031	1,031	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	168		184 96	184 96	-	-	-	-	-	-	-	-	-	-
3b.4.9 3b.4.10	Site O&M Cost Security Staff Cost	-	-	-	-	-		83 165		96 189	189	-	-	-	-	-			-	-	3,154
3b.4.10	DOC Staff Cost	-	-	-	-	-		3,437		3,953	3,953	-	-	-					-	-	43,109
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	7,229		8,313	8,313	-	-	-	-	-	-	-	-	-	100,937
3b.4	Subtotal Period 3b Period-Dependent Costs	27	489	6	3	-	17			14,982	14,982	-	-	-	267	-	-	-	5,344	9	
3b.0	TOTAL PERIOD 3b COST	914	1,589	6	3	-	17	18,085	3,498	24,111	23,719	-	392	-	267	-	-	-	5,344	13,051	165,640
PERIOD	3 TOTALS	914	2,527	16	8		48	45,309	7,705	56,526	55,836		690	-	748	-	-	-	14,956	13,066	403,242

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(t	housand	ls of 2014 dolla	rs)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity	A state To a state	Decon	Removal		Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
PERIOD 4a - I	Large Component Removal																				
Period 4a Direct	t Decommissioning Activities																				
	Supply System Removal	49	151	9.4	27		0.50		191	C40	C 4 0				1 700				105 100	9.070	
	actor Coolant Piping essurizer Relief Tank	43 8	151 30			-	$\frac{252}{47}$	-	131 25	648 125	648 125	-	-	-	1,708 329	-	-	-	195,190 36,553	2,979 596	
	actor Coolant Pumps & Motors essurizer	29 12	108 69			-	1,390 879	-	426 296	2,230 1,731	2,230 1,731	-	-	-	4,796 3,033	-	-	-	780,540 240,915	2,726 1,527	80 750
4a.1.1.5 Stea	am Generators	98	4,496	1,591	2,916	-	10,319		4,349	23,769	23,769	-	-	-	62,044	-			3,098,575	20,508	2,250
	DMs/ICIs/Service Structure Removal actor Vessel Internals	41 93	301 2,899	230 6,520		-	188 4,995	290	173 6,656	979 22,511	979 22,511	-	-	-	3,881 1,835	- 1,127	- 393	-	145,494 328,507	5,232 27,350	
4a.1.1.8 Ves	ssel & Internals GTCC Disposal	-	-	-	-	-	11,996	-	1,799	13,795	13,795	-	-	-	-	-	-	2,217	433,180	-	-
4a.1.1.9 Rea 4a.1.1 Tota	actor Vessel als	115 438	5,075 13,130			-	2,832 32,898	290 580		17,747 83,534	17,747 83,534	-	-	-	9,331 86,956	1,127	393	2,217	960,579 6,219,533	27,350 88,269	
Removal of Maj																					
	in Turbine/Generator in Condensers	-	603 1,204			-	3,337 5,039	-	1,458 1,893	9,584 10,963	9,584 10,963	-	-	-	57,484 75,240	-	-	-	2,984,647 3,906,532	9,146 18,250	
	s from Clean Building Demolition		_,	1,020	000		2,000		1,000		_ 3,000				. 5,2 10				-,,	-5,250	
4a.1.4.1 Rea	actor	-	1,250		-	-	-	-	188	1,438	1,438	-	-	-	-	-	-	-	-	12,130	
	xiliary Building dwaste/Service Building	-	702 456		-	-	-	-	105 68	807 525	807 525	-	-		-	-	-	-	-	6,896 5,060	
4a.1.4.4 Ref	ueling Water Storage Tank	-	122	-	-	-	-	-	18	140	140		-		-	-	-	-	-	1,299	-
4a.1.4.5 Fue 4a.1.4 Tota	el Handling Building als	-	360 2,890			-	-	-	54 434	414 3,324	414 3,324	-	-	-	-	-	-	-	-	3,690 29,074	
Disposal of Plan	nt Systems																				
	xiliary Feedwater	-	256			-	120		102 20	543 154	543	-	- 154	-	1,791	-	-	-	93,271	3,811	-
	xiliary Steam xiliary Steam RCA		134 368		36	-	183	-	150	805	805	-	104		2,714	-	-	-	141,487	2,107 5,387	
	ric Acid Processing	-	481		47	-	238	-	195	1,042	1,042	-	- 01	-	3,611	-	-	-	184,114	7,055	
	2 & H2 2 & H2 RCA	-	18 35		4		18	-	$\frac{3}{14}$	21 78	78	-	21		276			-	14,104	289 492	
	emical Feed illed Water	-	169 94		-	-	-	-	25	195 108	-	-	195 108	-	-	-	-	-	-	2,663	
	culating Water	-	608		-	-	-	-	14 91	700	-	-	700		-	-	-	-	-	1,454 9,669	
4a.1.5.10 Con		-	341 340		-	-	-	-	51	392 391	-	-	392 391	-	-	-	-	-	-	5,317	-
	ndensate Booster ndensate Cleanup		186		-		-	-	51 28	214	-	-	214		-			-		5,314 3,000	
	ntainment Spray	-	259		46	-	231	-	138	755	755	-	-		3,455	-	-	-	179,291	3,839	
	sel Fuel Oil sential Service Water	-	185 320		-	-	-	-	28 48	213 368	-	-	213 368	-	-	-	-	-		2,848 5,049	
	raction Steam	-	229		-	-	-	-	34	263	-	-	263	-	-	-	-	-	-	3,637	
	edwater edwater Drains	-	310 736		-	-		-	47 110	357 846		-	357 846		-	-		-	-	4,925 11,719	
4a.1.5.19 Gla		-	39		-	-	-	-	6	44	-	-	44		-	-	-	-	-	616	
4a.1.5.20 Gla 4a.1.5.21 Mai		-	28 316		-	-		-	47	33 363		-	33 363		-	-		-	-	458 4,979	
4a.1.5.22 Mai		-	87		13	-	64	-	42	225	225	-	-	-	947	-	-	-	49,262	1,292	
	ke-up Demineralizer rogen	-	159 1		-			-	24 0	183 1	-	-	183 1		-			-	-	2,595 18	
4a.1.5.25 Nor	n-Essential Service Water	-	370		-	-	-	-	56	426	-	-	426	-	-	-	-	-	-	5,903	-
4a.1.5.26 Nor 4a.1.5.27 Off	n-Essential Service Water RCA Gas	-	184 689		50 95	-	251 478	-	124 322	690 1,746	690 1,746	-	-		3,738 7,112	-		-	194,273 370,343	2,692 10,290	
4a.1.5.28 Pots	able Water	-	5	-		-	-	-	1	6	-	-	6	-	-	-	-	-	-	75	-
	cess Radiation Monitoring cess Sampling	-	68 150		2 8	-	9 41	-	20 50	103 264	103 264	-	-		134 615	-	-	-	7,021 31,992	1,093 2,368	
4a.1.5.31 Sew	vage Treatment Plant	-	98	-	-	-	-	-	15	113	-	-	113	-	-	-	-	-	,002	1,579	-
	tion Air tion Heating	-	44 151		-	-	-	-	7 23	51 174	-	-	51 174	-	-	-	-	-	-	705 2,391	
4a.1.5.34 Stea	am Humidification	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	115	-
	itchgear Heat Removal rbine Bldg Equip Drains	-	33 79		-	-	-	-	5 12	38 91		-	38 91		-	-		-		519 1,235	
4a.1.5.37 Tur	rbine Bldg Floor Drains	-	135	-	-	-	-	-	20	156	-	-	156	-	-	-	-	-	-	2,117	-
4a.1.5.38 Tur	rbine Oil rbine-Generator Auxilaries	-	85 57		-	-	-	-	13 9	98 66	-	-	98 66	-	-	-	-	-	-	1,359 884	
4a.1.0.00 IUI	DING-GENELARDI AUXIIALIES	-	97	-	-	-	-	-	9	90	-	-	99	-	-	-	-	-	-	004	-

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(0	iio asaiia	s of 2014 dolla	15)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed	-		Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Disposal o	f Plant Systems (continued)																				
4a.1.5.40		-	33	-	-	-		-	5	38	-	-	38						-	517	-
4a.1.5.41	Well Water	-	80		-	-		-	12	93	-	-	93	-	·	-	-	-		1,247	
4a.1.5	Totals	-	7,970	563	323	-	1,632	-	1,966	12,454	6,253	-	6,202	-	24,394	-	-	-	1,265,158	123,619	-
4a.1.6	Scaffolding in support of decommissioning	-	1,572	14	7	-	37	-	405	2,035	2,035	-	-	-	556	-	-	-	28,884	26,134	-
4a.1	Subtotal Period 4a Activity Costs	438	27,368	16,475	7,932	-	42,944	580	26,157	121,894	115,692	-	6,202	-	244,631	1,127	393	2,217	14,404,750	294,493	5,532
	Additional Costs							1.050	* 00	0.700	0.800									01.181	
4a.2.1 4a.2.2	Remedial Action Surveys Asbestos Abatement	-	-	-	-	-	-	1,976 50	593 8	2,569 58	2,569 58	-	-	-						31,151	-
4a.2.3	Operational Tools and Equipment	-	_	9	51	-	189	-	56	304	304	-	-	-	5,855		_	-	146,375	16	
4a.2	Subtotal Period 4a Additional Costs	-	-	9	51	-	189	2,026	656	2,931	2,931	-	-	-	5,855	-	-	-	146,375	31,167	
Period 4a	Collateral Costs																				
4a.3.1	Process decommissioning water waste	12	-	13	34	-	43	-	23	125	125	-	-	-	123	-	-	-	7,395	24	-
4a.3.3	Small tool allowance	12	324 324	13	34	-	43	-	49 72	373 498	336 461	-	37 37	-	- 123	-	-	-	7,395	24	-
4a.3	Subtotal Period 4a Collateral Costs	12	324	13	34	-	43	-	72	498	461	-	31	-	123	-	-	-	7,395	24	-
	Period-Dependent Costs	00							90	100	100										
4a.4.1 4a.4.2	Decon supplies Insurance	80	-	-	-	-	-	771	20 77	100 848	100 848	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	_	-	_	-	-	739	74	813	732	-	81	-	_	-	_	-	-	-	_
4a.4.4	Health physics supplies	-	2,207	-	-	-	-	-	552	2,758	2,758	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	3,006	-	-	-	-	-	451	3,457	3,457	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	80	43	-	245	-	76	444	444	-	-	-	3,819	-	-	-	76,389	125	-
4a.4.7 4a.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	2,499 620	375 62	2,874 681	2,874 681	-	-	-	-	-	-	-	-		-
4a.4.9	Site O&M Cost		-	-	-	-	-	244	37	281	281	-		-	-	-	-	-	-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services		-	-	-	-	-	593	89	682	682	-			-	-	-	-	-		-
4a.4.11	Security Staff Cost		-	-	-	-	-	4,012	602	4,614	4,614	-	-	-	-	-	-	-	-	-	70,694
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	17,706	2,656	20,362	20,362	-	-	-	-	-	-	-	-	-	212,914
4a.4.13 4a.4	Utility Staff Cost Subtotal Period 4a Period-Dependent Costs	80	5,213	80	43	-	- 245	29,360 56,545	4,404 9,474	33,764 71,680	33,764 71,599	-	- 81	-	3,819	-	-	-	76,389	- 125	385,714 669,322
4a.0	TOTAL PERIOD 4a COST	530	32,906		8,060		43,420	59,152	36,359	197,003	190,683		6,320		254,429	1,127	393	2,217		325,808	
	4b - Site Decontamination	990	52,300	10,077	0,000		10,120	00,102	50,565	101,000	100,000		0,020		204,423	1,127	000	2,211	14,004,010	929,000	074,004
Period 4b 4b.1.1	Direct Decommissioning Activities Remove spent fuel racks	1,138	123	344	140	-	705	-	831	3,280	3,280	-	-	-	10,524	-	-	-	546,426	2,174	-
Disposal o	f Plant Systems																				
4b.1.2.1	Chemical & Volume Control	-	1,085	153	81	-	407	-	400	2,126	2,126	-	-	-	6,063		-	-	315,292	15,801	-
4b.1.2.2	Chilled Water RCA	-	667	168	93	-	470	-	315	1,713	1,713	-	-	-	7,000		-	-	364,517	9,521	-
4b.1.2.3 4b.1.2.4	Component Cooling Electrical	-	709 4,261	209	119	-	600	-	366 639	2,002 4,900	2,002	-	4,900	-	8,936	-	-	-	464,778	10,502 66,259	
4b.1.2.5	Electrical - Contaminated	-	1,757	181	120	-	608		627	3,294	3,294	-	4,300	-	9,079		-	-	471,393	26,007	
4b.1.2.6	Electrical - RCA	-	2,529		272	-	1,372	-	1,058	5,655	5,655	-	-	-	20,491	-	-	-	1,063,899	38,351	-
4b.1.2.7		-	96		-	-	-	-	14	111	-	-	111	-	-	-	-	-	-	1,514	
4b.1.2.8	Essential Service Water RCA	-	345		119	-	601	-	274	1,535	1,535	-	-	-	8,972	-	-	-	466,273	5,336	
4b.1.2.9 4b.1.2.10	Fire Protection Fire Protection RCA	-	315 537		- 83	-	419	-	47 266	362 1,447	1,447	-	362	-	6,243	-	-		324,808	4,983 7,672	
4b.1.2.11	Fuel Handling Bldg Equip Drains	-	167		18	-	91		70	377	377	-	-	-	1,386		-	-	70,185	2,442	
	Fuel Handling Bldg Floor Drains	-	170		16	-	82		69	368	368	-	-	-	1,241		-	-	63,725	2,480	
4b.1.2.13		-	119		11	-	58	-	48	257	257	-	-	-	874		-	-	44,626	1,769	
4b.1.2.14	Fuel Hnadling Bldg Equip Drains (Unit 1)	-	30		2	-	9	-	10	54	54	-	-	-	129	-	-	-	6,739	429	
	Fuel Pool Cooling & Cleanup Fuel Pool Cooling & Cleanup (Unit 1)	-	226 210		26 25	-	133 124	-	98 92	530 493	530 493	-	-	•	1,989 1,857	-	-	-	103,404	3,329	
4b.1.2.16 4b.1.2.17		-	564	42 108	72	-	361	-	92 253	1,358	1,358	-	-		5,390	-			96,476 279,889	3,103 8,029	
4b.1.2.18	HVAC-Control Room HVAC	-	8	-		-	-	-	1	9	1,000	-	9		-	-	-	-	-10,000	127	
4b.1.2.19	HVAC-Diesel Generator Room	-	44		-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	686	-
4b.1.2.20	HVAC-Laboratory	-	20		-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	315	
4b.1.2.21	HVAC-Machine Shop HVAC-Miscellaneous	-	18		-	-	•	-	3 17	21	-	-	21			-		-	-	297	
4b.1.2.22 4b.1.2.23	HVAC-Miscellaneous HVAC-Primary Containment	-	112 627		135	-	683	-	17 368	128 2,017	2,017	-	128		10,197	-	-		529,451	1,769 8,908	
	HVAC-Pumphouse	-	18		-	-	-	-	3	2,017	2,017	-	20		-	-	-		523,431	275	
	* * * * * * * * * * * * * * * * * * *		10						3				_0								

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
	•	Cost	COST	Costs	Costs	Costs	Costs	Costs	contingency	Costs	Costs	Costs	Costs	Cu. I cct	cu. rect	cu. rect	cu. rect	cu. r cct	77 t., 105.	Mamiours	Maimour
	of Plant Systems (continued) HVAC-Radwaste		326	CO	42		213		1.47	701	701				9.177				164 091	4 410	
4b.1.2.26		-	189	63	42	-	213	-	147 28	791 217	791	-	217	-	3,177		-		164,931	4,412 3,158	-
4b.1.2.27			73	_	_	-	-	-	11	84	-	-	84	_	-	_	_		_	1,197	_
4b.1.2.28		-	249	29	13	-	68	-	84	443	443	-	-	-	1,002	-	-	-	52,414	3,630	-
4b.1.2.29		-	76	14	8	-	40	-	31	168	168	-	-	-	592	-	-	-	30,841	1,125	-
4b.1.2.30		-	301	128	74	-	375	-	193	1,071	1,071	-	-	-	5,582	-	-	-	290,664	4,721	-
4b.1.2.31		-	839	218	133	-	670	-	419	2,278	2,278	-	-	-	10,451	-	-	-	519,324	12,918	-
4b.1.2.32 4b.1.2.33	•		2,769 110	478 23	270 13	-	1,365 67	-	1,122 48	6,004 261	6,004 261	-	-	-	20,695 997	-	-	-	1,058,144 51,818	40,223 1,605	-
4b.1.2.34		-	41	6	3	-	16	-	16	83	83	-	-	-	245	-	-		12,768	604	-
4b.1.2.35	0	-	167	20	10	-	51	-	58	307	307	-	-	-	763	-	-	-	39,871	2,413	-
4b.1.2.36	Residual Heat Removal	-	190	47	28	-	143	-	92	501	501	-	-	-	2,129	-	-	-	110,771	2,894	-
4b.1.2.37		-	877	224	134	-	676	-	431	2,341	2,341	-	-	-	10,357	-	-	-	523,998	13,451	-
4b.1.2.38		-	58	8	4	-	19	-	21	110	110	-	-	-	283	-	-	-	14,808	833	-
4b.1.2.39		-	253	56	31	-	156	-	112	607	607	-	-	-	2,315	-	-	-	120,573	3,664	-
4b.1.2.40		-	26 91	4	2	-	10	-	10	52 105	52	-	105	-	149	-	-	-	7,762	370	-
4b.1.2.41 4b.1.2	Waste Water Treatment Totals	-	21,267	3,277	1,959	-	9,887		14 7,885	44,275	38,242	-	6,033	-	148,585	-	-	-	7,664,142	1,464 318,585	-
40.1.2		-				•		-				-	0,033	-		-	•	-			•
4b.1.3	Scaffolding in support of decommissioning	-	2,358	20	11	•	56	-	607	3,052	3,052	•	-	-	834	-	-	-	43,325	39,201	-
	nination of Site Buildings																				
4b.1.4.1	Reactor	2,018		217	339	-	1,358	-	1,784	7,169	7,169	-	-	-	24,850	-	-	-	1,271,867	50,421	-
4b.1.4.2	Auxiliary Building	236		20	19	-	75	-	173	647	647	-	-	-	1,209	-	-	-	72,602	5,258	-
4b.1.4.3 4b.1.4.4	Radwaste/Service Building Refueling Water Storage Tank	155 367		9 38	12 17	-	38 83	-	102 318	363 1,253	363 1,253	-	-	-	686 1,240	-	-	-	42,199 67,351	2,958 11,972	
4b.1.4.4 4b.1.4.5	Fuel Handling Building	1,052		102	52	-	236	-	898	3,518	3,518	-	-	-	3,552	-	-	-	198,851	33,507	-
4b.1.4	Totals	3,828		386	439	-	1,790	-	3,274	12,950	12,950	-	-	-	31,537	-	-	-	1,652,869	104,117	-
4b.1	Subtotal Period 4b Activity Costs	4,966	26,980	4,027	2,549	-	12,437	-	12,598	63,557	57,524	-	6,033	-	191,480	-	-	-	9,906,763	464,076	-
Period 4b	Additional Costs																				
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	993	298	1,291	1,291	-	-	-	-	-	-	-	-	-	6,240
4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,566	1,070	4,636	4,636	-	-	-	-	-	-	-	-	56,209	-
4b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-		-	-	-	-	-	-
4b.2.4 4b.2.5	License Termination ISFSI Underground Services Excavation	-	450 506	197	274	-	893	1,213	757 76	3,783 581	3,783 581	-	-	-	14,543	-	-	-	1,178,711	7,043 2,755	7,144
4b.2.5 4b.2	Subtotal Period 4b Additional Costs	-	955	197	274		893	5,822	2,208	10,349	10,349	-	-		14,543			-	1,178,711	66,006	13,38
Period 4h	Collateral Costs																				
4b.3.1	Process decommissioning water waste	31	-	36	96	-	122	_	64	349	349	_	_	_	348	-	-	-	20,864	68	_
4b.3.3	Small tool allowance	-	523	-	-	-	-	-	78	601	601	-	-	-	-	-	-	-	· -	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	171	94	-	472	-	149	887	887	-	-	-	7,054	-	-	-	366,237	88	-
4b.3	Subtotal Period 4b Collateral Costs	31	523	207	190	-	594	-	292	1,837	1,837	-	-	-	7,401	-	-	-	387,101	156	-
	Period-Dependent Costs																				
4b.4.1	Decon supplies	949	-	-	-	-	-		237	1,186	1,186	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,409	141	1,550	1,550	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	9.717	-	-	-	-	1,351	135 929	1,486	1,486	-	-	-	-	-	-	-	-	-	-
4b.4.4 4b.4.5	Health physics supplies Heavy equipment rental	-	3,717 5,440	-	-	-	-	-	929 816	4,646 6,256	4,646 6,256	-	-	-	-	-		-	-		-
4b.4.6	Disposal of DAW generated	-	5,440	139	- 75	-	424	-	131	769	769	-	-	-	6,618				132,358	216	-
4b.4.7	Plant energy budget	_	_	-	-	-	-	3,607	541	4,148	4,148	_	_	_	-		_			-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,132	113	1,246	1,246	-	-	-	-				-	-	-
4b.4.9	Site O&M Cost	-	-	-	-	-	-	446	67	513	513	-	-	-	-	-	-	-	-	-	-
4b.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,084	163	1,247	1,247	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	10,072	1,511	11,583	11,583	-	-	-	-	-	-	-	-	-	176,25
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	31,501	4,725	36,226	36,226	-	-	-	-		-	-	-	-	377,88
4b.4.13	Utility Staff Cost	- 0.40	0.155	100	-	-	- 40.4	50,998	7,650	58,648	58,648	-	-	-	- 0.010	-	-	-	100.050	- 01.0	665,52
4b.4	Subtotal Period 4b Period-Dependent Costs	949	9,157	139	75	-	424	101,601	17,159	129,505	129,505	-	-	-	6,618	-	-	-	132,358	216	1,219,65
4b.0	TOTAL PERIOD 4b COST	5,946	37,615	4,571	3,088	-	14,349	107,424	32,256	205,248	199,216	-	6,033	-	220,043	-	-	-	11,604,930	530,454	1,233,034

Table D-2
Byron Nuclear Power Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(*	no abana.	s of 2014 dollar												
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	Class A Cu. Feet	Burial V Class B Cu. Feet	Class C	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
•	of - License Termination																		· · · · · · · · · · · · · · · · · · ·		
Period 4f D	rirect Decommissioning Activities																				
4f.1.1 4f.1.2	ORISE confirmatory survey Terminate license	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	a 224	224	-	-	-	-	-	-	-	-	-	-
	dditional Costs							0.500	2 222	44.000	44.000									400 ==0	0.400
f.2.1 f.2	License Termination Survey Subtotal Period 4f Additional Costs		-	-	-	-	-	8,763 8,763	2,629 2,629	$11,392 \\ 11,392$	11,392 11,392	-	-	-	-	-	-	-	-	$128,776 \\ 128,776$	3,12 3,12
	ollateral Costs																				
.3.1 .3	DOC staff relocation expenses Subtotal Period 4f Collateral Costs		-	-	-	-	-	1,080 1,080	162 162	1,242 $1,242$	1,242 1,242	-	-	-	-	-	-	-	-	-	
riod 4f P	eriod-Dependent Costs																				
4.1	Insurance	-	-	-	-	-	-	393	39	432	432	-	-	-	-	-	-	-	-	-	-
.2	Property taxes Health physics supplies		649	-		-	-	376	38 162	414 812	414 812		-	-	-				-	-	-
1.4	Disposal of DAW generated		-	7	4	-	21	-	7	39	39	-	-	-	335		-	-	6,698	11	-
4.5	Plant energy budget	-	-	-	-	-	-	268	40	308	308	-	-	-	-	-	-	-	-	-	-
1.6	NRC Fees	-	-	-	-	-	-	302	30	333	333	-	-	-	-	-	-	-	-	-	-
1.7 1.8	Site O&M Cost Security Staff Cost		-	-	-	-		124 684	19 103	143 787	143 787	-	-	-	-				-	-	11,78
1.9	DOC Staff Cost	-		-	-	-	-	3,919	588	4,507	4,507	-	-	-	-				-	-	46,75
.10	Utility Staff Cost	-	-	-	-	-	-	4,776	716	5,493	5,493	-	-	-	-	-	-	-	-	-	56,96
ŀ	Subtotal Period 4f Period-Dependent Costs	-	649	7	4	-	21	10,843	1,742	13,266	13,266	-	-	-	335	-	-	-	6,698	11	115,50
	TOTAL PERIOD 4f COST	-	649	7	4	-	21	20,858	4,584	26,124	26,124	-	-	-	335	-	-	-	6,698	128,787	118,620
RIOD 4	TOTALS	6,476	71,170	21,155	11,152	-	57,790	187,433	73,200	428,375	416,023	-	12,353	-	474,807	1,127	393	2,217	26,246,550	985,049	2,026,509
ERIOD 5	b - Site Restoration																				
riod 5b I	Direct Decommissioning Activities																				
	of Remaining Site Buildings		5 010						1 000	0.004			0.004							00 11	
1.1.1 1.1.2	Reactor Aux Feedwater-Steam Tunnel/Penetr. Area	-	7,213 719		-	-	-	-	1,082 108	8,294 827	-	-	8,294 827	-	-				-	69,541 5,187	-
1.1.3	Auxiliary Building		6,318		-	-			948	7,266	-	-	7,266	-	-				-	62,064	-
1.1.4	Berms, Settling Ponds, and Drying Beds	-	154		-	-	-	-	23	178	-	-	178	-	-	-	-	-	-	1,631	-
1.1.5	Circulating Water Pumphouse	-	1,090		-	-	-	-	163	1,253	-	-	1,253	-	-		-	-	-	11,861	-
1.1.6 1.1.7	Essential Service Cooling Tower Make-up Demineralizer Area	-	510 1,817		-	-	-	-	76 273	586 2,089	-	-	586 2,089	-	-	-	-	-	-	5,067 20,770	-
L.1.8	Miscellaneous Site Structures		1,954		-	-			273 293	2,069	-	-	2,247	-	-				-	20,770	-
1.1.9	Radwaste/Service Building	-	4,166		-	-	-	-	625	4,791	-	-	4,791	-	-		-	-	-	45,688	-
	Receiving Building	-	193		-	-		-	29	222	-	-	222	-	-				-	2,294	-
1.1.11	Refueling Water Storage Tank River Screen House	-	1,099 591		-	-	-	-	165 89	1,263 680	-	-	1,263 680	-	-	-	-	-	-	11,688 5,869	-
	Security Modifications	-	1,103		-	-	-		166	1,269	-	-	1,269	-	-				-	8,636	-
	Turbine Building	-	6,069		-	-	-	-	910	6,979	-	-	6,979	-	-				-	70,347	-
	Turbine Pedestal	-	1,463		-	-	-	-	219	1,682	-	-	1,682	-	-	-	-	-	-	12,628	-
	Yard Inventory Fuel Handling Building	-	2,253 3,242		-	-	-	-	338 486	2,591 3,729	-	-	2,591 3,729	-	-		-	-	-	20,857 33,246	-
	Totals	-	39,954		-	-	-	-	5,993	45,947	-	-	45,947	-	-	-	-	-	-	407,920	-
	ut Activities								505	* 001			₩ 001							0.0#0	
.1.2 .1.3	BackFill Site Grade & landscape site	-	5,114 345		-	-	-	-	$767 \\ 52$	5,881 397		-	5,881 397	-	-		-	-		9,059 869	
1.3	Final report to NRC		540	-	-	-		85	13	98	98	-	59 <i>1</i>	-	-				-	-	668
.1	Subtotal Period 5b Activity Costs	-	45,413	-	-	-	-	85	6,825	52,322	98	-	52,225	-	-	-	-		-	417,849	66
riod 5b A	Additional Costs Site Restoration ISFSI		645					28	101	774			774							6,477	0
.2.1 .2.2	Site Restoration ISFSI Concrete Crushing	-	645 988		-	-	-	28 6		1,142		-	774 1,142			-	-			6,477 4,554	8
.2.3	Cofferdam Construction and Teardown		455		-	-		-	68	523	-	-	523		-	-	-	-	-	3,996	-
b.2.4 b.2	Demolish Cooling Tower Subtotal Period 5b Additional Costs	-	5,142 7,229		-	-	-	165 198	796 1,114	6,102 8,542	-	-	6,102 8,542	-	-	-	-		-	18,598 33,625	- 80

Table D-2 Byron Nuclear Power Station, Unit 2 Delayed DECON Decommissioning Cost Estimate (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activit; Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
D 1 FL																					
5b.3.1	Collateral Costs Small tool allowance		541						81	622	_		622								
5b.3	Subtotal Period 5b Collateral Costs		541	-	-	-	-	-	81	622	-	-	622	-	-	-	-	-	-	-	-
Period 5b	Period-Dependent Costs																				
5b.4.2	Property taxes	-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	7,086	-	-	-	-	-	1,063	8,149	-	-	8,149	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	441	66	507		-	507	-	-	-	-	-		-	-
5b.4.5	Site O&M Cost	-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	2,015	302	2,317	-	-	2,317	-	-	-	-	-	-	-	34,287
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	11,965	1,795	13,760		-	13,760	-	-	-	-	-		-	137,043
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	5,873	881	6,754	-	-	6,754	-	-	-	-	-	-	-	67,229
5b.4	Subtotal Period 5b Period-Dependent Costs	-	7,086	-	-	-	-	21,942	4,292	33,321	-	-	33,321	-	-	-	-	-	-	-	238,558
5b.0	TOTAL PERIOD 5b COST	-	60,269	-	-	-	-	22,226	12,312	94,807	98	-	94,709	-	-	-	-	-	-	451,474	239,306
PERIOD	5 TOTALS	-	60,269	-	-	-	-	22,226	12,312	94,807	98	-	94,709	-	-	-	-	-	-	451,474	239,306
TOTAL	COST TO DECOMMISSION	13,585	140,581	21,584	11,992	_	59,193	641,188	150,515	1,038,639	722,840	208,046	107,753	_	484,359	1,127	393	2,217	26,547,890	1,524,888	5,863,279

TOTAL COST TO DECOMMISSION WITH 16.95% CONTINGENCY:	\$1,038,639	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 69.59% OR:	\$722,840	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 20.03% OR:	\$208,046	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 10.37% OR:	\$107,753	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	485,879	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	cubic feet
TOTAL SCRAP METAL REMOVED:	71,774	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,524,888	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

APPENDIX E

DETAILED COST ANALYSIS

SAFSTOR

	Page
Byron Nuclear Power Station, Unit 1	E-2
Byron Nuclear Power Station, Unit 2	E-12

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

							`		s of 2014 dolla	,											
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	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	SAFSTOR site characterization survey	-	-	-	-	-	-	481	144	625	625	-		-	-	-	-	-	-		-
1a.1.2 1a.1.3	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	•	-	-	-	-	166	25	190 a	190	-	-	-	-	-	-	-	-	-	1,30
1a.1.4	Remove fuel & source material									n/a											
la.1.5 la.1.6	Notification of Permanent Defueling Deactivate plant systems & process waste									a a											
la.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	255	38	293	293	-	-	-	-	-	-	-	-	-	2,00
a.1.8 a.1.9	Review plant dwgs & specs. Perform detailed rad survey	-	-	-	-	-	-	166	25	190 a	190	-	-	-	-	-	-	-	-	-	1,30
a.1.10	Estimate by-product inventory	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,00
a.1.11 a.1.12	End product description Detailed by-product inventory	-	-	-	-		-	127 191	19 29	146 220	146 220	-	-	-	-	-	-	-	-	-	1,00 1,50
a.1.13	Define major work sequence	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,00
1a.1.14 1a.1.15	Perform SER and EA Perform Site-Specific Cost Study	-	-	-	-		-	395 637	59 95	454 732	454 732	-	-	-	-	-	-	-	-	-	3,10 5,00
Activity S	pecifications																				
1a.1.16.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	626	94	720	720	-	-	-	-	-	-	-	-	-	4,920
	Plant systems Plant structures and buildings	-	-			-	-	531 397	80 60	610 457	610 457	-	-		-	-	-				4,16' 3,120
la.1.16.4	Waste management	-	-			-	-	255	38	293	293	-	-		-	-		-			2,000
	Facility and site dormancy Total	-					-	255 2,063	38 310	293 2,373	293 2,373	-	-	-		-	-	-	-	-	2,00 16,20
								2,000	310	2,515	2,010										10,20
	Vork Procedures Plant systems	_	_		_	_	_	151	23	173	173	_	_		_	_		_			1,188
a.1.17.2	Facility closeout & dormancy	-	-	-	-	-	-	153	23	176	176	-	-	-	-	-	-	-	-	-	1,200
a.1.17	Total	-	-	-	-	•	-	303	46	349	349	-	-	-	-	-	-	-	-	-	2,383
a.1.18	Procure vacuum drying system	-	-	-	-	-	-	13	2	15	15	-	-	-	-	-	-	-	-	-	100
a.1.19 a.1.20	Drain/de-energize non-cont. systems Drain & dry NSSS									a a											
la.1.21	Drain/de-energize contaminated systems									a											
la.1.22 la.1	Decon/secure contaminated systems Subtotal Period 1a Activity Costs	-	-	-	-		-	5,050	830	a 5,880	5,880	-	-	-	-	-	-	-	-	-	35,89
Pariod 1a	Additional Costs																				
1a.2.1	ISFSI Expansion	-	-	-	-	-	-	4,800	720	5,520	-	5,520	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	4,800	720	5,520	-	5,520	-	-	-	-	-	-	-	-	-
	Collateral Costs							= 0.40	4.400	0.440		0.440									
la.3.1 la.3	Spent Fuel Capital and Transfer Subtotal Period 1a Collateral Costs	-			-		-	7,346 7,346	1,102 1,102	8,448 8,448		8,448 8,448	-	-	-	-	-	-	-	-	-
Poviod 1a	Period-Dependent Costs																				
	Insurance	-		-		-	-	1,855	185	2,040	2,040	-	-	-	-	-	-	-	-	-	-
	Property taxes Health physics supplies	-	493	-	-	-	-	-	- 100	616	616	-	-	-	-	-	-	-	-	-	-
la.4.3 la.4.4	Heavy equipment rental	-	493 529	-	-	-	-	-	123 79	608	608	-	-	-	-		-		-	-	-
la.4.5	Disposal of DAW generated	-	-	13	7	-	39	-	12	71	71	-	-	-	610	-	-	-	12,190	20	-
la.4.6	Plant energy budget	-	-	-	-	-	-	1,778	267	2,045	2,045	-	-	-	-	-	-	-	-	-	-
la.4.7	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	1,181 2,171	118 217	1,299 2,388	1,299	2,388	-	-	-	-	-	-	-	-	-
la.4.8 la.4.9	Site O&M Cost	-		-	-	-	-	165	217 25	2,388 190	190	2,388	-	-					-	-	-
la.4.10	Spent Fuel Pool O&M	_	-	-	_	_	-	396	59	455	-	455	-	-	_	-	_	_	-	-	-
a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-			-	-	-	-	-
la.4.12	Security Staff Cost	-	-	-	-	-	-	640	96	736	736	-	-	-	-	-	-	-	-	-	12,26
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	32,279	4,842	37,121	37,121		-	-	-	-	-	-	-	-	423,400
la.4	Subtotal Period 1a Period-Dependent Costs	-	1,022	13	7	-	39	40,512	6,031	47,624	44,727	2,898	-	-	610	-	-	-	12,190	20	435,664
1a.0	TOTAL PERIOD 1a COST	-	1,022	13	7		39	57,709	8,683	67,472	50,606	16,865	-	_	610	_	-		12,190	20	471,554

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(tnousand	ls of 2014 dolla	rs)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	1b - SAFSTOR Limited DECON Activities																				
Period 1b	Direct Decommissioning Activities																				
Decontan	nination of Site Buildings																				
1b.1.1.1	Reactor	2,223		-		-	-	-	1,111	3,334	3,334	-	-		-	-	-	-	-	33,093	
1b.1.1.2 1b.1.1.3	Auxiliary Building Refueling Water Storage Tank	220 366		-	-	-	-	-	110 183	330 549	330 549	-	-	-		-	-	-	-	3,289 5,322	
1b.1.1.5 1b.1.1	Totals	2,809		-	-	-	-	-	1,404	4,213	4,213	-	-	-	-	-	-	-	-	41,705	
1b.1	Subtotal Period 1b Activity Costs	2,809	-	-	-	-	-	-	1,404	4,213	4,213	-	-		-	-	-	-	-	41,705	-
Period 1b	o Collateral Costs																				
1b.3.1	Decon equipment	886			-	-	-		133	1,019	1,019	-	-	-		-	-	-	-	-	-
1b.3.2 1b.3.4	Process decommissioning water waste Small tool allowance	180	46	118	314	-	398	-	248 7	1,258 53	1,258 53	-	-	-	1,135	-		-	68,086	221	-
1b.3.4 1b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-		1,831	275	2,106	-	2,106	-	-	-				-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,066	46	118	314	-	398	1,831	663	4,436	2,330	2,106	-	-	1,135	-	-	-	68,086	221	-
	Period-Dependent Costs																				
1b.4.1	Decon supplies	624	-	-	-	-	-	-	156	780	780	-	-	-	-	-	-	-	-	-	-
1b.4.2 1b.4.3	Insurance Property taxes							350 4,101	35 410	385 4,511	385 4,511			-					-		
1b.4.4	Health physics supplies	-	314	-	-	-	-		79	393	393	-	-	-	-	-		-	-	-	-
1b.4.5	Heavy equipment rental	-	132		-	-	-	-	20	152	152	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	11	6	-	33	-	10	60	60	-	-	-	517	-	-	-	10,338	17	-
1b.4.7 1b.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	443 172	67 17	510 189	510 189	-	-	-	-		-		-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	_	541	54	595	-	595	-	-	-	-	_		-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	99		113	-	113	-	-	-	-	-	-	-	-	-
1b.4.12 1b.4.13	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	12 160	$\begin{array}{c} 2 \\ 24 \end{array}$	14 184	184	14	-	-	-	-		-	-		3,058
1b.4.14	Utility Staff Cost	-	-	_	-	_	-	8,048	1,207	9,255	9,255	_	-	-	-		-		-	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	624	446	11	6	-	33	13,967	2,101	17,188	16,466	722	-	-	517	-	-	-	10,338	17	
1b.0	TOTAL PERIOD 1b COST	4,498	492	129	320	-	431	15,798	4,169	25,837	23,009	2,829	-	-	1,652	-	-	-	78,424	41,943	108,618
PERIOD	1c - Preparations for SAFSTOR Dormancy																				
Period 1c	Direct Decommissioning Activities																				
1c.1.1	Prepare support equipment for storage	-	487			-	-	-	73	561	561	-	-	-	-	-		-		3,000	-
1c.1.2	Install containment pressure equal. lines	-	48	-	-	-	-		7	56	56	-	-	-	-	-	-	-	-	700	
1c.1.3 1c.1.4	Interim survey prior to dormancy Secure building accesses	-	-	-	-	-	-	733	220	953 a	953	-	-	-	-	-	-	-	-	10,874	-
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	74	11	85	85	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	536	-	-	-	-	807	311	1,654	1,654	-	-	-	-	-	-	-	-	14,574	583
Period 1c	Collateral Costs																				
1c.3.1	Process decommissioning water waste	142	-	93	248		314	-	196	993	993	-	-	-	896	-	-	-	53,749		-
1c.3.3 1c.3.4	Small tool allowance Spent Fuel Capital and Transfer	-	4	-	-	-	-	1,831	$\frac{1}{275}$	5 2,106	5	2,106	-	-	-	-	-	-	-	-	-
1c.3.4 1c.3	Subtotal Period 1c Collateral Costs	142	4	93	248	-	314		471	3,104	998	2,106 2,106			896	-			53,749	- 175	-
Period 1c	Period-Dependent Costs																				
1c.4.1	Insurance	-	-	-		-	-	350	35	385	385	-	-		-	-	-	-	-	-	-
1c.4.2	Property taxes	-	100	-	-	-	-	4,101	410	4,511	4,511	-	-	-	-	-	-	-	-	-	-
1c.4.3 1c.4.4	Health physics supplies Heavy equipment rental	-	190 132			-	-	-	48 20	238 152	238 152	-	-		-	-	-	-	-	-	-
1c.4.4	Disposal of DAW generated	-	-	3	2	-	10		3	18	18	-	-		152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	443	67	510	510	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	172 541	17 54	189 595	189	- 595	-	-	-	-	-	-	-	-	-
1c.4.8 1c.4.9	Site O&M Cost	-	-	-	-	-	-	541 41		595 47	47	999	-			-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-		-	-	99	15	113		113		-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(•	mousanu	s of 2014 dolla	15)											
Activity		Decon	Removal	Packaging		Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC		Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	e Period-Dependent Costs (continued)																				
1c.4.12 1c.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	160 8,048	24 1,207	184 9,255	184 9,255	-	-		-	-	-	-		-	3,058 $105,560$
1c.4	Subtotal Period 1c Period-Dependent Costs	-	322	3	2	-	10	13,967	1,907	16,211	15,488	722	-	-	152	-	-	-	3,039	5	
1c.0	TOTAL PERIOD 1c COST	142	862	96	250	-	324	16,605	2,690	20,969	18,141	2,829	-	-	1,048	-	-	-	56,788	14,753	109,201
PERIOD	O 1 TOTALS	4,640	2,376	238	577	-	795	90,112	15,541	114,279	91,756	22,523	-	-	3,309	-	-	-	147,402	56,716	689,372
PERIOD	2a - SAFSTOR Dormancy with Wet Spent Fuel Storage																				
	a Direct Decommissioning Activities																				
2a.1.1 2a.1.2	Quarterly Inspection Semi-annual environmental survey									a											
2a.1.2 2a.1.3	Prepare reports									a a											
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	31	5	35	35	-	-	-	-	-	-	-	-	-	-
2a.1.5 2a.1	Maintenance supplies Subtotal Period 2a Activity Costs	-	-	-	-	-	-	836 867	209 214	1,045 1,081	1,045 1,081	-	-		-	-	-	-	-	-	-
	•	-		•	•	•	-	807	214	1,001	1,001	-	-	-	•	-	-	-	•	•	-
Period 2a 2a.3.1	a Collateral Costs Spent Fuel Capital and Transfer							44,216	6,632	50,849		50,849									
2a.3.1 2a.3	Subtotal Period 2a Collateral Costs	-	-		-	-	-	44,216	6,632	50,849	-	50,849	-		-		-	-			-
Pariod 2s	a Period-Dependent Costs																				
2a.4.1	Insurance	-	-	-	-	-	-	4,025	402	4,427	3,451	976	-			-		-	-	-	-
2a.4.2	Property taxes	-		-	-	-	-	28,506	2,851	31,357	31,357	-	-	-	-	-	-	-	-	-	-
2a.4.3 2a.4.4	Health physics supplies Disposal of DAW generated	-	1,115	- 27	14	-	81	-	279 25	1,393 148	1,393 148	-	-	-	1,269	-	-	-	25,378	41	
2a.4.5	Plant energy budget	-	-	-	-	-	-	2,141	321	2,462	1,231	1,231	-	-		-	-	-	20,510	-	
2a.4.6	NRC Fees	-	-	-	-	-	-	1,742	174	1,916	1,916	-	-	-	-	-	-	-	-	-	-
2a.4.7 2a.4.8	Emergency Planning Fees Site O&M Cost	-	•	-	-	-	-	11,429 993	1,143 149	12,571 $1,142$	1,142	12,571	-	-	-	-	-	-	-	-	-
2a.4.9	Spent Fuel Pool O&M	-		-	-	-		2,381	357	2,738	1,142	2,738	-	-	-				-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	287	43	330	-	330	-	-	-	-	-	-	-	-	-
2a.4.11 2a.4	Utility Staff Cost Subtotal Period 2a Period-Dependent Costs	-	- 1,115	- 27	14		- 81	23,020 $74,524$	3,453 9,197	26,473 84,958	6,592 47,230	19,881 37,728	-	-	1,269	-	-	-	- 25,378	41	295,026 295,026
2a.0	TOTAL PERIOD 2a COST		1,115		14	_	81		16,043	136,888	48,310	88,577	_		1,269	_	_	_	25,378	41	295,026
	2 2b - SAFSTOR Dormancy with Dry Spent Fuel Storage		1,110				01	110,001	10,010	100,000	10,010	00,011			1,200				20,010		200,020
	Direct Decommissioning Activities																				
2b.1.1	Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3 2b.1.4	Prepare reports Bituminous roof replacement							96	14	a 110	110										
2b.1.4 2b.1.5	Maintenance supplies	-		-	-	-		2,593	648	3,241	3,241	-	-	-	-				-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	2,689	663	3,352	3,352	-	-	•	-	-	-	-	-	-	-
	o Collateral Costs																				
2b.3.1 2b.3	Spent Fuel Capital and Transfer Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	9,688 9,688	1,453 1,453	11,141 11,141	-	11,141 11,141	-	-	-	-	-	-	-	-	-
		-		•	•	•	-	3,000	1,400	11,141		11,141	-	-	•	-	-	-	•	•	-
	Period-Dependent Costs							0.791	072	10.704	10.704										
2b.4.1 2b.4.2	Insurance Property taxes	-	-			-	-	9,731 9,328	973 933	10,704 $10,261$	10,704 10,261	-	-		-		-	-			-
2b.4.3	Health physics supplies	-	1,703	-	-	-	-	-	426	2,129	2,129	-	-	-	-	-	-	-	-	-	-
2b.4.4 2b.4.5	Disposal of DAW generated Plant energy budget	-	-	41	22	-	124	- 9 990	38 498	224	224 3,818	-	-	-	1,928	-	-	-	38,567	63	-
2b.4.5 2b.4.6	NRC Fees	-	-			-	-	3,320 5,152	498 515	3,818 5,667	3,818 5,667	-	-		-		-	-			-
2b.4.7	Emergency Planning Fees	-	-		-	-	-	35,446	3,545	38,990	-	38,990	-	-	-	-	-	-		-	-
2b.4.8 2b.4.9	Site O&M Cost ISFSI Operating Costs	-	-	-	-	-	-	3,080 891	462 134	3,542 1,025	3,542	1,025	-	-	-	-	-	-	-	-	-
2b.4.9 2b.4.10	Security Staff Cost	-	-	-	-		-	30,446	4,567	35,013	20,979	1,025	-	-	-	-	-	-		-	525,651
2b.4.11	Utility Staff Cost	-	-		-	-	-	29,464	4,420	33,883	20,444	13,439	-	-	-	-	-	-	-		389,371
2b.4	Subtotal Period 2b Period-Dependent Costs	-	1,703	41	22	-	124	126,857	16,510	145,256	77,768	67,488	-	-	1,928	-	-	-	38,567	63	915,023
2b.0	TOTAL PERIOD 2b COST	-	1,703	41	22	-	124	139,234	18,626	159,748	81,119	78,629	-	-	1,928	-	-	-	38,567	63	915,023

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(mousana	s of 2014 dolla	13)											
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	2c - SAFSTOR Dormancy without Spent Fuel Storage																				
Period 2c 2c.1.1 2c.1.2 2c.1.3 2c.1.4 2c.1.5	Direct Decommissioning Activities Quarterly Inspection Semi-annual environmental survey Prepare reports Bituminous roof replacement Maintenance supplies			:	-		-	135 3,666	20 916	a a a 156 4,582	156 4,582	-	:	:				-	-		
2c.1.5	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	3,801	937	4,738	4,738	-	-	-	-	-	-	-	-	-	-
Period 2c 2c.4.1 2c.4.2 2c.4.3 2c.4.4 2c.4.5 2c.4.6 2c.4.7 2c.4.8 2c.4.9 2c.4	Period-Dependent Costs Insurance Property taxes Health physics supplies Disposal of DAW generated Plant energy budget NRC Fees Site O&M Cost Security Staff Cost Utility Staff Cost Subtotal Period 2c Period-Dependent Costs		2,332 - - - - - - - - - 2,332	55 - - - - - - - - 55	30 - - - - - 30	- - - -		13,756 13,187 - 4,693 6,695 4,354 25,789 25,133 93,607	1,376 1,319 583 52 704 670 653 3,868 3,770 12,994	15,132 14,506 2,916 304 5,397 7,365 5,007 29,658 28,902 109,186	15,132 14,506 2,916 304 5,397 7,365 5,007 29,658 28,902 109,186		- - - - - - - -		2,611 				52,221 - - - - - - - - 52,221		- - 412,848 351,192
2c.0	TOTAL PERIOD 2c COST	-	2,332	55	30	-	167	97,409	13,931	113,924	113,924	-	-	-	2,611	-	-	-	52,221	85	764,035
PERIOD	2 TOTALS	-	5,150	122	66	-	372	356,249	48,600	410,560	243,353	167,206	-	-	5,808	-	-	-	116,166	189	1,974,083
PERIOD	3a - Reactivate Site Following SAFSTOR Dormancy																				
3a.1.1 3a.1.2 3a.1.3 3a.1.4 3a.1.5 3a.1.6 3a.1.7 3a.1.8 3a.1.9 3a.1.10	Direct Decommissioning Activities Prepare preliminary decommissioning cost Review plant dwgs & specs. Perform detailed rad survey End product description Detailed by-product inventory Define major work sequence Perform SER and EA Perform Site-Specific Cost Study Prepare/submit License Termination Plan Receive NRC approval of termination plan pecifications			- - - - - - -	:	:		166 586 127 166 955 395 637 522	25 88 19 25 143 59 95 78	190 674 a 146 190 1,098 454 732 600 a	190 674 146 190 1,098 454 732 600			-					:		1,300 4,600 1,000 1,300 7,500 3,100 5,000 4,096
3a.1.11.1 3a.1.11.2 3a.1.11.3 3a.1.11.4 3a.1.11.5 3a.1.11.6 3a.1.11.7 3a.1.11.8 3a.1.11.9 3a.1.11.10	Re-activate plant & temporary facilities Plant systems Reactor internals Reactor vessel Biological shield Steam generators Reinforced concrete Main Turbine Main Condensers Plant structures & buildings Waste management Facility & site closeout			- - - - - - - - - - - -				938 531 904 828 64 397 204 51 51 397 586 115 5,064	141 80 136 124 10 60 31 8 8 60 88 17	1,079 610 1,040 952 73 457 234 59 59 457 674 132 5,824	971 549 1,040 952 73 457 117 - - 228 674 66 5,127	- - - - - - - - - - - -	108 61 - - - 117 59 59 228 - 66 697	-					-		7,370 4,167 7,100 6,500 500 3,120 1,600 400 400 3,120 4,600 900 39,777
Planning 3a.1.12 3a.1.13 3a.1.14 3a.1.15 3a.1.16 3a.1	& Site Preparations Prepare dismantling sequence Plant prep. & temp. svces Design water clean-up system Rigging/Cont. Cntrl Envlps/tooling/etc. Procure casks/liners & containers Subtotal Period 3a Activity Costs	- - - - -	- - - - -	· · · · · · ·	- - - - -	- - - - -	- - - - -	306 3,000 178 2,300 157 14,557	46 450 27 345 23 2,183	351 3,450 205 2,645 180 16,740	351 3,450 205 2,645 180 16,043	- - - - -	- - - - - 697	· · · · · · ·	- - - - -	- - - - -	· · · ·	- - - - -	- - - - -	- - - - -	2,400 - 1,400 - 1,230 72,703
Period 3a 3a.4.1 3a.4.2 3a.4.3	Period-Dependent Costs Insurance Property taxes Health physics supplies		- - 431	- - -	-		- - -	521 500	52 50 108	573 550 539	573 550 539		- - -	- -			-		-	-	- - -

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

A . 42 . 24		D	D	D. J. S.	TD	Off-Site	LLRW	0:1	m 1	m . 4 . 1	NRC	Spent Fuel	Site	Processed	CI A		Volumes	ОТОО	Burial /	C C	Utility and
Activity Index		Decon Cost	Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 3a	Period-Dependent Costs (continued)																				
3a.4.4	Heavy equipment rental	_	529	_	_	_	-		79	608	608	_	-	-	_	-	_		_	-	_
3a.4.5	Disposal of DAW generated		-	11	6	-	33	-	10	60		-		-	514	-	-	-	10,287	17	-
3a.4.6	Plant energy budget		-	-	-	-	-	1,778	267	2,045	2,045	-		-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	378	38	416	416	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	3,725	559	4,283	4,283	-	-	-	-	-	-	-	-	-	65,179
3a.4.10	Utility Staff Cost	-	960	- 11	- 0	-	-	19,668	2,950	22,618	22,618	-	-	-	- E14	-	-	-	10.007	- 17	258,629
3a.4	Subtotal Period 3a Period-Dependent Costs	-	960	11	б	-	33	26,735	4,138	31,882	31,882	-	-	-	514	-	-	-	10,287	17	
3a.0	TOTAL PERIOD 3a COST	ē	960	11	6	-	33	41,291	6,321	48,622	47,924	-	697	-	514	-	-	-	10,287	17	396,510
PERIOD	3b - Decommissioning Preparations																				
Period 3b	Direct Decommissioning Activities																				
	Work Procedures								_												
	Plant systems	-	-	-	-	-	-	603	90	693	624	-	69	-	-	-	-	-	-	-	4,733
3b.1.1.2	Reactor internals		-	-	-	-	-	318	48	366	366	-	140	-	-	-	-	-	-	-	2,500
3b.1.1.3 3b.1.1.4	Remaining buildings CRD cooling assembly	-	-	-	-	-	-	172 127	26 19	198 146	49 146	-	148	-	-	-	-	-	-	-	1,350 1,000
3b.1.1.4 3b.1.1.5	CRD housings & ICI tubes			-		-	-	127	19	146	146						-	-			1,000
3b.1.1.6	Incore instrumentation		-	-	-	-	-	127	19	146	146	-		-	-	-	-	-	-	-	1,000
3b.1.1.7	Reactor vessel		-	-	-	-	-	462	69	531	531	-		-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	153	23	176	88	-	88	-	-	-	-	-	-	-	1,200
3b.1.1.9	Missile shields	-	-	-	-	-	-	57	9	66		-	-	-	-	-	-	-	-	-	450
	Biological shield	-	-	-	-	-	-	153	23	176		-	-	-	-	-	-	-	-	-	1,200
3b.1.1.11		-	-	-	-	-	-	586	88	674	674	-	-	-	-	-	-	-	-	-	4,600
	Reinforced concrete Main Turbine	-	-	-	-	-	-	127 199	19 30	146 228	73	-	73 228	-	-	-	-	-	-	-	1,000 1,560
	Main Condensers		-	-	-	-	-	199	30	228		-	228	-	-	-	-	-	-	-	1,560
	Auxiliary building	-	-	-	-	-	_	348	52	400		-	40	-	-	-	-	-	-	-	2,730
	Reactor building		_	-	-	-	_	348	52	400	360	-	40	-	-	-	-	-	_	-	2,730
3b.1.1	Total		-	-	-	-	-	4,105	616	4,721	3,806	-	915	-	-	-	-	-	-	-	32,243
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	4,105	616	4,721	3,806	-	915	-	-	-	-	-	-	-	32,243
	Additional Costs																				
3b.2.1	Site Characterization	-	-	-	-	-	-	6,444	1,933	8,377	8,377	-	-	-	-	-	-	-	-	30,500	10,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	6,444	1,933	8,377	8,377	-	-	-	-	-	-	-	-	30,500	10,852
Period 3b 3b.3.1	Collateral Costs Decon equipment	886						-	133	1,019	1,019										
3b.3.2	DOC staff relocation expenses	-	-	_	-	-	-	1,080	162	1,242				-	-	-	_	-	_		-
3b.3.3	Pipe cutting equipment	-	1,100	_	-	-	_	-	165	1,265	1,265	-	-	_	-	-	-	-	_	-	_
3b.3	Subtotal Period 3b Collateral Costs	886	1,100	-	-	-	-	1,080	460	3,526	3,526	-	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs								=	2 :	<i>a</i> :										
3b.4.1	Decon supplies	27	-	-	-	-	-	- 261	$\frac{7}{26}$	34 287	34 287	-	-	-	-	-	-	-	-	-	-
3b.4.2 3b.4.3	Insurance Property taxes	-		-	-	-	-	261 251	26 25	287 276	287	-	-	-				-	-	-	-
3b.4.3	Health physics supplies	-	238	-	-	-	-	201	60	298	298	-	-	-					-	-	-
3b.4.5	Heavy equipment rental	-	265	-	-	-	-	-	40	305	305	-		-		-		-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	3	-	19		6	34	34	-	-	-	292			-	5,834	10	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	892	134	1,025	1,025	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	190	19	208		-	-	-		-	-	-	-	-	-
3b.4.9	Site O&M Cost	-	-	-	-	-	-	83	12	95	95	-	-	-	-	-	-	-	-	-	
3b.4.10	Security Staff Cost	-	-	-	-	-	-	1,867	280	2,148		-	-	-	-	-	-	-	-	-	32,679
3b.4.11	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	5,085 9,861	763 1,479	5,847	5,847	-	-	-	-	-	-	-	-	-	58,560
3b.4.12 3b.4	Subtotal Period 3b Period-Dependent Costs	27	503	- 6	3	-	19		1,479 2,850	11,340 21,897	$11,340 \\ 21,897$	-	-	-	292	-	-	-	5,834	10	129,669 220,907
3b.0	TOTAL PERIOD 3b COST	913	1,603	6	3	-	19	30,117	5,859	38,521	37,606	-	915	-	292	-	-		5,834	30,510	264,002
PERIOD	3 TOTALS	913	2,563	17	9		52	71,409	12,180	87,143	85,530	-	1,613	-	806	-	-	-	16,121	30,526	660,512

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(t	housand	ls of 2014 dolla	rs)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 4	4a - Large Component Removal																				
Period 4a l	Direct Decommissioning Activities																				
Nuclear St	team Supply System Removal																				
4a.1.1.1	Reactor Coolant Piping	46	160		38	-	263	-	138	680	680	-	-	-	1,783	-	-	-	203,843	3,153	-
4a.1.1.2 4a.1.1.3	Pressurizer Relief Tank Reactor Coolant Pumps & Motors	8 29	30 108		198	-	47 1,390	-	$\frac{25}{426}$	125 2,230	125 2,230	-	-		329 4,796	-	-	-	36,553 780,540	596 2,726	80
	Pressurizer	12	69	368	106	-	879	-	296	1,731	1,731	-	-	-	3,033	-	-	-	240,915	1,527	750
4a.1.1.5 4a.1.1.6	Steam Generators Retired Steam Generator Units	98	4,496	2,810 1,591	3,697 2,916	-	11,075 10,319	-	4,777 3,176	26,953 18,002	26,953 18,002	-	-	-	67,463 62,044	-	-	-	3,820,664 3,098,575	20,508 10,800	4,500 $2,250$
4a.1.1.6 4a.1.1.7	CRDMs/ICIs/Service Structure Removal	41	301		2,916	-	188	-	173	979	979	-	-	-	3,881	-	-	-	145,494	5,232	2,250
4a.1.1.8	Reactor Vessel Internals	93	2,899	6,520	1,077	-	4,331	290	,	21,539	21,539	-	-	-	2,461	501	393	-	328,507	27,350	1,226
4a.1.1.9 4a.1.1.10	Vessel & Internals GTCC Disposal Reactor Vessel	115	5,075	2,149	1,140	-	11,996 2,832	290	1,799 6,146	13,795 17,747	13,795 17,747	-	-	-	9,331	-	-	2,217	433,180 960,579	27,350	1,226
	Totals	441	13,139		9,226		43,320	580		103,781	103,781	-	-	-	155,121	501	393	2,217	10,048,850	99,243	10,032
	of Major Equipment														<u>-</u>				0.0:		
4a.1.2 4a.1.3	Main Turbine/Generator Main Condensers	-	614 1,204		1,094 998	-	3,399 5,039	-	1,482 1,893	9,739 10,963	9,739 10,963	-	-	-	58,555 $75,240$	-	-	-	3,040,215 3,906,532	9,317 18,250	-
Cascading	Costs from Clean Building Demolition																				
4a.1.4.1	Reactor	-	1,250		-	-	-	-	188	1,438	1,438	-	-	-	-	-	-	-	-	12,130	-
4a.1.4.2 4a.1.4.3	Auxiliary Building Refueling Water Storage Tank	-	692 122		-	-		-	104 18	796 140	796 140	-	-	-				-	-	6,810 1,299	-
4a.1.4	Totals	-	2,065		-	-	-	-	310	2,374	2,374	-	-	-	-	-	-	-	-	20,238	-
-	f Plant Systems																				
4a.1.5.1 4a.1.5.2	Auxiliary Feedwater Auxiliary Steam	-	80 72			-	-	-	12 11	92 83		-	92 83	-	-	-	-	-		1,244 1,126	-
4a.1.5.3	Auxiliary Steam RCA	-	138		11	-	54		52	276	276	-	-	-	805			-	42,068	1,984	-
4a.1.5.4	Boric Acid Processing	-	517		78	-	392	-	252	1,366	1,366	-		-	6,102	-	-	-	303,638	8,026	-
4a.1.5.5 4a.1.5.6	CO2 & H2 CO2 & H2 RCA	-	27 40	- 5	- 9	-	11		4 13	31 71	71	-	31	-	159				8,312	419 583	-
	Chemical Feed	-	59	-		-	-		9	68	-	-	68	-	-			-		934	-
	Chilled Water	-	74		-	-		-	11	85	-	-	85	-	-	-	-	-	-	1,142	-
4a.1.5.9 4a.1.5.10	Circulating Water Condensate	-	323 386		-	-		-	48 58	372 444	-	-	372 444	-	-	-		-	-	5,150 6,023	-
	Condensate Booster	-	347		-	-	-	-	52	400	-	-	400	-	-	-	-	-	-	5,428	-
	Condensate Cleanup	-	68		- 46	-	-	-	10	79	-	-	79	-	9 401	-	-	-	100 055	1,060	-
	Containment Spray Diesel Fuel Oil	-	264 105		46	-	233		139 16	765 120	765	-	120	-	3,481		-	-	180,655	3,897 1,615	-
	Essential Service Water	-	244		-	-	-	-	37	280	-	-	280	-	-	-	-	-	-	3,837	-
		-	194		-	-	-	-	29	223	-	-	223	-	-	-	-	-	-	3,089	-
	Feedwater Feedwater Drains	-	324 776		-	-			49 116	372 892	-	-	372 892	-	-	-	-	-	-	5,142 12,366	-
4a.1.5.19	Gland Steam	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	932	-
	Gland Water Main Steam	-	51 331		-	-	-	-	8 50	59 380	-	-	59 380	-	-			-		828 5,216	-
	Main Steam RCA	-	53		10	-	49	-	28	155	155	-	-	-	726	-			37,727	769	-
4a.1.5.23		•	3	1	1	-	3		2	10	10	-	-	-	49			-	2,447	50	-
	Non-Essential Service Water Non-Essential Service Water RCA	-	183 96		19	-	94	-	27 53	211 294	- 294	-	211	-	1,400			-	72,790	2,916 1,358	-
		-	583		71	-	360	-	259	1,398	1,398	-	-	-	5,352	-		-	278,775	8,689	-
	Process Radiation Monitoring	-	43		1	-	7	-	13	68	68	-	-	-	109	-	-	-	5,726	671	-
	Process Sampling Station Air	-	125 31		8	-	40	-	44 5	228 36	228	-	- 36	-	590	-	-	-	30,697	1,947 498	-
	Station Heating		113				-	-	5 17	130		-	130	-	-	-	-	-		1,771	-
	Switchgear Heat Removal	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	139	-
	Turbine Bldg Equip Drains Turbine Generator	-	1 58	-			-	-	0	1 67	•	-	1 67	-	-	-	-	-	-	17 901	-
	Turbine Oil	-	89				-	-	13	103		-	103		-	-	-	-		1,399	-
4a.1.5.35	Waste Oil Sumps	-	31		-		-	-	5	35	-	-	35	-	-	-	-	-		483	-
4a.1.5	Totals	•	5,894		246	-	1,242	-	1,460	9,268	4,630	-	4,638	-	18,774	-	-	-	962,836	91,647	-
4a.1.6	Scaffolding in support of decommissioning	-	1,088	9	5	-	24	-	280	1,406	1,406	-	-	-	359	-	-	-	18,654	18,101	-
4a.1	Subtotal Period 4a Activity Costs	441	24,004	19,201	11,569	-	53,025	580	28,710	137,530	132,892	-	4,638	•	308,049	501	393	2,217	17,977,090	256,796	10,032

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

A -4::4-	_	D	D 1	Da alaania n	Т	Off-Site	LLRW	041	T-4-1	Т-4-1	NRC	Spent Fuel	Site	Processed	Class A		Volumes	СТСС	Burial /	C 64	Utility and
Activity Index		Decon Cost	Removal Cost	Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
	a Additional Costs																				
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,976 50	593 8	2,569 58	2,569 58		-	-	-	-	-	-	-	31,151	-
4a.2.2 4a.2.3	Asbestos Abatement Operational Tools and Equipment	-	-	9	51	-	189	- 50	56	304	304		-	-	5,855		-		146,375	16	-
4a.2	Subtotal Period 4a Additional Costs	-	-	9	51	-	189	2,026	656	2,931	2,931	-	-	-	5,855	-	-	-	146,375	31,167	-
	a Collateral Costs																				
4a.3.1	Process decommissioning water waste	5		9	23	-	30	-	14	82	82		-	-	85	-	-	-	5,089	17	
4a.3.3 4a.3	Small tool allowance Subtotal Period 4a Collateral Costs	5	273 273	9	23		30		41 55	314 396	283 365		31 31	-	85	-	-	-	5,089	17	-
Period 4a	a Period-Dependent Costs																				
4a.4.1	Decon supplies	81	-	-	-	-	-	-	20	101	101		-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	781	78	859			-	-	-	-	-	-	-	-	-
4a.4.3 4a.4.4	Property taxes Health physics supplies	-	2,044	-	-	-	-	749	75 511	824 2,555	741 2,555		82	-			-	-	-	-	-
4a.4.5	Heavy equipment rental	_	3.045	-	_	_	-		457	3,502	3,502		-	-	_		-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	79	42	-	239	-	74	434	434		-	-	3,733	-	-	-	74,651	122	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	2,532	380	2,912	2,912		-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees Site O&M Cost	-	-	-	-	-	-	905	90 37	995 284	995 284		-	-	-	-	-	-	-	-	-
4a.4.9 4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	247 601	90	691	691	-	-	-	-		-		-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,582	837	6,419	6,419	-	-	-	-		-	-	-	-	97,679
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	17,936	2,690	20,626	20,626		-	-	-	-	-	-	-	-	215,674
4a.4.13 4a.4	Utility Staff Cost Subtotal Period 4a Period-Dependent Costs	- 81	5,089	- 79	42	-	- 239	29,741 59,073	4,461 9,801	34,202 74,404	34,202 74,322		- 82	-	- 3,733	-	-	-	74,651	122	390,714 704,067
4a.0	TOTAL PERIOD 4a COST	527	29,366	19,298	11,686	-	53,482	61,679	39,223	215,262	210,510		4,752	-	317,721	501	393	2,217		288,101	714,099
PERIOD	O 4b - Site Decontamination																				
Disposal	of Plant Systems																				
4b.1.2.1	Chemical & Volume Control	-	1,136	159	83	-	419	-	417	2,213	2,213	-	-	-	6,236	-	-	-	324,551	16,476	-
4b.1.2.2	Chilled Water RCA	-	322	108	60	-	304	-	176	970	970		-	-	4,527	-	-	-	235,699	4,956	
4b.1.2.3 4b.1.2.4	Component Cooling RCA Electrical	-	682 3,113	194	110	-	553		345 467	1,884 3,580	1,884	-	3,580	-	8,239	•	-	-	428,586	10,074 48,490	
4b.1.2.4	Electrical - Contaminated	-	1,160		85	-	430		423	2,225	2,225	-	5,560	-	6,418		-		333,233	17,294	
4b.1.2.6	Electrical - RCA	-	1,940	347	222	-	1,123	-	834	4,466	4,466		-	-	16,763	-	-	-	870,329	29,753	
4b.1.2.7	Emergency Diesel Generator	-	132	-	-	-	-	-	20	152	-	-	152	-	-	-	-	-	-	2,066	
4b.1.2.8 4b.1.2.9	Essential Service Water RCA Fire Protection	-	306 127	112	66	-	333	-	181 19	998 146	998	-	146	-	4,958	-	-	-	257,885	4,643 1,984	-
	Fire Protection RCA	-	189	29	14	-	70	-	70	371	371		140	-	1,032		-	-	53,961	2,693	-
4b.1.2.11		-	518	97	64	-	323		230	1,233	1,233		-	-	4,827		-	-	250,668	7,298	
4b.1.2.12		-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	682	-
	HVAC-Miscellaneous	-	42 627	203	- 135	-	683	-	6 368	49 2,017	9.017	-	49	-	10 107	-	-	-	- E90 4E1	656 8,908	
4b.1.2.14 4b.1.2.15	HVAC-Primary Containment HVAC-Turbine Building	-	190	203	150	-	- 669		28	2,017	2,017	-	218	-	10,197		-		529,451	3,177	
	Instrument Air Supply	-	47	-	-	-	-		7	54	-	-	54	-			-		-	760	
4b.1.2.17	* * *	-	76	10	5	-	24	-	27	141	141		-	-	354	-	-	-	18,493	1,096	
	Miscellaneous Drains	-	40	7	4	-	20	-	16	87	87		-	-	299	-	-	-	15,562	594	
	Primary Containment Purge Primary Water	-	285 62	128 6	75 3	-	377 15		189 20	1,054 106	1,054 106		-		5,614 218		-	-	292,306 11,425	4,509 924	-
4b.1.2.21		-	945	159	88	-	446		377	2,015	2,015		-	-	6,808	-	-	-	345,754	14,349	-
4b.1.2.22	Reactor Building Equipment Drains	-	100		9	-	47	-	40	213	213	-	-		695	-	-	-	36,107	1,451	-
4b.1.2.23		-	47	7	4	-	18	-	17	92	92		-	-	265	-	-	-	13,801	686	
4b.1.2.24 4b.1.2.25			175 197	22 49	11 29	-	55 147	-	61 95	324 516	324 516		-	-	812 2,184	-	-	-	42,440 113,636	2,529 2,985	
	S Safety Injection		902		137	-	694		443	2,405	2,405		-		10,622	-		-	537,761	13,820	
4b.1.2.27	Station Air RCA	-	37	5	2	-	11	-	13	68	68		-		169		-	-	8,811	531	
4b.1.2.28	Station Heating RCA	-	124	31	16	-	81	-	57	309	309		-	-	1,209	-	-	-	63,061	1,826	-
4b.1.2.29		-	19 579	1	1 999	-	3 c 174	-	3	15			4.0%0	-	50		-	-	2,602	95	
4b.1.2	Totals	-	13,572			-	6,174		4,955	27,973			4,250	-	92,495		-	-	4,786,121	205,305	
4b.1.3	Scaffolding in support of decommissioning	-	1,633	13	7	-	36	-	420	2,108	2,108	-	-	-	539	-	-	-	27,981	27,151	-

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(,	mousana	s of 2014 dolla	15)											
Activit	y	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet		Manhours	Manhours
Decontar	nination of Site Buildings																				
4b.1.4.1 4b.1.4.2	Reactor Auxiliary Building	2,018 202		207 20	328 17	-	999 69	-	1,692 150	6,696 567	6,696 567	-	-	-	16,618 1,101	-	-	-	1,181,636 63,260	50,402 4,568	-
4b.1.4.2 4b.1.4.3	Refueling Water Storage Tank	367	428	38	17	-	83	-	318	1,253	1,253	-	-		1,101	-	-	-	67,351	11,972	-
4b.1.4	Totals	2,587	1,990	265	362	-	1,152	-	2,160	8,516	8,516	-	-	-	18,960	-	-	-	1,312,247	66,942	-
4b.1	Subtotal Period 4b Activity Costs	2,587	17,195	2,327	1,592	-	7,362	-	7,535	38,597	34,348	-	4,250	-	111,994	-	-	-	6,126,348	299,399	-
	Additional Costs																				
4b.2.1 4b.2.2	License Termination Survey Planning Remedial Action Surveys	-	-	-	-	-	-	993 2,923	298 877	1,291 3,800	1,291 3,800	-	-	-	-	-	-	-	-	46,072	6,240
4b.2.3	Asbestos Abatement	-				-		50	8	58	58	-	-		-	-		-	-	-	-
4b.2.4	License Termination ISFSI	-	506 506	197	322	-	893	1,723	910	4,552	4,552	-	-	-	14,550	-	-	-	1,178,838	11,245	
4b.2.5 4b.2	Underground Services Excavation Subtotal Period 4b Additional Costs	-	1,012	197	322	-	893	5,689	$76 \\ 2,169$	581 10,282	581 10,282		-	-	14,550	-	-	-	1,178,838	2,755 $60,071$	13,492
Period 4l	o Collateral Costs																				
4b.3.1	Process decommissioning water waste	6	-	11	29	-	37	-	18	102			-		106	-	-	-	6,368	21	-
4b.3.3 4b.3.4	Small tool allowance Decommissioning Equipment Disposition	-	330	- 171	94		472	-	49 149	379 887	379 887	-	-		7,054	-		-	366,237	- 88	-
4b.3	Subtotal Period 4b Collateral Costs	6	330	182	123	-	510	-	217	1,368	1,368	-		-	7,160	-	-	-	372,606	109	
Period 4l	Period-Dependent Costs																				
4b.4.1	Decon supplies	730	-	-	-	-	-		183	913	913	-	-	-	-	-	-	-	-	-	-
4b.4.2 4b.4.3	Insurance Property taxes	-	-	-	-	-	-	1,155 1,107	116 111	1,271 1,218	1,271 1,218	-	-		-	-		-	-	-	-
4b.4.4	Health physics supplies	-	2,610	-	-	-	-	-	652	3,262	3,262	-	-	-	-	-	-	-	-	-	-
4b.4.5 4b.4.6	Heavy equipment rental Disposal of DAW generated	-	4,459	91	- 40	-	- 276	-	669 85	5,128 501	5,128 501	-	-	-	4,309	-	-	-	86,182	- 141	-
4b.4.7	Plant energy budget	-	-	- 31	- 49	-	- 210	2,956	443	3,400		-	-		4,509	-	-	-		-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,338	134	1,472			-	-	-	-	-	-	-	-	-
4b.4.9 4b.4.10	Site O&M Cost Liquid Radwaste Processing Equipment/Services	-	-			-	-	366 889	55 133	420 1,022	420 1,022		-			-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	1,328	199	1,527	1,527	-	-	-	-	-	-	-	-	-	25,426
4b.4.12 4b.4.13	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	16,578 27,981	2,487 4,197	19,065 32,178	19,065 32,178		-	-	-	-	-	-	-	-	217,274 $388,320$
4b.4	Subtotal Period 4b Period-Dependent Costs	730	7,069	91	49	-	276	53,698	9,464	71,377	71,377		-	-	4,309	-	-	-	86,182	141	631,020
4b.0	TOTAL PERIOD 4b COST	3,324	25,606	2,797	2,086	-	9,041	59,387	19,384	121,624	117,374	-	4,250	-	138,012	-	-	-	7,763,973	359,719	644,512
PERIOI	0 4e - Delay before License Termination																				
	e Period-Dependent Costs																				
4e.4.1 4e.4.2	Insurance Property taxes	-	-	-	-	-	-	777 745	78 74	855 819	855 819		-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	132			-		-	33	166			-		-	-		-	-		-
4e.4.4	Disposal of DAW generated NRC Fees	-	-	3	2	-	10	- 378	3 38	17 416	17 416		-	-	149	-	-	-	2,971	5	-
4e.4.6 4e.4.7	Site O&M Cost	-	-			-	-	246	36 37	283			-			-	-	-	-		-
4e.4.8	Utility Staff Cost	-	-	-		-	-	1,497	224	1,721	1,721	-	-	-	-	-	-	-	-		21,760
4e.4	Subtotal Period 4e Period-Dependent Costs	-	132	3	2	-	10	3,642	487	4,276	4,276	-	-	-	149	-	-	-	2,971	5	21,760
4e.0	TOTAL PERIOD 4e COST	-	132	3	2	-	10	3,642	487	4,276	4,276	-	-	-	149	-	-	-	2,971	5	21,760
	9 4f - License Termination																				
	Direct Decommissioning Activities							150	F0	004	90.4										
4f.1.1 4f.1.2	ORISE confirmatory survey Terminate license	-	-	-	-	-	-	172	52	224 a	224	-	-	-	-	-	-	-	-	-	-
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
	Additional Costs																				
4f.2.1 4f.2	License Termination Survey Subtotal Period 4f Additional Costs	-	-	-	-	-	-	6,411	1,923 1,923	8,334 8,334	8,334 8,334		-	-	-	-	-	-	-	91,892 91,892	
41.2	Subtotal Period 41 Additional Costs	-	-	-	-	-	-	6,411	1,923	8,334	8,334	-	-	-	-	-	-	-	-	91,892	3,120
	Collateral Costs							1 000	100	1040	1010										
4f.3.1 4f.3	DOC staff relocation expenses Subtotal Period 4f Collateral Costs	-	-	-			-	1,080 1,080	162 162	1,242 1,242			-			-	-	-	-		-
								-,0		-,	-,										

Table E-1
Byron Nuclear Power Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activi Inde		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C	GTCC Cu. Feet	Processed	Craft Manhours	Contractor Manhours
Period 4	of Period-Dependent Costs																				
4f.4.1	Insurance	-	-	-	-	-	-	393	39	432	432	-	-	-	-	-	-	-	-	-	-
4f.4.2 4f.4.3	Property taxes Health physics supplies	-	546	-	-	-	-	376	38 137	414 683	414 683	-	-	-		-		-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	4	-	21	-	7	39	39	-	-	-	335	-	-	-	6,698	11	-
4f.4.5 4f.4.6	Plant energy budget NRC Fees			-		-		268 455	40 46	308 501	308 501	-	-			-		-		-	-
4f.4.7	Site O&M Cost	-	-	-	-	-	-	124	19	143	143	-	-		-	-	-	-	-	-	-
4f.4.8	Security Staff Cost	-	-	-	-	-	-	684	103	787	787	-	-	-	-	-	-	-	-	-	11,786
4f.4.9 4f.4.10	DOC Staff Cost Utility Staff Cost	-		-	-	-	-	3,919 4,776	588 716	4,507 5,493	4,507 5,493	-	-					-	-	-	46,750 56,964
4f.4	Subtotal Period 4f Period-Dependent Costs	-	546	7	4	-	21	10,996	1,731	13,306	13,306	-	-	-	335	-	-	-	6,698	11	115,500
4f.0	TOTAL PERIOD 4f COST	-	546	7	4	-	21	18,659	3,868	23,106	23,106	-	-	-	335	-	-	-	6,698	91,902	118,620
PERIO	D 4 TOTALS	3,851	55,650	22,104	13,778	-	62,554	143,367	62,963	364,268	355,266	-	9,002	-	456,217	501	393	2,217	25,976,840	739,728	1,498,991
PERIO	D 5b - Site Restoration																				
Period 5	b Direct Decommissioning Activities																				
	ion of Remaining Site Buildings																				
5b.1.1.1 5b.1.1.2		-	7,213 6,230	-	-	-	-	-	1,082 934	8,294	-	-	8,294 7,164	-	-	-	-	-	-	69,541	-
5b.1.1.3		-	490	-	-	-	-		954 74	7,164 564	-	-	7,164 564							61,288 4,868	-
5b.1.1.4	Refueling Water Storage Tank	-	1,099	-	-	-	-	-	165	1,263	-	-	1,263		-	-	-	-	-	11,688	-
5b.1.1.5 5b.1.1.6		-	6,069 1,463	-	-	-	-	-	910 219	6,979 1,682	-	-	6,979 1,682	-	-	-	-	-	-	70,347 12,628	-
5b.1.1	Totals	-	22,563	-	-		-	-	3,384	25,947			25,947	-	-	-	-	-	-	230,359	
	seout Activities																				
5b.1.2 5b.1.3	Grade & landscape site Final report to NRC	-	345	-	-	-	-	- 199	52 30	397 228	- 228	-	397	-	-	-	-	-	-	869	1,560
5b.1.5	Subtotal Period 5b Activity Costs	-	22,908	-	-	-	-	199	3,466	26,572	228	-	26,344	-	-	-	-	-	-	231,229	1,560
	b Additional Costs																				
5b.2.1 5b.2.2	Site Restoration ISFSI Concrete Crushing	-	1,199 607	-	-	-	-	28 4	184 92	1,411 702	-	-	1,411 702		-	-	-	-	-	13,522 2,798	80
5b.2.3	Demolish Cooling Tower	-	5,877	-		-	-	165	906	6,948		-	6,948		-	-			-	73,296	-
5b.2	Subtotal Period 5b Additional Costs	-	7,682	-	-	-	-	196	1,182	9,060	-	-	9,060	-	-	-	-	-	-	89,615	80
Period 5 5b.3.1	b Collateral Costs Small tool allowance		316					_	47	364			364								
5b.3	Subtotal Period 5b Collateral Costs	-	316	-	-	-	-	-	47	364	-	-	364	-	-	-	-	-	-	-	-
	b Period-Dependent Costs							1.000	10.1	1 000			1.000								
5b.4.2 5b.4.3	Property taxes Heavy equipment rental	-	7,086	-	-	-	-	1,239	124 1,063	1,363 8,149	-	-	1,363 8,149	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	441	66	507	-	-	507	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Cost Security Staff Cost	-	-	-	-	-	-	409 2,015	61 302	470 2,317	-	-	470 2,317	-	-	-	-	-	-	-	34,287
5b.4.6 5b.4.7	DOC Staff Cost	-	-	-	-	-	-	11,965	302 1,795	13,760	-	-	13,760	-	-	-	-	-	-	-	137,043
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	5,873	881	6,754	-	-	6,754	-	-	-	-	-	-	-	67,229
5b.4	Subtotal Period 5b Period-Dependent Costs	-	7,086	-	-	-	-	21,942	4,292	33,321	-	-	33,321	-	-	-	-	-	-	-	238,558
5b.0	TOTAL PERIOD 5b COST	-	37,993	-	-	-	-	22,337	8,988	69,317	228	-	69,089	-	-	-	-	-	-	320,844	240,198
	D 5 TOTALS	-	37,993	-	-	-	-	22,337	8,988	69,317	228	-	69,089	-	-	-	-	-	-	320,844	240,198
TOTAL	COST TO DECOMMISSION	9,404	103,733	22,481	14,430	-	63,772	683,474	148,271	1,045,566	776,133	189,729	79,704	-	466,140	501	393	2,217	26,256,530	1,148,004	5,063,157

Table E-1 Byron Nuclear Power Station, Unit 1 **SAFSTOR Decommissioning Cost Estimate** (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours

TOTAL COST TO DECOMMISSION WITH 16.52% CONTINGENCY:	\$1,045,566	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 74.23% OR:	\$776,133	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 18.15% OR:	\$189,729	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 7.62% OR:	\$79,704	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	467,034	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,217	cubic feet
TOTAL SCRAP METAL REMOVED:	56,010	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,148,004	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 E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(1101	isanas of 2014	uonars)											
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	Class A Cu. Feet	Burial V Class B Cu. Feet	Class C	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	1a - Shutdown through Transition																				
Period 1a	Direct Decommissioning Activities																				
a.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	481	144	625	625	-	-	-	-	-	-	-	-	-	-
a.1.2 a.1.3	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	71	11	81 a	81	-	-	-	-	-	-	-	-	-	556
a.1.5 a.1.4 a.1.5	Remove fuel & source material Notification of Permanent Defueling									n/a a											
a.1.6	Deactivate plant systems & process waste									a											
a.1.7 a.1.8	Prepare and submit PSDAR Review plant dwgs & specs.	-	-		-	-	-	109 71	16 11	125 81	125 81	-	-	-	-	-	-	-			850 550
a.1.9	Perform detailed rad survey								11	a											
a.1.10	Estimate by-product inventory	-	-	-	-	-	-	54 54	8 8	63 63	63 63	-	-	-	-	-	-	-	-	-	428
a.1.11 a.1.12	End product description Detailed by-product inventory	-	-	-	-	-	-	54 82	8 12	94	94	-	-	-	-	-	-	-	-	-	428 649
a.1.13	Define major work sequence	-	-	-	-	-	-	54	8	63	63	-	-	-	-	-	-	-	-	-	428
a.1.14 a.1.15	Perform SER and EA Perform Site-Specific Cost Study	-	-	-	-	-	-	169 272	25 41	194 313	194 313	-	-	-	-	-	-	-	-	-	1,327 2,140
		-	-	-	•	•	-	212	41	313	313	-	•	•	-	-	-	-	-	-	2,140
ctivity S _i a 1 16 1	pecifications Prepare plant and facilities for SAFSTOR		_	_	_	_		268	40	308	308	_	_	_		_			_	_	2,106
a.1.16.2	Plant systems	-	-	-	-	-		227	34	261	261	-	-	-		-	-		-	-	1,783
	Plant structures and buildings	-	-	-	-	-	-	170	26	196	196	-	-	-	-	-	-	-	-	-	1,335
	Waste management Facility and site dormancy	-		-	-	-	-	109 109	16 16	$\frac{125}{125}$	125 125	-	-	-	-		-	-	-	-	856 856
a.1.16	Total	-	-	-	-	-	-	883	132	1,016	1,016	-	-	-	-	-	-	-	-	-	6,936
	Vork Procedures																				
	Plant systems Facility closeout & dormancy	-	-	-	-	-	-	64 65	10 10	74 75	74 75	-	-	-	-	-	-	-	-	-	506 514
a.1.17.2	Total	-	-	-	-	-	-	130	19	149	149	-	-	-	-	-	-	-	-	-	1,020
.1.18	Procure vacuum drying system Drain/de-energize non-cont. systems	-	-	-	-	-	-	5	1	6	6	-	-	-	-	-	-	-	-	-	43
.1.19	Drain & dry NSSS									a a											
.1.21	Drain/de-energize contaminated systems									a											
i.1.22 i.1	Decon/secure contaminated systems Subtotal Period 1a Activity Costs	-	-	-	-	-	-	2,436	438	a 2,874	2,874	-	-	-	-	-	-	-	-	-	15,361
	Additional Costs																				
a.2.1 a.2	ISFSI Expansion Subtotal Period 1a Additional Costs	-	-	-	-	-	-	4,800 4,800	720 720	5,520 5,520	-	5,520 5,520	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	4,000	120	9,920		9,020	-	-	-	-	-		-	_	
erioa 1a a.3.1	Collateral Costs Spent Fuel Capital and Transfer			_	-	-		10,066	1,510	11,576	-	11,576	-	-			-		-	-	-
.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	10,066	1,510	11,576	-	11,576	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs							1.055	105	2.040	0.040										
a.4.1 a.4.2	Insurance Property taxes	-		-	-	-	-	1,855	185	2,040	2,040	-	-	-	-		-	-	-	-	-
a.4.3	Health physics supplies	-	494	-	-	-		-	124	618	618	-	-	-		-	-		-	-	-
a.4.4	Heavy equipment rental	-	530			-	-	-	80	610	610	-	-	-	-	-	-	-	-	-	-
a.4.5 a.4.6	Disposal of DAW generated Plant energy budget	-	-	13	7	-	39	1,783	$\frac{12}{267}$	71 $2,051$	$71 \\ 2,051$	-	-	-	611		-		12,224	20	-
a.4.7	NRC Fees	-	-	-	-	-	-	836	84	920	920	-	-	-	-	-	-	-	-	-	-
a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,177	218	2,394	-	2,394	-	-	-	-	-	-	-	-	-
a.4.9 a.4.10	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	165 397	25 59	190 456	190	456	-	-	-	-	-	-	-	-	-
a.4.10 a.4.11	ISFSI Operating Costs	-	-		-	-	-	48	59 7	456 55	-	456 55	-		-	-	-	-		-	-
a.4.12	Security Staff Cost	-	-	-	-	-	-	8,569	1,285	9,855	9,855	-	-	-	-	-	-	-	-	-	157,903
a.4.13	Utility Staff Cost	-	1.095	- 13	- 7	-	- 20	32,368	4,855	37,223	37,223	2 006	-	-	- 011	-	-	-	19 994	20	424,560
a.4	Subtotal Period 1a Period-Dependent Costs		1,025			-	39	48,198	7,202	56,483	53,577	2,906	-	-	611	-	-	-	12,224		
a.0	TOTAL PERIOD 1a COST	-	1,025	13	7	-	39	65,500	9,869	76,453	56,451	20,001	-	-	611	-	-	-	12,224	20	597,824

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

	(thousands of 2014 dollars) Off-Site LLRW NRC Spent Fuel Site Processed Burial Volumes Burial / Utility ar																					
Activity Index	Activity Description	Decon Cost	Remov		ckaging 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	Class A Cu. Feet	Burial Class B	Class C		Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	1b - SAFSTOR Limited DECON Activities	ı																				
Period 1b	Direct Decommissioning Activities																					
Decontam	ination of Site Buildings																					
1b.1.1.1	Reactor	2,223		-	-	-	-			1,111	3,334	3,334	-	-	-	-	-			-	33,093	-
1b.1.1.2	Auxiliary Building	256		-	-	-	-	-	-	128	384	384	-	-	-	-	-	-	-	-	3,830	-
1b.1.1.3	Radwaste/Service Building	167		-	-	-	-	-	-	83	250	250	-	-	-	-	-	-	-	-	2,506	-
1b.1.1.4 1b.1.1.5	Refueling Water Storage Tank Fuel Handling Building	366 1,046		-		-	-	-	-	183 523	549 1,569	549 1,569	-	-	-				-	-	5,322 15,238	-
1b.1.1	Totals	4,058		-	-	-	-	-	-	2,029	6,086	6,086	-	-	-	-	-	-	-	-	59,990	
1b.1	Subtotal Period 1b Activity Costs	4,058		-	-	-	-	-	-	2,029	6,086	6,086	-	-	-	-	-	-	-	-	59,990	-
	Collateral Costs																					
1b.3.1	Decon equipment	886		-	-	- 240	-	- 449	-	133	1,019	1,019	-	-	-	1 000	-	-	-	-	- 0.46	-
1b.3.2 1b.3.4	Process decommissioning water waste Small tool allowance	200		- 67	131	349	-	443	-	276 10	1,399 77	1,399 77	-	-	-	1,262	-	-	-	75,709	246	-
1b.3.4 1b.3.5	Spent Fuel Capital and Transfer	-		-	-	-	-		2,503	375	2,878	- ' '	2,878	-	-	-	-	-		-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,086		67	131	349	-	443	2,503	795	5,373	2,495	2,878		-	1,262	-	-	-	75,709		-
	Period-Dependent Costs																					
1b.4.1	Decon supplies	816		-	-	-	-	-	-	204	1,020	1,020	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-		-	-	-	-	-	234	23	258	258	-	-	-	-	-	-	-	-	-	-
1b.4.3 1b.4.4	Property taxes Health physics supplies	-		- 398	-	-	-	-	4,112	411 100	4,524 498	4,524 498	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental			132	-	-	-	-		20	152	152		-	-	-	-		-	-	-	-
1b.4.6	Disposal of DAW generated			-	12	7	_	37		12	68	68	-	_	-	585	-		-	11,700	19	-
1b.4.7	Plant energy budget	-		-	-	-	-	-	443	67	510	510	-	-	-	-	-	-	-	´-	-	-
1b.4.8	NRC Fees	-		-	-	-	-	-	116	12	128	128	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-		-	-	-	-	-	541	54	595		595	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-		-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1b.4.11 1b.4.12	Spent Fuel Pool O&M ISFSI Operating Costs	-		-	-	-	-	-	99 12	$\begin{array}{c} 15 \\ 2 \end{array}$	113 14		113 14		-	-	-	-	-	-	-	-
1b.4.12 1b.4.13	Security Staff Cost			-	-	-	-	-	2,131	320	2,450	2,450	14	-	-	-	-		-	-	-	39,260
1b.4.14	Utility Staff Cost	-		-	-	_	_	-	8,048	1,207	9,255	9,255	-	_	-	-	-	-	-	_	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	816		530	12	7	-	37	15,777	2,451	19,631	18,908	722	-	-	585	-	-	-	11,700	19	144,820
1b.0	TOTAL PERIOD 1b COST	5,960		597	143	356	-	480	18,280	5,275	31,091	27,490	3,601	-	-	1,847	-	-	-	87,408	60,255	144,820
PERIOD	1c - Preparations for SAFSTOR Dormanc	·y																				
Period 1c	Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-		487	-	-	-	-	-	73	561	561	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-		48	-	-	-	-	-	7	56	56	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy Secure building accesses	-		-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	10,874	-
1c.1.4 1c.1.5	Prepare & submit interim report	-		-	-	-	-	-	32	5	a 37	37	-	-	-	-	-	-	-	-	-	250
1c.1	Subtotal Period 1c Activity Costs	-		536	-	-	-	-	765	305	1,606	1,606	-	-	-	-	-	-	-	-	14,574	250
Period 1c	Additional Costs																					
1c.2.1	Spent fuel pool isolation	-		-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1c.2	Subtotal Period 1c Additional Costs	-		-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
	Collateral Costs																				_	
1c.3.1	Process decommissioning water waste	236		- 4	155	414	-	525	-	327	1,658	1,658	-	-	-	1,496	-	-	-	89,742		-
1c.3.3 1c.3.4	Small tool allowance Spent Fuel Capital and Transfer	-		4	-	-	-	-	2,503	$\frac{1}{375}$	$\frac{5}{2,878}$	5 -	2,878	-	-	-	-	•	-	-	-	-
1c.3.4 1c.3	Subtotal Period 1c Collateral Costs	236		4	155	414	-	525	2,503	703	4,541	1,663	2,878		-	1,496	-	-	-	89,742		-
Period 1c	Period-Dependent Costs																					
1c.4.1	Insurance	-		-	-	-	-	-	234	23	258	258	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-		-	-	-	-	-	4,112	411	4,524	4,524	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-		191	-	-	-	-	-	48	239	239	-	-	-	-	-	-	-	-	-	-

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(1110)	usanas of 2014	aonars,											
Activity Index		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	Class A Cu. Feet	Burial V Class B Cu. Feet	Class C		Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
-	i i								<i>6y</i>										,		
Period Ic . 1c.4.4	Period-Dependent Costs (continued) Heavy equipment rental		132	_	_			-	20	152	152		_	_				_	_	_	_
1c.4.5	Disposal of DAW generated	-	-	3	2	-	10	-	3	18	18	-	_	_	152	_	-	_	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	443	67	510	510	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	116	12	128	128	-	-	-	-	-	-	-	-	-	-
1c.4.8 1c.4.9	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	541 41	54 6	595 47	47	595 -	-	-	-	-	-	-	-	-	-
1c.4.3 1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	99	15	113	-	113	-	-	-		-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-
1c.4.12	Security Staff Cost	-	-	-	-	-	-	2,131	320	2,450	2,450	-	-	-	-	-	-	-	-	-	39,260
1c.4.13 1c.4	Utility Staff Cost Subtotal Period 1c Period-Dependent Costs	-	- 323	- 3	- 2	-	10	8,048 15,777	1,207 $2,187$	9,255 $18,301$	9,255 17,579	722	-	-	152	-	-	-	3,039	- 5	105,560 144,820
1c.0	TOTAL PERIOD 1c COST	236	863	158	416	-	535	29,857	4,817	36,882	33,282	3,601	-	-	1,648	-	_	-	92,781	14,870	145,070
PERIOD	1 TOTALS	6,196	2,484	315	779	-	1,054	113,637	19,960	144,425	117,223	27,203	_	-	4,106	-	_	_	192,413	75,145	887,713
PERIOD	2a - SAFSTOR Dormancy with Wet Spent	Fuel Stor					,	•	,	,	,	,			,				,	,	,
	Direct Decommissioning Activities																				
2a.1.1 2a.1.2	Quarterly Inspection Semi-annual environmental survey									a a											
2a.1.3	Prepare reports									a											
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	69	10	79	79	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies Subtotal Period 2a Activity Costs	-	-	-	-	-	-	556 625	139 149	695 774	695 774	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Feriod 2a Activity Costs	-	-	•	-	-	-	629	149	114	114	-	-	-	-	-	-	-	-	-	-
	Collateral Costs																				
2a.3.1 2a.3	Spent Fuel Capital and Transfer Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	40,154 $40,154$	6,023 6,023	46,177 46,177	-	46,177 46,177	-	-	-	-	-	-	-	-	-
								10,101	0,020	10,111		10,111									
	Period-Dependent Costs							0.000	000	0.500	2.202	1 000									
2a.4.1 2a.4.2	Insurance Property taxes	-	-	-	-	-		3,203 $27,474$	$320 \\ 2,747$	3,523 $30,222$	2,293 $30,222$	1,230	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	741	_	-	-	_	-	185	926	926	-	-	-	-	-	-	_	-	-	-
2a.4.4	Disposal of DAW generated	-	-	18	10	-	54	-	17	98	98	-	-	-	843	-	-	-	16,864	28	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	1,423	213	1,636	818	818	-	-	-	-	-	-	-	-	-
2a.4.6 2a.4.7	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	1,063 7,595	106 759	1,170 8,354	1,170	8,354	-	-	-	-	-	-	-	-	-
2a.4.8	Site O&M Cost	-	_	_	-	-	_	660	99	759	759	-	-	-	-	-	-	_	-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	1,582	237	1,819	-	1,819	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	191	29	220	-	220	-	-	-	-	-	-	-	-	-
2a.4.11 2a.4.12	Security Staff Cost Utility Staff Cost	-	-	-	-	-		24,487 $15,298$	3,673 2,295	28,160 17,593	4,495 4,381	23,665 13,212	-	-	-	-	-	-	-	-	444,257 196,057
2a.4.12 2a.4	Subtotal Period 2a Period-Dependent Costs	-	741	18	10	-	54	82,976	10,682	94,479	45,161	49,318	-	-	843	-	-	-	16,864	28	640,314
2a.0	TOTAL PERIOD 2a COST	-	741	18	10	-	54	123,754	16,854	141,430	45,935	95,495	_	-	843	-	-		16,864	28	640,314
PERIOD	2b - SAFSTOR Dormancy with Dry Spent	Fuel Stor																			
Period 2b 2b.1.1	Direct Decommissioning Activities Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3	Prepare reports									a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	323	48	371	371	-	-	-	-	-	-	-	-	-	-
2b.1.5 2b.1	Maintenance supplies Subtotal Period 2b Activity Costs	-	-		-	-	-	2,593 2,916	648 697	3,241 3,612	3,241 $3,612$	-	-		-	-	-	-	-	-	-
	·							_,,,,,	007	-,	-,012										
Period 2b 2b.3.1	Collateral Costs Spent Fuel Capital and Transfer	_	_	_	_	-	-	9,688	1,453	11,141	_	11,141	_	_	-	_	_	_	_	_	_
2b.3.1 2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	9,688	1,453	11,141	-	11,141	-	-	-	-	-	-	-	-	-
Period 2h	Period-Dependent Costs																				
2b.4.1	Insurance	-		-	-	-		9,731	973	10,704	10,704	-	-	-		-	-	-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	9,328	933	10,261	10,261	-	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	1,703	-	-	-	-	-	426	2,129	2,129	-	-	-	-	-	-	-	-	-	-

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(tho	usanas of 2014	i dollars)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
		0000	0000	0.000	00000	0000	0 0 0 0 0	0000	contingency	0000	0000		00000	04.1000	04,100	04,100	04,100	04,1000	***************************************	namo ar s	NIAIII OUI S
Period 2b 2b.4.4	Period-Dependent Costs (continued) Disposal of DAW generated			41	22		124		38	224	224				1,928				38,567	63	
2b.4.4 2b.4.5	Plant energy budget	-	-	41	- 44	-	124	3,320	498	3,818	3,818	-	-	-	1,926	-	-	-	30,367	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	4,775	477	5,252	5,252	-	-	-	-	_	-	-	-	-	_
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	35,446	3,545	38,990	-	38,990	-	-	-	-	-	-	-	-	-
2b.4.8	Site O&M Cost	-	-	-	-	-	-	3,080	462	3,542	3,542	-	-	-	-	-	-	-	-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	891	134	1,025	-	1,025	-	-	-	-	-	-	-	-	-
2b.4.10	Security Staff Cost	-	-	-	-	-	-	30,446	4,567	35,013	20,979	14,034	-	-	-	-	-	-	-	-	525,651
2b.4.11 2b.4	Utility Staff Cost Subtotal Period 2b Period-Dependent Costs	-	1,703	41	22	-	124	29,464 126,480	4,420 $16,472$	33,883 144,841	20,444 $77,352$	13,439 67,488	-	-	1,928	-	-	-	38,567	- 63	389,371 915,023
	_	-				•				,			•	-	,	-	-	-	ŕ		
2b.0	TOTAL PERIOD 2b COST	-	1,703	41	22	-	124	139,083	18,622	159,594	80,965	78,629	-	-	1,928	-	-	-	38,567	63	915,023
PERIOD	2c - SAFSTOR Dormancy without Spent F	uel Stora	age																		
	Direct Decommissioning Activities																				
2c.1.1	Quarterly Inspection									a											
2c.1.2 2c.1.3	Semi-annual environmental survey Prepare reports									a											
2c.1.3	Bituminous roof replacement			_	_	_		473	71	544	544	_	_	_	_	_			_	_	
2c.1.5	Maintenance supplies	-	-	_	-	-	_	3,805	951	4,756	4,756	_	_	-	-	-		-	-	-	_
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	4,278	1,022	5,300	5,300	-	-	-	-	-	-	-	-	-	-
Period 2c	Period-Dependent Costs																				
2c.4.1	Insurance	-	-	-	-	-	-	14,278	1,428	15,705	15,705	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	13,687	1,369	15,055	15,055	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	2,421	-	-	-	-	-	605	3,026	3,026	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	57	31	-	174	-	54	315	315	-	-	-	2,710	-	-	-	54,200	88	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	4,871	731	5,602	5,602	-	-	-	-	-	-	-	-	-	-
2c.4.6 2c.4.7	NRC Fees Site O&M Cost	-	-	-	-	-	-	6,744 4,519	674 678	7,419 5,197	7,419 5,197	-	-	-	-	-	-	-	-	-	-
2c.4.7 2c.4.8	Security Staff Cost	-	-	-	-	-	-	26,767	4,015	30,782	30,782	-	-	-		-	-	-		-	428,486
2c.4.9	Utility Staff Cost	-	-	-	-	-	-	26,085	3,913	29,998	29,998	-	-	-	-	-	_	-	-	-	364,499
2c.4	Subtotal Period 2c Period-Dependent Costs	-	2,421	57	31	-	174	96,950	13,466	113,098	113,098	-	-	-	2,710	-	-	-	54,200	88	792,984
2c.0	TOTAL PERIOD 2c COST	-	2,421	57	31	-	174	101,228	14,488	118,399	118,399	-	-	-	2,710	-	-	-	54,200	88	792,984
PERIOD	2 TOTALS	-	4,865	115	62	-	351	364,065	49,964	419,423	245,299	174,124	-	-	5,482	-	-	-	109,632	179	2,348,321
PERIOD	3a - Reactivate Site Following SAFSTOR I	Dormanc	y																		
Period 3a	Direct Decommissioning Activities																				
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	71	11	81	81	-	-	-	-	-	-	-	-	-	556
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	251	38	288	288	-	-	-	-	-	-	-	-	-	1,969
3a.1.3 3a.1.4	Perform detailed rad survey End product description							54	8	a 63	63										428
3a.1.4	Detailed by-product inventory	-	-	-	-	-	-	71	11	81	81	-	-	-		-	-	-	-	-	556
3a.1.6	Define major work sequence	-	-	-	-	-	_	409	61	470	470	_	_	_	_			-	-	_	3,210
3a.1.7	Perform SER and EA	-	-	-	-	-	-	169	25	194	194	-	-	-	-	-	-	-	-	-	1,327
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	272	41	313	313	-	-	-	-	-	-	-	-	-	2,140
3a.1.9 3a.1.10	Prepare/submit License Termination Plan Receive NRC approval of termination plan	-	-	-	-	-	-	223	33	257 a	257	-	-	-	-	-	-	-	-	-	1,753
	Specifications																				
	Re-activate plant & temporary facilities							402	60	462	416		46								3,154
	Plant systems	-	-	-	-	-	-	402 227	34	261	235	-	46 26	-	-	-	-	-	-	-	3,154 1,783
	Reactor internals	-	-	-	-	-	-	387	58	445	445	-	-	-				-	-	-	3,039
3a.1.11.4	Reactor vessel	-	-	-	-	-	-	354	53	407	407	-	-	-		-	-	-	-	-	2,782
	Biological shield	-	-	-	-	-	-	27	4	31	31	-	-	-		-	-	-	-	-	214
	Steam generators	-	-	-	-	-	-	170	26	196	196	-	-	-	-	-	-	-	-	-	1,335
	Reinforced concrete	-	-	-	-	-	-	87	13	100	50	-	50	-	-	-	-	-	-	-	685
	Main Turbine Main Condensers	-	-	-	-	-	-	22 22	3	25 25	-	-	25 25	-	-	-	-	-	-	-	171
) Plant structures & buildings	-	-	-	-	-	-	170	26	196	98	-	25 98	-		-	-	-	-	-	171 1,335
	Waste management	-	-	-	-	-	-	251	38	288	288	-	-	-	-		-	-	-	-	1,969
									30	_00	_00										1,000

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

Activity	7	Decon	Removel	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet			Cu. Feet	Wt., Lbs.	Manhours	
	pecifications (continued) 2 Facility & site closeout							40	7	56	90		28								205
3a.1.11 3a.1.11		-	-	-	-	-	-	49 2,168	325	2,493	28 2,194	-	28 299	-	-	-	-	-	-	-	385 $17,024$
	& Site Preparations																				
3a.1.12 3a.1.13	Prepare dismantling sequence Plant prep. & temp. svces	-	-	-	-	-	-	131 3,000	20 450	150 3,450	150 3,450	-	-	-	-	-	-	-	-	-	1,027
3a.1.14	Design water clean-up system	-	-	-	-	-	-	76	11	88	88	-	-	-	-	-	-	-	-	-	599
Ba.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc. Procure casks/liners & containers	-	-	-	-	-	-	2,300 67	345 10	2,645 77	2,645 77	-	-	-	-	-	-	-	-	-	- 526
a.1.16 a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	9,262	1,389	10,651	10,353		299	-	-	-	-	-	-	-	31,117
	Period-Dependent Costs																				
8a.4.1 8a.4.2	Insurance Property taxes	-	-	-	-	-	-	521 500	52 50	573 550	573 550	-	-	-	-	-	-	-	-	-	
a.4.2 a.4.3	Health physics supplies	-	409	-	-	-		-	102	511	511	-	-	-	-		-		-	-	-
a.4.4	Heavy equipment rental	-	529	-		-		-	79	608	608	-	-	-	-	-	-	-			-
a.4.5 a.4.6	Disposal of DAW generated Plant energy budget	-	-	10	5	-	31	1,778	$\frac{10}{267}$	$\frac{56}{2,045}$	56 2,045	-	-	-	481	-	-	-	9,613	16	-
a.4.7	NRC Fees	-	-	-	-	-	-	332	33	366	366	-	-	-	-	-	-	-	-	-	-
a.4.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	
a.4.9 a.4.10	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	327 14,339	49 2,151	376 16,490	376 16,490	-	-	-	-	-	-	-	-	-	6,257 200,229
a.4.10	Subtotal Period 3a Period-Dependent Costs	-	938	10	5	-	31	17,963	2,818	21,765	21,765			-	481	-	-	-	9,613	16	
a.0	TOTAL PERIOD 3a COST	-	938	10	5	-	31	27,225	4,207	32,416	32,117	-	299	-	481	-	-	-	9,613	16	237,603
ERIOD	3b - Decommissioning Preparations																				
eriod 3b	Direct Decommissioning Activities																				
	Work Procedures																				
b.1.1.1 b.1.1.2	Plant systems Reactor internals	-	-	-	-	-	-	258 136	39 20	$\frac{297}{157}$	267 157	-	30	-	-	-	-	-	-	-	2,026 1,070
0.1.1.3	Remaining buildings			-	-	-	-	74	11	85	21	-	63	-					-	-	578
.1.1.4	CRD cooling assembly	-	-	-	-	-	-	54	8	63	63	-	-	-	-		-	-	-	-	428
0.1.1.5	CRD housings & ICI tubes Incore instrumentation	-	-	-	-	-	-	54 54	8 8	63 63	63 63	-	-	-	-	-	-	-	-	-	428 428
0.1.1.6 0.1.1.7	Reactor vessel	-	-	-	-	-		198	30	227	227	-	-	-	-		-	-	-	-	1,554
0.1.1.8	Facility closeout	-	-	-	-	-	-	65	10	75	38	-	38	-	-	-	-	-	-	-	514
0.1.1.9	Missile shields	-	-	-	-	-	-	25 65	4	28 75	28 75	-	-	-	-	-	-	-	-	-	193
0.1.1.10	Biological shield Steam generators	-	-	-	-	-	-	251	10 38	288	288	-	-	-		-	-	-	-	-	514 1,969
0.1.1.12		-	-	-	-	-	-	54	8	63	31	-	31	-	-		-		-	-	428
	Main Turbine	-	-	-	-	-	-	85	13	98	-	-	98	-	-	-	-	-	-	-	668
	Main Condensers Auxiliary building			-	-	-	-	85 149	13 22	98 171	- 154	-	98 17	-					-	-	668 1,168
	Reactor building	-	-	-	-	-	-	149	22	171	154	-	17	-			-		-	-	1,168
b.1.1 b.1	Total Subtotal Period 3b Activity Costs	-	-	-	-	-	-	1,757 $1,757$	264 264	2,021 $2,021$	1,629 1,629	-	392 392	-	-	-	-	-	-	-	13,800 13,800
eriod 3b	Additional Costs																				
b.2.1	Site Characterization	-	-	-	-	-	-	2,755	827	3,582	3,582	-	-	-	-	-	-	-	-	13,042	
0.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	2,755	827	3,582	3,582	-	-	-	-	-	-	-	-	13,042	4,640
	Collateral Costs Decon equipment	000							100	1.010	1.010										
o.3.1 o.3.2	DOC staff relocation expenses	886	-	-	-	-	-	1,080	133 162	1,019 1,242	1,019 1,242	-	-		-	-	-	-	-	-	-
0.3.3 0.3	Pipe cutting equipment Subtotal Period 3b Collateral Costs	- 886	1,100 1,100	-	-	-	-	1,080	165 460	1,265 3,526	1,265 3,526	-	-	-	-	-	-	-	-	-	-
		000	1,100	-	-	•	-	1,000	400	3,320	5,526	•	•	-	-	-	-	-	-	-	•
eriod 3b b.4.1	Period-Dependent Costs Decon supplies	27	_	-	-	-	_	-	7	34	34	-	-	-	-	_	_	_		-	-
b.4.2	Insurance	-	-	-	-	-	-	263	26	289	289	-	-	-	-	-	-	-	-	-	-
3b.4.3 3b.4.4	Property taxes	-	-	-	-	-	-	252		277	277	-	-	-	-	-	-	-	-	-	-
	Health physics supplies	_	222	_	_	_	_	_	56	278	278		_	_		_	_	_	_	_	

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(usanus on 2014	,											
		_			_	Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V			Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 3b	Period-Dependent Costs (continued)																				
3b.4.5	Heavy equipment rental	-	267	-	-	-	-	-	40	307	307	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	3	-	17	-	5	31	31	-	-	-	267	-	-	-	5,344	9	-
3b.4.7 3b.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	896 168	134 17	1,031 184	1,031 184	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Cost		-	-	-	-	-	83	12	96	96	-	-	-	-	-			-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	165	25	189	189	-	-	-	-	-	-	-	-	-	3,154
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	3,437	516	3,953	3,953	-	-	-	-	-	-	-	-	-	43,109
3b.4.12	Utility Staff Cost	-	-	-	-	-		7,229	1,084	8,313	8,313	-	-	-	-	-	-	-	-	-	100,937
3b.4	Subtotal Period 3b Period-Dependent Costs	27	489	6	3	-	17	12,493	1,947	14,982	14,982	-	-	-	267	-	-	-	5,344	9	147,200
3b.0	TOTAL PERIOD 3b COST	914	1,589	6	3	-	17	18,085	3,498	24,111	23,719	-	392	-	267	-	-	-	5,344	13,051	165,640
PERIOD	3 TOTALS	914	2,527	16	8	-	48	45,309	7,705	56,526	55,836	-	690	-	748	-	-	-	14,956	13,066	403,242
PERIOD	4a - Large Component Removal																				
Period 4a	Direct Decommissioning Activities																				
	Steam Supply System Removal			2 :	~=		250		-0:	0.10									*****	2.25	
4a.1.1.1	Reactor Coolant Piping Pressurizer Relief Tank	43	151 30	34 7	37 7	-	252	-	131	648	648	-	-	-	1,708	-	-	-	195,190	2,979 596	-
4a.1.1.2 4a.1.1.3	Reactor Coolant Pumps & Motors	8 29	108	79	198	-	47 1,390	-	$\frac{25}{426}$	$\frac{125}{2,230}$	125 2,230	-	-	-	329 4,796	-	-	-	36,553 780,540	2,726	80
4a.1.1.4	Pressurizer	12	69	368	106	_	879	-	296	1,731	1,731	-	-	_	3,033	-		_	240,915	1,527	750
4a.1.1.5	Steam Generators	98	4,496	1,591	2,916	-	10,319	-	4,349	23,769	23,769	-	-	-	62,044	-	-	-	3,098,575	20,508	2,250
4a.1.1.6	CRDMs/ICIs/Service Structure Removal	41	301	230	47	-	188	-	173	979	979	-	-	-	3,881	-	-	-	145,494	5,232	-
4a.1.1.7	Reactor Vessel Internals	93	2,899	6,520	1,077	-	4,353	290	6,340	21,572	21,572	-	-	-	2,461	501	393		328,507	27,350	1,226
4a.1.1.8	Vessel & Internals GTCC Disposal Reactor Vessel	115	5,075	0.140	1 140	-	11,996	290	1,799	13,795	13,795	-	-	-	- 0.001	-	-	2,217		27,350	1 000
4a.1.1.9 4a.1.1	Totals	115 438	13,130	2,149 10,978	1,140 5,528	-	2,832 $32,256$	580	6,146 19,685	$17,747 \\ 82,596$	17,747 82,596			-	9,331 87,582	501	393	2,217	960,579 6,219,533	88,269	1,226 5,532
Removal	of Major Equipment																				
4a.1.2 4a.1.3	Main Turbine/Generator Main Condensers	-	603 1,204	3,092 1,828	1,094 998	-	3,337 5,039	-	1,458 1,893	9,584 10,963	9,584 10,963	-	-	-	57,484 75,240	-	-	-	2,984,647 3,906,532	9,146 18,250	
			-,	-,			-,		-,	,	,				,				-,,	,	
4a.1.4.1	g Costs from Clean Building Demolition Reactor		1,250	_	_		_	_	188	1,438	1,438	_	_	_			_		_	12,130	_
4a.1.4.1	Auxiliary Building		702	-	-	-	-	-	105	807	807	-	-	-	-	-		-	-	6,896	-
4a.1.4.3	Radwaste/Service Building	-	456	-	-	-	-	-	68	525	525	-	-	-	-	-	-	-	-	5,060	-
4a.1.4.4	Refueling Water Storage Tank	-	122	-	-	-	-	-	18	140	140	-	-	-	-	-	-	-	-	1,299	-
4a.1.4.5	Fuel Handling Building	-	360	-	-	-	-	-	54	414	414	-	-	-	-	-	-	-	-	3,690	-
4a.1.4	Totals	-	2,890	•	-	-	•	-	434	3,324	3,324	•	-	•	-	-	-	-	-	29,074	-
Disposal 4a.1.5.1	of Plant Systems Auxiliary Feedwater		256	41	24		120		102	543	543				1,791				93,271	3,811	-
4a.1.5.1 4a.1.5.2	Auxiliary Steam	-	134	- 41	∠4 -	-	120	-	20	154	545	-	154	-	1,791			-	95,271	2,107	-
4a.1.5.3	Auxiliary Steam RCA	-	368	69	36	-	183	-	150	805	805	-	-	-	2,714		-		141,487		-
4a.1.5.4	Boric Acid Processing	-	481	82	47	-	238	-	195	1,042	1,042	-	-	-	3,611	-	-	-	184,114	7,055	-
4a.1.5.5	CO2 & H2	-	18	-	- ,	-	-	-	3	21	-	-	21	-	-	-	-	-	-	289	-
4a.1.5.6	CO2 & H2 RCA	-	35	7	4	-	18	-	14	78	78	-	- 105	-	276	-	-	-	14,104	492	-
4a.1.5.7 4a.1.5.8		-	169 94	-	-	-	-	-	$\frac{25}{14}$	195 108	-	-	195 108	-	•	-	-	-	-	2,663 1,454	-
4a.1.5.8 4a.1.5.9		-	608	-	-	-	-	-	91	700	-	-	700	-			-		-	9,669	-
	Condensate	-	341	-	-	-	-	-	51	392		-	392	-	-	-	-	-	-	5,317	-
4a.1.5.11	Condensate Booster	-	340	-	-	-	-	-	51	391	-	-	391	-	-	-	-	-	-	5,314	-
	Condensate Cleanup	-	186	-		-	-	-	28	214	-	-	214	-	-	-	-	-	-	3,000	-
	Containment Spray	-	259	81	46	-	231	-	138	755	755	-	-	-	3,455	-	-	-	179,291	3,839	-
	Diesel Fuel Oil Essential Service Water	-	185 320	-	-	-	-	-	28 48	213 368	-	-	213 368	-	-	-	-	-	-	2,848 5,049	-
	Extraction Steam		229	-	-	-	-	-	34	263	-	-	263	-					-	3,637	-
	Feedwater	-	310	-	-	-	-	-	47	357	-	-	357	-	-	-	-	-	-	4,925	-
4a.1.5.18	Feedwater Drains	-	736	-	-	-	-	-	110	846	-	-	846	-	-	-	-	-	-	11,719	-
	Gland Steam	-	39	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	616	-
	Gland Water	-	28	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	458	-
	Main Steam	-	316	- 01	-	-	-	-	47	363	-	-	363	-	- 0.45	-	-	-	40.000	4,979	-
4a.1.5.22	Main Steam RCA	-	87	21	13	-	64	-	42	225	225	-	-	-	947	-	-	-	49,262	1,292	-

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

Part									(thou	sands of 2014	uonars)											
The first Section Se			ъ	ъ .	D 1 .	m			0.1	m . 1	m . 1								СТСС		G &	Utility and
14.1.1.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2													_									Contractor Manhours
16.10.10 1.00																						
M. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.			-		-	-	-	-	-			-	-		-	-	-	-	-	-		-
14.1.1.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2			-		-	-	-	-	-		-		-	-	-	-	-	-	-			-
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1						50	-	251	-				-	420	-	3 738	-					
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1							-		-				-	_	_		-		-		,	_
16.1.1.2. Posee Seminary 1.1 8			-		-	-	-	-	-				-	6	-	-	-	-	-			-
18 18 18 18 18 18 18 18	4a.1.5.29	Process Radiation Monitoring	-		4	2	-	9	-	20	103	103	-	-	-	134	-	-	-	7,021	1,093	-
18 18 18 18 18 18 18 18			-		14	8	-	41	-			264	-		-	615	-	-	-	31,992		-
18.10 Select Menting 18.10 Sel			-		-	-	-	-	-				-		-	-	-	-	-	-		-
84 Look Manufalingtoon 7			-		-	-	-	-	-	•		-	-		-	-	-	-	-	-		-
13.1.5.2 Springhyeer Rose Rosemand 30 -			-		-	-	-	-	-			-	-		-	-	-		-	-		-
14.1.1.2.1.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2										_												
14.1.5.5 Turbine Ridge Troor Drawns		0			_	-	_	_	-	-		_	_		_	_	-	-	_	-		_
All			-		-	-	-	-	-		156	-	-		-	-	-	-	-	-		-
Ast	4a.1.5.38	Turbine Oil	-	85	-	-	-	-	-	13	98	-	-	98	-	-	-	-	-	-	1,359	-
Aut.			-		-	-	-	-	-	U	00	-	-		-	-	-	-	-	-		-
14.1.5 Suffelding in support of denominisationing 1.672 1.675		*	-		-	-	-	-	-	-		-	-		-	-	-	-	-	-		-
Section of the commission of						-	-	1 000					-		-	-	-	-	-			-
A bloom I Period to Activity Case	4a.1.5		-	7,970	563	323	-	1,632	-	1,966	12,454	6,253	-	6,202	-	24,394	-	-	-	1,265,158	123,619	-
Part Additional Content Additional Content 1	4a.1.6	Scaffolding in support of decommissioning	-	1,572	14	7	-	37	-	405	2,035	2,035	-	-	-	556	-	-	-	28,884	26,134	-
	4a.1	Subtotal Period 4a Activity Costs	438	27,368	16,475	7,951	-	42,302	580	25,841	120,955	114,754	-	6,202	-	245,257	501	393	2,217	14,404,750	294,493	5,532
14.2 2 Asbestos Absternest 15.2 C Asbestos Abste																						
14.2 S. Operational Tools and Equipment 9			-	-	-	-	-	-					-	-	-	-	-	-	-	-		-
1.6.2 Subtoal Period the Additional Costs			-	-	- 0	- 21	-	100					-	-	-	-	-	-	-			-
143.1 Peces decomnissioning water water 5			-		-		-						-	-	-	,	-	-	-			-
143.1 Peces decomnissioning water water 5	Period 4a	Collateral Costs																				
As 3 subtoral Period As Collateral Costs Ferriod As Period As Collateral Costs Ferriod As Period As Collateral Costs As 1	4a.3.1	Process decommissioning water waste	5	-	9	24	-	31	-	15	84	84	-	-	-	87	-	-	-	5,225	17	-
Period 4a Period 4b pendent Costs 4a. 4.1 Decon supplies 81	4a.3.3		-		-	-	-		-				-		-	-	-	-	-			-
44.4.1 Decon supplies	4a.3	Subtotal Period 4a Collateral Costs	5	324	9	24	-	31	-	64	457	420	-	37	-	87	-	-	-	5,225	17	-
44.4.2 Insurance			0.1							20	101	101										
4a.4.4 Health physics supplies 2.216		* *	81	-	-	-	-	-	- 701				-	-	-	-	-	-	-	-	-	-
44.4 Health physics supplies 2,216			-	-	-	-	-	-					-	- 99	-	-	-	-	-	-	-	-
4a.4.6 Heavy equipment rental 1,345			-		-	-	-	-					-	- 02	-	-	-		-	-	-	-
4a.46 Disposal of DAW generated			-		-	-	-	_	-				-	-	-	-	-	-	-	-	-	-
44.4.8 NRC Fees	4a.4.6	Disposal of DAW generated	-	-	81	43	-	245	-	76	445	445	-	-	-	3,831	-	-	-	76,618	125	-
4a.4.9 Site O&M Cost 4a.4.10 Liquid Radwaste Processing Equipment/Ser 4a.4.11 Security Staff Cost 4a.4.11 Security Staff Cost 4a.4.12 South Staff Cost 4a.4.13 Utility Staff Cost 4a.4.13 Utility Staff Cost 4a.4.13 Utility Staff Cost 4a.4.14 DoC Staff Cost 4a.4.15 Utility Staff Cost 4a.4.16 Subtoal Period Dependent Costs 81 5.261 81 43 245 57.246 9.586 72.544 72.462 82 3.831			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
4a.4.10 Liquid Radwaste Processing Equipment/Ser			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
4a.4.11 Security Staff Cost			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
44.4.12 DGC Staff Cost				-	-	-	-	-					-	-	-	-	-	-	-	-		71,047
4a.4.13 Utility Staff Cost 4a.4 Subtotal Period 4a Period-Dependent Costs 81 5.261 81 43 43 43 445 57.246 5			-	-	-	-	-	-	,			,	-	-	-	-		-	-	-		215,674
4a.4 Subtotal Period 4a Period-Dependent Costs 81 5.261 81 43 - 245 57.246 9.586 72.544 72.462 - 82 3.831 76.618 125 4a.0 TOTAL PERIOD 4a COST 525 32.954 16.573 8.069 - 42.766 59.853 36.147 196.888 190.566 - 6.321 255.030 501 393 2.217 14.632.970 325.801 PERIOD 4b - Site Decontamination Period 4b Direct Decommissioning Activities 4b.1.1 Remove spent fuel racks 1.138 123 344 140 - 705 - 831 3.280 3.280 10.524 546.426 2.174 Disposal of Plant Systems 4b.1.2.1 Chemical & Volume Control - 1.085 153 81 - 407 - 400 2.126 2.126 6.603 315.292 15.801 4b.1.2.2 Chilled Water RCA - 667 168 93 - 470 - 315 1.713 1.713 7.000 7.000 364.517 9.521 4b.1.2.3 Component Cooling - 709 209 119 - 600 - 366 2.002 2.002 4.900			-		-	-	-	-					-	-	-	-				-		390,714
Period 4b Direct Decommissioning Activities 4b.1.1 Remove spent fuel racks 1,138 123 344 140 - 705 - 831 3,280 3,280 - 10,524 - 10,524 - 546,426 2,174 Disposal of Plant Systems 4b.1.2.1 Chemical & Volume Control - 1,085 153 81 - 407 - 400 2,126 2,126 606,33 315,292 15,801 4b,12.2 Chilled Water RCA - 667 168 93 - 470 - 315 1,713 1,713 5 1,000 364,517 9,521 4b,12.3 Component Cooling - 709 209 119 - 600 - 366 2,002 2,002 4,900 8,936 464,778 10,502 4b,12.4 Electrical - 4,261 - 4,261 -			81	5,261	81	43	-	245					-	82	-	3,831	-	-	-	76,618		677,436
Period 4b Direct Decommissioning Activities 4b.1.1 Remove spent fuel racks 1,138 123 344 140 - 705 - 831 3,280 3,280 10,524 546,426 2,174 Disposal of Plant Systems 4b.1.2.1 Chemical & Volume Control - 1,085 153 81 - 407 - 400 2,126 2,126 6,063 5315,292 15,801 4b.1.2.2 Chilled Water RCA - 667 168 93 - 470 - 315 1,713 1,713 5 7,000 364,517 9,521 4b.1.2.3 Component Cooling - 709 209 119 - 600 - 366 2,002 2,002 7,000 7,000 7,000 7,000 4b.1.2.4 Electrical - 4,261 4,261 66,259	4a.0	TOTAL PERIOD 4a COST	525	32,954	16,573	8,069	-	42,766	59,853	36,147	196,888	190,566	-	6,321	-	255,030	501	393	2,217	14,632,970	325,801	682,968
4b.1.1 Remove spent fuel racks 1,138 123 344 140 - 705 - 831 3,280 3,280 10,524 546,426 2,174 Disposal of Plant Systems 4b.1.2.1 Chemical & Volume Control - 1,085 153 81 - 407 - 400 2,126 2,126 667 168 93 315,292 15,801 4b.1.2.2 Chilled Water RCA - 667 168 93 - 470 - 315 1,713 1,713 67,000 364,517 9,521 4b.1.2.3 Component Cooling - 709 209 119 - 600 - 366 2,002 2,002 8,936 4464,778 10,502 4b.1.2.4 Electrical - 4,261 4,261 66,259	PERIOD	4b - Site Decontamination																				
Disposal of Plant Systems 4b.1.2.1 Chemical & Volume Control - 1,085 153 81 - 407 - 400 2,126 2,126 6,063 315,292 15,801 - 40.1.2.2 Chilled Water RCA - 667 168 93 - 470 - 315 1,713 1,713 7,000 364,517 9,521 - 364,517 9,521 315,000 366 2,002 2,002 8,936 364,778 10,502 4,261	Period 4b																					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4b.1.1	Remove spent fuel racks	1,138	123	344	140	-	705	-	831	3,280	3,280	-	-	-	10,524	-	-	-	546,426	2,174	-
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				1.00*	150	01		405		400	0 100	0.100				0.000				915 000	15 001	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$							-						-	-	-				-			-
4b.1.2.4 Electrical - $4,261$ $66,259$							-						-		-		-	-				-
							-						-		-			-				-
4b.1.2.5 Electrical - Contaminated - 1,757 181 120 - 608 - 627 3,294 9,079 471,393 26,007		Electrical - Contaminated	-	1,757	181	120	-	608		627	3,294	3,294			-	9,079	-		-	471,393	26,007	-

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(1110)	usanas of 2014	uonais)											
Activity	y	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Disposal	of Plant Systems (continued)																				
4b.1.2.6	Electrical - RCA	-	2,529	424	272	-	1,372	-	1,058	5,655	5,655	-	-	-	20,491	-	-	-	1,063,899	38,351	-
4b.1.2.7	Emergency Diesel Generator	-	96	-	-	-	-	-	14	111	-	-	111	-	-	-	-	-	-	1,514	-
4b.1.2.8	Essential Service Water RCA	-	345	195	119	-	601	-	274	1,535	1,535	-	-	-	8,972	-	-	-	466,273	5,336	-
4b.1.2.9 4b.1.2.10	Fire Protection Fire Protection RCA	-	315 537	143	83	-	419	-	47 266	362 $1,447$	1,447	-	362	-	6,243	-	-	-	324,808	4,983 7,672	-
4b.1.2.10 4b.1.2.11			167	32	18	-	91	-	70	377	377	-	-	-	1,386		-	-	70,185	2,442	-
4b.1.2.12	0 0 1 1	-	30	4	2	-	9	-	10	54	54	-		-	129	-	-	-	6,739	429	-
4b.1.2.13	Fuel Handling Bldg Floor Drains	-	170	31	16	-	82	-	69	368	368	-	-	-	1,241	-	-	-	63,725	2,480	-
4b.1.2.14		-	119	22	11	-	58	-	48	257	257	-	-	-	874	-	-	-	44,626	1,769	-
	Fuel Pool Cooling & Cleanup	-	226	46	26 25	-	133	-	98	530	530	-	-	-	1,989	-	-	-	103,404	3,329	-
4b.1.2.16	Fuel Pool Cooling & Cleanup (Unit 1) HVAC-Auxiliary Building	-	210 564	42 108	25 72	-	124 361	-	92 253	493 1,358	493 1,358	-	-	-	1,857 5,390	-	-	-	96,476 279,889	3,103 8,029	-
4b.1.2.17		-	8	-	- 12	-	-	-	200	1,556	1,550	-	9	-	5,550	-	-	-	213,003	127	-
4b.1.2.19		-	44	_	_	-	-	-	7	51	-	-	51	_	-	-	-	-	-	686	_
4b.1.2.20	HVAC-Laboratory	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	315	-
4b.1.2.21		-	18	-	-	-	-	-	3	21	-	-	21		-	-	-	-	-	297	-
4b.1.2.22		-	112	-	-	-	-	-	17	128		-	128	-	-	-	-	-	-	1,769	-
4b.1.2.23		-	627	203	135	-	683	-	368 3	2,017	2,017	-	-	-	10,197	-	-	-	529,451	8,908	-
4b.1.2.24 4b.1.2.25			18 326	- 63	42	-	213		3 147	20 791	791	-	20	-	3,177		-	-	164,931	275 4,412	
4b.1.2.26			189	-	-	-	-	-	28	217	-	-	217	-			-	-	-	3,158	
4b.1.2.27		-	73	-	-	-	-	-	11	84	-	-	84	-	-	-	-	-	-	1,197	-
4b.1.2.28		-	249	29	13	-	68	-	84	443	443	-	-	-	1,002	-	-	-	52,414	3,630	-
4b.1.2.29		-	76	14	8	-	40	-	31	168	168	-	-	-	592	-	-	-	30,841	1,125	-
4b.1.2.30		-	301	128	74	-	375	-	193	1,071	1,071	-	-	-	5,582	-	-	-	290,664	4,721	-
4b.1.2.31 4b.1.2.32	•	-	839 2,769	218 478	133 270	-	670 1,365	-	419 1,122	2,278 6,004	2,278 6,004	-	-	-	10,451 $20,695$	-	-	-	519,324 1,058,144	12,918 40,223	
4b.1.2.33	Reactor Bldg Equipment Drains	-	2,769	23	13	-	1,565	-	1,122	261	261	-		-	20,695	-	-	-	51,818	1,605	-
4b.1.2.34	Reactor Building Floor Drains		41	6	3	-	16	-	16	83	83	-	-	-	245	-	-	-	12,768	604	-
4b.1.2.35		-	167	20	10	-	51	-	58	307	307	-	-	-	763	-	-	-	39,871	2,413	-
4b.1.2.36	Residual Heat Removal	-	190	47	28	-	143	-	92	501	501	-	-	-	2,129	-	-	-	110,771	2,894	-
4b.1.2.37		-	877	224	134	-	676	-	431	2,341	2,341	-	-	-	10,357	-	-	-	523,998	13,451	-
4b.1.2.38		-	58 253	8	4	-	19 156	-	21	110	110 607	-	-	-	283	-	-	-	14,808	833	-
4b.1.2.39 4b.1.2.40	· ·	-	26	56 4	31	-	106	-	112 10	607 52	52	-	-	-	2,315 149	-	-	-	120,573 $7,762$	3,664 370	-
4b.1.2.41	Waste Water Treatment	-	91			-	-	-	14	105	- 52	-	105	-	-	-	-	-	1,102	1,464	-
4b.1.2	Totals	-	21,267	3,277	1,959	-	9,887	-	7,885	44,275	38,242	-	6,033		148,585	-	-	-	7,664,142	318,585	-
4b.1.3	Scaffolding in support of decommissioning	-	2,358	20	11	-	56	-	607	3,052	3,052	-	-	-	834	-	-	-	43,325	39,201	-
D 4	nination of Site Buildings																				
4b.1.4.1	Reactor	2,018	1,452	207	328		999		1,692	6,696	6,696				16,618				1,181,636	50,402	
4b.1.4.1	Auxiliary Building	236	124	207	19	-	75	-	173	647	647	-	-	-	1,209	-	-	-	72,602	5,258	-
4b.1.4.3	Radwaste/Service Building	155	49	9	12	-	38	-	102	363	363	-		-	686	-	-	-	42,199	2,958	-
4b.1.4.4	Refueling Water Storage Tank	367	428	38	17	-	83	-	318	1,253	1,253	-	-	-	1,240	-	-	-	67,351	11,972	-
4b.1.4.5	Fuel Handling Building	1,052	1,179	102	52	-	236	-	898	3,518	3,518	-	-	-	3,552	-	-	-	198,851	33,507	-
4b.1.4	Totals	3,828	3,232	376	428	-	1,431	-	3,182	12,477	12,477	-	-	-	23,305	-	-	-	1,562,638	104,099	-
4b.1	Subtotal Period 4b Activity Costs	4,966	26,980	4,017	2,538	-	12,079	-	12,505	63,084	57,052	-	6,033	-	183,249	-	-	-	9,816,532	464,058	-
Period 4b	Additional Costs																				
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	993	298	1,291	1,291	-	-	-	-	-	-	-	-	-	6,240
4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,566	1,070	4,636	4,636	-	-	-	-	-	-	-	-	56,209	-
4b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	1 150 000	- 11 045	-
4b.2.4 4b.2.5	License Termination ISFSI Underground Services Excavation	-	506 506	197	322	-	893	1,723	910 76	4,552 581	4,552 581	-	-	-	14,550	-	-	-	1,178,838	11,245 2,755	
4b.2.5 4b.2	Subtotal Period 4b Additional Costs	-	1,012	197	322	-	893	6,332	2,361	11,118	11,118	-	-	-	14,550	-	-	-	1,178,838	70,208	
Dominal 41	Collateral Costs																				
4b.3.1	Process decommissioning water waste	16	_	27	71	_	90	_	44	248	248	_	_	_	258	_	_	_	15,463	50	_
4b.3.1 4b.3.3	Small tool allowance	-	523	-	-	-	-		78	602	602	-	-	-	256	-	-		15,465	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	171	94	-	472	-	149	887	887	-	-	-	7,054				366,237	88	
4b.3	Subtotal Period 4b Collateral Costs	16	523	198		-	563	-	272	1,736	1,736	-	-	-	7,311	-	-	-	381,700	138	

Table E-2
Byron Nuclear Power Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(110)	usanas of 2014	donars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 4b	Period-Dependent Costs																				
4b.4.1	Decon supplies	949	-	-	-	-	-	-	237	1,186	1,186	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,409	141	1,550	1,550	-	-	-	-	-	-	-	-	-	-
4b.4.3 4b.4.4	Property taxes Health physics supplies	-	3,736	-	-	-	-	1,351	135 934	1,486 4,670	1,486 4,670	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	5,440	-	-	-	-	-	816	6,256	6,256	-	-	-	-			-	-	-	-
4b.4.6	Disposal of DAW generated	-	-,	139	75	-	424	-	131	769	769	-	-	-	6,618	-	-	-	132,358	216	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	3,607	541	4,148	4,148	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,132	113	1,246	1,246	-	-	-	-	-	-	-	-	-	-
4b.4.9 4b.4.10	Site O&M Cost Liquid Radwaste Processing Equipment/Serv	-	-	-	-	-	-	446 1,084	67 163	513 $1,247$	513 1,247	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	10,072	1,511	11,583	11,583	_	-	-	-	-		_	-	-	176,250
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	31,501	4,725	36,226	36,226	-	-	-	-	-	-	-	-	-	377,880
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	50,998	7,650	58,648	58,648	-	-	-	-	-	-	-	-	-	665,520
4b.4	Subtotal Period 4b Period-Dependent Costs	949	9,176	139	75	-	424	101,601	17,164	129,529	129,529	-	-	-	6,618	-	-	-	132,358	216	1,219,650
4b.0	TOTAL PERIOD 4b COST	5,931	37,691	4,552	3,100	-	13,959	107,933	32,302	205,467	199,434	-	6,033	-	211,728	-	-	-	11,509,430	534,620	1,233,142
PERIOD	4f - License Termination																				
	Direct Decommissioning Activities							150		22.4	22.4										
4f.1.1 4f.1.2	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
4f.1.2 4f.1	Terminate license Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	a 224	224	-		-	-	-	-	-	-	-	-
Period 4f	Additional Costs																				
4f.2.1	License Termination Survey	-	-	-	-	-	-	8,763	2,629	11,392	11,392	-	-	-	-	-	-	-	-	128,776	3,120
4f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	8,763	2,629	11,392	11,392	-	-	-	-	-	-	-	-	128,776	3,120
Period 4f	Collateral Costs																				
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,080	162	1,242	1,242	-	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,080	162	1,242	1,242	-	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs							200	00	100	400										
4f.4.1 4f.4.2	Insurance Property taxes	-	-	-	-	-	-	393 376	39 38	432 414	432 414	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies		649	-	-	-	-	-	162	812	812	-	-	-	-	-		-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	4	-	21	-	7	39	39	-	-	-	335	-	-	-	6,698	11	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	268	40	308	308	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees	-	-	-	-	-	-	302	30	333	333	-	-	-	-	-	-	-	-	-	-
4f.4.7 4f.4.8	Site O&M Cost Security Staff Cost	-	-	-	-	-	-	124 684	19 103	143 787	143 787	-	-	-	-	-	-	-	-	-	11,786
4f.4.9	DOC Staff Cost		-	-	-	-	-	3,919	588	4,507	4,507	-	-	-	-	-		-	-	-	46,750
4f.4.10	Utility Staff Cost	-	-	-	-	-	-	4,776	716	5,493	5,493	-	-	-	-	-	-	-	-	-	56,964
4f.4	Subtotal Period 4f Period-Dependent Costs	-	649	7	4	-	21	10,843	1,742	13,266	13,266	-	-	-	335	-	-	-	6,698	11	115,500
4f.0	TOTAL PERIOD 4f COST	-	649	7	4	-	21	20,858	4,584	26,124	26,124	-	-	-	335	-	-	-	6,698	128,787	118,620
PERIOD	4 TOTALS	6,455	71,294	21,132	11,173	-	56,747	188,644	73,034	428,478	416,125	-	12,354	-	467,092	501	393	2,217	26,149,100	989,208	2,034,730
PERIOD	5b - Site Restoration																				
Period 5b	Direct Decommissioning Activities																				
	on of Remaining Site Buildings																				
5b.1.1.1	Reactor	-	7,213	-	-	-	-	-	1,082	8,294	-	-	8,294	-	-	-	-	-	-	69,541	-
5b.1.1.2	Aux Feedwater-Steam Tunnel/Penetr. Area	-	719	-	-	-	-	-	108	827	-	-	827	-	-	-	-	-	-	5,187	-
5b.1.1.3 5b.1.1.4	Auxiliary Building Berms, Settling Ponds, and Drying Beds	-	6,318 154	-	-	-		-	948 23	7,266 178		-	7,266 178	-		-	-		-	62,064 1,631	-
5b.1.1.4 5b.1.1.5	Circulating Water Pumphouse	-	1,090	-	-	-	-	-	163	1,253		-	1,253	-		-	-		-	11,861	-
5b.1.1.6	Essential Service Cooling Tower	-	510	-	-	-	-	-	76	586	-	-	586	-	-	-	-	-	-	5,067	-
5b.1.1.7	Make-up Demineralizer Area	-	1,817	-	-	-	-	-	273	2,089	-	-	2,089	-	-	-	-	-	-	20,770	-
5b.1.1.8	Miscellaneous Site Structures	-	1,954	-	-	-	-	-	293	2,247	-	-	2,247	-	-	-	-	-	-	20,544	-
5b.1.1.9	Radwaste/Service Building	-	4,166	-	-	-	-	-	625	4,791	-	-	4,791	-	-	-	-	-	-	45,688	-
5b.1.1.10		-	193	-	-	-	-	-	29	222	-	-	222 1,263	-	-	-	-	-	-	2,294	-
op.1.1.11	Refueling Water Storage Tank	-	1,099	-	-	-	-	-	165	1,263	-	-	1,263	-	-	-	-	-	-	11,688	-

Table E-2 Byron Nuclear Power Station, Unit 2 **SAFSTOR Decommissioning Cost Estimate** (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes .		Burial /		Utility and
Activity		Decon				Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	\mathbf{Craft}	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Domolitio	n of Remaining Site Buildings (continued)																				
	River Screen House		591	_	_	_	_		89	680		_	680					_		5,869	
5b.1.1.13	Security Modifications	-	1,103	_	-	_	_	_	166	1,269	-	-	1,269	_	-	_	_	_	_	8,636	-
5b.1.1.14	Turbine Building	-	6.069	-	-	_	-	-	910	6,979	_	-	6.979	-	_	-	-	-	_	70,347	_
	Turbine Pedestal	-	1,463	-	-	-	-	-	219	1,682	-	-	1,682	-	-	-	-	-	-	12,628	
5b.1.1.16	Yard Inventory	-	2,253	-	-	-	-	-	338	2,591	-	-	2,591	-	-	-	-	-	-	20,857	-
5b.1.1.17	Fuel Handling Building	-	3,242	-	-	-	-	-	486	3,729	-		3,729		-	-	-	-	-	33,246	-
5b.1.1	Totals	-	39,954	-	-	-	-	-	5,993	45,947	-	-	45,947	-	-	-	-	-	-	407,920	-
Site Close	out Activities																				
5b.1.2	BackFill Site	-	5.114	-	-	_	-	_	767	5.881	_	-	5.881	-	_	_	-	_	_	9.059	_
5b.1.3	Grade & landscape site	-	345	_	_	-	-	-	52	397	_		397	-	_	-	-	-	_	869	-
5b.1.4	Final report to NRC	_	-	_	_	_	-	85	13	98	98	-	-	-	_	_	-	_	_	-	668
5b.1	Subtotal Period 5b Activity Costs	-	45,413	-	-	-	-	85	6,825	52,322	98	-	52,225	-	-	-	-	-	-	417,849	668
Period 5b	Additional Costs																				
5b.2.1	Site Restoration ISFSI	-	1,199	-	-	_	-	28	184	1,411	_	-	1.411	-	_	_	-	_	_	13,522	80
5b.2.2	Concrete Crushing	-	988	_	_	-	-	6	149	1,142	_		1,142	-	_	-	-	-	_	4,554	-
5b.2.3	Cofferdam Construction and Teardown	-	455	-	-	_	-	-	68	523	_	-	523	-	_	_	-	_	_	3,996	_
5b.2.4	Demolish Cooling Tower	-	5.142	_	_	-	-	165	796	6.102	_		6.102	-	_	-	-	-	_	18,598	_
5b.2	Subtotal Period 5b Additional Costs	-	7,783	-	-	-	-	198	1,197	9,178	-	-	9,178	-	-	-	-	-	-	40,670	80
Period 5b	Collateral Costs																				
5b.3.1	Small tool allowance	_	549	_	_	_	-	_	82	631	_	-	631	-	_	_	-	_	_	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	549	-	-	-	-	-	82	631	-	-	631	-	-	-	-	-	-	-	-
Period 5b	Period-Dependent Costs																				
5b.4.2	Property taxes	-	-	-	-	-	-	1,239	124	1,363	-	-	1,363	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	7,086	-	-	-	-	· -	1,063	8,149	-	-	8,149	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	441	66	507	-	-	507	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Cost	-	-	-	-	-	-	409	61	470	-	-	470	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	2,015	302	2,317	-	-	2,317	-	-	-	-	-	-	-	34,287
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	11,965	1,795	13,760	-	-	13,760	-	-	-	-	-	-	-	137,043
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	5,873	881	6,754	-	-	6,754	-	-	-	-	-	-	-	67,229
5b.4	Subtotal Period 5b Period-Dependent Costs	-	7,086	-	-	-	-	21,942	4,292	33,321	-	-	33,321	-	-	-	-	-	-	-	238,558
5b.0	TOTAL PERIOD 5b COST	-	60,831	-	-	-	-	22,226	12,397	95,453	98	-	95,355	-	-	-	-	-	-	458,519	239,306
PERIOD	5 TOTALS	-	60,831	-	-	-	-	22,226	12,397	95,453	98	-	95,355	-	-	-	-	-	-	458,519	239,306
TOTAL (COST TO DECOMMISSION	13,565	142,001	21,578	12,022	-	58,200	733,881	163,059	1,144,306	834,580	201,327	108,400	-	477,428	501	393	2,217	26,466,100	1,536,118	5,913,313

TOTAL COST TO DECOMMISSION WITH 16.62% CONTINGENCY:	\$1,144,306	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 72.93% OR:	\$834,580	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 17.59% OR:	\$201,327	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 9.47% OR:	\$108,399	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC	478,321	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED	2,217	cubic feet
TOTAL SCRAP METAL REMOVED:	71,774	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,536,118	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

APPENDIX F

ISFSI DECOMMISSIONING

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Delayed DECON Alternative	F-3

Table F-1 Byron Nuclear Power Station ISFSI Decommissioning Cost Estimate DECON and SAFSTOR Decommissioning Alternatives

(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	471	471	-	-	1,312
Decontamination (activated overpack disposition)	414	394	644	1,787	19	3,259	29,099	4,291	-
License Termination (radiological surveys)	-	-	-	-	2,132	2,132	-	18,198	-
Subtotal	414	394	644	1,787	2,622	5,862	29,099	22,489	1,312
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	384	384	-	-	776
Insurance	-	-	-	-	114	114	-	-	-
Property Taxes	-	-	-	-	326	326	-	-	-
Plant Energy Budget					-	-			
Security Staff Cost	-	-	-	-	288	288	-	-	4,937
Oversight Staff Cost	-	-	-	-	310	310	-	-	3,740
Subtotal	-	-	-	-	1,422	1,422	-	-	9,453
Total (w/o contingency)	414	394	644	1,787	4,044	7,283	29,099	22,489	10,765
Total (w/25% contingency)						9,104			

The application of contingency (25%) is consistent with the evaluation criteria referenced by the NRC in NUREG-1757 ("Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. NRC's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Vol. 3, Rev. 1, February 2012)

Table F-2 Byron Nuclear Power Station ISFSI Decommissioning Cost Estimate Delayed DECON Decommissioning Alternative

(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	293	293	-	-	1,096
Decontamination (activated overpack disposition)	900	394	548	1,786	19	3,048	29,086	3,387	-
License Termination (radiological surveys)	-	-	-	-	692	1,291	-	10,698	-
Subtotal	900	394	548	1,786	1,004	4,632	29,086	14,086	1,096
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	384	384	-	-	776
Insurance	-	-	-	-	114	114	-	-	-
Property Taxes	-	-	-	-	326	326	-	-	-
Plant Energy Budget					-	-			
Security Staff Cost	-	-	-	-	288	288	-	-	3,740
Oversight Staff Cost	-	-	-	-	310	310	-	-	8,677
Subtotal	-	-	-	-	1,422	1,422	-	-	13,193
Total (w/o contingency)	900	394	548	1,786	2,426	6,054	29,086	14,086	14,289
Total (w/25% contingency)						7,567			

The application of contingency (25%) is consistent with the evaluation criteria referenced by the NRC in NUREG-1757 ("Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. NRC's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Vol. 3, Rev. 1, February 2012)

ATTACHMENT 3

LaSalle County Station, Units 1 and 2 Decommissioning Cost Estimate

DECOMMISSIONING COST ANALYSIS

for the

LASALLE COUNTY STATION

UNITS 1 AND 2



 $prepared\ for$

Exelon Generation Company LLC

prepared by

TLG Services, Inc. Bridgewater, Connecticut

December 2014

APPROVALS

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Project Engineer

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Date

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REVISION LOG

No.	Date	Item Revised	Reason for Revision
0	12-08-2014		Original Issue

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the LaSalle County Station (LaSalle County) for the selected decommissioning scenarios following a scheduled cessation of plant operations. The updated estimates are designed to provide Exelon Generation Company LLC (Exelon) with the information to assess its current decommissioning liability, as it relates to the nuclear station.

The analysis relies upon site-specific, technical information, developed in an evaluation in 2009,^[1] and updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a comprehensive engineering evaluation, but presents estimates prepared in advance of the detailed planning required to execute the decommissioning of the nuclear units. It may also not reflect the actual plan to decommission LaSalle County; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

The 2009 inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis. Other than the ISFSI, no currently-planned or recent substantive changes were identified to the configuration of the station or site facilities, (that would impact decommissioning).

The costs to decommission LaSalle County for the scenarios evaluated are tabulated at the end of this section. Costs are reported in 2014 dollars and include monies anticipated to be spent for radiological remediation and operating license termination, spent fuel management, and site restoration activities.

A complete discussion of the assumptions relied upon in this analysis is provided in Section 3, along with schedules of annual expenditures for each scenario. A sequence of significant project activities is provided in Section 4 with a timeline for each scenario. Detailed cost reports used to generate the summary tables contained within this document are provided in Appendices C, D and E.

TLG Services, Inc.

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¹ "Decommissioning Cost Analysis for the LaSalle County Station, Units 1 and 2," Document No. E16-1555-012, Rev. 0, TLG Services, Inc., June 2009

Consistent with the 2009 analysis, the current cost estimates assume that the shutdown of the nuclear station is a scheduled and pre-planned event (e.g., there is no delay in transitioning the plant and workforce from operations or in obtaining regulatory relief from operating requirements, etc.). The estimates incorporate a minimum cooling period of approximately five and one-half years for the spent fuel in the storage pool at the cessation of Unit 2 operations. In the DECON and SAFSTOR scenarios, any residual fuel remaining in the pools after the cooling period is relocated to an on-site independent spent fuel storage installation (ISFSI) to await transfer to a Department of Energy (DOE) facility (the fuel present in the spent fuel pools or reactors is assumed to remain in the storage pools for the Delayed DECON scenario and transferred directly from the pools to DOE). The estimates also include the dismantling of non-essential structures and limited restoration of the site.

<u>Alternatives and Regulations</u>

The U.S. 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.

<u>DECON</u> 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]

<u>SAFSTOR</u> 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.

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

³ Ibid. Page FR24022, Column 3

⁴ Ibid.

<u>ENTOMB</u> 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 viable option. The resulting evaluation provided recommendations, however, rulemaking has been deferred based upon several factors (e.g., 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 amended its decommissioning regulations 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 amendments 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 estimates is also consistent with the recommendations of Regulatory Guide 1.202, issued in February 2005. [7]

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will

⁵ Ibid. Page FR24023, Column 2

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

[&]quot;Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, U.S. Nuclear Regulatory Commission, February 2005

become a legacy site. [8] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details are included in this analysis, including the ISFSI decommissioning estimate (Appendix F).

Decommissioning Scenarios

The following scenarios were evaluated and are representative of the alternatives available to the owner. The scenarios assume that the units operate for 60 years, followed by a planned and scheduled shutdown.

- 1. DECON: The first scenario assumes that the two units are promptly decommissioned as an integrated activity. Spent fuel that is not transferred directly to the DOE from the storage pools is relocated to the ISFSI so as to facilitate decontamination and dismantling activities within the reactor buildings. Spent fuel storage operations continue at the site, independent of decommissioning operations, until the transfer of the fuel to the DOE is complete, assumed for purposes of this study to be in the year 2061. At that time, the ISFSI is decommissioned and the site released for alternative use.
- 2. Delayed DECON: In the second scenario, the units are prepared for an abbreviated period of safe-storage. The spent fuel resident in the reactor building's storage pools, remains in the pools until it can be transferred to the DOE (i.e., the ISFSI is not used to off-load the pools following the cessation of operations). Spent fuel placed at the ISFSI during operations remains in storage until the pools are emptied at which time the ISFSI is also emptied. Decommissioning is scheduled to commence once the transfer of the fuel to the DOE is complete (i.e., in the year 2061).
- 3. SAFSTOR: The units are also placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent permitted by the current regulations. Similar to the DECON alternative, the spent fuel that cannot be transferred directly to the DOE in the first five and one-half years is relocated to the ISFSI for interim storage.

U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011

The units remain in protective storage following the removal of spent fuel from the site. Decommissioning operations commence such that license termination is completed within the required 60-year period. As with the first two scenarios, decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling process.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines [9] 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.

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

Contingency

Consistent with standard cost estimating practice, contingencies are applied to the decontamination and dismantling costs 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 the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

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

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

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

<u>Low-Level Radioactive Waste Disposal</u>

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] and its Amendments of 1985,^[12] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

With the exception of Texas, no new compact facilities have been successfully sited, licensed, and constructed. The Texas Compact disposal facility is now operational and waste is being accepted from generators within the Compact by the operator, Waste Control Specialists (WCS). The facility is also able to accept limited quantities of non-Compact waste.

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to Exelon. The majority of the low-level radioactive waste designated for direct disposal (Class A^[13]) can be sent to Energy Solutions' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon Exelon's Life of Plant Agreement with Energy Solutions. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. For purposes of this analysis, GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner to, and at a cost equivalent to that envisioned for the spent fuel. The GTCC is either stored on site with

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

¹² "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986

Waste is classified in accordance with U.S. Code of Federal Regulations, Title 10, Part 61.55

the spent fuel or shipped directly to a DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act" (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 DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008. The current Administration has cut the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle ... and make recommendations for a new plan."[14] Towards this goal, the Administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[0]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[15]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on nuclear waste disposal. Two of the recommendations that may impact decommissioning planning are:

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"[16]
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[17]

Blue Ribbon Commission on America's Nuclear Future Charter, http://cybercemetery.unt.edu/archive/brc/20120620215336/http://brc.gov/index.php?q=page/charter

¹⁵ Ibid.

[&]quot;Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf, p. 32, January 2012

¹⁷ <u>Ibid</u>., p.27

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[18]

"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."[19]

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013) [20] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in

¹⁸ "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013

¹⁹ Ibid., p.2

United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, August 2013

 $[\]underline{http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB}\\18/\$file/11-1271-1451347.pdf$

which it was discharged from the reactor.^[21] With a large fleet of reactors, Exelon may be able to re-assign allocations between its units to minimize on-site storage costs.

Assuming a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (based upon the proposed timeline for the availability of the larger interim storage facility), the assemblies generated from LaSalle County operations are projected to be shipped from the LaSalle County site in the years 2056 through 2061 (assuming the cessation of plant operations in 2042 and 2043 for Units 1 and 2, respectively). This equates to 117 multi-purpose canisters (at 68 assemblies per canister), in addition to the 68 on the pad from operations.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[22]), has been constructed to support continued plant operations. This analysis assumes that the facility can be expanded to support decommissioning operations (in the DECON and SAFSTOR scenarios).

The spent fuel in the wet storage pools at the cessation of plant operations is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios) within the first five and one-half years following shutdown. Once the wet storage pools are emptied, the reactor buildings can be either decontaminated and dismantled or prepared for long-term storage. The pools are kept operational in the Delayed DECON scenario until the spent fuel stored in the pools can be transferred to the DOE.

Exelon's strongly held position is that the DOE has a contractual obligation to accept LaSalle County's fuel in a timely manner and 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 the DOE has not met its contractual obligation to take the fuel.

U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV – Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) ... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such materials from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance ..."

U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites."

Site Restoration

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

This estimate assumes that some site features will remain following the decommissioning project. These include the existing electrical switchyard, which is assumed to remain functional in support of the regional electrical distribution system.

Consequently, this analysis assumes that non-essential site structures within the restricted access area are removed to a nominal depth of three feet below the local grade level wherever possible. The site is then graded and stabilized.

Summary

The costs to decommission LaSalle County were evaluated for several decommissioning scenarios, incorporating the attributes of both the DECON and SAFSTOR decommissioning alternatives. Regardless of the timing of the decommissioning activities, the estimates assume the eventual removal of all the contaminated and activated plant components and structural materials, such that the facility operator may then have unrestricted use of the site with no further requirement for an operating license. Delayed decommissioning is initiated after the spent fuel has been removed from the site and 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 can be completed. Once the transfer is complete, the storage facilities are also decommissioned.

The scenarios analyzed for the purpose of generating the estimates are 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 Appendices C, D, and E. Cost summaries for the various scenarios are provided at the end of this section for the major cost components.

The cost elements in the estimates for the DECON and SAFSTOR alternatives are assigned to one of three subcategories: NRC License Termination (radiological remediation), 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 §50.75). The cost reported for this subcategory is generally sufficient to terminate the operating license(s), recognizing that there may be some additional cost impact from spent fuel management. The License Termination cost subcategory also includes costs to decommission the ISFSI (as required by 10 CFR §72.30). Section 3.5.1 provides the basis for the ISFSI decommissioning cost.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pools to the ISFSI for interim storage or directly to the DOE, as well as the transfer of the spent fuel in storage at the ISFSI. Costs are included for the operation of the storage pools and the management of the ISFSI until such time that the transfer is complete. It does not include any spent fuel management expenses incurred prior to the cessation of plant operations, nor does it include any costs related to the final disposal of the spent fuel.

"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 below grade 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., Asset Retirement Obligation 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.

As noted within this document, the estimates were developed and costs are presented in 2014 dollars. As such, the estimates do not reflect the escalation of costs (due to inflationary and market forces) over the remaining operating life of the station or during the decommissioning period.

SUMMARY OF DECOMMISSIONING COST ELEMENTS DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	22,479	25,148	47,627
Removal	144,238	173,786	318,024
Packaging	38,630	40,296	78,925
Transportation	22,492	23,558	46,050
Waste Disposal	129,629	136,835	266,464
Off-site Waste Processing	0	0	0
Program Management [1]	284,697	308,164	592,861
Security	28,064	72,060	100,124
Spent Fuel Pool Isolation	12,434	8,290	20,724
Spent Fuel Management [2]	153,419	149,752	303,171
Insurance and Regulatory Fees	19,087	15,797	34,884
Energy	11,041	10,996	22,037
Characterization and Licensing Surveys	33,874	31,032	64,906
Property Taxes	36,966	36,050	73,016
Miscellaneous Equipment	6,881	6,876	13,757
Site O&M	3,749	3,433	7,182
Total [3]	947,679	1,042,072	1,989,751

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	696,880	774,765	1,471,645
Spent Fuel Management	191,700	188,033	379,733
Site Restoration	59,099	79,274	138,373
Total [3]	947,679	1,042,072	1,989,751

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS DELAYED DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	25,134	30,533	55,667
Removal	140,504	170,010	310,514
Packaging	33,215	34,918	68,133
Transportation	17,597	18,814	36,411
Waste Disposal	99,443	106,993	206,436
Off-site Waste Processing	0	0	0
Program Management [1]	365,795	371,103	736,899
Security	74,202	89,316	163,518
Spent Fuel Pool Isolation	12,434	8,290	20,724
Spent Fuel Management [2]	81,845	78,143	159,987
Insurance and Regulatory Fees	34,772	31,056	65,827
Energy	18,593	18,598	37,192
Characterization and Licensing Surveys	34,564	31,792	66,356
Property Taxes	42,227	41,311	83,538
Miscellaneous Equipment	11,957	14,794	26,752
Site O&M	5,596	5,280	10,876
Total [3]	997,878	1,050,952	2,048,830

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	697,417	800,838	1,498,254
Spent Fuel Management	242,164	171,500	413,664
Site Restoration	58,297	78,614	136,911
Total [3]	997,878	1,050,952	2,048,830

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS SAFSTOR ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	25,087	30,481	55,568
Removal	143,639	173,133	316,771
Packaging	33,132	34,833	67,965
Transportation	17,494	18,706	36,201
Waste Disposal	96,307	103,796	200,103
Off-site Waste Processing	0	0	0
Program Management [1]	372,618	377,789	750,407
Security	93,793	108,923	202,716
Spent Fuel Pool Isolation	12,434	8,290	20,724
Spent Fuel Management [2]	151,016	147,349	298,365
Insurance and Regulatory Fees	67,355	63,411	130,766
Energy	22,647	22,645	45,291
Characterization and Licensing Surveys	34,564	31,792	66,356
Property Taxes	60,107	59,190	119,298
Miscellaneous Equipment	19,111	27,127	46,237
Site O&M	11,769	11,453	23,222
Total [3]	1,161,072	1,218,918	2,379,990

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	906,058	949,754	1,855,812
Spent Fuel Management	195,915	189,747	385,662
Site Restoration	59,100	79,416	138,516
Total [3]	1,161,072	1,218,918	2,379,990

^[1] Includes engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

1. INTRODUCTION

This report presents estimates of the cost to decommission the LaSalle County Station (LaSalle County) for the selected decommissioning scenarios following a scheduled cessation of plant operations. The updated estimates are designed to provide Exelon Generation Company LLC (Exelon) with the information to assess its current decommissioning liability, as it relates to the nuclear station.

The analysis relies upon site-specific, technical information, developed in an evaluation in 2009,^[1] * and updated to reflect current assumptions pertaining to the disposition of the nuclear units and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a comprehensive engineering evaluation, but presents estimates prepared in advance of the detailed planning required to execute the decommissioning of the nuclear unit. It may also not reflect the actual plan to decommission LaSalle County; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the cost to decommission LaSalle County, to provide a sequence or schedule for the associated activities, and to develop waste stream projections from the decontamination and dismantling activities.

Operating licenses were issued on April 17, 1982 for Unit 1 and on December 16, 1983 for Unit 2. Exelon Generation has notified the NRC that they intend to pursue license renewal. An application for LaSalle County is tentatively scheduled to be submitted in the first quarter of 2015. As such, a sixty year operating lifetime has been assumed for the purpose of this study. The cessation of operations would then be April 17, 2042 and December 16, 2043, for Units 1 and 2, respectively. These dates were used to schedule the decommissioning activities.

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

1.2 SITE DESCRIPTION

LaSalle County is located approximately 55 miles southwest of Chicago, Illinois, and 20 miles west of the Dresden Nuclear Power Station. The station is comprised of two essentially identical boiling water reactors with supporting facilities.

The primary coolant system consists of a boiling water reactor system designed by General Electric. The reactor recirculation system is comprised of the reactor vessel and two recirculation pump loops external to the reactor vessel which provide the driving flow of water to the reactor vessel jet pumps. Each external loop contains one high-capacity, motor driven recirculation pump and three motor-operated gate valves for pump maintenance. The recirculation loops are part of the reactor coolant pressure boundary and are located inside the primary containment structure. The design reactor thermal power level is 3546 Megawatts thermal (MWth). The corresponding maximum net dependable electrical capacity is approximately 1,111 Megawatts electric (MWe).

The containment system at LaSalle County is comprised of a primary containment and a secondary containment. Primary containment is a Mark II type containment, comprised of a steel dome head and post-tensioned concrete wall standing on a base mat of reinforced concrete. The inner surface of containment is lined with steel plate which acts as a leaktight membrane. The suppression system is of the over-and-under configuration. The drywell, in the form of a frustum of a cone, is located directly above the suppression chamber. The suppression pool chamber is cylindrical and separated from the drywell by a reinforced concrete slab. The drywell is topped by an elliptical steel dome called the drywell head. The drywell atmosphere is vented into the suppression chamber through a series of downcomer pipes penetrating and supported by the drywell floor.

Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of steam produced in the reactor into mechanical shaft power and then into electrical energy. The main turbine consists of one double-flow, high-pressure turbine and three double-flow, low-pressure turbines. The generator is driven at 1800 rpm and rated at 1300 MVA. The exhaust steam from the turbine is condensed and deaerated in the main condenser. The heat rejected to the main condenser is removed by the circulating water system.

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

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 these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the 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. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative.^[4] 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 had considered rulemaking to alter the 60year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments.^[5] However, the NRC's staff has recommended that rulemaking be deferred, based upon several factors, e.g., 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.

The NRC published amendments to its decommissioning regulations in 1996.^[6] When the regulations were originally 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 applications to the NRC to terminate the license, which will include a License Termination Plan (LTP).

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site. [7] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details, including an ISFSI decommissioning estimate, are included in this analysis.

1.3.1 <u>High-Level Radioactive Waste Management</u>

Congress passed the "Nuclear Waste Policy Act" (NWPA) in 1982,^[8] 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 DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, even with the License Application for a geologic repository submitted by the DOE to the NRC in 2008. The current Administration has cut the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle ... and make recommendations for a new plan." Towards this goal, the Administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed." [9]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on nuclear waste disposal. Two of the recommendations that may impact decommissioning planning are:

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[10]

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."^[11]

"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013)^[12] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. [13] With a large fleet of reactors, Exelon may be able to re-assign allocations between its units to minimize onsite storage costs.

Assuming a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (based upon the proposed timeline for the availability of the larger interim storage facility), the assemblies generated from LaSalle County operations are projected to be shipped from the LaSalle County site in the years 2056 through 2061 (assuming the cessation of plant operations in 2042 and 2043 for Units 1 and 2, respectively). This equates to 117 multi-purpose canisters (at 68 assemblies per canister), in addition to the 68 on the pad from operations.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[14]), has been constructed to support continued plant operations. This analysis assumes that the facility can be expanded to support decommissioning operations (in the DECON and SAFSTOR scenarios).

The spent fuel in the wet storage pools at the cessation of plant operations is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios) within the first five and one-half years following shutdown. Once the wet storage pools are emptied, the reactor buildings can be either decontaminated and dismantled or prepared for long-term storage. The spent fuel pools are kept operational in the Delayed DECON scenario until the transfer of spent fuel from the pools to the DOE can be completed.

Exelon's strongly held position is that the DOE has a contractual obligation to accept LaSalle County's fuel in a timely manner and 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 the DOE has not met its contractual obligation to take the fuel.

1.3.2 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,^[15] and its Amendments of 1985,^[16] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. It was expected that groups of states would combine together to jointly deal with their radioactive wastes; these organizations are referred to as waste disposal compacts.

With the exception of Texas, no new compact facilities have been successfully sited, licensed, and constructed. The Texas Compact disposal facility is now operational and waste is being accepted from generators within the Compact by the operator, Waste Control Specialists (WCS). The facility is also able to accept limited quantities of non-Compact waste.

All options and services currently available to Exelon for disposition of the various waste streams produced by the decommissioning process were considered. The majority of the low-level radioactive waste designated for direct disposal (Class A^[17]) can be sent to EnergySolutions' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon Exelon's Life of Plant Agreement with EnergySolutions. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. For purposes of this analysis, GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner to, and at a cost equivalent to that envisioned for the spent fuel. The GTCC is either stored on site with the spent fuel or shipped directly to a DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination," [18] amending 10 CFR §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 estimates for LaSalle County assume that the site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). [19] An additional limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water. [20]

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)^[21] 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 ALTERNATIVES

Detailed cost estimates were developed to decommission LaSalle County for three variations of the approved decommissioning alternatives: DECON and SAFSTOR. Although the scenarios differ with respect to technique, process, cost, and schedule, they attain the same result: the ultimate release of the site for unrestricted use.

The following scenarios were evaluated and are representative of the alternatives available to the owner. The scenarios assume that the units operate for 60 years, followed by a planned and scheduled shutdown.

- 1. DECON: The first scenario assumes that the two units are promptly decommissioned as an integrated activity. Spent fuel that is not transferred directly to the DOE from the storage pools is relocated to the ISFSI so as to facilitate decontamination and dismantling activities within the reactor buildings. Spent fuel storage operations continue at the site, independent of decommissioning operations, until the transfer of the fuel to the DOE is complete, assumed for purposes of this study to be in the year 2061. At that time, the ISFSI is decommissioned and the site released for alternative use.
- 2. Delayed DECON: In the second scenario, the units are prepared for an abbreviated period of safe-storage. The spent fuel resident in the reactor buildings' storage pools remains in the pools until it can be transferred to the DOE (i.e., the ISFSI is not used to off-load the pools following the cessation of operations). Spent fuel placed at the ISFSI during operations remains in storage until the pools are emptied, at which time the ISFSI is then emptied. Decommissioning is scheduled to commence once the transfer of the fuel to the DOE is complete (i.e., in the year 2061).
- 3. SAFSTOR: The units are also placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent permitted by the current regulations. Similar to the DECON alternative, the spent fuel that cannot be transferred directly to the DOE in the first five and one-half years is relocated to the ISFSI for interim storage. The units remain in protective storage following the removal of spent fuel from the site. Decommissioning operations commence such that license termination is completed within the required 60-year period. As with the first two scenarios, decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling process.

The following sections describe the basic activities associated with each 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 facilitate deactivation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

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

2.1 DECON

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." This study does not address the cost to dispose of the spent fuel residing at the site; such costs are funded through a surcharge on electrical generation. However, the study does estimate the costs incurred with the interim on-site storage of the fuel pending shipment by the DOE to an off-site disposal facility.

2.1.1 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.

Engineering and Planning

The PSDAR, required within two years of the notice of cessation of a description of the licensee's planned operations. provides 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 meeting to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure (10 CFR §50.59 establishes the conditions under which licensees may make changes to the facility or procedures and conduct test or experiments, i.e., without prior 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 §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor recirculation system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

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

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

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

Site Preparations

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

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the reactor vessel and its internals), internal piping, and sacrificial shield cores.
- Isolation of the spent fuel storage pools and reactor systems, such that decommissioning operations can commence on the balance of the plant. Decommissioning operations are scheduled around the reactor areas to optimize the overall project schedule. The fuel is transferred to the ISFSI as it decays to the point that it meets the heat load criteria of the containers. Consequently, it is assumed that the fuel pool remains operational for approximately five and one-half years following the cessation of each unit's operations.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and nonmetallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.2 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 §50 operating license. Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. 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 reactor buildings to support the segmentation of the reactor vessel internals and component extraction.
- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Transfer of the steam separator and dryer assemblies to the dryerseparator pool for segmentation. Segmentation by weight and activity maximizes the loading of the shielded transport casks. The operations are conducted under water using remotely operated tooling and contamination controls.
- Disconnection of the control blades from the drives on the vessel lower head. Blades are transferred to the spent fuel pool for packaging.
- Disassembly, segmentation, and packaging of the core shroud and incore guide tubes. Some of the material is expected to exceed Class C disposal requirements. As such, those segments are packaged in a modified fuel storage canister for geologic disposal.

- Removal and segmentation of the remaining internals including the jet pump assemblies, fuel support castings, and core plate assembly.
- Draining and decontamination of the reactor well and the permanent sealing of the spent fuel transfer gate. Install a shielded platform for segmentation of the reactor vessel. Cutting operations are performed in air using remotely operated equipment within a contamination control envelope, with the water level maintained just below the cut to minimize the working area dose rates. Sections are transferred to the dryer-separator pool for packaging and interim storage.
- Disconnection of the control rod drives and instrumentation tubes from reactor vessel lower head. The lower reactor head is then segmented.
- Removal of the reactor recirculation pumps. Exterior surfaces are decontaminated and openings covered. Components can serve as their own burial containers provided that all penetrations are properly sealed.
- Demolition of the sacrificial shield activated concrete by controlled demolition.
- Expansion of the ISFSI and transfer of the spent fuel from the storage pools to the ISFSI pad for interim storage. Spent fuel storage operations continue throughout the active decommissioning period. Fuel transfer is expected to begin in 2056 and to be completed by the end of the year 2061.

At least two years prior to the anticipated date of license termination, an LTP is required. Submitted as a supplement to the Final Safety Analysis Report (FSAR) or its 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 meeting. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

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

- Removal of the steel liners from the drywell, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/contaminated concrete.
- Removal of the steel liners from the steam separator and dryer pool, reactor well and spent fuel storage pool.
- Surveys of the decontaminated areas of the containment structures.
- Removal of the contaminated equipment and material from the turbine and auxiliary buildings, and any other contaminated facility. Use radiation and contamination control techniques until radiation surveys indicate that the structures 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 will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.
- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).
- Routing of material removed in the decontamination and dismantling to 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)."[22] 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 amend the operating license when 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 property (exclusive of the ISFSI) is suitable for release.

2.1.3 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 may substantially degrade power block structures including the reactor and auxiliary buildings. Under certain circumstances, verifying that subsurface radionuclide concentrations meet NRC site release requirements will require removal of grade slabs and lower floors, potentially weakening footings and structural supports. This removal activity will be necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

Prompt dismantling of site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The effort 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.

2.1.4 <u>ISFSI Operations and Decommissioning</u>

The ISFSI will continue to operate under the general license provisions of 10 CFR §72 following the amendment of the §50 operating license to release the adjacent (power block) property. Assuming the DOE starts accepting fuel in 2025, transfer of spent fuel from LaSalle County is anticipated to begin in 2056 and continue through the year 2061.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the Part 50 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. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

For purposes of this cost analysis, it is assumed that once the inner canisters containing the spent fuel assemblies have been removed, any required decontamination performed, and the license for the facility terminated, the modules can be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad will then be removed, and the area graded and landscaped to conform to the surrounding environment.

2.2 SAFSTOR and DELAYED DECON

The NRC defines SAFSTOR 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." The facility is left intact (during the dormancy period), with structures maintained in a sound condition. Systems not required to operate in support of the spent fuel pool or site surveillance and security are drained, de-energized, and secured. Minimal cleaning/removal of loose contamination and/or fixation and sealing of

remaining contamination are performed. Access to contaminated areas is secured to provide controlled access for inspection and maintenance.

The engineering and planning requirements are similar to those for the DECON alternative. Site preparations are also similar to those for the DECON alternative. However, with the exception of the required radiation surveys and site characterizations, the mobilization and preparation of site facilities is less extensive.

The following discussion is appropriate for both the SAFSTOR and Delayed DECON scenarios, the primary differences being in the length of the dormancy period. In the Delayed DECON scenario, the fuel remains in the reactor buildings' storage pools until such time that the transfer to a DOE facility is complete. Decommissioning operations are assumed to begin once fuel is off site. By contrast, in the SAFSTOR scenario, the spent fuel is relocated to the ISFSI. The plant remains in safe-storage even after the fuel is removed from site. Decommissioning operations are initiated such that the license is terminated within the required 60-year time period.

2.2.1 Period 1 - Preparations

Preparations for long-term storage include the planning for permanent defueling of the reactors, revision of technical specifications appropriate to the operating conditions and requirements, a characterization of the facility and major components, and the development of the PSDAR.

The process of placing the plant in safe-storage includes, but is not limited to, the following activities:

- Isolation of the spent fuel storage services and fuel handling systems located in the reactor buildings so that safe-storage operations may commence on the balance of the plant. This activity may be carried out by plant personnel in accordance with existing operating technical specifications. Activities are scheduled around the fuel handling systems to the greatest extent possible
- Draining and de-energizing of the non-contaminated systems not required to support continued site operations or maintenance.
- Disposing of contaminated filter elements and resin beds not required for processing wastes from layup activities for future operations.

- Draining of the reactor vessel, with the internals left in place and the vessel head secured.
- Draining and de-energizing non-essential systems, decontaminating them as required for future maintenance and inspection.
- Preparing lighting and alarm systems whose continued use is required; de-energizing portions of fire protection, electric power, and HVAC systems whose continued use is not required.
- Cleaning of the loose surface contamination from building access pathways.
- Performing an interim radiation survey of plant, posting warning signs where appropriate.
- Erecting physical barriers and/or securing all access to radioactive or contaminated areas, except as required for inspection and maintenance.
- Installing security and surveillance monitoring equipment and relocating security fence around secured structures, as required.

2.2.2 Period 2 - Dormancy

The second phase identified by the NRC in its rule addresses licensed activities during a storage period and is applicable to the dormancy phase of the deferred decommissioning alternatives. Dormancy activities include a 24-hour security force, preventive and corrective maintenance on security systems, area lighting, general building maintenance, heating and ventilation of buildings, routine radiological inspections of contaminated structures, maintenance of structural integrity, and a site radiation environmental and monitoring program. Resident maintenance personnel perform equipment maintenance, inspection activities, routine services to maintain safe conditions, adequate lighting, heating, and ventilation, and periodic preventive maintenance on essential site services.

An environmental surveillance program is carried out during the dormancy period to ensure that releases of radioactive material to the environment are prevented and/or detected and controlled. Appropriate emergency procedures are established and initiated for potential releases that exceed prescribed limits. The environmental surveillance program constitutes an abbreviated version of the program in effect during normal plant operations.

Security during the dormancy period is conducted primarily to prevent unauthorized entry and to protect the public from the consequences of their own actions. The security fence, sensors, alarms, and other surveillance equipment provide security. Fire and radiation alarms are also monitored and maintained. While remote surveillance is an option, it does not offer the immediate response time of a physical presence.

The transfer of the spent fuel to a DOE facility continues during this period until complete. Fuel is shipped exclusively from the ISFSI in the SAFSTOR scenario and from both the pools and the ISFSI in the Delayed DECON scenario.

After an optional period of storage (such that license terminations are accomplished within 60 years of final shutdown of Unit 1), it is required that the licensee submit applications to terminate the license, along with an LTP (described in Section 2.1.2), thereby initiating the third phase.

2.2.3 Periods 3 and 4 - Delayed Decommissioning

Prior to the commencement of decommissioning operations, preparations are undertaken to reactivate site services and prepare for decommissioning. Preparations include engineering and planning, a detailed site characterization, and the assembly of a decommissioning management organization. Final planning for activities and the writing of activity specifications and detailed procedures are also initiated at this time.

Much of the work in developing a termination plan is relevant to the development of the detailed engineering plans and procedures. The activities associated with this phase and the follow-on decontamination and dismantling processes are detailed in Sections 2.1.1 and 2.1.2. The primary difference between the sequences anticipated for the DECON and deferred scenarios is the absence, in the latter, of any constraint on the availability of the fuel storage facilities located within the reactor buildings for decommissioning.

Variations in the length of the dormancy period are expected to have little effect upon the quantities of radioactive wastes generated from system and structure removal operations. Given the levels of radioactivity and spectrum of radionuclides expected from sixty years of plant operation, no plant process system identified as being

contaminated upon final shutdown will become releasable due to the decay period alone (i.e., there is no significant reduction in the waste generated from the decommissioning activities). However, due to radioactive decay during the dormancy period, lower activity levels are expected.

The delay in decommissioning also yields lower working area radiation levels. As such, the estimates for the delayed scenarios incorporate reduced ALARA controls for the lower occupational exposure potential.

Although the initial radiation levels due to ⁶⁰Co will decrease during the dormancy period, the internal components of the reactor vessel will still exhibit sufficiently high radiation dose rates to require remote sectioning under water due to the presence of long-lived radionuclides such as ⁹⁴Nb, ⁵⁹Ni, and ⁶³Ni. Therefore, the dismantling procedures described for the DECON alternative would still be employed during deferred scenarios. Portions of the sacrificial shield will still be radioactive due to the presence of activated trace elements with long half-lives (¹⁵²Eu and ¹⁵⁴Eu). Decontamination will require controlled removal and disposal. It is assumed that radioactive corrosion products on inner surfaces of piping and components will not have decayed to levels that will permit unrestricted use or allow conventional removal. These systems and components will be surveyed as they are removed and disposed of in accordance with the existing radioactive release criteria.

2.2.4 Period 5 - Site Restoration

Following completion of decommissioning operations, site-restoration activities can begin. If the site structures are to be dismantled, dismantling as a continuation of the decommissioning process is clearly the most appropriate and cost-effective option, as described in Section 2.1.3. The basis for the dismantling cost in the deferred scenarios is consistent with that described for DECON, removal of structures and site facilities to a nominal depth of three feet below grade and limited restoration of the site.

3. COST ESTIMATE

The cost estimates prepared for decommissioning LaSalle County consider the unique features of the site, including the NSSS, power generation systems, support services, site buildings, and ancillary facilities. The basis of the estimates, 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 ESTIMATE

The estimates were developed with site-specific, technical information developed in an evaluation prepared for Exelon in 2009. The information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluation 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 Commercial Nuclear Power Plant Decommissioning "Decommissioning Handbook."[24] Estimates,"[23] and the DOE documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal (\$/cubic yard), steel removal (\$/ton), and cutting costs (\$/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.^[25]

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, San

Onofre-1, Crystal River and Vermont Yankee nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units.

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

Work Difficulty Factors

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

•	Access Factor	10% to 20%
•	Respiratory Protection Factor	10% to 50%
•	Radiation/ALARA Factor	10% to 40%
•	Protective Clothing Factor	10% 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 radiologically controlled areas. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities are 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 resulting cost estimate.

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 estimates do 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 (~ 42%).
- Segmenting the reactor vessel and internals will require the use of special equipment. 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. This permits sharing of the segmentation equipment between the two units.
- 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. Trying to complete the final status survey of Unit 1, while Unit 2 still has ongoing radiological remediation work and waste handling in process is considered impractical. As such, the transfer of

the spent fuel from the storage pools and subsequent decontamination of the reactor buildings are coordinated so as to synchronize the final status survey for the station.

- The final demolition of buildings at Units 1 and 2 are considered to take place concurrently.
- 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 emergency response fees, regulatory agency fees, corporate overhead, 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, i.e., license termination and site restoration.

3.4.1 Contingency

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.

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^[26] 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, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a "safety factor issue." Safety factors provide additional security and address situations that may never occur. Contingency funds are expected to be fully expended throughout the program. They also provide assurance that sufficient funding is available to accomplish the intended tasks. An estimate without contingency, or from which contingency has been removed, can disrupt the orderly progression of events and jeopardize a successful conclusion to the decommissioning process.

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

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

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies ranged from 10% to 75%, depending on the degree of difficulty judged to be appropriate from TLG's actual decommissioning experience. The contingency values used in this study are as follows:

Decontamination	50%
Contaminated Component Removal	25%
Contaminated Component Packaging	10%
Contaminated Component Transport	15%
Low-Level Radioactive Waste Disposal	25%
Reactor Segmentation	75%
NSSS Component Removal	25%
Reactor Waste Packaging	25%
Reactor Waste Transport	25%
Reactor Vessel Component Disposal	50%
GTCC Disposal	15%
Non-Radioactive Component Removal	15%
Heavy Equipment and Tooling	15%
Supplies	25%
Engineering	15%
Energy	15%
Characterization and Termination Surveys	30%
Construction	15%
Taxes and Fees	10%
Insurance	10%
Staffing	15%
Spent Fuel Storage (Dry) Modules	15%
Spent Fuel Transfer Costs	15%
Operations and Maintenance Expenses	15%
ISFSI Decommissioning	25%

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each estimate. For example, the composite contingency values reported for the DECON alternative are 19.1% and 18.9% for Units 1 and 2, respectively. Values for the other alternatives are delineated within the detailed cost tables in Appendices D and E.

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:

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.
- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.
- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.
- Regulatory changes (e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal).
- Policy decisions altering national commitments (e.g., in the ability to accommodate certain waste forms for disposition or in the timetable for such, for example, in the start and rate of acceptance of spent fuel by the DOE).

 Pricing changes for basic inputs, such as labor, energy, materials, and burial.

This cost study does not add any additional cost 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 will 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 impacts of the considerations identified below are included in this cost study.

3.5.1 Spent Fuel Management

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

The total inventory of assemblies that will require handling during decommissioning is based upon several assumptions. The pickup of commercial fuel is assumed to begin in the year 2025. The maximum rate at which the fuel is removed from the commercial sites is based upon an annual capacity at the geologic repository of 3,000 metric tons of uranium (MTU). 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 all three scenarios, the ISFSI will continue to operate until such time that the transfer of spent fuel to the DOE can be completed. Assuming that the DOE commences repository operation in 2025, fuel is projected to be

removed from the LaSalle County site by the end of year 2061. In the Delayed DECON scenario, the ISFSI is only used to store fuel placed during plant operations. Spent fuel off-loaded from the reactors after operations cease, remains in the pools during the transfer period. The inventory of fuel assemblies located in the spent fuel pools is preferentially off-loaded as the allocations permit.

Operation and maintenance costs for the storage facilities (the ISFSI and the pools for the Delayed DECON scenario) are included within the estimates and address the cost for staffing the facilities, as well as security, insurance, and licensing fees. The estimates include the costs to purchase (DECON and SAFSTOR scenarios), load, and transfer the fuel storage canisters. Costs are also provided for the final disposition of the facilities once the transfer is complete.

Repository Startup

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. With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that could result in an interim storage facility being available by 2025.

Spent Fuel Management Model

The Exelon nuclear fleet consists of 26 units at 14 sites in Illinois, Pennsylvania, New Jersey, New York and Maryland, including the inactive units at Dresden, Peach Bottom and Zion (Zion is still included in the spent fuel analysis model since the fuel transfer to DOE will be done as part of the Exelon allocation). The ability to complete the decommissioning of these units, particularly for the DECON and Delayed DECON alternatives, is highly dependent upon when the DOE is assumed to remove spent fuel from the sites.

The DOE's repository program assumes that spent fuel will be accepted for disposal from the nation's commercial nuclear plants in the order (the "queue") in which it was removed from service ("oldest fuel first"). A computer model developed by Exelon Nuclear was used to determine when the DOE would provide allocations in the queue for removal of spent fuel from the individual sites. Repository operations were based

upon annual industry-wide receipt of 400 Metric Tons Heavy Metal (MTHM) in the first year of operation, a total of 3,800 MTHM in years 2 through 4 and 3,000 MTHM for year 5 and beyond. [27]

ISFSIs are constructed as necessary to maintain full-core discharge capability at the individual sites. Once the DOE begins repository operations, spent fuel shipments are managed across the fleet to optimize spent fuel storage.

Canister Design

The design and capacity of the ISFSI is based upon a Holtec HI-STORM vertical cask system, with a 68-fuel assembly capacity. This is also the basis for future cask acquisitions. The DOE is assumed to provide the MPC for fuel transferred directly from the pools to the DOE at no cost to the owner.

Canister Loading and Transfer

An average cost of \$250,000 is used for the labor to load/transport the spent fuel from the pools to the ISFSI pad, based upon Exelon experience. For estimating purposes, 50% of this cost is used to estimate the cost to transfer the fuel from the ISFSI to the DOE.

Operations and Maintenance

Annual costs (excluding labor) of approximately \$792,000 and \$96,000 are used for operation and maintenance of each spent fuel pool and the ISFSI, respectively.

ISFSI Decommissioning

A multi-purpose (storage and transport) dry shielded storage canister with a vertical, reinforced concrete storage module is used as a basis for the cost analysis. The final core off load from each unit, equivalent to 12 total casks, are assumed to have some level of neutron-induced activation as a result of the long-term storage of the fuel (i.e., to levels exceeding free-release limits). The cost of the disposition of this material is included in the estimate. Appendix F details the costs necessary to survey, decontaminate, and terminate the NRC license on the ISFSI facility. The estimates in Appendices C through E also include

the costs for the demolition of the ISFSI facility following NRC license termination (as a Site Restoration expense).

3.5.2 Reactor Vessel and Internal Components

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

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

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal (i.e., GTCC). Although the material is not classified as high-level waste, federal regulations under the LLRW Policy Amendments Act specifies the GTCC LLWR is designated a federal responsibility under Section 3(b)(1)(D). However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has been packaged and disposed of in the same manner as high-level waste, at a cost equivalent to that envisioned for the spent fuel. This is consistent with the concept that the generator of GTCC waste will bear all reasonable costs of disposing of such wastes. [28]

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 would remain in storage at the LaSalle County site.

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. 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 LaSalle County ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, the study assumes the reactor vessel will require segmentation, as a bounding condition.

3.5.3 Primary System Components

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

3.5.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condensers will also be disassembled and moved to a laydown area. Clean material is released on site as scrap metal; radioactive or potentially radioactive material is then prepared

for transportation to an offsite facility for controlled disposal. Components will be packaged and readied for transport in accordance with the intended disposition.

3.5.5 <u>Transportation Methods</u>

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.[29] 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 §71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Transport of the highly activated metal, produced in the segmentation of the reactor vessels 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. Truck transport costs were estimated using published tariffs from Tri-State Motor Transit.^[30]

3.5.6 Low-Level Radioactive Waste Disposal

The mass of radioactive waste generated during the various decommissioning activities is reported by line-item in Appendices C, D and E, and summarized in Section 5. The Section 5 waste summaries are consistent with 10 CFR §61 classifications. Commercially available steel containers are 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 waste

volumes are calculated on the exterior package dimensions for containerized material or a dimensional calculation for components serving as their own waste containers.

The more highly activated reactor components are transported in reusable, shielded truck casks with disposable liners. In calculating disposal costs, the burial fees are applied against the liner volume, with surcharges added for the special handling requirements and the radiological characteristics 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 calculated using current disposal agreements, with surcharges added for the highly activated components, such as those 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 Exelon's current disposal agreement with Energy *Solutions* for its facility in Clive, Utah.

EnergySolutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the reactor vessel and segmentation of the components closest to the core. As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for noncompact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

Material exceeding Class C limits (limited to material closest to the reactor core and comprising a small percentage of the total waste volume) is generally not suitable for shallow-land disposal. This material is packaged in the same multipurpose canisters used for spent fuel storage/transport and designated for geologic disposal.

3.5.7 <u>Site Conditions Following Decommissioning</u>

The NRC will terminate (or amend) the site license when it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the

next step in the decommissioning process, as well as the owner's own future plans for the site.

Non-essential structures or buildings severely damaged in decontamination process are removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities is processed and made available as clean fill. The excavations will be regraded such that the power block area will have a final contour consistent with adjacent surroundings.

The estimates do assume the remediation of a small volume of contaminated soil. This estimate may be adjusted by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

3.6 ASSUMPTIONS

The following are the major assumptions made in the development of the estimates for decommissioning the site.

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

Exelon, 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 Exelon. 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.

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

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

Staffing levels are assigned for each unit by sub-period and functional area. Economies of a multi-unit decommissioning are recognized by establishing a primary and a secondary staff level. The unit assigned the primary staff will include common supervisory positions and positions that may be shared across both units. The types of positions and staffing levels are adjusted based upon the type of activity occurring in each sub-period.

A profile of the staffing level for the two-unit decommissioning, including contractors and craft, is provided in Figures 3.1 through 3.3 for the DECON, Delayed DECON, and SAFSTOR scenarios, respectively. Utility staffing levels will gradually decrease after completing the removal of physical systems at each of the units.

Staffing levels and management support will vary based upon the amount and type of decommissioning work. Craft manpower levels decrease after systems removal and structures decontamination and drop substantially during the delay period and the license termination survey period. However, craft staff levels increase again during the site restoration period due to the work associated with structures demolition.

3.6.3 <u>Design Conditions</u>

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

The curie contents of the vessel and internals at final shutdown are derived from those listed in NUREG/CR-3474.^[31] Actual estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the LaSalle County components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from CR-0130^[32] and CR-0672,^[33] and benchmarked to the long-lived values from CR-3474.

The disposal cost for the control blades removed from the vessel with the final core load is included within the estimates. Control blade residence time in the reactor is assumed to be controlled such that the blades do not become GTCC material. Disposition of any blades stored in the pools from operations is considered an operating expense and therefore not accounted for in the estimates.

Activation of the reactor building structures is confined to the sacrificial shield.

3.6.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by Exelon and its subcontractors. The plant's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale.

• Processes operating waste inventories, i.e., the estimates do not address the disposition of any legacy wastes; 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. Exelon will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG 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 possible salvage 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 estimates do not include the additional cost for size reduction and preparation to meet "furnace ready" conditions. For example, the recovery of copper from electrical cabling may require the removal and disposition of any contaminated insulation, an added expense. With a volatile market, the potential profit margin in scrap recovery is highly speculative, regardless of the ability to free release this material. This assumption is an implicit recognition of scrap value in the disposal of clean metallic waste at no additional cost to the project.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other property will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other facilities. Spare parts will also be 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. Replacement power costs are used for the cost of energy consumption during decommissioning for tooling, lighting, ventilation, and essential services.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums throughout the decommissioning process are based upon guidance provided by Exelon.

Taxes

Property taxes are included for all decommissioning periods. Exelon provided a schedule of decreasing tax payments against the current tax assessment. These reductions continue until reaching a minimum property tax payment of \$1 million per year for the site; this level is maintained for the balance of the decommissioning program.

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

A schedule of expenditures for each scenario is provided in Tables 3.1 through 3.3. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2014 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure. The annual

expenditures are based upon the detailed activity costs reported in Appendices C through E, along with the schedules discussed in Section 4.

TABLE 3.1a LaSALLE COUNTY STATION, UNIT 1 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2042	44,817	9,327	1,325	35	7,655	63,159
2043	75,724	25,808	2,783	15,451	30,981	150,748
2044	75,099	35,728	1,778	48,282	25,246	186,135
2045	62,346	27,694	1,563	26,693	17,606	135,901
2046	52,661	21,568	1,400	10,130	11,762	97,521
2047	49,229	19,039	1,264	11,428	11,367	92,327
2048	12,609	3,072	237	5,206	5,840	26,964
2049	2,878	163	12	9	3,962	7,024
2050	34,488	3,600	323	26	4,099	42,538
2051	19,951	8,901	187	0	3,446	32,485
2052	15,229	6,486	136	0	3,477	25,329
2053	2,516	0	0	0	3,524	6,041
2054	2,516	0	0	0	3,524	6,041
2055	2,516	0	0	0	3,524	6,041
2056	2,613	270	0	0	3,534	6,417
2057	3,163	1,941	0	0	3,524	8,628
2058	3,163	1,941	0	0	3,524	8,628
2059	3,163	1,941	0	0	3,524	8,628
2060	3,170	1,941	0	0	3,534	8,645
2061	3,163	1,941	0	0	3,524	8,628
2062	2,174	1,893	32	1,878	13,875	19,852

11,041

119,137

171,056

947,679

Total

473,190

173,254

TABLE 3.1b LaSALLE COUNTY STATION, UNIT 2 DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2043	2,845	576	82	2	456	3,962
2044	65,778	13,760	1,959	549	11,654	93,700
2045	82,564	31,614	2,665	31,952	30,402	179,197
2046	84,875	36,651	1,773	49,603	25,253	198,155
2047	76,228	23,618	1,435	15,610	13,070	129,960
2048	75,546	22,340	1,404	12,151	11,851	123,292
2049	63,438	15,402	1,032	14,573	10,600	105,044
2050	38,074	4,670	323	26	3,936	47,030
2051	25,848	12,562	187	0	3,447	42,044
2052	19,527	9,155	136	0	3,478	32,296
2053	2,516	0	0	0	3,524	6,041
2054	2,516	0	0	0	3,524	6,041
2055	2,516	0	0	0	3,524	6,041
2056	2,613	270	0	0	3,534	6,417
2057	3,163	1,941	0	0	3,524	8,628
2058	3,163	1,941	0	0	3,524	8,628
2059	3,163	1,941	0	0	3,524	8,628
2060	3,170	1,941	0	0	3,534	8,645
2061	3,163	1,941	0	0	3,524	8,628
2062	2,174	1,768	0	1,878	13,875	19,695
Total	562,882	182,089	10,996	126,344	159,761	1,042,072

TABLE 3.2a LaSALLE COUNTY STATION, UNIT 1 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2042	33,955	963	1,325	35	13,908	50,186
2043	46,104	6,125	1,556	966	17,337	72,088
2044	8,387	420	374	17	6,351	15,550
2045	8,365	419	373	17	6,334	15,507
2046	8,365	419	373	17	6,334	15,507
2047	8,365	419	373	17	6,334	15,507
2048	8,387	420	374	17	6,351	15,550
2049	8,365	419	373	17	6,334	15,507
2050	8,365	419	373	17	6,334	15,507
2051	8,365	419	373	17	6,334	15,507
2052	8,387	420	374	17	6,351	15,550
2053	8,365	419	373	17	6,334	15,507
2054	8,365	419	373	17	6,334	15,507
2055	8,365	419	373	17	6,334	15,507
2056	8,747	1,498	374	17	6,351	16,987
2057	10,952	8,181	373	17	6,334	25,857
2058	7,345	4,132	279	13	5,147	16,916
2059	3,848	299	187	8	3,979	8,322
2060	4,433	2,025	187	8	3,990	10,644
2061	4,495	2,240	187	8	3,979	10,909
2062	46,707	1,762	1,867	41	1,889	52,266
2063	67,241	18,243	1,820	20,142	10,499	117,945
2064	68,404	24,053	1,761	39,102	18,654	151,972
2065	43,711	9,439	1,400	11,225	7,264	73,039
2066	43,711	9,439	1,400	11,225	7,264	73,039
2067	23,592	5,019	736	5,908	4,649	39,905
2068	1,268	113	0	8	1,752	3,140
2069	33,275	3,339	327	27	1,817	38,785

TABLE 3.2a (continued) LaSALLE COUNTY STATION, UNIT 1 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Equipment &

Year	Labor	Materials	Energy	Burial	Other	Total
2070	18,139	9,019	187	0	757	28,102
2071	13,915	6,918	143	0	581	21,557
Total	580,285	117,835	18,593	88,952	192,213	997,878

TABLE 3.2b LaSALLE COUNTY STATION, UNIT 2 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
	Парот	Wiaterials	Hillingy	Duriar		10tai
2043	2,341	59	82	2	661	3,145
2044	55,400	2,232	1,872	159	15,375	75,038
2045	37,433	5,449	1,053	925	12,749	57,609
2046	8,468	453	373	17	6,332	15,644
2047	8,468	453	373	17	6,332	15,644
2048	8,492	455	374	17	6,350	15,687
2049	8,468	453	373	17	6,332	15,644
2050	8,468	453	373	17	6,332	15,644
2051	8,468	453	373	17	6,332	15,644
2052	8,492	455	374	17	6,350	15,687
2053	8,468	453	373	17	6,332	15,644
2054	8,468	453	373	17	6,332	15,644
2055	8,468	453	373	17	6,332	15,644
2056	8,492	455	374	17	6,350	15,687
2057	8,468	453	373	17	6,332	15,644
2058	9,798	4,442	373	17	6,332	20,963
2059	11,056	8,216	373	17	6,332	25,994
2060	5,382	2,937	210	9	4,279	12,818
2061	4,599	2,275	187	8	3,978	11,046
2062	2,452	330	187	8	1,766	4,743
2063	17,160	1,096	1,103	25	1,805	21,189
2064	36,171	6,136	1,868	1,967	2,646	48,786
2065	71,942	25,506	1,773	41,394	19,050	159,666
2066	66,439	16,665	1,558	25,110	12,286	122,058
2067	62,423	10,212	1,400	13,224	7,349	94,608
2068	62,594	10,240	1,404	13,261	7,369	94,868
2069	37,332	4,348	342	172	1,711	43,905

TABLE 3.2b (continued) LaSALLE COUNTY STATION, UNIT 2 DELAYED DECON ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Equipment &

Year	Labor	Materials	Energy	Burial	Other	Total
2070	24,036	12,680	187	0	759	37,661
2071	18,504	9,762	144	0	584	28,994
Total	626,751	128,030	18,598	96,501	181,072	1,050,952

TABLE 3.3a LaSALLE COUNTY STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2042	36,629	8,983	1,325	35	16,479	63,450
2043	49,871	17,428	1,556	966	19,185	89,006
2044	12,165	11,754	374	17	10,183	34,494
2045	12,132	11,722	373	17	10,156	34,400
2046	12,132	11,722	373	17	10,156	34,400
2047	10,407	9,343	334	15	8,870	28,970
2048	3,858	300	187	8	3,990	8,344
2049	3,848	299	187	8	3,979	8,322
2050	3,848	299	187	8	3,979	8,322
2051	3,848	299	187	8	3,979	8,322
2052	3,858	300	187	8	3,990	8,344
2053	3,848	299	187	8	3,979	8,322
2054	3,848	299	187	8	3,979	8,322
2055	3,848	299	187	8	3,979	8,322
2056	3,948	570	187	8	3,990	8,704
2057	4,495	2,240	187	8	3,979	10,909
2058	4,495	2,240	187	8	3,979	10,909
2059	4,495	2,240	187	8	3,979	10,909
2060	4,505	2,241	187	8	3,990	10,932
2061	4,495	2,240	187	8	3,979	10,909
2062	2,348	296	187	8	1,753	4,592
2063	2,348	296	187	8	1,753	4,592
2064	2,355	297	187	8	1,758	4,604
2065	2,348	296	187	8	1,753	4,592
2066	2,348	296	187	8	1,753	4,592
2067	2,348	296	187	8	1,753	4,592
2068	2,355	297	187	8	1,758	4,604
2069	2,348	296	187	8	1,753	4,592
2070	2,348	296	187	8	1,753	4,592
2071	2,348	296	187	8	1,753	4,592

TABLE 3.3a (continued) LaSALLE COUNTY STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2072	2,355	297	187	8	1,758	4,604
2073	2,348	296	187	8	1,753	4,592
$\frac{2073}{2074}$	2,348	296	187	8	1,753	4,592
$\frac{2071}{2075}$	2,348	296	187	8	1,753	4,592
2076	2,355	297	187	8	1,758	4,604
2077	2,348	296	187	8	1,753	4,592
2078	2,348	296	187	8	1,753	4,592
2079	2,348	296	187	8	1,753	4,592
2080	2,355	297	187	8	1,758	4,604
2081	2,348	296	187	8	1,753	4,592
2082	2,348	296	187	8	1,753	4,592
2083	2,348	296	187	8	1,753	4,592
2084	2,355	297	187	8	1,758	4,604
2085	2,348	296	187	8	1,753	4,592
2086	2,348	296	187	8	1,753	4,592
2087	2,348	296	187	8	1,753	4,592
2088	2,355	297	187	8	1,758	4,604
2089	2,348	296	187	8	1,753	4,592
2090	2,348	296	187	8	1,753	4,592
2091	2,348	296	187	8	1,753	4,592
2092	2,355	297	187	8	1,758	4,604
2093	2,348	296	187	8	1,753	4,592
2094	22,158	951	937	23	1,814	25,882
2095	54,914	6,256	1,867	44	1,890	64,970
2096	69,560	24,245	1,783	36,798	18,339	150,725
2097	56,424	17,021	1,583	24,669	13,290	112,988
2098	43,728	9,446	1,400	11,055	7,567	73,195
2099	43,728	9,446	1,400	11,055	7,567	73,195
2100	3,940	701	88	704	2,114	7,547
	10 =00					04 =00

2101

18,729

843

177

21

1,932

21,702

TABLE 3.3a (continued) LaSALLE COUNTY STATION, UNIT 1 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

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Year	Labor	Materials	Energy	Burial	Other	Total
2102	24,175	6,929	241	10	1,158	32,513
2103	18,472	9,088	187	0	757	28,504
2104	5,314	2,614	54	0	218	8,200
Total	626,913	182,130	22,647	85,815	243,567	1,161,072

TABLE 3.3b LaSALLE COUNTY STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

		Equipment &				
Year	Labor	Materials	Energy	Burial	Other	Total
				_ [
2043	2,506	555	82	2	820	3,965
2044	59,178	13,566	1,872	159	18,839	93,614
2045	41,200	16,752	1,053	925	14,831	74,761
2046	12,236	11,756	373	17	10,150	34,532
2047	12,236	11,756	373	17	10,150	34,532
2048	12,270	11,788	374	17	10,177	34,627
2049	7,719	5,529	272	12	6,785	20,317
2050	3,952	334	187	8	3,978	8,459
2051	3,952	334	187	8	3,978	8,459
2052	3,963	335	187	8	3,989	8,482
2053	3,952	334	187	8	3,978	8,459
2054	3,952	334	187	8	3,978	8,459
2055	3,952	334	187	8	3,978	8,459
2056	4,052	604	187	8	3,989	8,841
2057	4,599	2,275	187	8	3,978	11,046
2058	4,599	2,275	187	8	3,978	11,046
2059	4,599	2,275	187	8	3,978	11,046
2060	4,609	2,276	187	8	3,989	11,069
2061	4,599	2,275	187	8	3,978	11,046
2062	2,452	330	187	8	1,766	4,743
2063	2,452	330	187	8	1,766	4,743
2064	2,459	331	187	8	1,771	4,756
2065	2,452	330	187	8	1,766	4,743
2066	2,452	330	187	8	1,766	4,743
2067	2,452	330	187	8	1,766	4,743
2068	2,459	331	187	8	1,771	4,756
2069	2,452	330	187	8	1,766	4,743
2070	2,452	330	187	8	1,766	4,743
2071	2,452	330	187	8	1,766	4,743

TABLE 3.3b (continued) LaSALLE COUNTY STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2072	2,459	331	187	8	1,771	4,756
2073	2,452	330	187	8	1,766	4,743
2074	2,452	330	187	8	1,766	4,743
2075	2,452	330	187	8	1,766	4,743
2076	2,459	331	187	8	1,771	4,756
2077	2,452	330	187	8	1,766	4,743
2078	2,452	330	187	8	1,766	4,743
2079	2,452	330	187	8	1,766	4,743
2080	2,459	331	187	8	1,771	4,756
2081	2,452	330	187	8	1,766	4,743
2082	2,452	330	187	8	1,766	4,743
2083	2,452	330	187	8	1,766	4,743
2084	2,459	331	187	8	1,771	4,756
2085	2,452	330	187	8	1,766	4,743
2086	2,452	330	187	8	1,766	4,743
2087	2,452	330	187	8	1,766	4,743
2088	2,459	331	187	8	1,771	4,756
2089	2,452	330	187	8	1,766	4,743
2090	2,452	330	187	8	1,766	4,743
2091	2,452	330	187	8	1,766	4,743
2092	2,459	331	187	8	1,771	4,756
2093	2,452	330	187	8	1,766	4,743
2094	2,452	330	187	8	1,766	4,743
2095	2,674	342	200	8	1,766	4,991
2096	29,612	1,811	1,872	39	1,844	35,177
2097	55,845	17,214	1,819	20,406	10,684	105,968
2098	71,661	24,814	1,750	38,305	18,468	154,999
2099	62,439	10,217	1,400	13,053	7,647	94,757
2100	62,439	10,217	1,400	13,053	7,647	94,757
2101	52,308	6,239	916	6,919	4,946	71,328

TABLE 3.3b (continued) LaSALLE COUNTY STATION, UNIT 2 SAFSTOR ALTERNATIVE SCHEDULE OF TOTAL ANNUAL EXPENDITURES

(thousands, 2014 dollars)

Equipment &

Year	Labor	Materials	Energy	Burial	Other	Total
2102	29,181	9,563	241	10	1,094	40,089
2103	24,369	12,750	187	0	759	38,064
2104	7,010	3,668	54	0	218	10,950
Total	676,640	193,430	22,645	93,305	232,898	1,218,917

FIGURE 3.1 DECON SCENARIO MANPOWER LEVELS

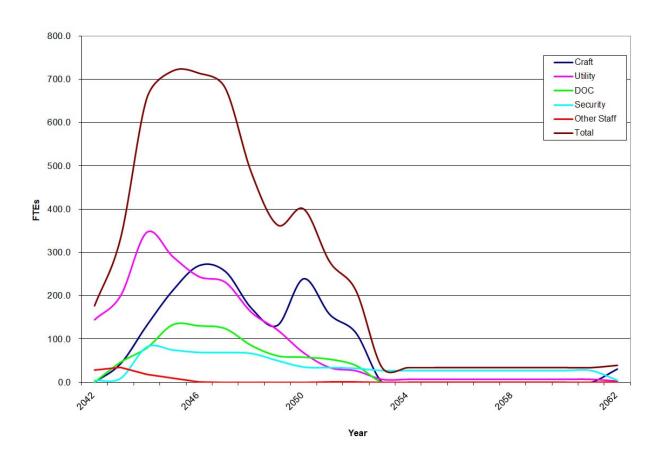


FIGURE 3.2 DELAYED DECON SCENARIO MANPOWER LEVELS

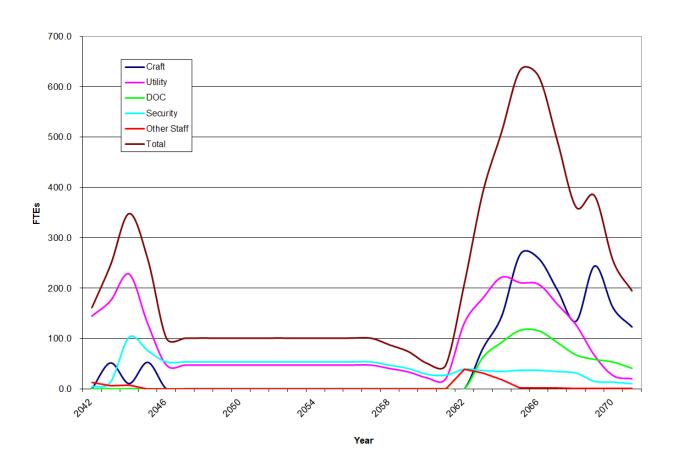
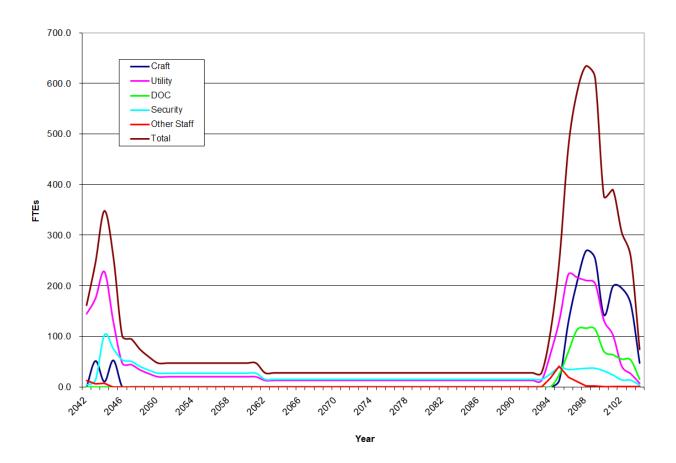


FIGURE 3.3 SAFSTOR SCENARIO MANPOWER LEVELS



4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this study follow 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 plans described in Section 3.5.1.

A schedule or sequence of activities is presented in Figure 4.1 for the DECON decommissioning alternative. The schedule is also representative of the work activities identified in the delayed dismantling scenarios, absent any spent fuel constraints. The scheduling sequence assumes that fuel is removed from the spent fuel pool within the first five and one-half years after operations cease at Unit 2. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost tables, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2010" computer software. [34]

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 tables, 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 DECON decommissioning schedule:

- The reactor buildings are isolated until such time that all spent fuel has been discharged to the ISFSI (DECON and SAFSTOR) or to the DOE (Delayed DECON). Decontamination and dismantling of the storage pools are initiated once the transfer of spent fuel to the ISFSI or DOE 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 the detailed cost tables are based upon the durations developed in the schedule for decommissioning LaSalle County. 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 also shown for the spent fuel cooling period, which determines the release of the reactor building for final decontamination.

Project timelines are provided in Figures 4.2 through 4.4; the milestone dates are based on this same shutdown date. The start of decommissioning activities in the Delayed Decommissioning scenario is concurrent with the end of the fuel transfer activity (i.e. to an off-site DOE facility).

FIGURE 4.1 DECON ACTIVITY SCHEDULE

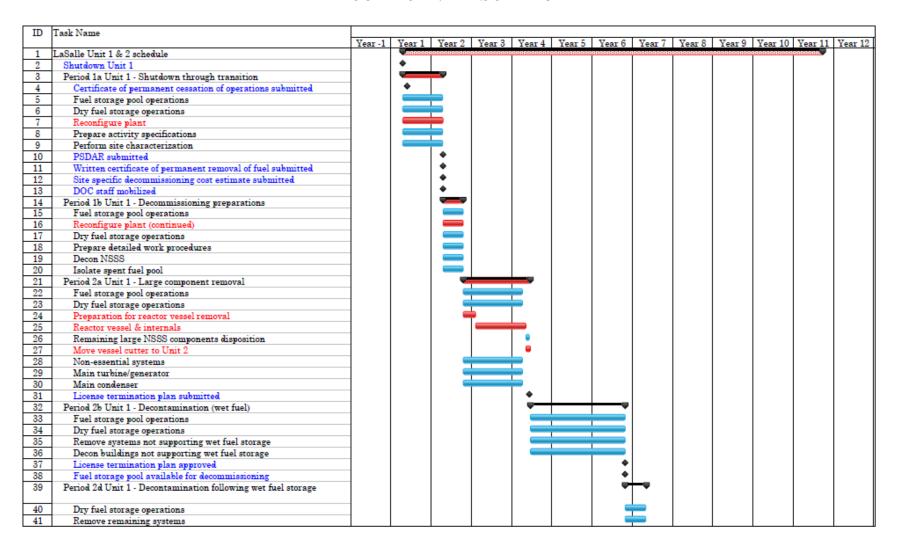


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

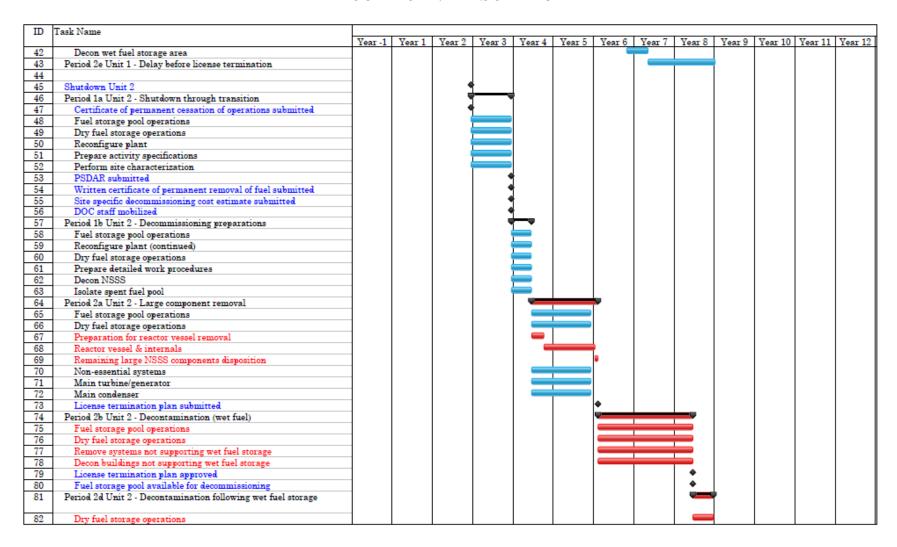


FIGURE 4.1 (continued) DECON ACTIVITY SCHEDULE

ID	Task Name													
		Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
83	Remove remaining systems													
84	Decon wet fuel storage area													
85														
86	Period 2f Unit 1 & 2 - Plant license termination									•				
87	Dry fuel storage operations													
88	Final Site Survey													
89	NRC review & approval													
90	Part 50 license terminated										•			
91	Period 3b Unit 1 & 2 - Site restoration										-			
92	Dry fuel storage operations										_			
93	Building demolitions, backfill and landscaping										—			
94	Building demolition										_			
95	Landscape Site												•	

FIGURE 4.2 DECOMMISSIONING TIMELINE DECON

(not to scale)

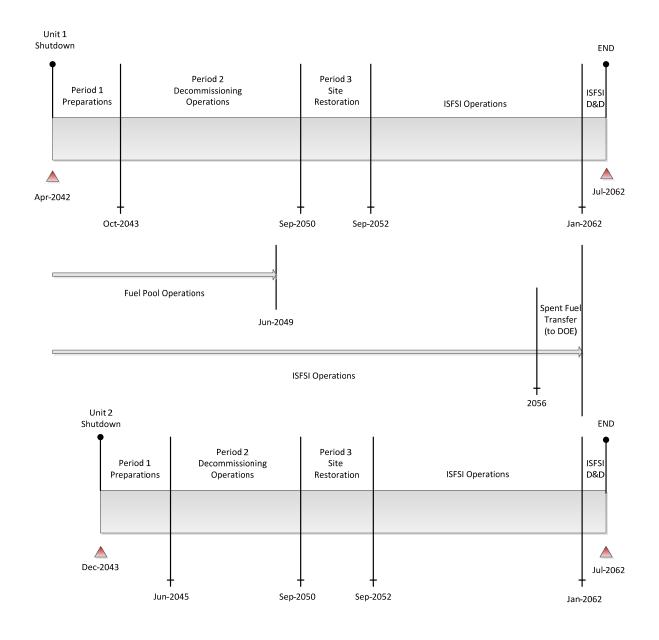


FIGURE 4.3 DECOMMISSIONING TIMELINE DELAYED DECON

(not to scale)

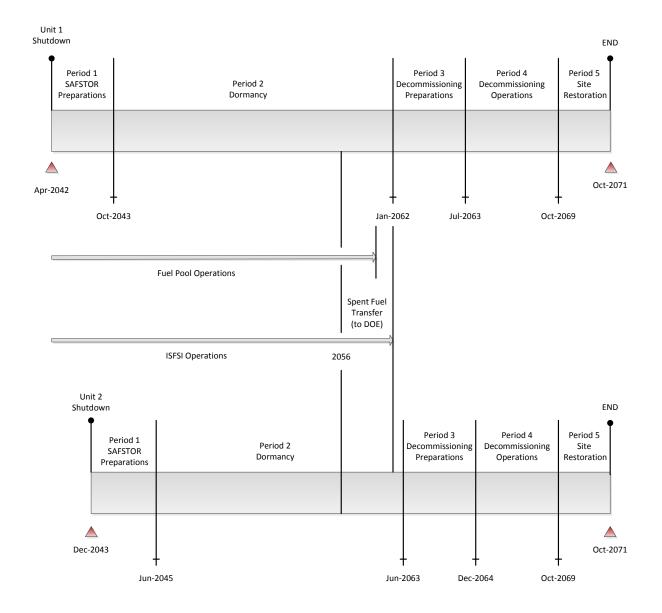
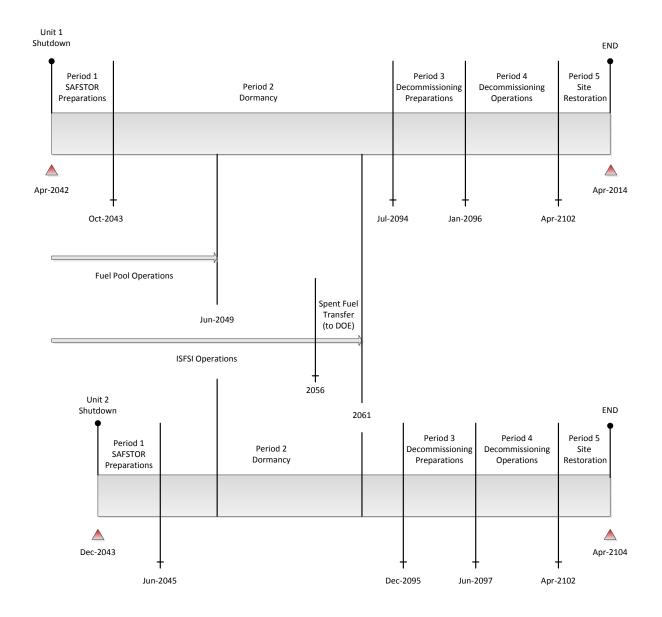


FIGURE 4.4 DECOMMISSIONING TIMELINE SAFSTOR

(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act, [35] 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, §71 defines radioactive material as it pertains to packaging and transportation and §61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR §173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3, as defined in subpart 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 destinations for the various waste streams from decommissioning are identified in Figures 5.1 and 5.2. The volumes of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in Appendices C, D, and E and summarized in Tables 5.1 through 5.3. The quantified waste volume summaries shown in these tables are consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material 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 ¹³⁷Cs will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of LaSalle County is primarily generated during Period 2 of the DECON alternative and Period 4 of the deferred alternatives. All radioactive waste is sent offsite for controlled disposal.

Disposal fees are calculated using current disposal agreements, 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 Exelon's current disposal agreement with Energy Solutions for its facility in Clive, Utah.

Energy Solutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the reactor vessel and segmentation of the components closest to the core. As a proxy for future disposal facilities, waste disposal costs for the higher activity waste (Class B and C) are based upon the last published rate schedule for non-compact waste for the Barnwell facility, adjusted for escalation of the Atlantic Compact rates.

FIGURE 5.1 RADIOACTIVE WASTE DISPOSITION

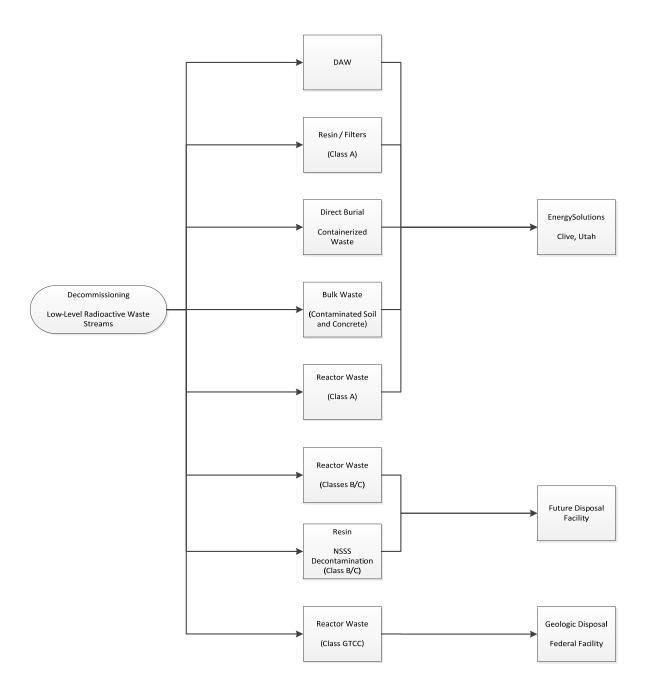
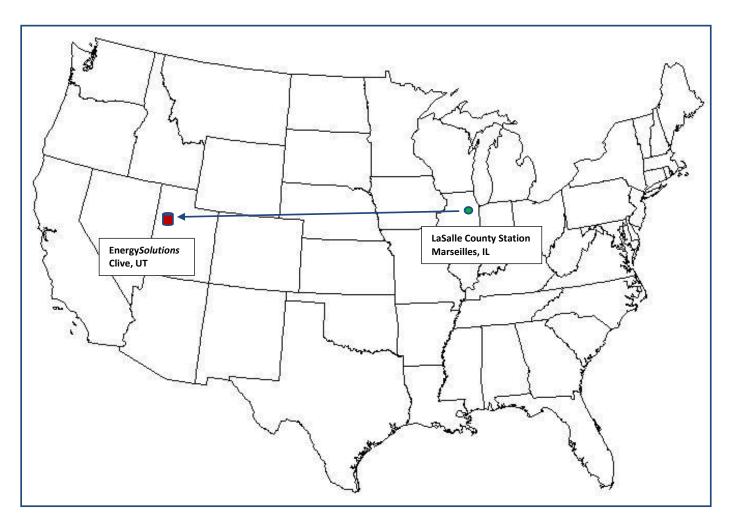


FIGURE 5.2 DECOMMISSIONING WASTE DESTINATIONS RADIOLOGICAL



The figure indicates the destinations for the low-level radioactive waste designated for direct disposal (Class A at Energy *Solutions*).

Disposition of the Class B and C low-level radioactive waste will be at a future disposal facility (to be determined). For estimating purposes, the facility is located (for capturing transportation costs) at a distance equivalent to the Energy Solutions facility and the disposal cost is based upon the currently operating Barnwell Low-Level Radioactive Waste Disposal Facility in South Carolina.

Disposal options (and destinations) for GTCC are still being evaluated.

TABLE 5.1 DECOMMISSIONING WASTE SUMMARY DECON

			Waste Volume	Mass
Waste	Cost Basis	Class [1]	(cubic feet)	(pounds)
				ur /
Low-Level Radioactive	Energy Solutions			
Waste (near-surface	Containerized	A	1,605,990	85,668,700
disposal)	Energy Solutions			
	Bulk	A	153,546	10,167,335
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	4,606	586,953
	Future LLRW			
	Disposal Facility			
	(Proxy)	C	2,132	175,411
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,900	965,294
T-4-1 [9]			1 771 179	07 500 000
Total [2]			1,771,173	97,563,693
Scrap Metal				238,404,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

TABLE 5.2 DECOMMISSIONING WASTE SUMMARY DELAYED DECON

			Waste Volume	Mass
Waste	Cost Basis	Class [1]	(cubic feet)	(pounds)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	1,576,608	83,979,700
disposal)	EnergySolutions			
	Bulk	A	146,645	9,459,232
	Future LLRW			
	Disposal Facility (Proxy)	В	3,799	370,596
	Future LLRW	D	0,100	310,000
	Disposal Facility			
	(Proxy)	C	1,079	133,842
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,900	965,294
Total ^[2]			1,733,030	94,908,663
Scrap Metal				238,404,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

TABLE 5.3 DECOMMISSIONING WASTE SUMMARY SAFSTOR

W	C + D :	O1 [1]	Waste Volume	Mass
Waste	Cost Basis	Class [1]	(cubic feet)	(pounds)
Low-Level Radioactive	EnergySolutions			
Waste (near-surface	Containerized	A	1,554,737	83,157,800
disposal)	Energy Solutions			
	Bulk	A	158,229	10,188,185
	Future LLRW			
	Disposal Facility			
	(Proxy)	В	4,093	397,791
	Future LLRW			
	Disposal Facility			
	(Proxy)	C	811	105,319
Greater than Class C	Spent Fuel			
(geologic repository)	Equivalent	GTCC	4,900	965,294
Total [2]			1,722,769	94,814,389
10tal t-1			1,122,100	01,011,000
Scrap Metal				238,404,000

 $^{^{[1]}}$ Waste is classified according to the requirements as delineated in Title 10 CFR, Part 61.55

^[2] Columns may not add due to rounding.

6. RESULTS

The analysis to estimate the costs to decommission LaSalle County relied upon the site-specific, technical information developed for a previous analysis prepared in 2009. While not an engineering study, the estimates provide Exelon with sufficient information to assess its financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenarios assume continued operation of the plant's spent fuel pools for a minimum of five and one-half years following the cessation of operations for continued cooling of the assemblies. For the DECON and SAFSTOR scenarios, the ISFSI is expanded to accommodate the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository. The spent fuel in the storage pools and reactors at the cessation of operations remains in the storage pools in the Delayed-DECON alternative.

The cost projected to promptly decommission (DECON) LaSalle County is estimated to be \$1.99 billion. The majority of this cost (approximately 74.0%) is associated with the physical decontamination and dismantling of the nuclear units so that the licenses can be terminated. Another 19.1% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 6.9% is for the demolition of the designated structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 through 6.3, 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. This analysis assumes that Exelon 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. However, once the operating license is terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel (for the DECON alternative).

As described in this report, the spent fuel pools will remain operational for a minimum of five and one-half years following the cessation of operations. The pools will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the pool areas. Over the five and one-half year period, the spent fuel will be packaged into transportable steel canisters for future loading into a DOE-provided transport cask (DECON and SAFSTOR alternatives). The canisters will be stored in concrete overpacks at the ISFSI until the DOE is able to receive them. Dry storage of the fuel provides additional flexibility in the event the DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the majority of the radioactive material is at EnergySolutions facility in Clive, Utah or some alternative facility. Highly activated components, requiring additional isolation from the environment, are packaged for geologic disposal. Disposal of these components is based upon a cost equivalent for spent fuel.

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. 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, e.g., 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.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling,

isotopic analysis, and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also require confirmation and will add to the expense of surveying the facilities alone.

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.

Comparison of the 2009 and 2014 Estimates

For illustrative purposes, the estimates for the 2009 and 2014 DECON scenarios are compared, with the cost difference for the major cost elements shown in Table 6.4. The 2009 cost elements are inflated using the CPI, Services index to 2014 dollars to remove the effect of financial escalation from the comparison. The cost difference between the escalated 2009 estimate (increased approximately 8.6%) and the 2014 estimate is approximately \$414 million. Unless otherwise noted, all cost values and percentages reflect 2009 estimate costs adjusted for inflation.

Spent Fuel Management

The 2014 estimate includes an additional 6 years of post-dismantling ISFSI operation. The increased residence time was based upon Exelon's revised projections for fleetwide DOE spent fuel acceptance, and with consideration of an additional delay in DOE startup (first acceptance of commercial spent fuel) from 2018 to 2025.

Spent Fuel Management (Direct Costs)

This cost category increased approximately \$109 million. There are two components to the category; costs associated with the purchase and loading of the dry storage systems (multi-purpose canister and storage overpack) and the costs associated with emergency planning while fuel is on site.

Dry Storage System

Exelon's 2014 fleet-wide spent fuel management plan, which reflected a seven year delay in DOE performance (as compared to the previous study), increased the on-site storage requirements (from 96 casks in 2009 to 117 casks in 2014). The cost impact of procuring the additional dry storage systems was compounded by a 21% increase in the cost of the dry storage systems (including loading) over the five year period. The combined increase was approximately \$43.9 million. The

increase was partially off-set by a savings in the cost estimated to expand the ISFSI in the 2014 estimate.

Emergency Planning

The 2009 estimate included a nominal allowance for emergency planning. The 2014 estimate included the Illinois Emergency Management Agency (IEMA) fee at an annual cost of \$3.9 million (for the station). The IEMA fee was maintained at that level while spent fuel was on site. The inclusion of the IEMA fee was the principal contributor in the \$78.3 million increase in the 2014 estimate.

Security

Security costs increased approximately \$37 million (58.6%) between the 2009 and 2014 estimates. Approximately \$22 million is due to the longer ISFSI operating period (six years) in the 2014 estimate. The remaining cost increase is due to the 23% increase in the average labor cost over the five year period.

Property Taxes

Property taxes for the 1st four years following unit shut down changed substantially. This was due to the method by which the Exelon schedule of property taxes was applied in the two estimates. Property taxes are assumed to be paid in arrears; therefore the tax payment in the year following shutdown is actually for the final year of operations, and therefore is not included in either the 2009 or 2014 estimates. In 2009 the cost model assumed that this first year (which as not included) was part of the reduction in tax payments; the 2014 estimate does not make this assumption. The 2009 estimate also assumed that the second year of payment was already reduced to 67% of the operations level; the 2014 estimate begins property tax payments at the operations level for the second year. The total impact of the change was that the 2009 estimate paid the equivalent of one year of operations-level taxes before beginning the \$1 million per year level payments; the 2014 estimate paid the equivalent of approximately two years of operations-level taxes prior to the \$1 million per year level payments. The increase in the spent fuel site residence time (6 years) also contributed to the increase in costs.

Decommissioning and Demolition

Plant system and structural commodity "Removal" costs increased as a result of an 8% increase in craft labor hourly rate over the five year period (used to perform physical plant dismantling) and a 14% average hourly rate increase in health physics personnel (used to support work crew activities, perform interim

radiological assessments, and license termination surveys). The 2014 "Removal" cost also includes the perimeter excavation of the power blocks for removing underground services. This was added in 2014 based upon industry experience.

In the 2009 cost estimate, a significant portion of the contaminated waste stream was designated for off-site processing, volume reduction and recovery. In the 2014 estimate, the LLRW strategy changed such that metal material was sent directly to the LLRW burial facility, where is can be separated for burial or processing by the waste vendor consistent with recent industry practice. This results in a single rate for burial or processing of waste metals. With the low direct disposal rate, third-party off-site processing was not utilized in the 2014 estimate.

The waste packaging density for Class A containerized waste was revised to reflect industry experience (the lower density used in the 2014 cost model increased the number of waste packages, the disposal volume, and the associated packaging, transport and disposal cost.

As a result of these changes:

- The packaging cost increased (due to both reduced density and increased quantity of material designated for direct disposal). Direct disposal of contaminated metals incorporates the mass and volume of the waste package, as well as the cost of the one-time use waste package. Off-site processing typically uses reusable containers that do not contribute substantially to the packaging cost. "Packaging" costs also increased with the addition (in 2014) of four spent fuel multi-purpose canisters and storage overpacks for GTCC waste (2 per unit at a nominal cost of \$1.2 million for each canister procurement and transfer). The additional packages resulted from a payload constraint being applied on the storage canisters, as a result of industry experience.
- 2) Shipping costs increased for four reasons, updated waste carrier tariff schedules, a greater distance to the waste disposal site v. the off-site waste processing site, an increased number of waste packages, and a 2014 price for diesel fuel being 45% higher than in 2009.
- 3) In 2014 low-level waste disposal costs increased relative to the combination of waste disposal and processing costs in 2009 principally because the 2014 cost of waste disposal for system components (using a single waste stream) is substantially larger than 2009 cost for disposal (which used separate waste streams for direct burial and off-site waste processing).

Characterization and Licensing Surveys

Characterization and surveys increased by \$18.4 million (40%). The majority of the increase in this cost category (84.6%) is associated with the addition (in 2014) of remedial action survey personnel during the active decontamination and dismantling periods. These teams are used to assess, process, and identify areas of concerns, and confirm that the desired remediation results have been achieved. This activity has been added based on industry experience. The remainder of the change is due to a 14% increase in the average hourly rate for an HP Technician.

Other

Additional costs were realized in the 2014 cost model from an updated "Insurance" model and "Site O&M" charges provided by Exelon (combined with the longer spent fuel site residence time). "Energy" costs increased 8% percent since the 2009 estimate. This is commensurate with a 16% increase (not adjusted for inflation) in the price of electricity used in the 2014 estimate and the model that adjusts energy consumption based on reactor thermal rating (LaSalle County had a power uprate between the 2009 and 2014 studies).

TABLE 6.1 SUMMARY OF DECOMMISSIONING COST ELEMENTS DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	47,627	2.4
Removal	318,024	16.0
Packaging	78,925	4.0
Transportation	46,050	2.3
Waste Disposal	266,464	13.4
Off-site Waste Processing	0	0.0
Program Management [1]	592,861	29.8
Security	100,124	5.0
Spent Fuel Pool Isolation	20,724	1.0
Spent Fuel Management [2]	303,171	15.2
Insurance and Regulatory Fees	34,884	1.8
Energy	22,037	1.1
Characterization and Licensing Surveys	64,906	3.3
Property Taxes	73,016	3.7
Miscellaneous Equipment	13,757	0.7
Site O&M	7,182	0.4
Total [3]	1,989,751	100.0

Cost Element	Total	Percentage
NRC License Termination	1,471,645	74.0
Spent Fuel Management	379,733	19.1
Site Restoration	138,373	6.9
Total [3]	1,989,751	100.0

^[1] Includes security and engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.2 SUMMARY OF DECOMMISSIONING COST ELEMENTS DELAYED DECON ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	55,667	2.7
Removal	310,514	15.2
Packaging	68,133	3.3
Transportation	36,411	1.8
Waste Disposal	206,436	10.1
Off-site Waste Processing	0	0.0
Program Management [1]	736,899	36.0
Security	163,518	8.0
Spent Fuel Pool Isolation	20,724	1.0
Spent Fuel Management [2]	159,987	7.8
Insurance and Regulatory Fees	65,827	3.2
Energy	37,192	1.8
Characterization and Licensing Surveys	66,356	3.2
Property Taxes	83,538	4.1
Miscellaneous Equipment	26,752	1.3
Site O&M	10,876	0.5
Total [3]	2,048,830	100.0

Cost Element	Total	Percentage
NRC License Termination	1,498,254	73.1
Spent Fuel Management	413,664	20.2
Site Restoration	136,911	6.7
Total [3]	2,048,830	100.0

^[1] Includes security and engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.3 SUMMARY OF DECOMMISSIONING COST ELEMENTS SAFSTOR ALTERNATIVE

(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	55,568	2.3
Removal	316,771	13.3
Packaging	67,965	2.9
Transportation	36,201	1.5
Waste Disposal	200,103	8.4
Off-site Waste Processing	0	0.0
Program Management [1]	750,407	31.5
Security	202,716	8.5
Spent Fuel Pool Isolation	20,724	0.9
Spent Fuel Management [2]	298,365	12.5
Insurance and Regulatory Fees	130,766	5.5
Energy	45,291	1.9
Characterization and Licensing Surveys	66,356	2.8
Property Taxes	119,298	5.0
Miscellaneous Equipment	46,237	1.9
Site O&M	23,222	1.0
Total [3]	2,379,990	100.0

Cost Element	Total	Percentage
NRC License Termination	1,855,812	78.0
Spent Fuel Management	385,662	16.2
Site Restoration	138,516	5.8
Total [3]	2,379,990	100.0

^[1] Includes security and engineering costs

Excludes program management costs (staffing) but includes costs for spent fuel loading/transfer/spent fuel pool O&M and EP fees

^[3] Columns may not add due to rounding

TABLE 6.4 SUMMARY COMPARISON DECON ALTERNATIVE

(thousands of dollars)

Cost Element	2009 Estimate (dollars)	2009 Escalated to 2014 ^[1] (dollars)	2014 Estimate (dollars)	Delta [2]
D	40.001	40.400	45.005	1 1 4 4
Decontamination	42,821	46,483	47,627	1,144
Removal	264,200	286,791	318,024	31,233
Packaging	40,909	44,407	78,925	34,518
Transportation	25,293	27,455	46,050	18,594
Waste Disposal	160,354	174,066	266,464	92,398
Off-site Waste Processing	26,459	28,721	0	-28,721
Program Management	510,032	553,644	592,861	39,217
Security	58,174	63,149	100,124	36,975
Spent Fuel Pool Isolation	18,572	20,160	20,724	564
Spent Fuel Management (Direct Costs)	179,204	194,527	303,171	108,644
Insurance and Regulatory Fees	21,558	23,402	34,884	11,482
Energy	18,743	20,345	22,037	1,691
Characterization/Licensing Surveys	42,870	46,536	64,906	18,370
Property Taxes	26,701	28,984	73,016	44,033
Miscellaneous Equipment	12,892	13,995	13,757	-238
Site O&M	2,762	2,998	7,182	4,184
Total	1,451,544	1,575,661	1,989,751	414,090

NRC License Termination	1,120,226	1,216,012	1,471,645	255,632
Spent Fuel Management	218,596	237,287	307,243	69,956
6 Additional Years of ISFSI Ops [3]			72,490	72,490
Site Restoration	112,723	122,361	138,373	16,012
Total	1,451,544	1,575,661	1,989,751	414,090

^[1] Escalated by CPI, Services for comparative purposes

^[2] "2014 Estimate" value minus "2009 Escalated to 2014" value

^[3] Based upon average annual cost of \$6.04 million per unit for 5 years

- 1. "Decommissioning Cost Analysis for the LaSalle County Station, Units 1 and 2," Document No. E16-1555-012, Rev. 0, TLG Services, Inc., June 2009
- 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, 53 Fed. Reg., 24018-, June 27, 1988
- 3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," Rev. 2, October 2011
- 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, 66 Fed. Reg. 52551, 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, 61 Fed. Reg. 39278, July 29, 1996
- 7. U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011
- 8. "Nuclear Waste Policy Act of 1982," 42 U.S. Code 10101, et seq. http://pbadupws.nrc.gov/docs/ML1327/ML13274A489.pdf#page=419
- 9. Blue Ribbon Commission on America's Nuclear Future Charter, http://cybercemetery.unt.edu/archive/brc/20120620215336/http://brc.gov/index.php?q=page/charter
- 10. "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf, p. 32, January 2012
- 11. "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013

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- 12. United States Court of Appeals for the District of Columbia Circuit, In Re: Aiken County, Et Al., August 2013, http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD9852 57BC6004DEB18/\$file/11-1271-1451347.pdf
- 13. U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) "... DOE shall issue an annual acceptance priority ranking for receipt of SNF and/or HLW at the DOE repository. This priority ranking shall be based on the age of SNF and/or HLW as calculated from the date of discharge of such materials from the civilian nuclear power reactor. The oldest fuel or waste will have the highest priority for acceptance ..."
- 14. U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites"
- 15. "Low Level Radioactive Waste Policy Act of 1980," Public Law 96-573, 1980
- 16. "Low-Level Radioactive Waste Policy Amendments Act of 1985," Public Law 99-240, 1986
- 17. U.S. Code of Federal Regulations, Title 10, Part 61.55 "Waste Classification"
- 18. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Final Rule, Radiological Criteria for License Termination," 62 Fed. Reg. 39058, July 21, 1997
- 19. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," EPA Memorandum OSWER No. 9200.4-18, August 22, 1997
- 20. U.S. Code of Federal Regulations, Title 40, Part 141.16, "Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems"
- 21. "Memorandum of Understanding Between the Environmental Protection Agency and the Nuclear Regulatory Commission: Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites," OSWER 9295.8-06a, October 9, 2002

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- 22. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG/CR-1575, Rev. 1, EPA 402-R-97-016, Rev. 1, August 2000
- 23. T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986
- 24. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980
- 25. "Building Construction Cost Data 2014," Robert Snow Means Company, Inc., Kingston, Massachusetts
- 26. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984
- 27. Civilian Radioactive Waste Management System Waste Acceptance System Requirements Document," Revision 5, ICN01 (DOE/RW-0351) effective March 10, 2008
- 28. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995
- 29. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178
- 30. Tri-State Motor Transit Company Radioactive Materials Tariff
- 31. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, August 1984
- 32. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, June 1978

(continued)

- 33. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission. June 1980
- 34. "Microsoft Project 2010," Microsoft Corporation, Redmond, WA, 2003
- 35. "Atomic Energy Act of 1954," (68 Stat. 919)

APPENDIX A UNIT COST FACTOR DEVELOPMENT

APPENDIX A UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

Act ID	Activity Description	Activity Duration (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)
\mathbf{f}	Rig for removal	30	30
g	Unbolt from mounts	30	30
h	Remove contamination controls	15	15
i	Remove, wrap, send to waste processing area	<u>60</u>	<u>60</u>
	Totals (Activity/Critical)	355	255
Dura	tion adjustment(s):		
$+ \operatorname{Re}$	espiratory protection adjustment (50% of critical dur	ration)	128
+ Ra	diation/ALARA adjustment (37% of critical duration	n)	$\underline{95}$
Adju	sted work duration		478
	otective clothing adjustment (30% of adjusted durat uctive work duration	tion)	$\frac{143}{621}$
	ork break adjustment (8.33 % of productive duration work duration (minutes)	n)	$\frac{52}{673}$

*** Total duration = 11.217 hr ***

^{*} Alpha designators indicate activities that can be performed in parallel

APPENDIX A

(continued)

3. LABOR REQUIRED

Crew	Number	Duration (Hours)	Rate (\$/hr)	Cost
Laborers	3.00	11.217	52.35	1,761.63
Craftsmen	2.00	11.217	68.71	1,541.44
Foreman	1.00	11.217	71.78	805.16
General Foreman	0.25	11.217	74.55	209.06
Fire Watch	0.05	11.217	52.35	29.36
Health Physics Technician	1.00	11.217	63.44	711.61
Total labor cost				\$5,058.26
4. EQUIPMENT & CON	SUMABLES	COSTS		
Equipment Costs				none
Consumables/Materials Costs				
 Blotting paper 50 @ \$0. 	.59/sq ft {1}			\$29.50
• Plastic sheets/bags 50 @	@ \$0.26/sq ft {2	2}		\$13.00
 Gas torch consumables 	1 @ \$18.64 x 1	1 /hr {3}		\$18.64
Subtotal cost of equipment an				\$61.14
Overhead & profit on equipme	ent and materi	ials @ 16.25 %		\$9.94
Total costs, equipment & mat	erial			\$71.08
TOTAL COST:				
Removal of contaminated hea	t exchanger <	3000 pounds:		\$5,129.34
Total labor cost:				\$5,058.26
Total equipment/material cost	ts:			\$71.08
Total craft labor man-hours re	equired per un	it:		81.88

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the Atomic Industrial Forum's (now NEI) program to standardize nuclear decommissioning cost estimates and are delineated in Volume 1, Chapter 5 of the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.
- References for equipment & consumables costs:
 - 1. <u>www.mcmaster.com</u> online catalog, McMaster Carr Spill Control (7193T88)
 - 2. R.S. Means (2014) Division 01 56, Section 13.60-0600, page 23
 - 3. R.S. Means (2014) Division 01 54 33, Section 40-6360, page 698
- Material and consumable costs were adjusted using the regional indices for LaSalle, Illinois.

Unit Cost Factor	Cost/Unit
Removal of clean instrument and sampling tubing, \$/linear foot	0.57
Removal of clean pipe 0.25 to 2 inches diameter, \$/linear foot	6.14
Removal of clean pipe >2 to 4 inches diameter, \$/linear foot	8.76
Removal of clean pipe >4 to 8 inches diameter, \$/linear foot	17.11
Removal of clean pipe >8 to 14 inches diameter, \$/linear foot	33.01
Removal of clean pipe >14 to 20 inches diameter, \$/linear foot	42.95
Removal of clean pipe >20 to 36 inches diameter, \$/linear foot	63.18
Removal of clean pipe >36 inches diameter, \$/linear foot	75.05
Removal of clean valve >2 to 4 inches	113.19
Removal of clean valve >4 to 8 inches	171.14
Removal of clean valve >8 to 14 inches	330.10
Removal of clean valve >14 to 20 inches	429.48
Removal of clean valve >20 to 36 inches	631.82
Removal of clean valve >36 inches	750.55
Removal of clean pipe hanger for small bore piping	39.01
Removal of clean pipe hanger for large bore piping	138.54
Removal of clean pump, <300 pound	289.34
Removal of clean pump, 300-1000 pound	802.23
Removal of clean pump, 1000-10,000 pound	3,166.13
Removal of clean pump, >10,000 pound	$6{,}125.57$
Removal of clean pump motor, 300-1000 pound	335.30
Removal of clean pump motor, 1000-10,000 pound	1,315.47
Removal of clean pump motor, >10,000 pound	2,959.79
Removal of clean heat exchanger <3000 pound	1,700.73
Removal of clean heat exchanger >3000 pound	4,284.52
Removal of clean feedwater heater/deaerator	12,073.77
Removal of clean moisture separator/reheater	24,815.40
Removal of clean tank, <300 gallons	372.11
Removal of clean tank, 300-3000 gallon	1,172.10
Removal of clean tank, >3000 gallons, \$/square foot surface area	9.85

Unit Cost Factor	Cost/Unit
Removal of clean electrical equipment, <300 pound	156.75
Removal of clean electrical equipment, 300-1000 pound	545.93
Removal of clean electrical equipment, 1000-10,000 pound	1,091.85
Removal of clean electrical equipment, >10,000 pound	2,593.79
Removal of clean electrical transformer < 30 tons	1,801.35
Removal of clean electrical transformer > 30 tons	5,187.59
Removal of clean standby diesel generator, <100 kW	1,839.93
Removal of clean standby diesel generator, 100 kW to 1 MW	4,106.84
Removal of clean standby diesel generator, >1 MW	8,501.98
Removal of clean electrical cable tray, \$/linear foot	14.74
Removal of clean electrical conduit, \$/linear foot	6.44
Removal of clean mechanical equipment, <300 pound	156.75
Removal of clean mechanical equipment, 300-1000 pound	545.93
Removal of clean mechanical equipment, 1000-10,000 pound	1,091.85
Removal of clean mechanical equipment, >10,000 pound	2,593.79
Removal of clean HVAC equipment, <300 pound	189.54
Removal of clean HVAC equipment, 300-1000 pound	655.97
Removal of clean HVAC equipment, 1000-10,000 pound	1,307.35
Removal of clean HVAC equipment, >10,000 pound	2,593.79
Removal of clean HVAC ductwork, \$/pound	0.61
Removal of contaminated instrument and sampling tubing, \$/linear foot	1.83
Removal of contaminated pipe 0.25 to 2 inches diameter, \$/linear foot	24.41
Removal of contaminated pipe >2 to 4 inches diameter, \$/linear foot	42.51
Removal of contaminated pipe >4 to 8 inches diameter, \$/linear foot	67.99
Removal of contaminated pipe >8 to 14 inches diameter, \$/linear foot	133.65
Removal of contaminated pipe >14 to 20 inches diameter, \$/linear foot	160.97
Removal of contaminated pipe >20 to 36 inches diameter, \$/linear foot	223.50
Removal of contaminated pipe >36 inches diameter, \$/linear foot	264.49
Removal of contaminated valve >2 to 4 inches	522.01
Removal of contaminated valve >4 to 8 inches	628.82

Unit Cost Factor	Cost/Unit
Removal of contaminated valve >8 to 14 inches	1,287.08
Removal of contaminated valve >14 to 20 inches	1,638.84
Removal of contaminated valve >20 to 36 inches	2,185.62
Removal of contaminated valve >36 inches	2,595.45
Removal of contaminated pipe hanger for small bore piping	170.59
Removal of contaminated pipe hanger for large bore piping	550.25
Removal of contaminated pump, <300 pound	1,121.14
Removal of contaminated pump, 300-1000 pound	2,592.98
Removal of contaminated pump, 1000-10,000 pound	8,452.88
Removal of contaminated pump, >10,000 pound	20,593.51
Removal of contaminated pump motor, 300-1000 pound	1,092.55
Removal of contaminated pump motor, 1000-10,000 pound	3,429.72
Removal of contaminated pump motor, >10,000 pound	7,700.11
Removal of contaminated heat exchanger <3000 pound	5,129.34
Removal of contaminated heat exchanger >3000 pound	14,843.57
Removal of contaminated feedwater heater/deaerator	36,275.43
Removal of contaminated moisture separator/reheater	79,265.18
Removal of contaminated tank, <300 gallons	1,860.41
Removal of contaminated tank, >300 gallons, \$/square foot	36.56
Removal of contaminated electrical equipment, <300 pound	872.62
Removal of contaminated electrical equipment, 300-1000 pound	2,111.34
Removal of contaminated electrical equipment, 1000-10,000 pound	4,065.17
Removal of contaminated electrical equipment, >10,000 pound	7,938.80
Removal of contaminated electrical cable tray, \$/linear foot	42.23
Removal of contaminated electrical conduit, \$/linear foot	19.71
Removal of contaminated mechanical equipment, <300 pound	971.35
Removal of contaminated mechanical equipment, 300-1000 pound	2,333.72
Removal of contaminated mechanical equipment, 1000-10,000 pound	4,486.09
Removal of contaminated mechanical equipment, >10,000 pound	7,938.80
Removal of contaminated HVAC equipment, <300 pound	971.35

Unit Cost Factor	Cost/Unit
Removal of contaminated HVAC equipment, 300-1000 pound	2,333.72
Removal of contaminated HVAC equipment, 1000-10,000 pound	4,486.09
Removal of contaminated HVAC equipment, >10,000 pound	7,938.80
Removal of contaminated HVAC ductwork, \$/pound	2.52
Removal/plasma arc cut of contaminated thin metal components, \$/linear in	. 4.62
Additional decontamination of surface by washing, \$/square foot	9.56
Additional decontamination of surfaces by hydrolasing, \$/square foot	41.77
Decontamination rig hook up and flush, \$/ 250 foot length	8,231.32
Chemical flush of components/systems, \$/gallon	18.91
Removal of clean standard reinforced concrete, \$/cubic yard	161.84
Removal of grade slab concrete, \$/cubic yard	216.45
Removal of clean concrete floors, \$/cubic yard	421.02
Removal of sections of clean concrete floors, \$/cubic yard	$1,\!259.53$
Removal of clean heavily rein concrete w/#9 rebar, \$/cubic yard	271.01
Removal of contaminated heavily rein concrete w/#9 rebar, \$/cubic yard	2,486.70
Removal of clean heavily rein concrete w/#18 rebar, \$/cubic yard	342.66
Removal of contaminated heavily rein concrete w/#18 rebar, \$/cubic yard	3,291.64
Removal heavily rein concrete w/#18 rebar & steel embedments, \$/cubic yard	d 521.35
Removal of below-grade suspended floors, \$/cubic yard	421.02
Removal of clean monolithic concrete structures, \$/cubic yard	1,052.84
Removal of contaminated monolithic concrete structures, \$/cubic yard	2,481.68
Removal of clean foundation concrete, \$/cubic yard	827.64
Removal of contaminated foundation concrete, \$/cubic yard	2,312.22
Explosive demolition of bulk concrete, \$/cubic yard	36.00
Removal of clean hollow masonry block wall, \$/cubic yard	115.17
Removal of contaminated hollow masonry block wall, \$/cubic yard	390.96
Removal of clean solid masonry block wall, \$/cubic yard	115.17
Removal of contaminated solid masonry block wall, \$/cubic yard	390.96
Backfill of below-grade voids, \$/cubic yard	33.68
Removal of subterranean tunnels/voids, \$/linear foot	133.68

Unit Cost Factor	Cost/Unit
Placement of concrete for below-grade voids, \$/cubic yard	128.64
Excavation of clean material, \$/cubic yard	3.51
Excavation of contaminated material, \$/cubic yard	48.12
Removal of clean concrete rubble (tipping fee included), \$/cubic yard	26.64
Removal of contaminated concrete rubble, \$/cubic yard	30.70
Removal of building by volume, \$/cubic foot	0.35
Removal of clean building metal siding, \$/square foot	1.53
Removal of contaminated building metal siding, \$/square foot	5.27
Removal of standard asphalt roofing, \$/square foot	2.69
Removal of transite panels, \$/square foot	2.47
Scarifying contaminated concrete surfaces (drill & spall), \$/square foot	14.52
Scabbling contaminated concrete floors, \$/square foot	9.06
Scabbling contaminated concrete walls, \$/square foot	24.18
Scabbling contaminated ceilings, \$/square foot	83.20
Scabbling structural steel, \$/square foot	7.35
Removal of clean overhead crane/monorail < 10 ton capacity	763.68
Removal of contaminated overhead crane/monorail < 10 ton capacity	$2,\!178.46$
Removal of clean overhead crane/monorail >10-50 ton capacity	1,832.84
Removal of contaminated overhead crane/monorail >10-50 ton capacity	$5,\!227.41$
Removal of polar crane > 50 ton capacity	7,649.11
Removal of gantry crane > 50 ton capacity	32,422.41
Removal of structural steel, \$/pound	0.23
Removal of clean steel floor grating, \$/square foot	5.53
Removal of contaminated steel floor grating, \$/square foot	16.14
Removal of clean free standing steel liner, \$/square foot	14.77
Removal of contaminated free standing steel liner, \$/square foot	42.80
Removal of clean concrete-anchored steel liner, \$/square foot	7.39
Removal of contaminated concrete-anchored steel liner, \$/square foot	49.89
Placement of scaffolding in clean areas, \$/square foot	16.16
Placement of scaffolding in contaminated areas, \$/square foot	28.45

Unit Cost Factor	Cost/Unit
Landscaping with topsoil, \$/acre	24,866.56
Cost of CPC B-88 LSA box & preparation for use	2,049.49
Cost of CPC B-25 LSA box & preparation for use	1,876.15
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,532.60
Cost of CPC B-144 LSA box & preparation for use	10,383.63
Cost of LSA drum & preparation for use	211.74
Cost of cask liner for CNSI 8 120A cask (resins)	12,308.04
Cost of cask liner for CNSI 8 120A cask (filters)	8,901.63
Decontamination of surfaces with vacuuming, \$/square foot	0.93

APPENDIX C

DETAILED COST ANALYSIS

DECON

	Page
LaSalle County Station, Unit 1	
LaSalle County Station, Unit 2	

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(tnousai	nds of 2014 do	mars)											
Activity		Decon	Removal		Transport			Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	•	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
PERIOD	1a - Shutdown through Transition																				
	Direct Decommissioning Activities																				
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	173	26	199	199	-	-	-	-	-	-	-	-	-	1,300
1a.1.2 1a.1.3	Notification of Cessation of Operations Remove fuel & source material									a n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5	Deactivate plant systems & process waste Prepare and submit PSDAR							907	40	a	207										9,000
1a.1.6 1a.1.7	Review plant dwgs & specs.	-		-	-	-	-	267 614	40 92	307 706	307 706	-	-	-				-	-	-	2,000 4,600
1a.1.8	Perform detailed rad survey									a											-,
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,000
1a.1.10 1a.1.11	End product description Detailed by-product inventory	-	-	-	-	-		133 173	20 26	153 199	153 199	-	-	-	-	-	-	-	-	-	1,000 1,300
1a.1.12	Define major work sequence	-	-	-	-	-		1,001	150	1,151	1,151	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	414	62	476	476	-	-	-	-	-	-	-	-	-	3,100
1a.1.14 1a.1.15	Perform Site-Specific Cost Study Prepare/submit License Termination Plan	-	-	-	-	-	-	667 546	100 82	767 628	767 628	-	-	-	-	-	-	-	-	-	5,000 4,096
1a.1.16	Receive NRC approval of termination plan							010	02	a	020										1,000
Activity S	pecifications																				
1a.1.17.1	Plant & temporary facilities	-	-	-	_	-	-	656	98	755	679	-	75	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	-	4,167
1a.1.17.3 1a.1.17.4	NSSS Decontamination Flush Reactor internals	-	-	-	-	-	•	67 947	10 142	77 1,089	77 1,089	-	-	-	-	-	-	-	-	-	500 7,100
1a.1.17.4 1a.1.17.5		-		-	-	-		867	130	997	997	-	-	-					-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	67	10	77	77	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters Reinforced concrete	-	-	-	-	-	-	133 213	20	153	153 123	-	123	-	-	-	-	-	-	-	1,000
1a.1.17.8 1a.1.17.9		-		-	-	-	-	279	32 42	245 320	320	-	123	-				-	-	-	1,600 2,088
	Main Condensers	-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,088
	Pressure suppression structure	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
	Drywell Plant structures & buildings	-		-	-	-		213 416	32 62	245 479	245 239	-	239	-					-		1,600 3,120
	Waste management	-	-	-	-	-		614	92	706	706	-	-	-	-	-	-	-	-	-	4,600
	Facility & site closeout	-	-	-	-	-	-	120	18	138	69	-	69	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	5,694	854	6,548	5,977	-	570	-	-	-	-	-	-	-	42,683
Planning a 1a.1.18	& Site Preparations Prepare dismantling sequence			_		_	_	320	48	368	368	_				_	_	_			2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	2,100
1a.1.20	Design water clean-up system	-	-	-	-	-	-	187	28	215	215	-	-	-	-	-	-	-	-	-	1,400
1a.1.21 1a.1.22	Rigging/Cont. Cntrl Envlps/tooling/etc. Procure casks/liners & containers	-	-	-	-	-	-	2,300 164	$\frac{345}{25}$	2,645 189	2,645 189	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	15,786	2,368	18,154	17,584	-	570	-	-	-	-	-	-	-	78,609
	Additional Costs																				
1a.2.1	ISFSI Expansion Subtotal Period 1a Additional Costs	-	-	-	-	-	-	3,150		3,623	-	3,623		-	-	-	-	-	-	-	-
1a.2		-	-	-	-	-	-	3,150	473	3,623	-	3,623	-	-	-	-	-	-	-	-	-
	Collateral Costs							10.105	1.000	15.051		15.051									
1a.3.1 1a.3	Spent Fuel Capital and Transfer Subtotal Period 1a Collateral Costs	-		-	-	-		13,105 13,105		15,071 $15,071$	-	15,071 15,071		-					-	-	-
	Period-Dependent Costs							10,100	1,000	15,011		10,011									
1a.4.1	Insurance		-	-	-	-	-	2,050	205	2,255	2,255	-	-	-	-	-	-	-	-		-
1a.4.2	Property taxes	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3 1a.4.4	Health physics supplies Heavy equipment rental		491 527		-	-	-	-	123 79	614 606	614 606	-	-	-	-	-	-	-	-	-	-
1a.4.4 1a.4.5	Disposal of DAW generated		527	13	- 7	7 -	39	-	19	71	71	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,623	243	1,867	1,867	-	-	-	-	-	-	-	,	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,181	118	1,299	1,299	- 9.450	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,227	223	2,450	-	2,450	-	-	-	-	-	-	-	-	-

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 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	Class A Cu. Feet	Burial Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
D . 1.																					-
	Period-Dependent Costs (continued)							105	05	100	100										
1a.4.9 1a.4.10	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	165 791	25 119	190 910	190	910	-	-	-	-	-	-	-	-	-
1a.4.10 1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-		-		-	610	91	701	701	-	-		-	-	-	-		-	12,264
1a.4.13	Utility Staff Cost	-	_	_	_	-	-	35,778	5,367	41,144	41,144	-	-	_	-	-	_	_	_	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	7	-	39	44,472	6,612	52,160	48,746	3,415	-	-	610	-	-	-	12,190	20	
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	7	-	39	76,513	11,418	89,008	66,329	22,108	570	-	610	-	-	-	12,190	20	514,273
PERIOD	1b - Decommissioning Preparations																				
Period 1b	Direct Decommissioning Activities																				
Dotailed V	Vork Procedures																				
1b.1.1.1	Plant systems			-	_	-	_	631	95	726	653	_	73	-		-	_	_	-	_	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	133	20	153	153	-	-	-	-		-	-	-	-	1,000
1b.1.1.3	Reactor internals	_	-	_	-	-	-	534	80	614	614	-	_	-	-		-		-	_	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	180	27	207	52	-	155	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	484	73	557	557	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	160	24	184	92	-	92	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	160	24	184	184	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	133	20	153	77	-	77	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	277	42	319	319	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	364	55	419	377	-	42	-	-	-	-	-	-	-	2,730
1b.1.1.16 1b.1.1	Reactor building Total	-	-	-	-	-	-	364 4,501	55 675	419 5,176	377 4,696		42 480	-	-	-	-	-	-	-	2,730 $33,741$
1b.1.2	Decon NSSS	805	_	_	-	-	-	_	403	1,208	1,208	-	_	-	-	-	-	_	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	805	-	-	-	-	-	4,501	1,078	6,384	5,904	-	480	-	-	-	-	-	-	1,067	33,741
Period 1b	Additional Costs																				
1b.2.1	Site Characterization	-	-	-	-	-	-	6,502	1,951	8,453	8,453	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.2	Spent Fuel Pool Isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	17,315	3,573	20,888	20,888	-	-	-	-	-	-	-	-	30,500	10,852
	Collateral Costs																				
1b.3.1	Decon equipment	883	-	-	-	-	-		132	1,015	1,015	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	35	-	23	61	-	77	-	48	244	244	-	-	-	221	1 000	-	-	13,236	43	
1b.3.4 1b.3.5	Process decommissioning chemical flush waste	2	- 0	98	374	-	4,228	-	1,124 0	5,828	5,828	-	-	-	-	1,000	-	-	106,507	187	-
1b.3.5 1b.3.6	Small tool allowance	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-		-
1b.3.7	Pipe cutting equipment Decon rig	1,500	1,100	-	-	-	-	-	225	1,265 $1,725$	1,265 $1,725$	-	-	-	-	-	-	-	-	-	-
1b.3.7 1b.3.8	Spent Fuel Capital and Transfer	-			-		_	6,570	986	7,556	1,720	7,556			-		_	_	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,420	1,102	121	435	-	4,306	7,734	2,855	18,973	11,417	7,556	-	-	221	1,000	-	-	119,743	230	
Period 1h	Period-Dependent Costs																				
1b.4.1	Decon supplies	27	-	_	-	-	-	-	7	34	34	-	_	-	-		-		-	_	-
1b.4.2	Insurance		-	-	-	-	-	791	79	870	870	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	6,008	601	6,608	6,608	-	-	-	-	-	-		-	-	-
1b.4.4	Health physics supplies	-	276	-	-	-	-	-	69	346	346	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	264	-	-	-	-	-	40	304	304	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	4	-	23	-	7	42	42	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	1,628	244	1,872	1,872	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,117	112	1,228	-	1,228	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	83	12	95	95	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(inousai	nas of 2014 ao	mars)											
Activity Index		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	Class A	Burial Class B	Volumes Class C	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Huca	netivity Bescription	Cost	COST	Costs	Costs	Costs	Costs	Costs	contingency	Costs	Costs	Costs	Costs	cu. rect	cu. rect	cu. reet	cu. r cct	cu. rect	11 ti, 1105.	Maimours	Mamours
	Period-Dependent Costs (continued)																				
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	24 306	4	28	- 351	28	-	-	-	-	-	-	-	-	- C 140
1b.4.13 1b.4.14	Security Staff Cost DOC Staff Cost	-	-	-	-	-	-	5,810	46 871	351 6,681	6,681	-	-	-	-	-	-	-	-	-	6,149 63,789
1b.4.14 1b.4.15	Utility Staff Cost		-	-	-		-	18,007	2,701	20,708	20,708			-		-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	27	540	7	4	-	23	34,514	4,887	40,003	38,291	1,712	-	-	358	-	-	-	7,159	12	283,263
1b.0	TOTAL PERIOD 1b COST	3,252	1,643	128	439	-	4,329	64,064	12,392	86,248	76,499	9,268	480	-	579	1,000	-	-	126,903	31,808	327,856
PERIOD	1 TOTALS	3,252	2,660	141	446	-	4,368	140,578	23,810	175,256	142,829	31,376	1,051	-	1,188	1,000	-	-	139,093	31,828	842,129
PERIOD	2a - Large Component Removal																				
Period 2a	Direct Decommissioning Activities																				
	team Supply System Removal																				
2a.1.1.1	Recirculation System Piping & Valves	120	100				157	-	131	559	559	-	-	-	1,064		-	-	121,654	3,377	-
2a.1.1.2	Recirculation Pumps & Motors	64	57	16			273	-	122	574	574	-	-	-	2,594		-	-	211,420		-
2a.1.1.3	CRDMs & NIs Removal	271	1,449				420	- 971	688	3,597	3,597	-	-	-	5,536		1.000	-	325,500	26,826	1 555
2a.1.1.4	Reactor Vessel Internals Reactor Vessel	244	3,409				23,003	371 371	17,892	59,542	59,542	-	-	-	1,753		1,066	-	448,975	35,575	1,555 1,555
2a.1.1.5 2a.1.1	Totals	180 878	6,595 11,609	3,061 14,769			5,587 $29,439$	741	9,102 27,934	26,700 90,972	26,700 90,972	-	-	-	18,654 29,602		1,066	-	1,914,434 3,021,984	35,575 103,310	3,110
Domoval a	of Major Equipment																				
2a.1.2	Main Turbine/Generator		619	3,165	1,736		8,822	_	2,937	17,280	17,280				131,716				6,838,856	9,664	
2a.1.3	Main Condensers	-	1,195				6,288	-	2,282	13,258	13,258	-	-	-	93,880		-	-	4,874,376	18,785	-
Cascading	Costs from Clean Building Demolition																				
2a.1.4.1	Reactor Building	_	1,179	_	_	_	_	_	177	1,356	1,356	_	_	_	_	_	_	_	_	11,163	_
2a.1.4.2	Auxiliary Building	-	489	_	-	-	-	_	73	562	562	_	-	-	_	-	-	-	_	4,733	-
2a.1.4.3	Off Gas Building	-	85	-	-	-	-	-	13	97	97	_	-	-	_	-	-	_	-	920	-
2a.1.4.4	Turbine Building	-	705	-	-	-	-	-	106	811	811	-	-	-	-	-	-	-	-	7,337	-
2a.1.4	Totals	-	2,457	-	-	-	-	-	369	2,825	2,825	-	-	-	-	-	-	-	-	24,153	-
Disposal o	f Plant Systems																				
2a.1.5.1	Auxiliary Steam	-	124	29	16	-	81	-	57	307	307	-	-	-	1,201	-	-	-	62,558	1,924	-
2a.1.5.2	CSCS Equipment Cooling	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	122	-
2a.1.5.3	Circulating Water	-	208	-	-	-	-	-	31	239	-	-	239	-	-	-	-	-	-	3,464	-
2a.1.5.4	Circulating Water - RCA	-	258	66	33	-	169	-	118	644	644	-	-	-	2,504	-	-	-	130,688	3,946	-
2a.1.5.5	Clean Condensate Storage	-	99	- 4	- 0	-	- 10	-	15	114	-	-	114	-	1.40	-	-	-	7.010	1,677	-
2a.1.5.6 2a.1.5.7	Clean Condensate Storage - RCA Condensate	-	29 1,087	4 550			10 1,644	-	10 786	55 4,391	55 4,391	-	-	-	146 $24,478$		-	-	7,618	428 18,095	-
2a.1.5.7 2a.1.5.8	Condensate Condensate Booster	-	1,126			-	3,646	-	1,418	8,084	8,084	-	-	-	54,329		-	-	1,274,330 2,826,158		-
2a.1.5.9	Condensate Polishing Demineralizer	_	1,045				370	-	378	2,002	2,002	_		_	5,589		-	_	286,960	16,338	-
2a.1.5.10	Containment Combustible Gas Control	-	97	17			44	-	38	205	205	_	-	_	647		-	_	33,798	1,474	-
2a.1.5.11	Cycled Condensate Storage	-	344	55		-	156	-	135	721	721	_	-	-	2,327	-	-	_	121,304	5,426	-
2a.1.5.12	Drywell Instrument Nitrogen	-	71	15	8	-	41	-	31	165	165	-	-	-	620	-	-	-	31,995	1,100	-
2a.1.5.13		-	416	128	83	-	420	-	234	1,281	1,281	-	-	-	6,260	-	-	-	325,273	6,826	-
2a.1.5.14	Feedwater	-	691	315		-	999	-	483	2,685	2,685	-	-	-	14,903		-	-	774,516	11,459	-
2a.1.5.15		-	3,295	965		-	2,880	-	1,725	9,433	9,433	-	-	-	42,923	-	-	-	2,232,839	53,650	-
2a.1.5.16	Gland Steam	-	294	44	24	-	122	-	112	595	595	-		-	1,807	-	-	-	94,247	4,660	-
2a.1.5.17	HVAC-River\Lake Screen House	-	9	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	151	-
2a.1.5.18		-	14		- 15	-	70	-	2	16	200	-	16	-	1 100	-	-	-	- -	221	-
2a.1.5.19 2a.1.5.20	Hydrogen & Carbon Dioxide Main Steam	-	126 160	29 20			79 56	-	56 58	306 304	306 304	-	-	-	1,168 833		•	-	60,856 43,458	1,940 2,508	-
2a.1.5.20 2a.1.5.21	Misc Bldgs Floor Drains	-	160	- 20	- 11	-	-	-	0	1	-		1	-	-	-	-		40,400	2,508	-
2a.1.5.21	Screen Wash	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-			-	506	-
2a.1.5.23	Service Air	-	13	-	-	_	-	-	2	15	-	_	15	_	_	-			_	222	_
2a.1.5.24	Standby Gas Treatment	-	66	21	13	-	67	-	37	204	204	-	-	-	1,003	-	-	-	52,115	1,073	-
2a.1.5.25	Station Heat Recovery	-	289	53			137	-	116	622	622	-	-	-	2,028		-	-	105,836	4,428	-
2a.1.5.26	Switchgear Heat Removal	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	180	-
2a.1.5.27	Turbine Bldg Closed Cooling Water	-	603	206			558	-	327	1,804	1,804	-	-	-	8,298		-	-	432,636	9,720	-
2a.1.5.28	Turbine Building Equip Drains	-	112				67	-	49	262	262	-	-	-	993		-	-	51,593	1,783	-
2a.1.5.29	Turbine Building Floor Drains	-	44	4	2	-	10	-	14	74	74	-	-	-	146	-	-	-	7,632	679	-

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousar	nds of 2014 do	llars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Rurial V	olumes		Burial /		Utility and
Activity	y	Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Dianagala	of Plant Systems (continued)																				
2a.1.5.30		-	233	103	68	_	346	_	165	915	915	_	-	_	5,174	_	_	_	267,870	3,873	_
2a.1.5.31	Turbine Oil	-	684		82	-	419	-	302	1,625	1,625	-	-	-	6,488	-	-	-	324,845	10,868	-
2a.1.5	Totals	-	11,585	4,097	2,424	-	12,318	-	6,710	37,135	36,683	-	452	-	183,863	-	-	-	9,549,126	188,497	-
2a.1.6	Scaffolding in support of decommissioning	_	2,796	58	32	-	162	-	750	3,798	3,798	_	-	_	2,414	_	_	_	125,345	48,820	-
2a.1	Subtotal Period 2a Activity Costs	878	30,262		11,030	_	57,029	741	40,982	165,269	164,817		452	-	441,476	1,303	1,066	_	24,409,690	393,231	3,110
D 1 0 -																					
2a.2.1	Additional Costs Remedial Action Surveys	_		_	_	_	_	2,171	651	2,823	2,823	_	_	_	_	_	_		_	34,226	_
2a.2.2	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,221	659	2,880	2,880	-	-	-	-	-	-	-	-	34,226	-
Period 2a	Collateral Costs																				
2a.3.1	Process decommissioning water waste	73	-	48	130	-	165	-	102	519	519	-	-	-	471	-	-	-	28,288	92	-
2a.3.3	Small tool allowance	-	425	-	-	-	-	-	64	489	440	-	49	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	21,578	3,237	24,815	-	24,815	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	73	425	48	130	-	165	21,578	3,403	25,823	959	24,815	49	-	471	-	-	-	28,288	92	-
Period 2a	Period-Dependent Costs																				
2a.4.1	Decon supplies	89	-	-	-	-	-	-	22	111	111	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	2,006	201	2,207	2,207	-	-	-	-	-	-	-	-	-	-
2a.4.3 2a.4.4	Property taxes Health physics supplies	-	2,772	-	-	-	-	14,841	1,484 693	16,325 $3,465$	14,693 3,465	-	1,633	-	-	-	-	-	-	-	-
2a.4.4 2a.4.5	Heavy equipment rental	-	3,333		-	-	-		500	3,832	3,832			-		-	-		-	-	-
2a.4.6	Disposal of DAW generated	-	-	167	90	-	514	-	159	930	930	-	-	-	8,024	-	-	-	160,477	262	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,539	381	2,920	2,920	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	1,031	103	1,134	1,134		-	-	-	-	-	-	-	-	-
2a.4.9 2a.4.10	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	3,213 272	321 41	3,535 312	312	3,535	-	-	-	-	-	-	-	-	-
2a.4.10 2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,303	195	1,498	512	1,498	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	79	12	90	-	90	-	-	-	-	-	-	-	-	-
2a.4.13	Security Staff Cost	-	-	-	-	-	-	940	141	1,081	1,081	-	-	-	-	-	-	-	-	-	18,889
2a.4.14	DOC Staff Cost	-	-	-	-	-	-	23,070	3,460	26,530	26,530	-	-	-	-	-	-	-	-	-	261,006
2a.4.15 2a.4	Utility Staff Cost Subtotal Period 2a Period-Dependent Costs	89	6,105	167	90	-	514	41,482 $90,775$	6,222 13,936	47,704 $111,676$	47,704 104,920	5,123	1,633	-	8,024	-	-	-	160,477	262	485,951 $765,846$
2a.4	Subtotal Feriou 2a Feriou-Dependent Costs	03	0,100	107	30	-	014	30,773	15,550	111,070	104,320	5,125	1,000	•	0,024	•	-	-	100,477	202	705,040
2a.0	TOTAL PERIOD 2a COST	1,040	36,792	24,561	11,250	-	57,709	115,316	58,979	305,648	273,576	29,938	2,134	-	449,971	1,303	1,066	-	24,598,450	427,811	768,956
	2b - Site Decontamination																				
	Direct Decommissioning Activities																				
	of Plant Systems		_						2											-	
2b.1.1.1	Aux Diesel Bldg Floor Drains	-	5 61	-	-	-	-	-	1 9	6 70	-	-	6 70	-	-	-	-	-	-	86 1,006	-
2b.1.1.2 2b.1.1.3	Auxiliary Diesel Generator Control Rod Drive	-	253		13	-	65	-	83	435	435	-	- 70		963	-	-	-	50,095	4,090	-
2b.1.1.4	Diesel Oil	-	51		-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	823	-
2b.1.1.5	Electrical	-	322		-	-	-	-	48	371	-	-	371	-	-	-	-	-	-	5,201	-
2b.1.1.6	Electrical - RCA	-	5,255		635	-	3,225	-	2,314	12,414	12,414	-	-	-	48,150	-	-	-	2,499,995	81,135	-
2b.1.1.7	Fire Protection	-	139		- 36	-	105	-	21	160	-	-	160	-	- 9.750	-	-	-	149.990	2,339	-
2b.1.1.8 2b.1.1.9	HVAC-Auxiliary Building HVAC-Diesel Generator Room	-	261 8	54	36	-	185	-	122	659 9	659	-	9	-	2,759	-	-	-	143,239	3,849 127	-
2b.1.1.9 2b.1.1.10		-	26	4	3	-	15		11	59 59	59	-	-	-	227	-		-	11,772	382	-
2b.1.1.11	HVAC-Radwaste Building	-	7	2	1	-	7	-	4	21	21	-	-	-	105	-	-	-	5,437	111	-
2b.1.1.12		-	964		117	-	592	-	424	2,270	2,270	-	-	-	8,842	-	-	-	459,063	14,113	-
2b.1.1.13	High Pressure Core Spray	-	406		112	-	567	-	280	1,564	1,564	-	-	-	8,429	-	-	-	439,323	6,695	-
2b.1.1.14 2b.1.1.15		-	5 155		- 8	-	41	-	$\frac{1}{52}$	$\frac{6}{274}$	274	-	6	-	609	-	-	-	31,863	94 2,413	-
2b.1.1.16		-	194		51	-	261	-	131	730	730	-	-	-	3,878	-	-	-	202,203	3,188	-
2b.1.1.17	1 2	-	1,978		369	-	1,876	-	1,079	5,907	5,907	-	-	-	27,962	-	-	-	1,454,480	32,354	-
2b.1.1.18		-	768		100	-	506	-	350	1,890	1,890	-	-	-	7,545	-	-	-	392,222	12,232	-
2b.1.1.19	Primary Containment Vent & Purge	-	527	219	145	-	734	-	359	1,984	1,984	-	-	-	10,959	-	-	-	569,165	8,774	-

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Active of Markety Interplation of the Parkety Interplation							Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Table 1 Annie	Activity		Decon	Removal	Packaging	Transport			Other	Total	Total		-			Class A			GTCC	_	Craft	Contractor
\$\frac{1}{2} 1.5 \text{ 1.5 \text																						Manhours
\$\frac{1}{2} 1.5 \text{ 1.5 \text	Disposal of	Plant Systems (continued)																				
State Stat	2b.1.1.20		-	26	1	1	-	3	-	7	38	38	-	-	-	40	-	-	-	2,101	438	-
10.128 Security Market Page Page Page Page Page Page Page Page	2b.1.1.21		-		2	1	-	6	-	11			-	-	-		-	-	-			-
10.124 Substraction of plants of control of plants of control of plants of plants of control of plants o	2b.1.1.22	Radioactive Waste Disposal	-	1,869	290	162	-	823	-	726	3,871	3,871	-	-	-	12,585	-	-	-	638,228	29,426	-
10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2b.1.1.23	Reactor Building Equipment Drains	-	83	11	6	-	30	-	30	160	160	-	-	-	455	-	-	-	23,195	1,306	-
15.1.1.29 Secolar Water Ubscare 9 54 1,000 150 151 260 150 260 150	2b.1.1.24	Reactor Core Isolation Cooling	-	274	42	23	-	119	-	106			-	-	-	1,773	-	-	-			-
11 127 Postfard Fee Demons 1908 1968 1968 297 277 1 1 1 1 1 1 1 1 1	2b.1.1.25				_	_	-		-				-	-	-		-	-	-			-
10.1.1.28 Generic Air T.C.A 280 37 17 457 458 591 41.0.28	2b.1.1.26						-		-			,	-	-	-	,	-	-	-	,	,	-
March Marc	2b.1.1.27		1,958	,			-		-				-	-	-	,	-	-	-			-
11-100 November Market All 15 September 12 S			-			17	-		-				-	-	-		-	-	-	67,085		-
10 10 10 10 10 10 10 10			-			104	-			-			-		-		-	-	-	-		-
1. 1 Varie			-				-						-		-		-	-	-			-
*** Seminolisma in export of decommissioning*** *** Seminolisma in export of decommissioning** *** Commissioning*** ** Commissioning** ** Commissioning*** ** Commissioning** ** Com			- 9 = 41		-	_	-		-				-		-		-	-	-			-
Secretary of the Medical Secretary of the Medi	20.1.1	Totals	2,541	17,948	4,262	2,550	-	12,955	-	9,740	49,997	49,250	-	141	-	193,392	-	-	-	10,042,920	299,105	-
h. 1.3.1 Bester Politising	2b.1.2	Scaffolding in support of decommissioning	-	3,495	73	40	-	202	-	938	4,747	4,747	-	-	-	3,018	-	-	-	156,682	61,026	-
16.13.2 Aurillary Buchling 979 119 6 27 66 200 877 977 1,101 10.869 7,000 1.1.3.3 UC abbiding 173 107 10 1 10 10 10 10 10 10 10 10 10 10 10 1	Decontami																					
16.1.5.8 of O'Go Febridalog 178 98 3 10 45 118 97 97 706 97.288 3.000 15.5.8 1706	2b.1.3.1		3,073	3,181	345		-	,	-				-	-	-	,	-	-	-	, ,	,	-
Signature 1.5	2b.1.3.2						-		-				-	-	-		-	-	-			-
1.6.1 S Tarals	2b.1.3.3	e			-		-		-				-	-	-		-	-	-		,	-
Saloral Period 26 Activity Costs 8, 192 20,003 4,818 0,187 10,142 15,277 72,019 71,872 747 228,828 12,308,000 514,221 Period 26 Activity Costs 8, 192 20,003 4,418 0,187 10,142 15,277 72,019 71,872 747 228,828 12,308,000 514,221 Period 26 Activity Costs 8 12,308,000 514,221 Period 26 Activity Costs 9 12,308,000 514,221 Period 26 Activity Costs	2b.1.3.4						-		-				-	-	-		-	-	-			-
From 2th Adultional Costs 1.2	2b.1.3	Totals	5,651	4,560	484	597	-	1,985	-	4,599	17,875	17,875	-	-	-	32,418	-	-	-	2,190,256	154,090	-
1.	2b.1	Subtotal Period 2b Activity Costs	8,192	26,003	4,818	3,187	-	15,142	-	15,277	72,619	71,872	-	747	-	228,828	-	-	-	12,389,860	514,221	-
1.2.2 Remedial Action Surveys	Period 2b	Additional Costs																				
1.2.3 Ashestar Absterment	2b.2.1	License Termination Survey Planning	-	-	-	-	-	-	983	295	1,277	1,277	-	-	-	-	-	-	-	-	-	6,240
1.2.1 Underground Services Excavation 542	2b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,107	932	4,039	4,039	-	-	-	-	-	-	-	-	48,976	-
1.2.5 Operational Tools and Equipment - 0 13 189 . 50 261 261 . 5.855 . 146,375 5.2,619 6.2	2b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
h 2 Subtotal Period 2b Additional Costs	2b.2.4		-	542	-	-	-	-	-	81			-	-	-	-	-	-	-		3,627	-
reried 2b Collateral Costs 5.2 Process decommissioning water waste 105 71 192 244 150 762 762 686 41,765 136 5.2 Process decommissioning water waste 11 488 1,778 2,960 1,659 6,276 6.276 4,748 505,981 889 5.2 889 1,878 1,828	2b.2.5		-	-	-		-						-	-	-		-	-	-			-
5.1 Process decommissioning water waste 105 71 192 244 150 762 762	2b.2	Subtotal Period 2b Additional Costs	-	542	9	13	-	189	4,140	1,366	6,259	6,259	-	-	-	5,855	-	-	-	146,375	52,619	6,240
1	Period 2b (Collateral Costs																				
5.3 Small tool allowance	2b.3.1	Process decommissioning water waste	105	-	71	192	-	244	-	150	762	762	-	-	-	696	-	-	-	41,765	136	-
5.4 Spent Fuel Capital and Transfer	2b.3.2	Process decommissioning chemical flush waste	11	-	468	1,778	-	2,960	-	1,059	6,276	6,276	-	-	-	4,748	-	-	-	505,981	889	-
Subtrail Period 2b Collateral Costs	2b.3.3		-	524	-	-	-	-		79		602		-	-	-	-	-	-	-	-	-
Fried 2b Period: Dependent Costs 1,728	2b.3.4						-								-	-	-	-	-			-
b.4.1 Decon supplies	2b.3	Subtotal Period 2b Collateral Costs	117	524	539	1,970	-	3,204	30,877	5,919	43,150	7,641	35,509	-	-	5,444	-	-	-	547,746	1,024	-
1.5.4 1.5.5 1.5.																						
b.4.4 Health physics supplies	2b.4.1		1,728	-	-	-	-	-	-				-	-	-	-	-	-	-	-	-	-
b.4.4 Health physics supplies	2b.4.2		-	-	-	-	-	-				,	-	-	-	-	-	-	-	-	-	-
b.4.6 Heavy equipment rental	2b.4.3		-	-	-	-	-	-	5,361				-	-	-	-	-	-	-	-	-	-
b.4.6 Disposal of DAW generated	2b.4.4		-		-	-	-	-	-		,	,	-	-	-	-	-	-	-	-	-	-
b.4.7 Plant energy budget			-	4,721	-	-	-	-				,	-	-	-	-	-	-	-	-		-
b.4.8 NRC Fees			-	-	182	99	-	560				,	-	-	-	8,737	-	-	-	174,749	285	-
b.4.9 Emergency Planning Fees			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
b.4.10 Site O&M Cost			-	-	-	-	-	-						-	-	-	-	-	-	-	-	-
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2b.4.14			-	-	-	-	_						-	_	-	_	-	_	_	_	27,029
b.4.16 Utility Staff Cost 40,506 6,076 46,582 46,582	2b.4.15		-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	265,371
b.4 Subtotal Period 2b Period-Dependent Costs 1,728 8,372 182 99 - 560 82,811 13,998 107,748 100,417 7,331 8,737 174,749 285 786,2	2b.4.16	Utility Staff Cost		-	-	-	-	-					-	-	-	-		-		-	-	493,886
5.0 TOTAL PERIOD 2b COST $10,036$ $35,441$ $5,547$ $5,269$ - $19,095$ $117,828$ $36,560$ $229,775$ $186,189$ $42,840$ 747 - $248,865$ $13,258,730$ $568,149$ $792,50$	2b.4		1,728	8,372	182	99	-	560					7,331	-	-	8,737	-	-	-	174,749	285	786,286
	2b.0	TOTAL PERIOD 2b COST	10,036	35,441	5,547	5,269	-	19,095	117,828	36,560	229,775	186,189	42,840	747	-	248,865	-	-	-	13,258,730	568,149	792,526

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousai	nas of 2014 ao	mars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A	Class B	Class C Cu. Feet	GTCC Cu. Feet	Processe t Wt., Lbs		Contractor Manhours
	2d - Decontamination Following Wet Fuel Stora				0000	00000		0000	contingency	0 0 0 0 0		0000		04.7000	04.1000	04.1000		0417000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	. Widinout b	i i i i i i i i i i i i i i i i i i i
	_	.gc																			
Period 2d . 2d.1.1	Direct Decommissioning Activities Remove spent fuel racks	1,078	96	195	242	_	1,231		927	3,769	3,769	_	_	_	18,378				954,2)2 1,632	
20.1.1	nemove spent ruer ruens	1,010	00	100	212		1,201		021	0,100	0,700				10,010				001,2	1,002	
	f Plant Systems						_			40	40								0.0		
2d.1.2.1 2d.1.2.2	Containment Monitoring Electrical - Contaminated		27 860	2 104	69	-	$\frac{5}{352}$		8 324	43 1,709	43 1,709	-	-	-	75 5,260			-	3,8 273,1		
2d.1.2.3	Fire Protection - RCA	-	760	182		-	485	-	344	1,867	1,867	-	-	-	7,210		-	-	375,9		
2d.1.2.4	Fuel Pool Cooling & Cleanup	-	939	301	169	-	858	-	505	2,772	2,772	-	-	-	12,790			-	665,4		
2d.1.2.5	HVAC-Primary Containment	•	1,124	235			753	-	515	2,775 $1,957$	2,775	-	-	-	11,263		•	-	583,9		
2d.1.2.6 2d.1.2.7	Reactor Bldg Closed Cooling Water Reactor Building Floor Drains		391 8	291	153 0	-	778 1	-	344	1,957	1,957 13	-	-	-	11,570 21	-		-	602,9 1,1		
2d.1.2	Totals	-	4,109	1,115		-	3,233	-	2,042	11,136	11,136	-	-	-	48,189	-	-	-	2,506,4		
	431. 7. 111																				
Jecontam: 2d.1.3.1	nation of Site Buildings Reactor Building Spent Fuel Pool	309	1,161	82	401		1,516		893	4,363	4,363				29,927				1,499,9	38 20,237	
2d.1.3.1 2d.1.3	Totals	309	1,161	82 82		-	1,516		893	4,363	4,363	-	-	-	29,927				1,499,9		
							,				,										
2d.1.4	Scaffolding in support of decommissioning	•	699	15	8	-	40	-	188	949	949	-	-	•	604	-	-	-	31,3	36 12,205	-
d.1	Subtotal Period 2d Activity Costs	1,388	6,065	1,407	1,288	-	6,021	-	4,049	20,217	20,217	-	-	-	97,097	-	-	-	4,991,9	98,820	-
Period 2d	Additional Costs																				
d.2.1	Remedial Action Surveys	-	-	-	-	-	-	694	208	902	902	-	-	-	-	-	-	-		10,934	
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	694	208	902	902	-	-	-	-	-	-	-	-	10,934	
Period 2d	Collateral Costs																				
2d.3.1	Process decommissioning water waste	86	-	58	157	-	200	-	122	622	622	-	-	-	569	-	-	-	34,1	23 111	
d.3.3	Small tool allowance	-	116		-	-	-	-	17	134	134	-	-	-	-	-	-	-			-
d.3.4 d.3	Decommissioning Equipment Disposition Subtotal Period 2d Collateral Costs	86	116	170 228		-	472 672	-	149 288	884 1,640	884 1,640		-	-	7,054 $7,622$	-	-	-	366,2 400,3		
Period 2d	Period-Dependent Costs																				
2d.4.1	Decon supplies	56	-	-	-	-	-	-	14	70	70	-	-	-	-	-	-	-		-	-
2d.4.2	Insurance	-	-	-	-	-	-	348	35	383	383	-	-	-	-	-	-	-	-	-	-
2d.4.3 2d.4.4	Property taxes Health physics supplies		715	-	-	-	-	263	26 179	289 894	289 894	-	-	-	-			-	-	-	-
2d.4.5	Heavy equipment rental	-	1,054	-	-	-	-	-	158	1,212	1,212	-	-	-	-	-	-	-		-	-
2d.4.6	Disposal of DAW generated	-	-	63	34	-	193	-	60	349	349	-	-	-	3,008	-		-	60,1	98	. <u>-</u>
2d.4.7	Plant energy budget	-	-	-	-	-	-	342	51	393	393	-	-	-	-	-	-	-	-	-	-
2d.4.8 2d.4.9	NRC Fees Emergency Planning Fees			-	-	-	-	280 1,027	28 103	308 1,129	308	1,129	-	-	-			-		-	-
2d.4.10	Site O&M Cost		-	-	-	-	-	87	13	100	100		-	-	-			-		-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	211	32	243	243	-	-	-	-	-	-	-	-	-	-
2d.4.12 2d.4.13	ISFSI Operating Costs Security Staff Cost	-	-	-	-	-	-	25 164	$\frac{4}{25}$	29 188	188	29	-	-	-	-	-	-	-	-	3,291
2d.4.15 2d.4.14	DOC Staff Cost			-	-	-	-	3.349		3.852	3,852	-	-	-						-	40.046
2d.4.15	Utility Staff Cost		-	-	-	-	-	5,201	780	5,981	5,981	-	-	-	-	-		-		-	66,377
2d.4	Subtotal Period 2d Period-Dependent Costs	56	1,769	63	34	-	193	11,296	2,009	15,419	14,260	1,158	-	-	3,008	-	-	-	60,1	98	3 109,714
2d.0	TOTAL PERIOD 2d COST	1,529	7,950	1,697	1,571	-	6,886	11,990	6,555	38,177	37,019	1,158	-	-	107,728	-	-	-	5,452,4	74 110,051	109,714
PERIOD	2e - Delay before License Termination																				
	Period-Dependent Costs																				
2e.4.1	Insurance	-	-	-	-	-	-	1,093	109	1,202	1,202	-	-	-	-	-	-	-	-	-	-
2e.4.2 2e.4.3	Property taxes Health physics supplies	-	146	-	-	-	-	825	83 37	908 183	908 183	-	-	-	-	-	-	-	-	-	-
2e.4.3 2e.4.4	Disposal of DAW generated		140	3	2	-	11		3	19	19	-	-	-	165	-		-	3,2	94 5	- , -
2e.4.6	NRC Fees	-	-	-		-	-	419	42	461	461	-	-	-	-	-	-	-	-,-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	3,224	322	3,546	-	3,546	-	-	-	-	-	-	-	-	-
2e.4.8 2e.4.9	Site O&M Cost ISFSI Operating Costs	-	-	-	-	-	•	273 79	41 12	313 91	313	91	-	-	-	-	-	-	-	-	-
4e.4.9	ior of Operating Costs	-	-	-	-	-	-	19	12	91	-	91	-	-	-	-	-	-	-	-	-

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

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								(tilousai	ias oi 2014 ao	iiais)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A	Class B Cu. Feet	Class C	GTCC	Processed	Craft Manhours	Contractor Manhours
muex	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., LDS.	Mailliours	Maillours
	Period-Dependent Costs (continued)										¥0.1										10.005
2e.4.10	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	514 1,816	77 272	591 2,088	591 2,088	-	-	-	-	-	-	-	-	-	10,337 24,120
2e.4.11 2e.4	Subtotal Period 2e Period-Dependent Costs	-	146	3	- 2		11	8,242	998	9,403	5,765	3,637			165	-	-		3,294	- 5	
					2																
2e.0	TOTAL PERIOD 2e COST	-	146	3	2	-	11	8,242	998	9,403	5,765	3,637	-	-	165	-	-	-	3,294	5	34,457
PERIOD :	2f - License Termination																				
	Direct Decommissioning Activities																				
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license							170	E 0	a 204	994										
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
	Additional Costs								. =												
2f.2.1	License Termination Survey	-	-	-	-	-	-	12,428	3,728	16,156	16,156	-	-	-	-	-	-	-	-	192,095	3,120
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	12,428	3,728	16,156	16,156	-	-	-	-	-	-	-	-	192,095	3,120
	Collateral Costs							1.100		1 000	1 000										
2f.3.1 2f.3	DOC staff relocation expenses Subtotal Period 2f Collateral Costs	-	-	-			-	1,163 1,163	175 175	1,338 1,338	1,338 1,338	- -	-	-	-	-	-	-		-	-
								-,		-,	-,										
2f.4.1	Period-Dependent Costs Insurance							505	51	556	556										
2f.4.1 2f.4.2	Property taxes	-	-	-				382	38	420	420				-	-	-		-	-	-
2f.4.3	Health physics supplies	-	828	-	_	-	-	-	207	1,035	1,035	-	-	-	-	-	-		_	-	-
2f.4.4	Disposal of DAW generated	_	-	7	4	-	22	-	7	40	40	_	_	_	342	_	_	_	6,832	11	_
2f.4.5	Plant energy budget	-	-	-	-	-	-	248	37	285	285	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	_	_	-	_	-	_	462	46	508	508	_	_	_	_	_	_	_	_	_	_
2f.4.7	Emergency Planning Fees	_	_	-	_	-	_	1,492	149	1,641	-	1,641	_	_	_	_	_	_	_	_	_
2f.4.8	Site O&M Cost	-	-	-	-	-	-	126	19	145	145	· -	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	36	5	42	-	42	-	-	-	-	-	-	-	-	-
2f.4.10	Security Staff Cost	-	-	-	-	-	-	1,556	233	1,790	1,790	-	-	-	-	-	-	-	-	-	28,299
2f.4.11	DOC Staff Cost	-	-	-	-	-	-	4,235	635	4,870	4,870	-	-	-	-	-	-	-	-	-	47,430
2f.4.12	Utility Staff Cost	-	-	-	-	-	-	5,466	820	6,286	6,286	-	-	-	-	-	-	-	-	-	60,981
2f.4	Subtotal Period 2f Period-Dependent Costs	-	828	7	4	-	22	14,509	2,248	17,618	15,935	1,683	-	-	342	-	-	-	6,832	11	136,710
2f.0	TOTAL PERIOD 2f COST	-	828	7	4	-	22	28,272	6,202	35,335	33,653	1,683	-	-	342	-	-	-	6,832	192,106	139,830
PERIOD	2 TOTALS	12,606	81,156	31,816	18,097	-	83,722	281,648	109,294	618,338	536,202	79,256	2,880	-	807,070	1,303	1,066	-	43,319,780	1,298,122	1,845,483
PERIOD	3b - Site Restoration																				
Period 3b l	Direct Decommissioning Activities																				
Domolition	n of Remaining Site Buildings																				
3b.1.1.1	Reactor Building	_	6,786	_	_	_	_	_	1,018	7,803	_	_	7,803	_	_			_	_	64,472	_
3b.1.1.2		-	4,423	-	-	-	-	-	663	5,087	-	-	5,087	-	-	-	-	-	-	43,048	-
3b.1.1.3	Diesel Generator Room	-	554	_	-	_	-	-	83	637	-	-	637	_	-			-	_	6,000	_
3b.1.1.4	Off Gas Building	-	772	-	-	-	-	-	116	888	-	-	888	-	-	-		-	-	8,484	-
3b.1.1.5	Turbine Building	-	6,492	-	-	-	-	-	974	7,466	-	-	7,466	-	-	-	-		-	68,584	-
3b.1.1.6	Turbine Pedestal	-	3,474	-	-	-	-	-	521	3,995	-	-	3,995	-	-	-	-	-	-	30,829	-
3b.1.1	Totals	-	22,501	-	-	-	-	-	3,375	25,876	-	-	25,876	-	-	-	-	-	-	221,416	-
	out Activities																				
3b.1.2	Grade & landscape site	-	198	-	-	-	-		30	228	-	-	228	-	-	-	-	-	-	499	
3b.1.3	Final report to NRC	-	-	-	-	-	-	208	31	239	239	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	22,699	-	-	-	-	208	3,436	26,343	239	-	26,104	-	-	-	-	-	-	221,916	1,560
	Additional Costs		0.15							0=0			^=·							0.000	
3b.2.1	Concrete Crushing	-	845		-	-	-	4	127	976	-	-	976	-	-	-	-	-	-	3,936	-
3b.2	Subtotal Period 3b Additional Costs	-	845	-	-	-	-	4	127	976	-	-	976	-	-	-	-	-	-	3,936	-

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity		Decon			Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	Collateral Costs																				
3b.3.1	Small tool allowance	-	240	-	-	-	-	-	36 36	276	-	-	276	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	240	-	-	-	•	-	36	276	-	-	276	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
3b.4.1	Insurance	-	-	-	-	-	-	660	66	726	-	726	-	-	-	-	-	-	-	-	-
3b.4.2 3b.4.3	Property taxes Heavy equipment rental	-	5.685	-	-	-	-	998	100 853	1,098 6,538		1,098	6,538	-	-		-		-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	324	49	373	-	-	373	-	-	-	-		_	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	253	25	279	-	279	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	3,898	390	4,288	-	4,288	-	-	-	-	-	-	-	-	-
3b.4.7 3b.4.8	ISFSI Operating Costs Site O&M Cost	-	-	-	-	-	-	95 329	14 49	110 379	-	110	- 379	-	-	-	-	-	-	-	
3b.4.9	Security Staff Cost	-	-	-	-	-	-	3,885	583	4,468	0	3,664	804	-	-		-		-	-	70,317
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	10,124	1,519	11,642	-	-,	11,642	-	-	-	-	-	-	-	110,391
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,422	963	7,386	-	1,329	6,056	-	-	-	-	-	-	-	70,317
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,685	-	-	-	-	26,990	4,611	37,285	0	11,493	25,792	-	-	-	-	-	-	-	251,026
3b.0	TOTAL PERIOD 3b COST	-	29,469	-	-	-	-	27,201	8,210	64,880	239	11,493	53,148	-	-	-	-	-	-	225,851	252,586
PERIOD 8	3c - Fuel Storage Operations/Shipping																				
Period 3c I	Direct Decommissioning Activities																				
Period 3c (Collateral Costs																				
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	_	-	_	11,563	1,734	13,297	-	13,297	_	_	_	_	_	-	_	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	11,563	1,734	13,297	-	13,297	-	-	-	-	-	-	-	-	-
Period 3c F	Period-Dependent Costs																				
3c.4.1	Insurance	-	-	-	-	-	-	3,068	307	3,375	-	3,375	-	-	-	-	-	-	-	-	-
3c.4.2 3c.4.4	Property taxes NRC ISFSI Fees	-	-	-	-	-	-	4,637 1,855	464 185	5,100 2,040	-	5,100 2,040	-	-	-	-	-	-	-	-	-
3c.4.4	Emergency Planning Fees	-	-		-		-	18,109		19,920	-	19,920	-	-			-		-	-	-
3c.4.6	Site O&M Cost	-	-	-	-	-	-	1,531	230	1,760	-	1,760	-	-	-		-		-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	443	66	509	-	509	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	14,801	2,220	17,021	-	17,021	-	-	-	-	-	-	-	-	261,283
3c.4.9 3c.4	Utility Staff Cost Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	5,504 49,947	826 6,109	6,329 56,056	-	6,329 56,056	-	-	-	-	-	-	-	-	65,417 326,700
OC. T	Subtotal Feriod Se Feriod-Dependent Costs	_	_	_		_	-	10,011	0,103	50,050		90,090		_	-	-	-	_	_	-	520,700
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	61,510	7,843	69,353	-	69,353	-	-	-	-	-	-	-	-	326,700
PERIOD 8	3d - GTCC shipping																				
Period 3d I	Direct Decommissioning Activities																				
	eam Supply System Removal			_															,		
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	750 750		-	9,123	-	1,556	11,429	11,429 $11,429$	-	-	-	-	-	-	2,450	482,647	-	-
3d.1.1 3d.1	Totals Subtotal Period 3d Activity Costs	-	-	750 750		-	9,123 9,123		1,556 1,556	$11,429 \\ 11,429$	11,429		-	-	-	-	-	2,450 $2,450$	482,647 482,647	-	-
Period 3d I	Period-Dependent Costs																				
3d.4.1	Insurance	-	-	-	-	-	-	13		14	-	14	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	19		21	-	21	-	-	-	-	-	-	-	-	-
3d.4.4	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	75 6	7	82 7	-	82	-	-	-	-	-	-	-	-	-
3d.4.5 3d.4.6	ISFSI Operating Costs	-			-	-	-	6 2	1	$\frac{7}{2}$	-	7	-		-	-		-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	61	9	70	-	70	-	-	-	-	-	-	-	-	1,080
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	23		26	-	26	-	-	-	-	-	-	-	-	270
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	199	24	223	-	223	-	-	-	-	-	-	-	-	1,350
3d.0	TOTAL PERIOD 3d COST	-	-	750	-	-	9,123	199	1,580	11,652	11,429	223	-	-	-	-	-	2,450	482,647	-	1,350

Table C-1
LaSalle County Station, Unit 1
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activit Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD	3e - ISFSI Decontamination																				
Period 3e	Direct Decommissioning Activities																				
Period 3e	Additional Costs																				
3e.2.1 3e.2	License Termination ISFSI Subtotal Period 3e Additional Costs	-	302 302	336 336			1,502 1,502	1,783 1,783	1,106 1,106	5,531 5,531	5,531 5,531	-	-	-	$24,637 \\ 24,637$	-	-	-	$1,948,035 \\ 1,948,035$	$14,596 \\ 14,596$	1,080 1,080
Period 3e	Period-Dependent Costs																				
3e.4.1	Insurance	-	-	-	-	-	-	56 163	14	70 204	70 204	-	-	-	-	-	-	-	-	-	-
3e.4.2 3e.4.4	Property taxes Security Staff Cost	-	-	-		-	-	138	41 35	204 173	204 173	-	-	-					-	-	2,468
3e.4.5	Utility Staff Cost	-	-	-	-	-	-	162	41	203	203	_	-	-	-	-	-		-	-	1,870
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	519	130	649	649	-	-	-	-	-	-	-	-	-	4,338
3e.0	TOTAL PERIOD 3e COST	-	302	336	502	-	1,502	2,303	1,236	6,180	6,180	-	-	-	24,637	-	-	-	1,948,035	14,596	5,418
PERIOD	3f - ISFSI Site Restoration																				
Period 3f	Direct Decommissioning Activities																				
	Additional Costs																				
3f.2.1	Site Restoration ISFSI	-	1,344	-	-	-	-	28	206	1,577	-	-	1,577	-	-	-	-	-	-	15,775	80
3f.2	Subtotal Period 3f Additional Costs	-	1,344	-	-	-	-	28	206	1,577	-	-	1,577	-	-	-	-	-	-	15,775	80
	Collateral Costs																				
3f.3.1	Small tool allowance	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	-	-
Period 3f	Period-Dependent Costs																				
3f.4.2	Property taxes	-	-	-	-	-	-	86	9	95	-	-	95	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	109	-	-	-	-	-	16	125	-	-	125	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	28	4	32	-	-	32	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	73	11	84	-	-	84	-	-	-	-	-	-	-	1,307
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	70	11	81	-	-	81	-	-	-	-	-	-	-	810
3f.4	Subtotal Period 3f Period-Dependent Costs	-	109	-	-	-	-	258	51	417	-	-	417	-	-	-	-	-	-	-	2,117
3f.0	TOTAL PERIOD 3f COST	-	1,474	-	-	-	-	286	260	2,020	-	-	2,020	-	-	-	-	-	-	15,775	2,197
PERIOD	3 TOTALS	-	31,244	1,086	502	-	10,625	91,499	19,129	154,085	17,849	81,069	55,167	-	24,637	-	-	2,450	2,430,682	256,222	588,252
TOTAL (COST TO DECOMMISSION	15,858	115,061	33,043	19,044	-	98,715	513,725	152,234	947,679	696,880	191,700	59,099	-	832,895	2,303	1,066	2,450	45,889,560	1,586,172	3,275,863

Table C-1 LaSalle County Station, Unit 1 **DECON Decommissioning Cost Estimate** (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration		Class A		Class C		Processed		Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours

TOTAL COST TO DECOMMISSION WITH 19.14% CONTINGENCY:	\$947,679	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 73.54% OR:	\$696,880	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 20.23% OR:	\$191,700	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 6.24% OR:	\$59,099	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	836,264	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,450	cubic feet
TOTAL SCRAP METAL REMOVED:	51,861	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,586,172	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
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thouse	ands of 2014 de	onars)											
Activity Index		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	Class A	Burial V Class B Cu. Feet	Volumes Class C	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
-	1a - Shutdown through Transition		0000		0000	0000	0000	COBUB	contingency	COSES	00000	0000		0417000	0417000	04.1000	04,100	0417000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	WIGHTOUTS.	Manifour
	Direct Decommissioning Activities																				
1a.1.1	Prepare preliminary decommissioning cost	-	_	-	-	-		73	11	84	84	-	-		-	_	-	_	_	_	545
1a.1.2	Notification of Cessation of Operations									a											
1a.1.3 1a.1.4	Remove fuel & source material Notification of Permanent Defueling									n/a a											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1a.1.7 1a.1.8	Review plant dwgs & specs. Perform detailed rad survey	-	-	-	-	-	-	257	39	296 a	296	-	-	-	-	-	-	-	-	-	1,927
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
1a.1.10	End product description	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
1a.1.11 1a.1.12	Detailed by-product inventory Define major work sequence	-	-	-	-	-	-	73 419	11 63	84 482	84 482	-	-	-	-	-	-	-	-	-	545 3,143
1a.1.12	Perform SER and EA	-		-	-	-	-	173	26	199	199	-	-	-	-		-	-	-	-	1,299
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	279	42	321	321	-	-	-	-	-	-	-	-	-	2,095
1a.1.15 1a.1.16	Prepare/submit License Termination Plan Receive NRC approval of termination plan	-	-	-	-	-	-	229	34	263 a	263	-	-	-	-	-	-	-	-	-	1,716
Activity S _I	pecifications																				
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	275	41	316	285	-	32	-	-	-	-	-	-	-	2,061
1a.1.17.2	Plant systems	-	-	-	-	-	-	233	35	268	241	-	27	-	-	-	-	-	-	-	1,746
1a.1.17.3 1a.1.17.4	NSSS Decontamination Flush Reactor internals	-	-	-	-	-	-	28 397	4 60	32 456	32 456	-	-	-	-	-	-	-	-	-	210 2,975
1a.1.17.5		-	-	-	-	-	-	363	54	418	418	-	-	-	-	-	-	-	-	-	2,724
1a.1.17.6		-	-	-	-	-	-	28	4	32	32	-	-	-	-	-	-	-	-	-	210
1a.1.17.7 1a.1.17.8	Moisture separators/reheaters Reinforced concrete	-	-	-	-	-	-	56 89	8 13	64 103	64 51	-	51	-	-	-	-	-	-	-	419 670
1a.1.17.9		-		-	-	-		117	18	134	134	-	-	-		-	-	-	-	-	875
	Main Condensers	-	-	-	-	-	-	117	18	134	134	-	-	-	-	-	-	-	-	-	875
1a.1.17.11 1a.1.17.12	Pressure suppression structure	-	-	-	-	-	-	112 89	17 13	129 103	129 103	-	-	-	-	-	-	-	-	-	838 670
	Plant structures & buildings	-		-	-	-		174	26	201	100	-	100	-		-	-	-	-	-	1,307
	Waste management	-	-	-	-	-	-	257	39	296	296	-	-	-	-	-	-	-	-	-	1,927
1a.1.17.15 1a.1.17	Facility & site closeout Total	-	-	-	-		-	50 2,386	8 358	58 $2,744$	29 2,505		29 239	•	-	-	-	-	-		377 17,884
Planning &	& Site Preparations																				
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	134	20	154	154	-	-	-	-	-	-	-	-	-	1,006
1a.1.19 1a.1.20	Plant prep. & temp. svces Design water clean-up system	-	-	-	-	-	-	3,000 78	450 12	3,450 90	3,450 90	-	-	-	-	-	-	-	-	-	- 587
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-		-	-	-		2,300	345	2,645	2,645	-	-	-		-	-	-	-	-	-
1a.1.22 1a.1	Procure casks/liners & containers Subtotal Period 1a Activity Costs	-	-	-	-	-	-	69 9,694	10 1,454	79 11,148	79 10,909	-	239	-	-	-	-	-	-	-	515 32,937
	Additional Costs							·,~~ *	-, 1	-,0	,- 30		_50								,
1a.2.1	ISFSI Expansion	-	-	-	-	-	-	3,150	473	3,623	-	3,623		-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	÷	-	-	-	•	3,150	473	3,623	-	3,623	-	Ē	-	-	-	-	Ē	-	-
	Collateral Costs							10 105	1.000	15.05		18.051									
1a.3.1 1a.3	Spent Fuel Capital and Transfer Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	13,105 $13,105$	1,966 1,966	$15,071 \\ 15,071$	-	$15,071 \\ 15,071$		-	-	-	-	-	-	-	-
	Period-Dependent Costs							A 4-4													
1a.4.1 1a.4.2	Insurance Property taxes	-	-	-	-	-	-	2,050	205	2,255	2,255	-	-	-	-	-	-	-	-	-	
1a.4.2 1a.4.3	Health physics supplies	-	491	1 -	-	-	-	-	123	614	614	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	527	7 -		-	-	-	79	606	606	-	-	-	-	-	-	-	-	-	-
1a.4.5 1a.4.6	Disposal of DAW generated Plant energy budget	-	-	13	7	-	39	1,623	12 243	71 1,867	71 1,867	-	-	-	610	-	-	-	12,190	20	
1a.4.0 1a.4.7	NRC Fees	-	-	-	-	-	-	834	83	917	917	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,227	223	2,450	-	2,450	-	-	-	-	-	-	-	-	-

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						O CC CT	T T 15447				MBG	0 . 5 1	Q*·	D ,		D	7 1		D 11/		TT: 11: 2
Activity	7	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet					Wt., Lbs.	Manhours	Manhours
Period 1a	Period-Dependent Costs (continued)																				
1a.4.9	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-		-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1a.4.12 1a.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	8,222 35,778	1,233 5,367	9,455 $41,144$	9,455 $41,144$	-	-	-	-	-	-	-	-	-	$157,471 \\ 423,400$
1a.4.15	Subtotal Period 1a Period-Dependent Costs		1,018	13	7	-	39	51,737	7,719	60,533	57,118	3,415	-	-	610	-		-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	7	-	39	77,686	11,611	90,374	68,027	22,108	239	-	610	-	-		12,190	20	613,808
PERIOD	1b - Decommissioning Preparations																				
Period 1b	Direct Decommissioning Activities																				
Detailed V	Vork Procedures																				
1b.1.1.1	Plant systems	-	-	-	-	-	-	265	40	304	274	-	30	-	-	-	-	-	-	-	1,983
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
1b.1.1.3	Reactor internals Remaining buildings	•	-	-	-	-	-	224 75	34 11	257 87	$ \begin{array}{r} 257 \\ 22 \end{array} $	-	- 65	-	•	-	-	-	-	-	1,676 566
1b.1.1.4 1b.1.1.5	CRD housings & NIs		-	-	-	-	-	75 56	8	64	64	-	- 69	-				-	-	-	419
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	203	30	233	233	-	-	-	-	-	-	-	-	-	1,521
1b.1.1.9	Facility closeout	-	-	-	-	-	-	67	10	77	39	-	39	-	-	-	-	-	-	-	503
1b.1.1.10 1b.1.1.11	Sacrificial shield Reinforced concrete	-	-	-	-	-	-	67 56	10	77 64	77 32	-	32	-	-	-	-	-	-	-	503 419
1b.1.1.11 1b.1.1.12	Main Turbine	-	-		-	-		116	17	134	134		- 5∠	-	-	-	-		-	-	872
1b.1.1.13	Main Condensers	-	-	-	-	-	-	117	18	134	134	-	-	-	-	-	-	-	-	-	875
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1b.1.1.15	Radwaste building	-	-	-	-	-	-	153	23	175	158	-	18	-	-	-	-	-	-	-	1,144
1b.1.1.16	Reactor building	-	-	-	-	-	-	153	23	175	158	•	18	-	-	-	-	-	-	-	1,144
1b.1.1	Total	-	-	-	-	-	-	1,886	283	2,169	1,968	-	201	-	-	-	-	-	-	-	14,137
1b.1.2	Decon NSSS	805		-	-	-	-	-	403	1,208	1,208	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	805	-	-	-	-	-	1,886	686	3,377	3,176	-	201	-	-	-	-	-	-	1,067	14,137
	Additional Costs																				=
1b.2.1	Site Characterization	-	-	-	-	-	-	2,724	817	3,542	3,542	-	-	-	-	-	-	-	-	12,779	4,547
1b.2.2 1b.2	Spent Fuel Pool Isolation Subtotal Period 1b Additional Costs	-	-	-	-	-	-	7,208 9,933	1,081 1,899	8,290 11,831	8,290 11,831	-	-	-	-	-	-		-	12,779	4,547
		-	_	_	_			0,000	1,000	11,001	11,001		_	-	-				_	12,770	4,041
	Collateral Costs	200							100		1015										
1b.3.1 1b.3.2	Decon equipment DOC staff relocation expenses	883	-	-	-	-	-	1,163	132 175	1,015 1,338	1,015 1,338	-	-	-	-	-	-	-	-	-	-
1b.3.2 1b.3.3	Process decommissioning water waste	35	-	23	61	-	77	1,165	48	1,556	1,556 244	-		-	221	-	-	-	13,236	43	-
1b.3.4	Process decommissioning water waste	2	_	98	374	-	4,228		1,124	5,828	5,828	_	_	-	-	1.000	-	-	106,507	187	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,500		-	-	-	-	-	225	1,725	1,725	-	-	-	-	-	-	-	-	-	-
1b.3.8 1b.3	Spent Fuel Capital and Transfer Subtotal Period 1b Collateral Costs	2,420	1,102	121	435	-	4,306	6,570 7,734	$986 \\ 2,855$	7,556 18,973	11,417	7,556 7,556	-	-	221	1,000	-	-	119,743	230	-
		2,120	1,102	121	100		1,000	1,101	2,000	10,010	11,111	1,500			221	1,000			110,710	250	
Period 1b 1b.4.1	Period-Dependent Costs Decon supplies	27	_	_	_	_	_	_	7	34	34	_	_	_	_	_	_	_	_	_	_
1b.4.1 1b.4.2	Insurance	- 41	-	-	-	-	-	791	79	870	870	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	6,008	601	6,608	6,608	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	276	-	-	-	-	-	69	346	346	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	264	-	-	-	-	-	40	304	304	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	4	-	23	1 000	7	42	42	-	-	-	358	-	-	-	7,159	12	-
1b.4.7 1b.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	1,628 234	$\frac{244}{23}$	1,872 257	1,872 257	-	-	-	-	-	-	-	-	-	-
1b.4.8 1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,117	23 112	1,228	297	1,228	-	-	-	-		-	-	-	-
1b.4.3 1b.4.10	Site O&M Cost		-	-	-	-	-	83	12	95	95	1,226	-	-					-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(thouse	ands of 2014 de	Jiiai s)											
Activity	Decon	Removal			Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Period 1b Period-Dependent Costs (continued) 1b.4.12 ISFSI Operating Costs 1b.4.13 Security Staff Cost 1b.4.14 DOC Staff Cost 1b.4.15 Utility Staff Cost 1b.4 Subtotal Period 1b Period-Dependent Costs	- - - - 27	- - - - 540	- - - - - 7	- - - - 4		- - - - 23	24 4,122 5,810 18,007 38,219	4 618 871 2,701 5,448	28 4,741 6,681 20,708 44,268	4,741 6,681 20,708 42,556	28 - - - - 1,712	- - - -	- - - -	- - - - 358	- - - -	- - - -		- - - - 7,159	- - - - 12	78,951 63,789 213,326 356,066
1b.0 TOTAL PERIOD 1b COST	3,252	1,643	128	439	-	4,329	57,771	10,887	78,450	68,980	9,268	201	-	579	1,000	-	-	126,903	14,087	374,750
PERIOD 1 TOTALS	3,252	2,660	141	446	-	4,368	135,457	22,498	168,823	137,007	31,376	440	-	1,188	1,000	-	-	139,093	14,107	988,559
PERIOD 2a - Large Component Removal																				
Period 2a Direct Decommissioning Activities																				
Nuclear Steam Supply System Removal 2a.1.1.1 Recirculation System Piping & Valves 2a.1.1.2 Recirculation Pumps & Motors 2a.1.1.3 CRDMs & NIs Removal 2a.1.1.4 Reactor Vessel Internals 2a.1.1.5 Reactor Vessel 2a.1.1 Totals	120 64 271 244 180 878	57 1,449 3,409 6,595	16 605 11,066 3,061	164 3,558 1,805	-	157 273 420 23,005 5,587 29,441	371 371 371 741	131 122 688 17,892 9,102 27,935	559 574 3,597 59,544 26,700 90,974	559 574 3,597 59,544 26,700 90,974	- - - - -	- - - - -		1,064 2,594 5,536 1,753 18,654 29,602	1,303 1,303	1,066 - 1,066	- - - - -	121,654 211,420 325,500 448,975 1,914,434 3,021,984	3,377 1,957 26,826 35,575 35,575 103,310	1,555 1,555
Removal of Major Equipment 2a.1.2 Main Turbine/Generator 2a.1.3 Main Condensers	- -	619 1,195		1,736 1,238	-	8,822 6,288	-	2,937 2,282	17,280 13,258	17,280 13,258	-	-	-	131,716 93,880	-	- -	-	6,838,856 4,874,376	9,664 18,785	- -
Cascading Costs from Clean Building Demolition 2a.1.4.1 Reactor Building 2a.1.4.2 Auxiliary Building 2a.1.4.3 IRSF Building 2a.1.4.4 Service Building 2a.1.4.5 Solid Radwaste Building 2a.1.4.6 Turbine Building 2a.1.4 Totals		1,181 488 88 188 268 705 2,917	3 - 3 - 3 -		- - - - - -	- - - - - -		177 73 13 28 40 106 438	1,358 561 101 216 309 811 3,355	1,358 561 101 216 309 811 3,355				- - - - - -	- - - - -		- - - - -		11,181 4,723 939 2,230 2,559 7,337 28,970	
Disposal of Plant Systems 2a.1.5.1 Acid & Caustic 2a.1.5.2 Auxiliary Steam 2a.1.5.3 CSCS Equipment Cooling 2a.1.5.4 Chemical Feed 2a.1.5.5 Circulating Water 2a.1.5.6 Circulating Water - RCA 2a.1.5.7 Clean Condensate Storage 2a.1.5.8 Clean Condensate Storage - RCA 2a.1.5.9 Condensate 2a.1.5.10 Condensate Booster 2a.1.5.11 Condensate Polishing Demineralizer 2a.1.5.12 Containment Combustible Gas Control 2a.1.5.13 Cycled Condensate Storage 2a.1.5.14 Drywell Instrument Nitrogen 2a.1.5.15 Extraction Steam 2a.1.5.16 Feedwater 2a.1.5.17 Feedwater Heater Vents & Drains 2a.1.5.18 Gland Steam 2a.1.5.19 HVAC-Machine Shop\TB Sandblast 2a.1.5.20 HVAC-River\Lake Screen House 2a.1.5.21 HVAC-Service Building 2a.1.5.22 Lake Makeup & Blowdown 2a.1.5.24 Main Steam 2a.1.5.25 Makeup Demineralizer 2a.1.5.26 Misc Bldgs Floor Drains		20 350 9 40 188 250 174 77 932 1,053 1,035 79 620 68 343 592 2,733 243 38 24 43 254 132 804 1,324	89	6 298 705 73 7 84 8 71 183 506 21 3		250 - - - - - - - - - - - - -		3 166 1 6 28 101 26 28 708 1,381 376 31 289 29 197 438 1,488 95 15 4 10 6 38 49 366 562	23 903 10 46 216 546 201 151 3,963 7,881 1,991 168 1,560 158 2,439 8,165 506 79 28 73 49 292 258 1,978 3,040	903 - 546 - 151 3,963 7,881 1,991 168 1,560 158 1,080 2,439 8,165 506 79 - - - - - - - - - - - - -		23 - 10 46 216 - 201 - - - - - - - - - - - - -		3,727 1,808 415 22,553 53,399 5,591 546 6,560 588 5,368 13,899 38,293 1,606 258 - - - - - - - - - - - - -				193,777	317 5,415 141 638 3,125 3,771 2,875 1,158 15,584 18,570 16,160 1,194 9,928 1,076 5,624 9,857 44,590 3,862 605 422 1,072 708 4,257 2,071 12,835 20,035	

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(tnous	ands of 2014 de	onars)											
						Off-Site	LLRW				NRC	Coont Eval	Site	Processed		D.mial V	Volumes		Burial/		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Spent Fuel Management		Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet		Cu. Feet		Cu. Feet		Manhours	Manhours
D: 1	CDI + C + (/ / 1)																				
2a.1.5.28	f Plant Systems (continued) Refrigeration - RCA		46	7	9		16		17	88	88				237				12,405	681	
2a.1.5.29	Screen Wash	-	24	- '		-	-		4	28	-	-	28	-	201	-	-	-	12,400	407	-
2a.1.5.30	Service Air	_	26	-	-	_	_	_	4	30	-	-	30	_	-	_	-	-	-	427	-
2a.1.5.31	Sewage Treatment	-	104	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	1,741	-
2a.1.5.32	Standby Gas Treatment	-	54	18	11	-	58	-	31	172	172	-	-	-	862	-	-	-	44,774	877	-
2a.1.5.33	Station Heat Recovery	-	669	254	130	-	661	-	377	2,091	2,091	-	-	-	9,845	-	-	-	512,043	10,593	-
2a.1.5.34	Switchgear Heat Removal	-	11	-	-	-	-	-	2	13		-	13	-		-	-	-		180	-
2a.1.5.35	Turbine Bldg Closed Cooling Water	-	533		105		534	-	302	1,671	1,671	-	-	-	7,935	-	-	-	413,833	8,605	-
2a.1.5.36 2a.1.5.37	Turbine Building Equipment Drains Turbine Building Floor Drains	-	94 96	19 9	11 4	-	58 21	-	42 31	224 161	224 161	-	-	-	862 315	-	-	-	44,802 16,508	1,495 1,493	-
2a.1.5.37 2a.1.5.38	Turbine Generator		278	115	76	-	384		188	1,041	1,041				5,774				297,530	4,607	-
2a.1.5.39	Turbine Oil	-	798	150	88		449		340	1,826	1,826	_	_	-	6,935	-	-	-	348,242	12,631	-
2a.1.5.40	Wastewater Treatment	-	153		-	-	-	-	23	176	-	-	176	-	-	-	-	-	-	2,499	-
2a.1.5	Totals	-	14,442	4,682	2,725	-	13,844	-	7,829	43,521	42,142	-	1,380	-	207,085	-	-	-	10,732,070	233,236	-
2a.1.6	Scaffolding in support of decommissioning	_	3,228	64	35	_	177	_	863	4,367	4,367	_	_		2,649	_	_	_	137,534	56,438	-
		0.50									ŕ					1 000	1.000				
2a.1	Subtotal Period 2a Activity Costs	878	34,011	24,936	11,334	-	58,573	741	42,283	172,756	171,377	-	1,380	-	464,933	1,303	1,066	-	25,604,820	450,404	3,110
	Additional Costs																				
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,161	648	2,809	2,809	-	-	-	-	-	-	-	-	34,055	-
2a.2.2	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	94.055	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,211	656	2,866	2,866	-	-	-	-	-	-	-	-	34,055	-
Period 2a	Collateral Costs																				
2a.3.1	Process decommissioning water waste	76	_	50	135	-	172		106	540	540	-	_	-	490	_	-	-	29,396	96	-
2a.3.3	Small tool allowance	-	482	-	-	-	-	-	72	554	498	-	55	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	21,470	3,221	24,691	-	24,691		-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	76	482	50	135	-	172	21,470	3,399	25,785	1,038	24,691	55	-	490	-	-	-	29,396	96	-
Dominal On	Davie d Donor dont Costs																				
2a.4.1	Period-Dependent Costs Decon supplies	88						_	22	110	110										
2a.4.1 2a.4.2	Insurance	-	-		-	-	-	2,001	200	2,201	2,201			-	-	-	-	-		-	
2a.4.3	Property taxes	-	_	-	-	-	_	14,797	1,480	16,277	14,649	-	1,628	-	-	_	-	-	-	-	-
2a.4.4	Health physics supplies	-	3,027	-	-	-	-	-	757	3,784	3,784	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,316	-	-	-	-	-	497	3,813	3,813	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	179	97	-	550	-	170	996	996	-	-	-	8,593	-	-	-	171,862	280	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,527	379	2,906	2,906	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	714 3,197	71 320	785 3,517	785 -	3,517	-	-	-	-	-	-	-	-	-
2a.4.9 2a.4.10	Site O&M Cost	-	-	-	-	-	-	270	320 41	311	311	5,517	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-		-	-	-	-	1,296	194	1,490	-	1,490		-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12	90	-	90		-	-	-	-	-	-	-	-
2a.4.13	Security Staff Cost	-	-	-	-	-	-	11,388	1,708	13,096	13,096	-	-	-	-	-	-	-	-	-	216,134
2a.4.14	DOC Staff Cost	-	-	-	-	-	-	22,955	3,443	26,398	26,398	-	-	-	-	-	-	-	-	-	259,703
2a.4.15	Utility Staff Cost	-		-		-	-	41,275	6,191	47,466	47,466		-	-	-	-	-	-			483,526
2a.4	Subtotal Period 2a Period-Dependent Costs	88	6,343	179	97	-	550	100,498	15,486	123,241	116,516	5,097	1,628	-	8,593	-	-	-	171,862	280	959,363
2a.0	TOTAL PERIOD 2a COST	1,043	40,836	25,165	11,565	-	59,295	124,920	61,824	324,648	291,797	29,788	3,063	-	474,016	1,303	1,066	-	25,806,070	484,836	962,473
PERIOD	2b - Site Decontamination																				
Period 2b	Direct Decommissioning Activities																				
Disposal o	f Plant Systems																				
2b.1.1.1	Aux Diesel Bldg Floor Drains	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	147	-
2b.1.1.2	Auxiliary Diesel Generator	-	82		-	-	-	-	12	94	-	-	94	-	-	-	-	-		1,341	-
2b.1.1.3	Control Rod Drive	-	242		12	-	62	-	80	415	415	-	-	-	920	-	-	-	47,858	3,912	-
2b.1.1.4 2b.1.1.5	Diesel Oil Domestic Water	-	69 30		-	-	-	-	10	80 35	-	-	80 35	-	-	-	-	-	-	1,104 499	-
2b.1.1.6 2b.1.1.6	Domestic Water Domestic Water - RCA	-	30 45		3	-	17	-	5 17	35 89	89	-	- -	-	255	-	-	-	13,307	499 670	-
2b.1.1.7	Electrical	-	611		-	-	-		92	702	-	-	702	-	255			-	15,507	9,872	-
2b.1.1.8	Electrical - RCA	-	5,832	1,072	690		3,507	-	2,545	13,646	13,646	-	-	-	52,355	-	-	-	2,718,307	89,972	-

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								`	ands or zorr a	,											
Activity Index		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	Class A Cu. Feet	Burial V Class B Cu. Feet	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	f Plant Systems (continued)								e v										ŕ		
2b.1.1.9	Fire Protection	_	254	_	_	-	-		38	292	_	-	292	-	-	_	-		-	4,263	-
2b.1.1.10	HVAC-Auxiliary Building	_	343	75	50	_	254	-	164	886	886	-		_	3,793	_	-	-	196,915	5,183	-
2b.1.1.11	HVAC-Control Rm\Aux Equip Area	-	44	-	-	-	-		7	51	-	-	51	-	-	-	-		· -	729	-
2b.1.1.12	HVAC-Diesel Generator Room	-	17	-	-	-	-	-	3	19	-	-	19	-	-	-	-	-	-	284	-
2b.1.1.13	HVAC-Off Gas Building	-	80	29	19	-	99	-	51	278	278	-	-	-	1,478	-	-	-	76,733	1,283	-
2b.1.1.14	HVAC-Radwaste Building	-	127	23	15	-	77	-	56	297	297	-	-	-	1,146	-	-	-	59,487	1,937	-
2b.1.1.15	HVAC-Turbine Building	-	964	174	117	-	592	-	424	2,270	2,270	-	-	-	8,842	-	-	-	459,063	14,113	-
2b.1.1.16 2b.1.1.17	High Pressure Core Spray Instrument Air	-	345 9	190	105	-	535	•	255	1,429 10	1,429	-	10	-	7,949	-	-	-	414,391	5,720 152	-
2b.1.1.17 2b.1.1.18	Instrument Air - RCA		165	19	9	-	45		56	293	293	-	- 10	-	659		-		34,507	2,558	-
2b.1.1.19	Low Pressure Core Spray	-	164	88	49	_	246		119	666	666	_	_	_	3,664	_	-	_	191,058	2,717	-
2b.1.1.20	Nuclear Boiler	-	1,641	526	319	-	1,623	-	917	5,026	5,026	-	-	-	24,184	-	-	-	1,258,120	26,878	-
2b.1.1.21	Off Gas	-	648	149	89	-	452	-	303	1,641	1,641	-	-	-	6,743	-	-	-	350,523	10,327	-
2b.1.1.22	Primary Containment Vent & Purge	-	514	208	137	-	694	-	343	1,895	1,895	-	-	-	10,400	-	-	-	537,713	8,529	-
2b.1.1.23	Process Radiation Monitoring	-	17	1	0	-	2	-	5	25	25	-	-	-	32	-	-	-	1,669	283	-
2b.1.1.24	Process Sampling	-	61	4	3	-	13	-	20	101	101	-	-	-	201	-	-	-	10,453	1,007	-
2b.1.1.25	Radioactive Waste Disposal	-	2,859	478	271	-	1,379	-	1,148	6,136	6,136	-	-	-	21,136	-	-	-	1,069,308	45,084	-
2b.1.1.26	Radwaste Area Floor Drains Reactor Building Equipment Drains	-	2 75	0 11	0 6	-	$0 \\ 28$	-	28	140	$\frac{4}{146}$	-	-	-	$\frac{6}{428}$	-	-	-	315 21,778	35 1,178	-
2b.1.1.27 2b.1.1.28	Reactor Core Isolation Cooling	-	230	37	21	-	105	-	90	146 483	483	-	-	-	1,564	-	-	-	81,526	3,654	-
2b.1.1.29	Reactor Recirculation		132	48	31		160		82	453	453				2,381				123,665	2,194	-
2b.1.1.30	Reactor Water Clean-up	481	861	87	43	_	217		525	2,214	2,214	-	_	_	3,219	_	-		168,302	20,204	_
2b.1.1.31	Residual Heat Removal	1,783	1,711	898	507	-	2,574	-	2,129	9,601	9,601	-	-	-	38,296	-	-	_	1,995,503	34,356	-
2b.1.1.32	Service Air - RCA	-	373	54	25	-	127	-	134	713	713	-	-	-	1,889	-	-	-	98,774	5,643	-
2b.1.1.33	Service Water	-	97	-	-	-	-	-	15	112	-	-	112	-	-	-	-	-	-	1,595	-
2b.1.1.34	Service Water - RCA	-	862	316	180	-	915	-	503	2,775	2,775	-	-	-	13,626	-	-	-	709,225	13,633	-
2b.1.1.35	Standby Liquid Control	-	48	8	4	-	19	-	18	97	97	-	-	-	281	-	-	-	14,698	719	-
2b.1.1	Totals	2,264	19,563	4,519	2,705	-	13,743	-	10,194	52,987	51,581	-	1,405	-	205,446	-	-	-	10,653,200	321,775	-
2b.1.2	Scaffolding in support of decommissioning	-	4,035	80	44	-	222	-	1,079	5,459	5,459	-	-	-	3,311	-	-	-	171,917	70,548	-
	ination of Site Buildings																				
2b.1.3.1	Reactor Building	3,073	3,176	343	278	-	1,066	-	2,673	10,608	10,608	-	-	-	16,817	-	-	-	1,040,843	94,951	-
2b.1.3.2	Auxiliary Building	1,633	760	477	224	-	1,061	-	1,353	5,508	5,508	-	-	-	15,844	-	-	-	868,933	36,938	-
2b.1.3.3	IRSF Building	92	41	2	10	-	24	-	64 86	233	233	-	-	-	427	-	-	-	36,063	1,976	-
2b.1.3.4 2b.1.3.5	Service Building Solid Radwaste Building	127 558	48 445	2 33	14 44	-	34 138	-	435	312 1,654	312 1,654	-	-	-	593 $2,265$	-	-	-	50,079 161,333	2,619 15,232	-
2b.1.3.6	Turbine Building	2,036	1,194	130		-	805		1,572	6,010	6,010				13,591				985,774	48,088	-
2b.1.3	Totals	7,519	5,664	987	843	-	3,129	-	6,183	24,325	24,325	-	-	-	49,537	-	-	-	3,143,025	199,804	-
2b.1	Subtotal Period 2b Activity Costs	9,783	29,262	5,586	3,592	-	17,093	-	17,455	82,771	81,365	-	1,405	-	258,294	-	-	-	13,968,140	592,127	-
Period 2b	Additional Costs																				
2b.2.1	License Termination Survey Planning	-	-	-	-	-	-	983	295	1,277	1,277	-	-	-	-	-	-	-	-	-	6,240
2b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,118	935	4,053	4,053	-	-	-	-	-	-	-	-	49,147	-
2b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
2b.2.4	Underground Services Excavation	-	542	-	- 10	-	100	-	81	623	623	-	-	-	-	-	-	-	146.977	3,627	-
2b.2.5 2b.2.6	Operational Tools and Equipment Soil Remediation	-	- 58	9	13 221	-	189 1,978	-	50 543	261 2,808	261 2,808	-	-	-	5,855 34,081	-	-	-	146,375 2,736,453	16 745	-
2b.2.6 2b.2	Subtotal Period 2b Additional Costs	-	600	16		-	2,167	4,151	1,912	9,080	2,808 9,080		-	-	39,936	-	-	-	2,736,453	53,534	6,240
Period 9h	Collateral Costs																				
2b.3.1	Process decommissioning water waste	124	_	84	226	-	288	-	177	900	900	_	-	_	822	-	-	_	49,290	160	-
2b.3.2	Process decommissioning water waste	10	-	433	1,646	-	2,739	-	980	5,808	5,808	-	_	-	4,394	-	-	-	468,221	822	-
2b.3.3	Small tool allowance	-	607	-	-,	-	-,	-	91	698	698	-	-	-	-,	-	-	-		-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	30,985	4,648	35,633	-	35,633	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	135	607	517	1,872	-	3,027	30,985	5,895	43,038	7,406	35,633	-	-	5,215	-	-	-	517,511	983	-
	Period-Dependent Costs																				
2b.4.1	Decon supplies	1,930	-	-	-	-	-	-	483	2,413	2,413	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,565	156	1,721	1,721	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes Health physics supplies	-	4,113	-	-	-	-	5,406	541 1,028	5,946 5,141	5,946 5 141	-	-	-	-	-	-	-	-	-	-
2b.4.4	meanin physics supplies	-	4,113	-	-	-	-	-	1,028	5,141	5,141	-	-	-	-	-	-	-	-	-	-

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	inds of 2014 de	onars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	olumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 2b	Period-Dependent Costs (continued)																				
2b.4.5	Heavy equipment rental	-	4,737		-	-	-	-	711	5,448	5,448	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	206	112	-	634		196	1,147	1,147	-	-	-	9,891	-	-	-	197,816	323	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	2,879	432	3,310	3,310	-	-	-	-	-	-	-	-	-	-
2b.4.8 2b.4.9	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	1,030 4,614	103 461	1,133 5,076	1,133	5,076	-	-	-	-	-		-	-	-
2b.4.10	Site O&M Cost		-	_	-	-	_	390	59	449	449	-	-	-	-	-	-		-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,870	281	2,151	-	2,151	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	474	71	545	545	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	113	17	130	-	130	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-	-	-	-	-	-	16,435	2,465	18,900	18,900	-	-	-	-	-	-	-	-	-	311,913
2b.4.15 2b.4.16	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	31,803 57,166	4,770 8,575	36,574 65,741	36,574 $65,741$	-	-	-	-	-	-	-	-	-	359,994
2b.4.16 2b.4	Subtotal Period 2b Period-Dependent Costs	1,930	8,850	206	112	-	634	123,745	20,348	155,824	148,468	7,356	-	-	9,891	-		-	197,816	- 323	668,209 1,340,116
2b.0	TOTAL PERIOD 2b COST	11,848	39,320					158,880		290,714	246,319	42,989	1,405		,				17,566,290	646,966	1,346,356
			59,520	6,324	5,810	-	22,921	100,000	45,611	290,714	246,519	42,969	1,405	-	313,335	-	-	-	17,566,290	040,900	1,546,556
	2d - Decontamination Following Wet Fuel Stora	ge																			
	Direct Decommissioning Activities Remove spent fuel racks	1,078	96	195	949		1,231		097	2.700	2.700				10 270				054 909	1,632	
2d.1.1	Remove spent ruei racks	1,078	96	190	242	-	1,231	-	927	3,769	3,769	-	-	-	18,378	-	-	-	954,202	1,632	-
	of Plant Systems																				
2d.1.2.1	Containment Monitoring	-	28		1	-	5	-	9	44	44	-	-	-	78	-	-	-	4,043	457	-
2d.1.2.2	Electrical - Contaminated	-	953			-	382	-	356	1,879	1,879	-	-	-	5,707	-	-	-	296,337	14,915	
2d.1.2.3 2d.1.2.4	Fire Protection - RCA Fuel Pool Cooling & Cleanup	-	1,184 902		163 166	-	828 843	-	$559 \\ 491$	3,045 2,698	3,045 2,698	-	-	-	12,306 12,562	-	-	-	641,747 653,382	18,258 14,554	
2d.1.2.5	HVAC-Primary Containment	-	1,041		144	-	733		488	2,633	2,633	-	-	-	10,961	-	-		568,155	15,980	
2d.1.2.6	Reactor Bldg Closed Cooling Water	-	409		154	-	782	-	350	1,988	1,988	_	_	-	11,625	-	_		605,888	6,817	
2d.1.2.7	Reactor Building Floor Drains	-	8		0	-	1		2	13	13	-	-	-	21	-	-	-	1,101	123	
2d.1.2.8	Well Water	-	107		-	-	-	-	16	123	-	-	123	-	-	-	-	-	-	1,732	
2d.1.2	Totals	-	4,631	1,245	703	-	3,574	-	2,271	12,424	12,301	-	123	-	53,260	-	-	-	2,770,654	72,836	-
	ination of Site Buildings	200			404				000		4.000				20.00=				1 400 000	20.00	
2d.1.3.1	Reactor Building Spent Fuel Pool Totals	309 309	1,161			-	1,516	•	893 893	4,363	4,363	-	-	-	29,927	-	-	-	1,499,988	20,237	-
2d.1.3		309	1,161			-	1,516	-		4,363	4,363	-	-	-	29,927	-	-	-	1,499,988	20,237	-
2d.1.4	Scaffolding in support of decommissioning	-	807	16	9	-	44	-	216	1,092	1,092	-	-	-	662	-	-	-	34,383	14,110	-
2d.1	Subtotal Period 2d Activity Costs	1,388	6,695	1,538	1,356	-	6,366	-	4,306	21,648	21,525	-	123	-	102,228	-	-	-	5,259,227	108,815	-
	Additional Costs																				
2d.2.1	Remedial Action Surveys Subtotal Period 2d Additional Costs	-	-	-	-	-	-	676	203 203	878 878	878 878	-	-	-	-	-	-	-	-	10,649	
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	676	203	818	818	-	-	-	-	-	-	-	-	10,649	-
	Collateral Costs	0.0			170		201		100	202	222								04.010		
2d.3.1	Process decommissioning water waste	86	126	59	158	-	201	•	123	626	626	-	-	-	572		-	-	34,310	111	-
2d.3.3 2d.3.4	Small tool allowance Decommissioning Equipment Disposition	-	120	170	93	-	472	-	19 149	145 884	145 884	-	-	-	7,054	-	-		366,237	- 88	-
2d.3	Subtotal Period 2d Collateral Costs	86	126			-	673	-	291	1,654	1,654	-	-	-	7,626		-	-	400,548	200	-
Period 2d	Period-Dependent Costs																				
2d.4.1	Decon supplies	55	-	-	-	-	-	-	14	69	69	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	339	34	373	373	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes Health physics supplies	-	- 773	-	-	-	-	256	26 193	282 966	282 966	-	-	-	-	-	-	-	-	-	-
2d.4.4 2d.4.5	Heavy equipment rental	-	1,027		-	-	-	-	193 154	1,180	1,180	-	-	-			-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	1,027	- 68	37	-	209	-	65	379	379	-	-	-	3.270				65.393	107	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	333	50	383	383	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	187	19	206	206	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,000	100	1,100	-	1,100	-	-	-	-	-	-	-	-	-
2d.4.10	Site O&M Cost	-	-	-	-	-	-	85	13	97	97	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	$\frac{205}{24}$	31 4	236 28	236	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	24	4	28	-	28	-	-	-	-	-	-	-	-	-

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Bronio 1 V	Volumes		Burial/		Utility and
Activity		Decon	Removal		Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	Period-Dependent Costs (continued)																				
2d.4.13 2d.4.14	Security Staff Cost DOC Staff Cost		-	-	-	-	-	1,967 4,740	295 711	2,262 5,451	2,262 5,451	-	-	-	-	-	-	-	-	-	35,530 53,429
2d.4.15	Utility Staff Cost		-	- -	-	-	-	8,980	1,347	10,327	10,327	-	-	-	-	-	-	-	-	-	102,049
2d.4	Subtotal Period 2d Period-Dependent Costs	55	1,799	68	37	-	209	18,115	3,054	23,338	22,210	1,128	-	-	3,270	-	-	-	65,393	107	191,007
2d.0	TOTAL PERIOD 2d COST	1,529	8,621	1,834	1,643	-	7,248	18,791	7,853	47,519	46,267	1,128	123	-	113,123	-	-	-	5,725,168	119,770	191,007
PERIOD	2f - License Termination																				
	Direct Decommissioning Activities																				
2f.1.1 2f.1.2	ORISE confirmatory survey Terminate license	-	-	-	-	-	-	172	52	224 a	224	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
Period 2f A	Additional Costs																				
2f.2.1	License Termination Survey	-	-	-	-	-	-	14,037	4,211	18,248	18,248	-	-	-	-	-	-	-	-	218,104	3,120
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	14,037	4,211	18,248	18,248	-	-	-	-	-	-	-	-	218,104	3,120
	Collateral Costs							1 100	155	1 990	1 990										
2f.3.1 2f.3	DOC staff relocation expenses Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,163 1,163	175 175	1,338 1,338	1,338 1,338	-	-	-	-	-	-	-	-	-	-
Period 2f F	Period-Dependent Costs																				
2f.4.1	Insurance	-		-	-	-		505	51	556	556	-	-	-			-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	382	38	420	420	-	-	-	-	-	-	-	-	-	-
2f.4.3 2f.4.4	Health physics supplies Disposal of DAW generated	-	900	- 7	- 4	-	22	-	$\frac{225}{7}$	1,125 40	1,125 40	-	-	-	342				6.832	11	-
2f.4.5	Plant energy budget	-		- '	-	-	-	248	37	285	285	-	-	-	-		-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	307	31	338	338	-	-	-	-	-	-	-	-	-	-
2f.4.7 2f.4.8	Emergency Planning Fees Site O&M Cost	-	-	-	-	-		1,492 126	149 19	1,641 145	- 145	1,641	-		-		-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	36	5	42	-	42	-	-	-	-	-	-	-	-	-
2f.4.10	Security Staff Cost	-	-	-	-	-	-	1,556	233	1,790	1,790	-	-	-	-	-	-	-	-	-	28,299
2f.4.11 2f.4.12	DOC Staff Cost Utility Staff Cost	-	-	-	-	-	-	4,235 5,466	635 820	4,870 6,286	4,870 6,286	-	-	-					-		47,430 60,981
2f.4	Subtotal Period 2f Period-Dependent Costs	-	900	7	4	-	22	14,354	2,251	17,537	15,855	1,683	-	-	342	-	-	-	6,832	11	136,710
2f.0	TOTAL PERIOD 2f COST	-	900	7	4	-	22	29,727	6,688	37,347	35,664	1,683	-	-	342	-	-	-	6,832	218,115	139,830
PERIOD	2 TOTALS	14,419	89,676	33,331	19,022	-	89,487	332,318	121,975	700,228	620,048	75,588	4,591	-	900,815	1,303	1,066	-	49,104,360	1,469,687	2,639,666
PERIOD	3b - Site Restoration																				
Period 3b l	Direct Decommissioning Activities																				
	of Remaining Site Buildings		0.500							= 000			= 000							A. 150	
3b.1.1.1 3b.1.1.2	Reactor Building Auxiliary Building	-	6,790 4,415	-	-		-	-	1,018 662	7,808 5,077	-	-	7,808 5,077	-	-	-	-	-	-	64,458 $42,962$	-
3b.1.1.3	Capital Improvements 2009	-	1,552	-	-	-	-	-	233	1,785	-	-	1,785	-	-	-	-	-	-	20,778	-
3b.1.1.4	Capital Improvements 2014	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	54	-
3b.1.1.5 3b.1.1.6	Chemical Feed Building Diesel Generator Room	-	39 554	-	-		-	-	6 83	45 637	-	-	45 637	-	-	-	-	-	-	482 6,000	-
3b.1.1.7	Discharge Structure	-	23	-	-	-	-	-	3	26	-	-	26	-	-	-	-	-	-	190	-
3b.1.1.8	IRSF Building	-	819	-	-	-	-	-	123	941	-	-	941	-	-	-	-	-	-	8,924	-
3b.1.1.9 3b.1.1.10	Lake Screen House Main Access Facility		1,295 462	-	-	-	-	-	194 69	1,489 532	-	-	1,489 532	-	-	-		-	-	13,877 5,396	-
3b.1.1.11	Miscellaneous Yard Structures	-	2,352	-	-	-	-	-	353	2,705	-	-	2,705	-	-	-	-	-	-	27,035	-
3b.1.1.12 3b.1.1.13	New Service Building Outfall Structure	-	2,166 9	-	-	-	-	-	325	2,491	-	-	2,491	-	-	-	-	-	-	23,587	-
3b.1.1.13 3b.1.1.14	River Screen House	-	387	-	-	-	-	-	58	11 445	-	-	11 445	-	-	-	-	-	-	113 4,231	-
3b.1.1.15	Security Modifications 2009	-	736	-	-	-	-	-	110	846	-	-	846	-	-	-	-	-	-	3,834	-
3b.1.1.16	Security Modifications 2014 Service Building	-	40 1,778	-	-	-	-	-	$\frac{6}{267}$	46 2,045	-	-	46 2,045	-	-	-	-	-	-	528 $21,582$	
JU.1.1.11	bervice bunning	-	1,778	-	-	-	-	-	207	4,045	-	-	2,045	-	-	-	-	-	-	21,082	-

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spont Fuel	Sita	Processed		Posici V	Volumes		Burial/		Utility and
Activity		Decon		Packaging		Processing	Disposal	Other	Total	Total	Lic. Term.	Spent Fuel Management	Site Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
	n of Remaining Site Buildings (continued)		40							40			40								
3b.1.1.18 3b.1.1.19	~	-	43 320	-	-	-	-	-	6 48	49 368	-	-	49 368	-	-	-	-	-	-	591 3,346	-
3b.1.1.20	Solid Radwaste Building	-	2,428	-	-	-	-		364	2,792	-	-	2,792	-	-	-	-		-	23,167	-
3b.1.1.21	Training Center	-	1,467	-	-	-	-	-	220	1,687	-	-	1,687	-	-	-	-	-	-	16,863	-
3b.1.1.22	Turbine Building	-	6,492	-	-	-	-	-	974	7,466	-	-	7,466	-	-	-	-	-	-	68,584	-
3b.1.1.23		-	2,536	-	-	-	-	-	380	2,917	-	-	2,917	-	-	-	-	-	-	22,592	
3b.1.1.24 3b.1.1	Wastewater Treatment Plant Totals	-	73 36,779	-	-		-	-	$ \begin{array}{r} 11 \\ 5,517 \end{array} $	83 42,296	-		83 42,296	-	-	-	-	-	-	911 380,083	
Site Close	out Activities																				
3b.1.2	BackFill Site	-	861	-	-	-	-	-	129	991	-	-	991	-	-	-	-	-	-	1,535	
3b.1.3	Grade & landscape site	-	198	-	-	-	-	-	30	228	-	-	228	-	-	-	-	-	-	499	
3b.1.4 3b.1	Final report to NRC Subtotal Period 3b Activity Costs	-	37,839	-	-	-	-	87 87	13 5,689	100 43,615	100 100	-	43,515	-	-	-	-	-	-	382,117	654 654
	·	-	51,059	-	-	-	-	01	5,669	45,615	100	-	45,515	-	-	-	-	-	-	362,117	694
Period 3b 3b.2.1	Additional Costs Concrete Crushing	_	1,260	_	-	_	-	6	190	1,456	-	-	1,456	_	-	_	-	_	-	5,872	
3b.2.2	Cofferdam Construction and Teardown	-	989	-	-	-	-	-	148	1,138	-	-	1,138	-	-	-	-	-	-	8,720	-
3b.2	Subtotal Period 3b Additional Costs	-	2,250	-	-	-	-	6	338	2,593	-	-	2,593	-	-	-	-	-	-	14,592	-
	Collateral Costs		415						20	450			450								
3b.3.1 3b.3	Small tool allowance Subtotal Period 3b Collateral Costs	-	$417 \\ 417$	-	-	-	-	-	63 63	479 479	-	-	479 479		-	-		-	-	-	-
Period 3b 3b.4.1	Period-Dependent Costs							660	66	790		726									
3b.4.1 3b.4.2	Insurance Property taxes	-	-	-	-	-	-	998	100	726 1,098	-	1,098	-	-	-	-	-	-	-	-	
3b.4.3	Heavy equipment rental	-	5,685	-	-	_	-	-	853	6,538	-	-	6,538	_	-	_	-		-	-	_
3b.4.4	Plant energy budget	-	-	-	-	-	-	324	49	373	-	-	373	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	253	25	279	-	279	-	-	-	-	-	-	-	-	-
3b.4.6 3b.4.7	Emergency Planning Fees ISFSI Operating Costs	-	-	-	-	-	-	3,898 95	390 14	4,288 110	-	4,288 110	-	-	-	-	-	-	-	-	-
3b.4.7 3b.4.8	Site O&M Cost	-	-	-	-	-	-	329	49	379	-	-	379	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	3,885	583	4,468	0	3,664	804	-	-	-	-	-	-	-	70,317
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	10,124	1,519	11,642	-	-	11,642	-	-	-	-	-	-	-	110,391
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,422	963	7,386	-	1,329	6,056	-	-	-	-	-	-	-	70,317
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,685	-	-	-	-	26,990	4,611	37,285	0	11,493	25,792	-	-	-	-	-	-	-	251,026
3b.0	TOTAL PERIOD 3b COST	-	46,191	-	-	-	-	27,082	10,700	83,973	100	11,493	72,380	-	-	-	-	-	-	396,708	251,680
PERIOD	3c - Fuel Storage Operations/Shipping																				
Period 3c	Direct Decommissioning Activities																				
Period 3c	Collateral Costs																				
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,563	1,734	13,297	-	13,297	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	•	-	-	•	-	11,563	1,734	13,297	-	13,297	-	-	•	-	•	-	-	-	-
	Period-Dependent Costs							0.000	22-	0.0==		0.055									
3c.4.1 3c.4.2	Insurance Property taxes	-	-	-	-	-	-	3,068 4,637	$307 \\ 464$	3,375 5,100	-	3,375 5,100	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	1,855	185	2,040	-	2,040	-			-			-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	18,109	1,811	19,920	-	19,920	-		-	-			-	-	-
3c.4.6	Site O&M Cost	-	-	-	-	-	-	1,531	230	1,760	-	1,760	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	443	66	509	-	509	-	-	-	-	-	-	-	-	- 001 000
3c.4.8 3c.4.9	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	14,801 5,504	2,220 826	17,021 6,329	-	17,021 6,329	-	-	-	-	-	-	-	-	261,283 65,417
3c.4.9	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	49,947	6,109	56,056	-	56,056	-			-			-	-	326,700
	-																				
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	61,510	7,843	69,353	-	69,353	-	-	-	-	-	-	-	-	326,700

Table C-2
LaSalle County Station, Unit 2
DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 8	Bd - GTCC shipping																				
Period 3d I	Direct Decommissioning Activities																				
3d.1.1.1	eam Supply System Removal Vessel & Internals GTCC Disposal	-	-	750	-	-	9,123	-	1,556	11,429	11,429	-	-	-	-	-	-	2,450	482,647	-	-
3d.1.1 3d.1	Totals Subtotal Period 3d Activity Costs	-	-	750 750	-	-	9,123 9,123	-	1,556 1,556	$11,429 \\ 11,429$	$11,429 \\ 11,429$	-	-	-	-	-	-	2,450 $2,450$	482,647 482,647	-	-
	Period-Dependent Costs							10		1.4		1.4									
3d.4.1 3d.4.2	Insurance Property taxes	-		-	-	-	-	13 19	1 2	14 21	-	$\frac{14}{21}$	-	-					-	-	-
3d.4.4	Emergency Planning Fees	-	-	-	-	-	-	75	7	82	-	82	-	-	-		-		-	-	-
3d.4.5	Site O&M Cost	-	-	-	-	-	-	6	1	7	-	7	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	61	9	70	-	70	-	-	-	-	-	-	-	-	1,080
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	270
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	199	24	223	-	223	-	-	-	-	-	-	-	-	1,350
3d.0	TOTAL PERIOD 3d COST	-	-	750	-	-	9,123	199	1,580	11,652	11,429	223	-	-	-	-	-	2,450	482,647	-	1,350
PERIOD 8	Be - ISFSI Decontamination																				
Period 3e I	Direct Decommissioning Activities																				
Period 3e A	Additional Costs																				
3e.2.1	License Termination ISFSI	_	302	336	502	-	1,502	1,783	1,106	5,531	5,531	_	_	-	24,637	-	_	_	1,948,035	14,596	1,080
3e.2	Subtotal Period 3e Additional Costs	-	302	336	502	-	1,502	1,783	1,106	5,531	5,531	-	-	-	24,637	-	-	-	1,948,035	14,596	1,080
	Period-Dependent Costs							~ 0	1.4	50	5 0										
3e.4.1	Insurance	-	-	-	-	-	-	56	14	70	70	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	163	41	204	204	-	-	-	-	-	-	-	-	-	9.400
3e.4.4	Security Staff Cost	-	-	-	-	-	-	138	35	173	173	-	-	-	-	-	-	-	-	-	2,468
3e.4.5	Utility Staff Cost	-	-	-	-	-	-	162 519	41 130	203	203 649	-	-	-	-	-	-	-	-	-	1,870
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-			649		-	-	-	-	-	-	-	-	-	4,338
3e.0	TOTAL PERIOD 3e COST	-	302	336	502	-	1,502	2,303	1,236	6,180	6,180	-	-	-	24,637	-	-	-	1,948,035	14,596	5,418
PERIOD :	3f - ISFSI Site Restoration																				
Period 3f I	Firect Decommissioning Activities																				
Period 3f A	dditional Costs																				
3f.2.1	Site Restoration ISFSI	-	1,344	-	-	-	-	28	206	1,577	-	-	1,577	-	-	-	-	-	-	15,775	80
3f.2	Subtotal Period 3f Additional Costs	-	1,344	-	-	-	-	28	206	1,577	-	-	1,577	-	-	-	-	-	-	15,775	80
	dollateral Costs																				
3f.3.1 3f.3	Small tool allowance Subtotal Period 3f Collateral Costs	-	22 22		-	-	-	-	3 3	25 25	-	-	25 25		-	-	-	-	-	-	-
Period 3f P	eriod-Dependent Costs																				
3f.4.2	Property taxes	-	-	-	-	-	-	86	9	95	-	-	95	-	-	-	-	-	-	-	-
3f.4.4	Security Staff Cost	-	-	-	-	-	-	73	11	84	-	-	84	-	-	-	-	-	-	-	1,307
3f.4.5	Utility Staff Cost	-	-	-	-	-	-	70	11	81	-	-	81		-	-	-	-	-	-	810
3f.4	Subtotal Period 3f Period-Dependent Costs	-	-	-	-	-	-	230	30	260	-	-	260	-	-	-	-	-	-	-	2,117
3f.0	TOTAL PERIOD 3f COST	-	1,366	÷	-	-	-	258	239	1,862	-	-	1,862	-	-	-	-	-	-	15,775	2,197
PERIOD :	3 TOTALS	-	47,858	1,086	502	-	10,625	91,351	21,599	173,021	17,710	81,069	74,242	-	24,637	-	-	2,450	2,430,682	427,079	587,346
TOTAL C	OST TO DECOMMISSION	17,671	140,194	34,558	19,970	-	104,480	559,126	166,073	1,042,072	774,765	188,033	79,274	-	926,640	2,303	1,066	2,450	51,674,140	1,910,874	4,215,570

Table C-2 LaSalle County Station, Unit 2 **DECON Decommissioning Cost Estimate** (thousands of 2014 dollars)

							Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial/		Utility and
Acti	vity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Inc	dex	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours

TOTAL COST TO DECOMMISSION WITH 18.96% CONTINGENCY:	\$1,042,072	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 74.35% OR:	\$774,765	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 18.04% OR:	\$188,033	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 7.61% OR:	\$79,274	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	930,009	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,450	cubic feet
TOTAL SCRAP METAL REMOVED:	67,341	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,910,874	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

APPENDIX D

DETAILED COST ANALYSIS

DELAYED DECON

	Pag	<u>ze</u>
LaSalle County Station, Unit 1	D	-2
LaSalle County Station, Unit 2	D	12

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(tilousaii	ias of 2014 ao	iiais)											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial V	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet		Cu. Feet				Manhours	
PERIOD	1a - Shutdown through Transition																				
Period 1a	Direct Decommissioning Activities																				
1a.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	481	144	625	625	-	-	-	-	-	-	-	-	-	
1a.1.2 1a.1.3	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	173	26	199 a	199	-	-	-	-	-	-	-	-	-	1,300
1a.1.4	Remove fuel & source material									n/a											
1a.1.5	Notification of Permanent Defueling									a											
1a.1.6 1a.1.7	Deactivate plant systems & process waste Prepare and submit PSDAR	_			_			267	40	a 307	307	_		_					_	_	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	173	26	199	199	-	-	-	-	-	-	-	-	-	1,300
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	133 133	20 20	153 153	153 153	-	-	-	-	-	-	-	-	-	1,000 1,000
1a.1.11 1a.1.12	End product description Detailed by-product inventory	-	-	-	-	-	-	200	30	230	230	-	-	-				-	-		1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	414	62	476	476	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	667	100	767	767	-	-	-	-	-	-	-	-	-	5,000
Activity Sp	pecifications																				
	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	656	98	755	755	-	-	-	-	-	-	-	-	-	4,920
		-	-	-	-	-	-	556	83	639	639	-	-	-	-	-	-	-	-	-	4,167
	Plant structures and buildings Waste management	-		-	-	-	-	416 267	62 40	479 307	479 307	-		-					-		3,120 2,000
		-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
1a.1.16	Total	-	-	-	-	-	-	2,162	324	2,486	2,486	-	-	-	-	-	-	-	-	-	16,207
Detailed W	Vork Procedures																				
	Plant systems	-	-	-	-	-	-	158	24	182	182	-	-	-	-	-	-		-	-	1,183
	Facility closeout & dormancy	-	-	-	-	-	-	160	24	184	184	-	-	-	-	-	-	-	-	-	1,200
1a.1.17	Total	-	-	-	-	-	-	318	48	366	366	-	-	-	-	-	-	-	-	-	2,383
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	13	2	15	15	-	-	-	-	-	-	-	-	-	100
1a.1.19	Drain/de-energize non-cont. systems									a											
1a.1.20	Drain & dry NSSS									a											
1a.1.21 1a.1.22	Drain/de-energize contaminated systems Decon/secure contaminated systems									a a											
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,268	862	6,131	6,131	-	-	-	-	-	-	-	-	-	35,890
Period 1a	Additional Costs																				
1a.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
Period 1a	Period-Dependent Costs																				
1a.4.1	Insurance	-	-	-	-	-	-	2,050	205	2,255	2,255	-	-	-	-	-	-	-	-	-	-
1a.4.2 1a.4.3	Property taxes Health physics supplies	-	491	-	-	-	-	-	123	614	614	-	-	-			-	-	-	-	-
1a.4.4	Heavy equipment rental	-	527	-	-	-	-		79	606	606	-	-	-					-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	7	-	39	-	12	71	71	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,623	243	1,867	1,867	-	-	-	-	-	-	-	-	-	-
1a.4.7 1a.4.8	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	1,181 2,227	118 223	1,299 2,450	1,299	2,450	-		-	-	-	-	-	-	-
1a.4.6 1a.4.9	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	2,450	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1a.4.12 1a.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	610 35,778	91 5,367	701 $41,144$	701 41,144	-	-	-	-	-	-	-	-	-	12,264 423,400
1a.4.13 1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	7	-	39	35,778 44,472	5,367 6,612	52,160	41,144	3,415	-		610	-	-	-	12,190	20	
1a.0	TOTAL PERIOD 1a COST		1,018			_	39	60,553	9,096	70,725		3,415			610				12,190		
18.0	TOTAL FEMIOD 18 COST	-	1,018	13	7	-	39	866,00	9,096	10,125	67,311	3,415	-	-	910	-	-	-	12,190	20	4/1,004

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(tnousan	ds of 2014 dol	iars)											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
PERIOD	1b - SAFSTOR Limited DECON Activities																				
Period 1b	Direct Decommissioning Activities																				
	nination of Site Buildings																				
1b.1.1.1	Reactor Building	3,298	-	-	-	-	-	-	1,649	4,947	4,947	-	-	-	-	-	-	-	-	49,197	-
1b.1.1.2	Auxiliary Building Off Gas Building	365	-	-	-	-	-	-	182	547	547	-	-	-	-	-	-	-	-	5,731	-
1b.1.1.3 1b.1.1.4	Turbine Building	163 1,915	-	-	-	-	-	-	81 958	244 $2,873$	244 2,873	-	-	-	-	-	-	-	-	2,566 30,081	-
1b.1.1.4 1b.1.1	Totals	5,741	-		-		-	-	2,870	8,611	8,611	-	-	-			-			87,576	
1b.1	Subtotal Period 1b Activity Costs	5,741	-	-	-	-	-	-	2,870	8,611	8,611	-	-	-	-	-	-	-	-	87,576	-
Period 1b	Collateral Costs																				
1b.3.1	Decon equipment	883	-	-	-	-	-	-	132	1,015	1,015	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	164	-	106	285	-	363	-	226	1,145	1,145	-	-	-	1,035	-	-	-	62,116	202	-
1b.3.4	Small tool allowance	-	94		-	-	-	-	14	108	108	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,047	94	106	285	-	363	-	373	2,268	2,268	-	-	-	1,035	-	-	-	62,116	202	-
	Period-Dependent Costs																				
1b.4.1	Decon supplies	1,459	-	-	-	-	-	-	365	1,824	1,824	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	394	39 300	434	434	-	-	-	-	-	-	-	-	-	-
1b.4.3 1b.4.4	Property taxes Health physics supplies	-	- 522	-	-	-	-	2,996	130	3,295 652	3,295 652	-	-	-	-	-	-	-	-	-	-
1b.4.4 1b.4.5	Heavy equipment rental	-	131	-	-	-	-		20	151	151	-	_	-	-	-	-	-		-	-
1b.4.6	Disposal of DAW generated	_	-	18	3 10	_	55	-	17	99	99		_	-	857	_	-	_	17,148	28	-
1b.4.7	Plant energy budget	_	-	-	-	_	-	405	61	465	465	-	_	-	-	_	-	-	-	-	_
1b.4.8	NRC Fees	-	-	-	-	_	-	172	17	189	189		-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	555	56	611	-	611	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	197	30	227	-	227	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	152	23	175	175	-	-	-	-	-	-	-	-	-	3,058
1b.4.14	Utility Staff Cost	1 450	-	-	-	-	-	8,920	1,338	10,258	10,258	-	-	-	-	-	-	-	15.140	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	1,459	653	18	3 10	-	55	13,844	2,403	18,441	17,590	851	-	-	857	-	-	-	17,148	28	108,618
1b.0	TOTAL PERIOD 1b COST	8,246	747	124	295	-	418	13,844	5,646	29,320	28,469	851	-	-	1,893	-	-	-	79,265	87,805	108,618
PERIOD	1c - Preparations for SAFSTOR Dormancy																				
Period 1c	Direct Decommissioning Activities																				
1c.1.1	Prepare support equipment for storage	-	486	-	-	-	-	-	73	559	559	-	-	-	-	-	-	-	-	3,000	
1c.1.2	Install containment pressure equal. lines	-	48	-	-	-	-	-	7	55	55	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	10,874	-
1c.1.4	Secure building accesses							5 0	10	a	20										7 00
1c.1.5	Prepare & submit interim report	-	-	-	-	•	-	78	12	89	89	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	534	-	-	-	-	811	312	1,657	1,657	-	-	-	-	-	-	-	-	14,574	583
	Collateral Costs																				
1c.3.1	Process decommissioning water waste	149	-	97			331	-	206	1,041	1,041	-	-	-	942		-	-	56,524	184	
1c.3.3	Small tool allowance	-	4	-		-	-	-	1	5	5	-	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	149	4	97	259	-	331	-	206	1,046	1,046	-	-	-	942	-	-	-	56,524	184	-
	Period-Dependent Costs							200	40	100	400										
1c.4.1	Insurance	-	-	-	-	-	-	399	40	439	439	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes Health physics supplies	-	101	-	-	-	-	3,029	303	3,331 239	3,331 239	-	-	-	-	-	-	-	-	-	-
1c.4.3 1c.4.4	Heavy equipment rental	-	191 133		-	-	-	-	48 20	239 153	239 153	-	-	-	-	-		-	-	-	-
1c.4.4 1c.4.5	Disposal of DAW generated	-	155	- 3	. 2	-	10	-	3	185	18	-	-	-	154	-	-	-	3,073	- 5	-
1c.4.6	Plant energy budget	-	-	-		-	-	409	61	471	471	-	-	_	-			-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	174	17	191	191	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	561	56	618	-	618	-	-	-	-	-	-	-	-	-

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousan	as of 2014 do	nars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 1c	Period-Dependent Costs (continued)																				
1c.4.9	Site O&M Cost	-	-	-	-	-	-	42	6	48	48	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	199	30	229	-	229	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	- 0.001
1c.4.12 1c.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	154 9,018	23 1,353	177 $10,371$	177 10,371	-	-	-	-	-	-	-	-	-	3,091 106,720
1c.4.15 1c.4	Subtotal Period 1c Period-Dependent Costs	-	324	3	2	-	10	13,996	1,962	16,297	15,436	861			154	-	-	-	3,073	5	109,811
1c.0	TOTAL PERIOD 1c COST	149	862	100	261	-	341	14,807	2,480	19,000	18,139	861	-	-	1,096	-	-	-	59,597	14,762	110,395
PERIOD	1 TOTALS	8,395	2,627	237	563	-	798	89,204	17,222	119,045	113,919	5,127	-	-	3,598	-	-	-	151,052	102,588	690,566
PERIOD	2a - SAFSTOR Dormancy with Wet Spent Fuel	l Storage																			
Period 2a	Direct Decommissioning Activities																				
2a.1.1	Quarterly Inspection									a											
2a.1.2	Semi-annual environmental survey									a											
2a.1.3	Prepare reports							F01	00	a	000										
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	591	89	680	680	-	-	-	-	-	-	-	-	-	-
2a.1.5 2a.1	Maintenance supplies Subtotal Period 2a Activity Costs	-	-	-	-	-	-	2,044 $2,635$	511 600	2,555 3,235	2,555 3,235	-	-	-	-	-	-	-	-	-	-
		•	-	•	-	•	-	2,055	000	5,255	3,233	-	-	-	-	-	•	-	•	•	-
	Collateral Costs							1 4 00 7	0.104	10.010		10010									
2a.3.1 2a.3	Spent Fuel Capital and Transfer Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	14,625 $14,625$	2,194 2,194	16,819 16,819	-	16,819 16,819	-	-	-	-	-	-	-	-	-
								11,020	2,101	10,010		10,010									
	Period-Dependent Costs							10.051				11.500									
2a.4.1	Insurance	-	-	-	-	-	-	10,654	1,065	11,720	-	11,720	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	9.714	-	-	-	-	25,544	2,554	28,098	28,098	-	-	-	-	-	-	-	-	-	-
2a.4.3 2a.4.4	Health physics supplies Disposal of DAW generated	-	2,714	65	- 35	-	199	-	679 61	3,393 360	3,393 360	-	-	-	3.102	-	-	-	62,040	101	-
2a.4.4 2a.4.5	Plant energy budget	-	-	69	99	-	199	4,777	717	5,494	-	5,494	-	-	5,102	-	-	-	62,040	101	-
2a.4.6	NRC Fees				_			4,258	426	4,684	4,684	0,404									
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	28,717	2,872	31,589	-	31,589	-	-	-	-	-	-	-	-	-
2a.4.8	Site O&M Cost	_	_	-	_	-	-	2,428	364	2,792	-	2,792	_	-	-	_	-	-	-	_	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	_	-	11,641	1,746	13,387	-	13,387	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	703	105	808	-	808	-	-	-	-	-	-	-	-	-
2a.4.11	Security Staff Cost	-	-	-	-	-	-	43,509	6,526	50,035	-	50,035	-	-	-	-	-	-	-	-	817,313
2a.4.12	Utility Staff Cost	-	-	-	-	-	-	63,131	9,470	72,600	-	72,600	-	-	-	-	-	-	-	-	721,249
2a.4	Subtotal Period 2a Period-Dependent Costs	-	2,714	65	35	-	199	195,360	26,585	224,958	36,534	188,424	-	-	3,102	-	-	-	62,040	101	1,538,561
2a.0	TOTAL PERIOD 2a COST	-	2,714	65	35	-	199	212,621	29,379	245,012	39,769	205,243	-	-	3,102	-	-	-	62,040	101	1,538,561
PERIOD	2b - SAFSTOR Dormancy with Dry Spent Fuel	l Storage																			
	Direct Decommissioning Activities																				
2b.1.1	Quarterly Inspection									a											
2b.1.2 2b.1.3	Semi-annual environmental survey									a											
2b.1.3 2b.1.4	Prepare reports Bituminous roof replacement					_		141	21	a 162	162										
2b.1.4 2b.1.5	Maintenance supplies	-	-	-	-	-	-	487	122	609	609	-	-	-	-	-	-	-	-	-	-
2b.1.6	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	628	143	771	771	-	-	-	-	-	-	-	-	-	-
Period 2b	Collateral Costs																				
2b.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	4,250	638	4,888	-	4,888	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	4,250	638	4,888	-	4,888	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
2b.4.1	Insurance	-	-	-	-	-	-	2,319	232	2,551	-	2,551	-	-	-	-	-	-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	1,752	175	1,927	-	1,927	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	319		-	-	-	-	80	398	398	-	-	-	-	-	-	-		-	-
2b.4.4	Disposal of DAW generated	-	-	8	4	-	23	-	7	42	42	-	-	-	362	-	-	-	7,245		-
2b.4.5	Plant energy budget	-	-	-	-	-	-	569	85	655	1.005	655	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	968	97	1,065	1,065	-	-	-	-	-	-	-	-	-	-

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

										,											
Activity		Decon	Removal	Dockoring	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet			Cu. Feet			Manhours	
eriod 2b I	Period-Dependent Costs (continued)																				
b.4.7	Emergency Planning Fees	-	-	-	-	-	-	6,844	684	7,528	-	7,528	-	-	-	-	-	-	-	-	-
b.4.8	Site O&M Cost	-	-	-	-	-	-	579	87	665	-	665	-	-	-	-	-	-	-	-	-
b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	167	25	193	-	193	-	-	-	-	-	-	-	-	-
b.4.10	Security Staff Cost	-	-	-	-	-	-	5,593	839	6,433	-	6,433	-	-	-	-	-	-	-	-	98,74
b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,048	907	6,955	-	6,955	-	-	-	-	-	-	-	-	73,14
b.4	Subtotal Period 2b Period-Dependent Costs	-	319	8	4	-	23	24,840	3,219	28,412	1,505	26,907	-	-	362	-	-	-	7,245	12	171,88
b.0	TOTAL PERIOD 2b COST	-	319	8	4	-	23	29,718	3,999	34,070	2,276	31,794	-	-	362	-	-	-	7,245	12	171,88
ERIOD 2	2 TOTALS	-	3,033	72	39	-	222	242,338	33,378	279,082	42,045	237,037	-	-	3,464	-	-	-	69,285	113	1,710,44
ERIOD :	Ba - Reactivate Site Following SAFSTOR Dorm	ancy																			
eriod 3a I	Direct Decommissioning Activities																				
a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	173	26	199	199	-	-	-	-	-	-	-	-	-	1,30
ı.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	614	92	706	706	-	-	-	-	-	-	-	-	-	4,60
.1.3	Perform detailed rad survey									a											
.1.4	End product description	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,00
1.5	Detailed by-product inventory	-	-	-	-	-	-	173	26	199	199	-	-	-	-	-	-	-	-	-	1,30
1.6	Define major work sequence	-	-	-	-	-	-	1,001	150	1,151	1,151	-	-	-	-	-	-	-	-	-	7,50
1.7	Perform SER and EA	-	-	-	-	-	-	414	62	476	476	-	-	-	-	-	-	-	-	-	3,10
1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	667	100	767	767	-	-	-	-	-	-	-	-	-	5,00
.9	Prepare/submit License Termination Plan Receive NRC approval of termination plan	-	-	-	-	-	-	546	82	628 a	628	-	-	-	-	-	-	-	-	-	4,09
.10	pecifications									а											
	Re-activate plant & temporary facilities	-	-	-	-	-	-	983	147	1,131	1,018	-	113	-	-	-	-	-	-	-	7,37
	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	-	4,16
	Reactor internals	-	-	-	-	-	-	947	142	1,089	1,089	-	-	-	-	-	-	-	-	-	7,10
	Reactor vessel	-	-	-	-	-	-	867	130	997	997	-	-	-	-	-	-	-	-	-	6,5
	Sacrificial shield	-	-	-	-	-	-	67	10	77	77	-	-	-	-	-	-	-	-	-	5
11.6	Moisture separators/reheaters	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,0
11.7	Reinforced concrete	-	-	-	-	-	-	213	32	245	123	-	123	-	-	-	-	-	-	-	1,6
11.8	Main Turbine	-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,0
11.9	Main Condensers	-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,0
11.10	Pressure suppression structure	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,0
	Drywell	-	-	-	-	-	-	213	32	245	245	-	-	-	-	-	-	-	-	_	1,6
.11.12	Plant structures & buildings	-	-	-	-	-	-	416	62	479	239	-	239	-	-	-	-	-	-	-	3,1
.11.13	Waste management	-	-	-	-	-	-	614	92	706	706	-	-	-	-	-	-	-	-	-	4,60
	Facility & site closeout	-	-	-	-	-	-	120	18	138	69	-	69	-	-	-	-	-	-	-	90
	Total	-	-	-	-	-	-	5,954	893	6,847	6,239	-	608	-	-	-	-	-	-	-	44,65
ning &	k Site Preparations																				
.12	Prepare dismantling sequence	-	-	-	-	-	-	320	48	368	368	-	-	-	-	-	-	-	-	-	2,40
.13	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
.14	Design water clean-up system	-	-	-	-	-	-	187	28	215	215	-	-	-	-	-	-	-	-	-	1,40
.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
.16	Procure casks/liners & containers	-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,23
	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	15,646	2,347	17,993	17,385	-	608	-	-	-	-	-	-	-	77,55
iod 3a I	Period-Dependent Costs																				
4.1	Insurance	-	-	-	-	-	-	661	66	727	727	-	-	-	-	-	-	-	-	-	-
.2	Property taxes	-	-	-	-	-	-	500	50	550	550	-	-	-	-	-	-	-	-	-	-
1.3	Health physics supplies	-	429	-	-	-	-	-	107	536	536	-	-	-	-	-	-	-	-	-	-
1.4	Heavy equipment rental	-	527	-	-	-	-	-	79	606	606	-	-	-	-	-	-	-	-	-	-
.5	Disposal of DAW generated	-	-	11	6	-	33	-	10	60	60	-	-	-	514	-	-	-	10,287	17	-
.6	Plant energy budget	-	-	-	-	-	-	1,623	243	1,867	1,867	-	-	-	-	-	-	-	-	-	-
.7	NRC Fees	-	-	-	-	-	-	378	38	416	416	-	-	-	-	-	-	-	-	-	-
.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	-
	Security Staff Cost	_	-	-	-	-	-	3,631	545	4,176	4,176	-	-	-	-	-	-	-	-	-	65,17
1.9																					
4.9 4.10	Utility Staff Cost	-	-	-	-	-	-	21,866	3,280	25,146	25,146	-	-	-	-	-	-	-	-	-	258,62

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate (thousands of 2014 dollars)

								(tilousaii	as of 2014 dol	iiais)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
3a.0	TOTAL PERIOD 3a COST		956				33	44,471	6,790	52,266	51,658		608		514				10,287	17	
		-	950	11	O	-	55	44,471	0,750	52,200	51,056	-	008	-	514	-	-	-	10,267	17	401,300
	3b - Decommissioning Preparations																				
Period 3b	Direct Decommissioning Activities																				
	Work Procedures							401	0.7	5 00	050		70								4.500
3b.1.1.1 3b.1.1.2	Plant systems Reactor internals	-	-	-	-	-	-	631 534	95 80	726 614	653 614	-	73	-	-	-	-	-	-	-	4,733 4,000
3b.1.1.2 3b.1.1.3	Remaining buildings	-	-	-	-	-	-	180	27	207	52	-	155	-	-	-	-	-	-		1,350
3b.1.1.4	CRD housings & NIs	_	-	_	_	_	-	133	20	153	153		100	_	_	_	_	_	_	-	1,000
3b.1.1.5	Incore instrumentation	_	-	_	_	_	_	133	20	153	153	-	-	-	_	-	-	_	_	-	1,000
3b.1.1.6	Removal primary containment	_	-	-	_	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.7	Reactor vessel	-	-	-	-	_	-	484	73	557	557	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	160	24	184	92	-	92	-	-	-	-	-	-	-	1,200
3b.1.1.9	Sacrificial shield	-	-	-	-	-	-	160	24	184	184	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	133	20	153	77	-	77	-	-	-	-	-	-	-	1,000
3b.1.1.11	Main Turbine	-	-	-	-	-	-	277	42	319	319	-	-	-	-	-	-	-	-	-	2,080
3b.1.1.12		-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,088
3b.1.1.13		-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.14		-	-	-	-	-	-	364	55	419	377	-	42	-	-	-	-	-	-	-	2,730
	Reactor building	-	-	-	-	-	-	364	55	419	377	-	42	-	-	-	-	-	-	-	2,730
3b.1.1	Total	-	-	-	-	-	-	4,368	655	5,023	4,542	-	480	-	-	-	-	-	-	-	32,741
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	•	-	4,368	655	5,023	4,542	-	480	-	-	-	-	-	-	-	32,741
	Additional Costs																				
3b.2.1	Site Characterization	-	-	-	-	-	-	6,502	1,951	8,453	8,453	-	-	-	-	-	-	-	-	30,500	10,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	•	-	6,502	1,951	8,453	8,453	-	-	-	-	-	-	-	-	30,500	10,852
Period 3b	Collateral Costs																				
3b.3.1	Decon equipment	883	-	-	-	-	-	-	132	1,015	1,015	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	883	1,100	-	-	-	-	1,163	472	3,618	3,618	-	-	-	-	-	-	-	-	-	-
Period 3b	Period-Dependent Costs																				
3b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	332	33	365	365	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	251	25	276	276	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	237	-	-	-	-	-	59	296	296	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	264	-	-	-	-	-	40	304	304	-	-	-	-	-	-	-		-	-
3b.4.6 3b.4.7	Disposal of DAW generated	-	-	6	3	-	19	814	6 122	34 936	34 936	-	-	-	292	-	-	-	5,834	10	-
3b.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	190	19	208	208	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Cost		_	-			_	83	12	95	95			-				_	-	-	
3b.4.10	Security Staff Cost	_	_	_	_	_	_	1,820	273	2,094	2,094		_	_	_	_	_	_	_	_	32,679
3b.4.11	DOC Staff Cost	_	-	_	_	-	-	5,326	799	6,125	6,125	_	-	-	_	-	-	-	_	_	58,560
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	10,963	1,644	12,608	12,608		-	-	-	-	-	-	-	-	129,669
3b.4	Subtotal Period 3b Period-Dependent Costs	27	501	6	3	-	19	19,778	3,039	23,373	23,373	-	-	-	292	-	-	-	5,834	10	220,907
3b.0	TOTAL PERIOD 3b COST	910	1,601	6	3	-	19	31,811	6,117	40,467	39,987	-	480	-	292	-	-	-	5,834	30,510	264,500
PERIOD	3 TOTALS	910	2,557	17	9	-	52	76,282	12,907	92,734	91,645	-	1,089	-	806	-	-	-	16,121	30,526	665,866
PERIOD	4a - Large Component Removal																				
Period 4a	Direct Decommissioning Activities																				
Nuclear S	team Supply System Removal																				
4a.1.1.1	Recirculation System Piping & Valves	25	90	21	23	-	157	-	80	395	395	-	-	-	1,064	-	-	-	121,654	1,846	-
4a.1.1.2	Recirculation Pumps & Motors	13	51				273	-	95	488	488	-	-	-	2,594	-	-	-	211,420		
4a.1.1.3	CRDMs & NIs Removal	56	1,138			-	420	-	497	2,840	2,840	-	-	-	5,536	-	-	-	325,500	18,886	-
4a.1.1.4	Reactor Vessel Internals	191	3,101	8,312	1,887	-	9,308	329	9,675	32,803	32,803	-	-	-	1,878	2,046	393		439,019		1,379
4a.1.1.5	Vessel & Internals GTCC Disposal	-	-	-	-	-	9,123	-	1,368	10,491	10,491	-	-	-	-	-	-	2,450	482,647		

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

							(thousan	us 01 2014 uo	iidi s)											
Activity	Decon	Removal			Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Nuclear Steam Supply System Removal (continued)																				
4a.1.1.6 Reactor Vessel 4a.1.1 Totals	146	6,287	2,695		-	5,571 $24,852$	329 657	8,721 20,436	25,449	25,449 72,466	-	-	-	18,660	2,046	393	9.450	1,914,414	31,175	1,379 2,758
4a.1.1 Totals	431	10,667	11,649	5,774	-	24,002	697	20,456	72,466	12,466	-	-	•	29,733	2,046	999	2,450	3,494,654	84,218	2,150
Removal of Major Equipment																				
4a.1.2 Main Turbine/Generator 4a.1.3 Main Condensers	-	547 1,070			-	8,822 6,288	-	2,919 2,251	17,190 13,102	17,190 13,102	-	-	-	131,716 93,880	-	-	-	6,838,856 4,874,376	8,523 16,783	-
4a.1.3 Walli Condensers	•	1,070	2,230	1,250	-	0,200	•	2,201	15,102	15,102	•	-	•	35,000	-	•		4,074,070	10,705	-
Cascading Costs from Clean Building Demolition		1.150								1.050									11.100	
4a.1.4.1 Reactor Building 4a.1.4.2 Auxiliary Building	-	1,179 489		-	-	-	-	177 73	1,356 562	1,356 562	-	-	-	-		-	-	-	11,163 4,733	-
4a.1.4.3 Off Gas Building	-	85		-	-	-	-	13	97	97	-	-	-	-	-	-	-	-	920	-
4a.1.4.4 Turbine Building	-	705	-	-	-	-	-	106	811	811	-	-	-	-	-	-	-	-	7,337	-
4a.1.4 Totals	-	2,457	-	-	-	-	-	369	2,825	2,825	-	-	-	-	-	-	-	-	24,153	-
Disposal of Plant Systems																				
4a.1.5.1 Auxiliary Steam 4a.1.5.2 CSCS Equipment Cooling	-	124 8			-	81	-	57	307 9	307	-	- 9	-	1,201	-	-	-	62,558	1,924 122	-
4a.1.5.2 CSCS Equipment Cooling 4a.1.5.3 Circulating Water	-	208	-	-	-	-	-	31	239	-	-	239	-	-	-	-	-	-	3,464	-
4a.1.5.4 Circulating Water - RCA	-	258	66	33	-	169	-	118	644	644	-	-	-	2,504	-	-	-	130,688	3,946	-
4a.1.5.5 Clean Condensate Storage	-	99		- 2	-	- 10	-	15	114		-	114	-	1.40	-	-	-	- 7.610	1,677	-
4a.1.5.6 Clean Condensate Storage - RCA 4a.1.5.7 Condensate	-	29 978			-	10 1,644	-	10 759	55 $4,254$	55 $4,254$	-	-		$\frac{146}{24,478}$	-	-	-	7,618 1,274,330	428 16,244	-
4a.1.5.8 Condensate Booster	-	1,011	1,177		-	3,646	-	1,390	7,941	7,941	-	-	-	54,329	-	-	-	2,826,158	17,851	-
4a.1.5.9 Condensate Polishing Demineralizer 4a.1.5.10 Containment Combustible Gas Control	-	946			-	370	-	354	1,880	1,880	-	-	-	5,589	-	-	-	286,960	14,655	-
4a.1.5.10 Containment Combustible Gas Control 4a.1.5.11 Cycled Condensate Storage	-	97 311			-	44 156	-	38 127	205 680	205 680	-	-	-	647 $2,327$		-	-	33,798 121,304	1,474 4,862	-
4a.1.5.12 Drywell Instrument Nitrogen	-	71			-	41	-	31	165	165	-	-	-	620	-	-	-	31,995	1,100	-
4a.1.5.13 Extraction Steam	-	375			-	420	-	224	1,229	1,229	-	-	-	6,260	-	-	-	325,273	6,120	-
4a.1.5.14 Feedwater 4a.1.5.15 Feedwater Heater Vents & Drains	-	621 2,966	315 965		-	999 2,880	-	466 1,643	2,598 9,022	2,598 9,022	-	-		14,903 42,923	-	-	-	774,516 2,232,839	10,284 48,063	-
4a.1.5.16 Gland Steam	-	265			-	122	-	105	559	559	-	-	-	1,807	-	-	-	94,247	4,171	-
4a.1.5.17 HVAC-River\Lake Screen House	-	9		-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	151	-
4a.1.5.18 HVAC-Service Building 4a.1.5.19 Hydrogen & Carbon Dioxide	-	14 126		15	-	79	-	2 56	16 306	306	-	16	-	1,168	-	-		60,856	221 1,940	-
4a.1.5.20 Main Steam	-	144			-	56	-	54	285	285	-	-	-	833	-	-	-	43,458	2,243	-
4a.1.5.21 Misc Bldgs Floor Drains	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	9	-
4a.1.5.22 Screen Wash 4a.1.5.23 Service Air	-	30 13	-	-	-		-	5	35 15	-	-	35 15			-		-		506 222	-
4a.1.5.24 Standby Gas Treatment	-	60	21	13	-	67	-	36	196	196	-	-	-	1,003	-	-	-	52,115	962	-
4a.1.5.25 Station Heat Recovery	-	289		27	-	137	-	116	622	622	-	-	-	2,028	-	-	-	105,836	4,428	-
4a.1.5.26 Switchgear Heat Removal 4a.1.5.27 Turbine Bldg Closed Cooling Water	-	11 545		110	-	558	-	2 313	13 1,731	1,731	-	13	-	8,298	-	-		432,636	180 8,724	-
4a.1.5.28 Turbine Building Equip Drains	-	101	22		-	67	-	46	249	249	-	-	-	993	-	-	-	51,593	1,596	-
4a.1.5.29 Turbine Building Floor Drains	-	39		2	-	10	-	13	68	68	-	-	-	146	-	-	-	7,632	606	-
4a.1.5.30 Turbine Generator 4a.1.5.31 Turbine Oil	-	208 617	103 138		-	346 419	-	159 285	884 1,542	884 1,542	-	-		5,174 6,488	-	-	-	267,870 324,845	3,470 9,769	-
4a.1.5 Totals	-	10,575	4,097	2,424	-	12,318	-	6,457	35,873	35,420	-	452	-	183,863	-	-	-	9,549,126	171,412	-
4a.1.6 Scaffolding in support of decommissioning	-	2,504	58	32	-	162	-	677	3,433	3,433	-	-	-	2,414	-	-	-	125,345	43,646	-
4a.1 Subtotal Period 4a Activity Costs	431	27,820	21,226	9,204	-	52,442	657	33,109	144,890	144,438	-	452	-	441,606	2,046	393	2,450	24,882,360	348,735	2,758
Period 4a Additional Costs																				
4a.2.1 Remedial Action Surveys	-	-	-	-	-	-	1,897	569	2,466	2,466	-	-	-	-	-	-	-	-	29,898	-
4a.2.2 Asbestos Abatement 4a.2.3 Operational Tools and Equipment	-	-	- 9	13	-	189	50 -	8 50	58 261	58 261	-	-	-	- 5,855	-	-	-	146,375	16	-
4a.2 Subtotal Period 4a Additional Costs	-	-	9		-	189	1,947	627	2,784	2,784	-	-	-	5,855	-	-	-	146,375	29,914	-
Period 4a Collateral Costs																				
4a.3.1 Process decommissioning water waste	12	-	11	30	-	38	-	21	112	112	-	-	-	109	-	-	-	6,558	21	-
4a.3.3 Small tool allowance	-	375		-	-	-	-	56	432	388	-	43		-	-	-	-	-	-	-
4a.3 Subtotal Period 4a Collateral Costs	12	375	11	30	-	38	-	77	544	501	-	43	-	109	-	-	-	6,558	21	-

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet			Cu. Feet			Manhours	
Period 4a	Period-Dependent Costs																				
4a.4.1	Decon supplies	78	-	-	-	-	-	-	20	98	98	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	962	96	1,058	1,058	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	727	73	800	720	-	80	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	2,427	-	-	-	-	-	607	3,033	3,033	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,944	- 140	-	-	-	-	442	3,386	3,386	-	-	-	-	-	-	-	105.045	-	-
4a.4.6	Disposal of DAW generated	-	-	142	77	-	435	- 0.044	134	788	788	•	-	-	6,797	-	-	-	135,947	222	-
4a.4.7	Plant energy budget NRC Fees	-	-	-	-	-	-	2,244 878	337 88	2,580 966	2,580 966	-	-	-	-	-	-	-	-	-	-
4a.4.8 4a.4.9	Site O&M Cost	-	-	-	-	-	-	240	36	276	276	-	-	-	-	-	-	-	-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services							583	87	671	671										
4a.4.11	Security Staff Cost	_	_	_	_		_	5,282	792	6,075	6,075	_	_	_	_	_	-	_	_	_	94,82
4a.4.12	DOC Staff Cost	_	-	_	-	-	-	18,428	2,764	21,192	21,192	_	-	-	_	_	-	-	-	_	209,36
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	32,094	4,814	36,908	36,908	_	-	-	-	_	-	-	-	-	379,280
4a.4	Subtotal Period 4a Period-Dependent Costs	78	5,371	142	77	-	435	61,438	10,290	77,830	77,750	-	80	-	6,797	-	-	-	135,947	222	
4a.0	TOTAL PERIOD 4a COST	521	33,566	21,387	9,324	_	53,105	64,042	44,103	226,049	225,473	_	575	_	454,368	2,046	393	2,450	25,171,240	378,892	686,231
	4b - Site Decontamination	021	55,500	21,001	0,021		55,105	01,012	11,100	220,010	220,170		0.10		101,000	2,010	555	2,100	20,111,210	370,002	000,201
	Direct Decommissioning Activities	0=0	^~	***	2.12				0.55	0.015	0.01=				10.050				0=1000		
4b.1.1	Remove spent fuel racks	976	96	195	242	-	1,231		875	3,615	3,615	-	-	-	18,378	-	-	-	954,202	1,632	-
Diamagala	f Plant Systems																				
4b.1.2.1	Aux Diesel Bldg Floor Drains		5						1	6			6							86	
4b.1.2.2	Auxiliary Diesel Generator		61						9	70	-		70						-	1,006	
4b.1.2.3	Containment Monitoring	_	24	2	1	-	5	-	8	39	39	_	-	-	75	_	-	-	3,888	395	
4b.1.2.4	Control Rod Drive	-	227	21	13	-	65	-	77	402	402	_	-	-	963	_	-	-	50,095	3,653	
4b.1.2.5	Diesel Oil	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	823	
4b.1.2.6	Electrical	-	322	-	-	-	-	-	48	371	-	-	371	-	-	-	-	-	-	5,201	-
4b.1.2.7	Electrical - Contaminated	-	773	104	69	-	352	-	302	1,600	1,600	-	-	-	5,260	-	-	-	273,105	12,036	-
4b.1.2.8	Electrical - RCA	-	5,255	985	635	-	3,225	-	2,314	12,414	12,414	-	-	-	48,150	-	-	-	2,499,995	81,135	
4b.1.2.9	Fire Protection	-	139	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	2,339	
4b.1.2.10	Fire Protection - RCA	-	760	182	95	-	485	-	344	1,867	1,867	-	-	-	7,210	-	-	-	375,999	11,689	
4b.1.2.11	Fuel Pool Cooling & Cleanup	-	847	301	169	-	858	-	482	2,658	2,658	-	-	-	12,790	-	-	-	665,463	13,616	
4b.1.2.12	HVAC-Auxiliary Building	-	235	54	36	-	185	-	116	626	626	-	-	-	2,759	-	-	-	143,239	3,337	-
4b.1.2.13	HVAC-Diesel Generator Room	-	23	- 4	- 3	-	15	-	10	9 56	- 56	-	9	-	227	-	-	-	11.779	127 332	-
4b.1.2.14 4b.1.2.15	HVAC-Off Gas Building HVAC-Primary Containment	-	1,013	4 235	3 148	-	753	-	487	2,636	2.636	-	-	-	11,263	-	-	-	11,772 583,908	15,268	
4b.1.2.16	HVAC-Radwaste Building		1,015	255	140	-	755		407	2,030	20				105				5,437	100	
4b.1.2.17	HVAC-Turbine Building	_	868	174	117	-	592	-	400	2,151	2,151	_	-	-	8,842	_	-	-	459,063	12,212	
4b.1.2.18	High Pressure Core Spray	_	366	200	112	_	567	-	270	1,514	1,514	_	-	-	8,429	_	-	-	439,323	6,022	
4b.1.2.19	Instrument Air	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	94	
4b.1.2.20	Instrument Air - RCA	-	155	18	8	-	41	-	52	274	274	-	-	-	609	-	-	-	31,863	2,413	-
4b.1.2.21	Low Pressure Core Spray	-	175	93	51	-	261	-	126	706	706	-	-	-	3,878	-	-	-	202,203	2,868	-
4b.1.2.22	Nuclear Boiler	-	1,781	604	369	-	1,876	-	1,030	5,661	5,661	-	-	-	27,962	-	-	-	1,454,480	29,004	
4b.1.2.23	Off Gas	-	693	166	100	-	506	-	331	1,796	1,796	-	-	-	7,545	-	-	-	392,222	10,952	
4b.1.2.24	Primary Containment Vent & Purge	-	473	219	145	-	734	-	345	1,916	1,916	-	-	-	10,959	-	-	-	569,165	7,859	
4b.1.2.25	Process Radiation Monitoring	-	23	1	1	-	3	-	7	34	34	-	-	-	40	-	-	-	2,101	395	
4b.1.2.26	Process Sampling	-	32	2	1	-	6	-	10	50	50	-	-	-	86	-	-	-	4,496	531	
4b.1.2.27	Radioactive Waste Disposal Reactor Bldg Closed Cooling Water	-	1,692 391	290 291	162	-	823 778	-	682 344	3,649 1,957	3,649	-	-	-	12,585 $11,570$	-	-	-	638,228	26,413 6,573	
4b.1.2.28 4b.1.2.29	Reactor Building Equipment Drains	-	591 74	11	153 6	-	30	-	28	1,957	1,957 150	-	-	-	455	-	-	-	602,953 23,195	1,167	
4b.1.2.29 4b.1.2.30	Reactor Building Floor Drains	-	7	11	0	-	50 1	-	20	12	12	-	-	-	455 21		-	-	1,101	1,167	
4b.1.2.31	Reactor Core Isolation Cooling	-	247	42	-	-	119		99	531	531	-	-	-	1,773		-	-	92,418	3,903	
4b.1.2.32	Reactor Recirculation	_	46	42	2	-	10		15	77	77	-	-	_	148	-	_		7,742	738	
4b.1.2.33	Reactor Water Clean-up	-	960	105	51	-	261	-	323	1,700	1,700	-	-	-	3,864	-	-	-	202,069	14,838	
4b.1.2.34	Residual Heat Removal	-	1,795	932	529	-	2,689		1,294	7,239	7,239	-	-	-	40,005	-	-	-	2,084,289	29,708	
4b.1.2.35	Service Air - RCA	-	269	37	17	-	87	-	95	504	504	-	-	-	1,283	-	-	-	67,085	4,079	
4b.1.2.36	Service Water	-	57	-	-	-	-	-	9	65	-	-	65	-	-	-	-	-	-	938	
4b.1.2.37	Service Water - RCA	-	785	286	164	-	832	-	458	2,526	2,526	-	-	-	12,398	-	-	-	645,252	12,468	
4b.1.2.38	Standby Liquid Control	-	58	9	4	-	22	-	22	116	116	-	-	-	329	-	-	-	17,192	874	
4b.1.2	Totals	-	20,703	5,376	3,186	-	16,189	-	10,173	55,627	54,880	-	747	-	241,581	-	-	-	12,549,340	325,300	-

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate (thousands of 2014 dollars)

								(inousan	ids of 2014 do	iiars)											
		-				Off-Site	LLRW	0.1	T		NRC	Spent Fuel	Site	Processed			Volumes	amaa	Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
4b.1.3	Scaffolding in support of decommissioning	-	3,757	87	48	-	243	-	1,016	5,150	5,150	-	-	-	3,621	-	-	-	188,018	65,468	-
Decontam	ination of Site Buildings																				
4b.1.4.1	Reactor Building	3,002	3,635	413	608	-	2,137		3,077	12,872	12,872	-	-	-	37,278	-	-	-	2,247,209	99,275	-
4b.1.4.2	Auxiliary Building	336	67	4	14	-	36	-	196	654	654	-	-	-	628	-	-	-	50,818		-
4b.1.4.3	Off Gas Building	152	34	2	10	-	24	-	92	313	313	-	-	-	421	-	-	-	34,784	2,798	-
4b.1.4.4	Turbine Building	1,782	748			-	567	-	1,257	4,643	4,643	-	-	-	9,367	-	-	-	619,740	38,054	-
4b.1.4	Totals	5,272	4,484	538	801	-	2,765	-	4,622	18,483	18,483	-	-	-	47,694	-	-	-	2,952,550	146,272	-
4b.1	Subtotal Period 4b Activity Costs	6,248	29,038	6,197	4,277	-	20,427	-	16,687	82,875	82,128	-	747	-	311,274	-	-	-	16,644,110	538,673	-
Period 4b	Additional Costs																				
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	983	295	1,277	1,277	-	-	-	-	-	-	-	-	-	6,240
4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,393	1,018	4,410	4,410	-	-	-	-	-	-	-	-	53,475	-
4b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
4b.2.4	License Termination ISFSI	-	231	336	442	-	1,502	1,700	1,053	5,264	5,264	-	-	-	24,629	-	-	-	1,947,877	9,942	5,274
4b.2.5 4b.2	Underground Services Excavation Subtotal Period 4b Additional Costs	-	542 773	336	442		1,502	6,125	81 2,454	623 11,632	623 11,632	-	-	-	24,629			-	1,947,877	3,627 67,044	11,514
40.2	Subtotal I eriou 40 Additional Costs	-	110	550	442	-	1,502	0,120	2,404	11,052	11,032	•	-	•	24,023	•	•	•	1,341,011	07,044	11,514
	Collateral Costs	0.4			00		110			0.45	0.45				000				00.000	00	
4b.3.1	Process decommissioning water waste Small tool allowance	34	-	35		-	119	-	64	345	345	-	-	-	339	-	-	-	20,320	66	-
4b.3.3 4b.3.4	Decommissioning Equipment Disposition	-	566	170	93	-	472	-	85 149	651 884	651 884	-	-	-	7,054	-	-	-	366,237	- 88	-
4b.3.4 4b.3	Subtotal Period 4b Collateral Costs	34	566	204	186	-	591		298	1,880	1,880	-	-	-	7,054	-		-	386,558	154	-
	Period-Dependent Costs																				
4b.4.1	Decon supplies	1,584	-	-	-	-	-	1.701	396	1,980	1,980	-	-	-	-	-	-	-	-	-	-
4b.4.2 4b.4.3	Insurance	-	-	-	-	-	-	1,701 1,285	170 129	1,871 1,414	1,871 1,414	-	-	-	-	-	-	-	-	-	-
4b.4.4	Property taxes Health physics supplies	-	3,875	-	-	-	-	1,260	969	4,843	4,843	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	5,155	-	-	-	-		773	5,928	5,928	-		-		-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	_	-	189	102	_	580	-	179	1,051	1,051	_	_	-	9.063	-	-	-	181,258	296	_
4b.4.7	Plant energy budget	_	-	-	-	-	-	3,132	470	3,602	3,602	-	-	-	-	-	-	-	-	-	_
4b.4.8	NRC Fees	-	-	-	-	-	-	1,553	155	1,708	1,708	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost	-	-	-	-	-	-	424	64	488	488	-	-	-	-	-	-	-	-	-	-
4b.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,031	155	1,186	1,186	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	1,468	220	1,688	1,688	-	-	-	-	-	-	-	-	-	29,511
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	20,847	3,127	23,974	23,974	-	-	-	-	-	-	-	-	-	252,189
4b.4.13	Utility Staff Cost	1 704	- 0.000	100	100	-	-	36,331	5,450	41,780	41,780	-	-	-	- 0.000	-	-	-	101.050	-	450,720
4b.4	Subtotal Period 4b Period-Dependent Costs	1,584	9,029	189	102	-	580	67,773	12,256	91,514	91,514	-	-	-	9,063	-	-	-	181,258	296	732,420
4b.0	TOTAL PERIOD 4b COST	7,866	39,407	6,926	5,007	-	23,101	73,898	31,695	187,900	187,153	-	747	-	352,359	-	-	-	19,159,800	606,167	743,934
PERIOD	4e - Delay before License Termination																				
	Period-Dependent Costs																				
4e.4.1	Insurance	-	-	-	-	-	-	982	98	1,080	1,080	-	-	-	-	-	-	-	-	-	-
4e.4.2	Property taxes	-	-	-	-	-	-	742	74	816	816	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	131	-	-	-	- ^	-	33	164	164	-	-	-	1.40	-	•	-	-		-
4e.4.4	Disposal of DAW generated NRC Fees	-	-	3	2	-	9	377	3 38	$\frac{17}{414}$	17 414	-	-	-	148	-	-	-	2,960	5	-
4e.4.6 4e.4.7	NRC Fees Site O&M Cost	-	-	-	-	-	-	$\frac{377}{245}$	38 37	414 282	414 282	-	-	-	-	-		-	-	-	-
4e.4.7 4e.4.8	Utility Staff Cost	-		-	-	-	-	1,632	245	1,877	1,877	-	-	-		-		-	-	-	21,680
4e.4	Subtotal Period 4e Period-Dependent Costs	_	131	3	2	_	9	3,978	527	4,651	4,651	_	_	_	148	-	-	-	2,960	5	21,680
4e.0	TOTAL PERIOD 4e COST	-	131	3	2	_	9	3,978	527	4,651	4,651	_	<u>-</u>	-	148	_	-	_	2,960	5	21,680
	4f - License Termination		101	0	2		3	5,010	521	1,001	1,001				170				2,000	Ü	21,000
	Direct Decommissioning Activities																				
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license							150	F	a	20.1										
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-

Table D-1
LaSalle County Station, Unit 1
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

									us 01 2014 u01												
A -42 **		ъ	D 1	D1 -2	M	Off-Site	LLRW	041	m-4 1	m-+ 1	NRC	Spent Fuel	Site	Processed	- Cl - A		Volumes	ОТОО	Burial /	O- 6	Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
eriod 4f Ad	dditional Costs																				
	License Termination Survey	-	-	-	-	-	-	12,428	3,728	16,156	16,156	-	-	-	-	-	-	-	-	192,095	3,12
f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	12,428	3,728	16,156	16,156	-	-	-	-	-	-	-	-	192,095	3,120
	ollateral Costs																				
	DOC staff relocation expenses	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	-	-	-
f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	-	-	-
	eriod-Dependent Costs																				
	Insurance Property taxes	-	-	-	-	-	-	504 381	50 38	554 419	554 419	-	-	-	-	-	-	-	-	-	-
	Health physics supplies	-	826		-	-		501	206	1,032	1,032	_		-	-	-	-	-	-	-	-
	Disposal of DAW generated	-	-	7	4	-	22	-	7	39	39	-	-	-	339	-	-	-	6,771	11	-
	Plant energy budget	-	-	- 1	-	-	-	247	37	284	284	-	-	-	-	-	-	-	-,	-	-
	NRC Fees	-	-	-	-	-	-	460	46	506	506	-	-	-	-	-	-	-	-	-	-
	Site O&M Cost	-	-	-	-	-	-	126	19	144	144	-	-	-	-	-	-	-	-	-	-
	Security Staff Cost	-	-	-	-	-	-	686	103	789	789	-	-	-	-	-	-	-	-	-	11,91
	DOC Staff Cost	-	-	-	-	-	-	4,219	633	4,852	4,852	-	-	-	-	-	-	-	-	-	47,26
	Utility Staff Cost	-	-		- ,	-	-	5,177	777	5,953	5,953	-	-	-	-	-	-	-	-	-	57,58
f.4	Subtotal Period 4f Period-Dependent Costs	-	826	7	4	-	22	11,800	1,916	14,574	14,574	-	-	-	339	-	-	-	6,771	11	116,76
f.0	TOTAL PERIOD 4f COST	-	826	7	4	-	22	25,563	5,870	32,292	32,292	-	-	-	339	-	-	-	6,771	192,106	119,886
PERIOD 4	TOTALS	8,388	73,930	28,323	14,337	-	76,237	167,481	82,196	450,891	449,569	-	1,322	-	807,213	2,046	393	2,450	44,340,770	1,177,169	1,571,72
ERIOD 5	b - Site Restoration																				
eriod 5b Di	irect Decommissioning Activities																				
Demolition of	of Remaining Site Buildings																				
	Reactor Building	-	6,786		-	-	-	-	1,018	7,803	-	-	7,803	-	-	-	-	-	-	64,472	-
	Auxiliary Building	-	4,423		-	-	-	-	663	5,087	-	-	5,087	-	-	-	-	-	-	43,048	-
	Diesel Generator Room	-	554		-	-	-	-	83	637	-	-	637	-	-	-	-	-	-	6,000	-
	Off Gas Building	-	772		-	-	-	-	116	888	-	-	888	-	-	-	-	-	-	8,484	-
	Turbine Building Turbine Pedestal	-	6,492 3,474		-	-	-	-	974 521	7,466 3,995	-	-	7,466 3,995	-	-	-	-	-	-	68,584 30,829	-
	Totals	-	22,501	-	-		-	-	3,375	25,876	-	-	25,876	-	-	-	-	-	-	221,416	-
to Classon	nt Activities																				
	Grade & landscape site		198						30	228	-		228							499	
	Final report to NRC	-	-	-	_	-	_	208	31	239	239	_	-	-	-	_	_	-	-	-	1,56
	Subtotal Period 5b Activity Costs	_	22,699	-	_	_	-	208	3,436	26,343	239	-	26,104	-	-	-	-	-	-	221,916	1,56
	·		,						2,222	,			,							,	-,
	dditional Costs		0.55					90	100	50F			50 F							0.005	,
	Site Restoration ISFSI	-	655	-	-	-	-	28	102	785 976	-	-	785	-	-	-	-	-	-	6,995	8
	Concrete Crushing Subtotal Period 5b Additional Costs	-	845 1,500		-	-	-	4 32	$\frac{127}{230}$	1,761	-		976 1,761	-	-	-	-	-		3,936 10,930	- 8
eriod 5b Co	ollateral Costs																				
	Small tool allowance	-	248	-	-	-	-	-	37	285	-	-	285	-	-	-		-	-	-	-
	Subtotal Period 5b Collateral Costs	-	248		-	-	-	-	37	285	-	-	285	-	-	-	-	-	-	-	-
	eriod-Dependent Costs																				
	Property taxes	-	-	-	-	-	-	998	100	1,098	-	-	1,098	-	-	-	-	-	-	-	-
	Heavy equipment rental	-	5,685	-	-	-	-	-	853	6,538	-	-	6,538	-	-	-	-	-	-	-	-
	Plant energy budget	-	-	-	-	-	-	324	49	373	-	-	373	-	-	-	-	-	-	-	-
	Site O&M Cost Security Staff Cost	-	-	-	-	-	-	329 1,618	49 243	379 1,861	-	-	379 1,861	-	-	-	-	-	-	-	27,61
	DOC Staff Cost	-	-	-	-	-	-	1,618	1,519	1,861	-	-	1,861	-			-	-	-	-	110,39
	Utility Staff Cost	-		-	-	-	-	5,084	763	5,847	-	-	5,847	-	-			-	-	-	54,15
	Subtotal Period 5b Period-Dependent Costs	-	5,685	-	-	-		18,477	3,574	27,737	-	-	27,737	-	-	-	-	-	-	-	192,16
	-																				
5b.0	TOTAL PERIOD 5b COST	-	30,132	-	-	-	-	18,717	7,277	56,126	239	-	55,887	-	-	-	-	-	-	232,846	193,804

Table D-1 LaSalle County Station, Unit 1 **Delayed DECON Decommissioning Cost Estimate** (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 5 TOTAI	LS	-	30,132	-	-	-	-	18,717	7,277	56,126	239	-	55,887	-	-	-	-	-	-	232,846	193,804
TOTAL COST TO	DECOMMISSION	17,693	112,278	28,648	14,948	-	77,308	594,023	152,980	997,878	697,416	242,164	58,297	-	815,081	2,046	393	2,450	44,577,230	1,543,242	4,832,409

TOTAL COST TO DECOMMISSION WITH 18.11% CONTINGENCY:	\$997,878	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 69.89% OR:	\$697,416	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 24.27% OR:	\$242,164	thousands of 2014 dollars
	+,	
NON-NUCLEAR DEMOLITION COST IS 5.84% OR:	\$58,297	thousands of 2014 dollars
NOTENOCEEE'M BENIGHTION COST IS 9.54% OR.	φου,201	thousands of 2014 donars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	017 500	cubic feet
IOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	817,320	cubic feet
TOTAL CREATED THAN OLAGO CRADINASTE VOLUME CENTRAL	2 170	1. 0
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,450	cubic feet
TOTAL SCRAP METAL REMOVED:	51,861	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,543,242	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 D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

Activity Index						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V			Burial /		Utility and
	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs		Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD :	1a - Shutdown through Transition																				
Period 1a I	Direct Decommissioning Activities																				
la.1.1	SAFSTOR site characterization survey		-	-		-	-	481	144	625	625	-	-		-	-	-	-	-	-	
la.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	545
1a.1.3	Notification of Cessation of Operations Remove fuel & source material									a n/o											
1a.1.4 1a.1.5	Notification of Permanent Defueling									n/a a											
1a.1.6	Deactivate plant systems & process waste									a											
1a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1a.1.8	Review plant dwgs & specs. Perform detailed rad survey	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	545
1a.1.9 1a.1.10	Estimate by-product inventory	_	_	_	_	_	_	56	8	64	64	_	_	_	_	_	_	_	_	_	419
1a.1.11	End product description	-		-	-	-		56	8	64	64	-	-	-	-	-	-	-	-	-	419
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	84	13	96	96	-	-	-	-	-	-	-	-	-	629
1a.1.13	Define major work sequence Perform SER and EA	-	-	-	-	-	-	56 173	$\begin{array}{c} 8 \\ 26 \end{array}$	64 199	64 199	-	-	-	-	-	-	-	-	-	419 1,299
1a.1.14 1a.1.15	Perform Site-Specific Cost Study	-		-	-	-		173 279	42	321	321	-	-	-	-				-	-	2,095
																					_,
	pecifications																				
1a.1.16.1 1a.1.16.2	Prepare plant and facilities for SAFSTOR Plant systems	-	-	-	-	-	-	$\frac{275}{233}$	41 35	316 268	316 268	-	-	-	-	-	-	-	-		2,061 1,746
1a.1.16.2	Plant structures and buildings	-	-	-	-	-	-	$\frac{255}{174}$	26	201	201	-		-	-	-			-	-	1,307
1a.1.16.4	Waste management	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1a.1.16.5	Facility and site dormancy	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1a.1.16	Total	-	-	-	-	-	-	906	136	1,042	1,042	-	-	-	-	-	-	-	-	-	6,791
Detailed W	Jork Procedures																				
1a.1.17.1	Plant systems	-	-	-	-	-	-	66	10	76	76	-	-	-	-	-	-	-	-	-	496
1a.1.17.2	Facility closeout & dormancy	-	-	-	-	-	-	67	10	77	77	-	-	-	-	-	-	-	-	-	503
1a.1.17	Total	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	999
1a.1.18	Procure vacuum drying system	-	_	_	_	-	-	6	1	6	6	-	-	_	-	-	_	-	-	-	42
1a.1.19	Drain/de-energize non-cont. systems									a											
1a.1.20	Drain & dry NSSS									a											
1a.1.21 1a.1.22	Drain/de-energize contaminated systems Decon/secure contaminated systems									a											
1a.1.22	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	2,487	445	2,932	2,932	-	-	-	-	-	-	-	-	-	15,038
	Additional Costs							7.000	1.001	0.000	0.000										
1a.2.1 1a.2	Spent Fuel Pool Isolation Subtotal Period 1a Additional Costs	-		-	-	-		7,208 7,208	1,081 1,081	8,290 8,290	8,290 8,290	-	-	-	-		-	-	-	-	-
								1,200	1,001	0,200	0,200										
	Period-Dependent Costs																				
1a.4.1 1a.4.2	Insurance	-	-	-	-	-	-	2,050	205	2,255	2,255	-	-	-	-	-	-	-	-	-	-
1a.4.2 1a.4.3	Property taxes Health physics supplies		491	-	-	-	-		123	614	614		-	-	-	-		-	-	-	-
1a.4.4	Heavy equipment rental	-	527		-	-	-		79	606	606	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	7	-	39	-	12	71	71	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,623	243	1,867	1,867	-	-	-	-	-	-	-	-	-	-
1a.4.7 1a.4.8	NRC Fees Emergency Planning Fees	-		-	-	-	•	834 2,227	83 223	917 2,450	917	2,450	-	-	-	-	-		-	-	-
1a.4.9	Site O&M Cost	-	-	-		-	-	165	25 25	190	190	2,400	-		-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1a.4.12 1a.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	8,222 $35,778$	1,233 5,367	9,455 $41,144$	9,455 $41,144$	-	-	-	-	-	-	-	-	-	157,471 423,400
1a.4.15 1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	7	-	39	51,737	7,719	60,533	57,118	3,415	-		610	-	-		12,190	20	
**			ŕ		•																
1a.0	TOTAL PERIOD 1a COST		1,018	13	7		39	61,433	9,245	71,754	68,339	3,415			610				12,190	20	595,909

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								`	1105 01 2014 00	,											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	1b - SAFSTOR Limited DECON Activities																				
Period 1b	Direct Decommissioning Activities																				
Decontami	ination of Site Buildings																				
1b.1.1.1	Reactor Building	3,298		-	-	-	-	-	1,649	4,947	4,947	-	-	-	-	-	-	-	-	49,197	-
1b.1.1.2 1b.1.1.3	Auxiliary Building IRSF Building	1,619 78		-	-	-		-	809 39	2,428 117	2,428 117	-					-	-	-	24,021 1,210	
1b.1.1.4	Service Building	108		-	-	-	-	-	54	163	163	-	-	-			-	-	-	1,692	
1b.1.1.5	Solid Radwaste Building	487	-	-	-	-	-	-	244	731	731	-	-	-	-	-	-	-	-	7,355	
1b.1.1.6 1b.1.1	Turbine Building Totals	1,739 7,330		-	-	-	-	-	870 3,665	2,609 10,996	2,609 10,996	-	-	-	-	-	-	-	-	27,018 110,493	
1b.1	Subtotal Period 1b Activity Costs	7,330		-	-	-	-	_	3,665	10,996	10,996	_	-	-	-	-	_	_	_	110,493	
	Collateral Costs	,							,	•	,									,	
1b.3.1	Decon equipment	883		-	-	-	-	-	132	1,015	1,015	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	192		125		-	426	-	265	1,343	1,343	-	-	-	1,215	-	-	-	72,882	237	-
1b.3.4 1b.3	Small tool allowance Subtotal Period 1b Collateral Costs	1,075	120 120		335		426	-	18 416	139 2,497	139 2,497	-	-		1,215	-	-	-	72,882	- 237	
	Period-Dependent Costs	,									,				, -						
1b.4.1	Decon supplies	1,643	-	-	-	-	-	-	411	2,054	2,054	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	394 2,996	39 300	434 3,295	434 3,295	-	-	-	-	-	-	-	-	-	-
1b.4.3 1b.4.4	Property taxes Health physics supplies	-	626	-	-	-		2,996	300 157	3,295 783	3,295 783	-	-	-			-	-	-	-	-
1b.4.5	Heavy equipment rental	-	131	-	-	-	-	-	20	151	151	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	18	10	-	56	-	17	102	102	-	-	-	876	-	-	-	17,516	29	
1b.4.7 1b.4.8	Plant energy budget NRC Fees	-		-	-	-	-	405 116	61 12	465 128	465 128	-	-	-					-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	555	56	611	-	611	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1b.4.11 1b.4.12	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	197 12	30 2	$\frac{227}{14}$	-	227 14	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-		-	-	-	-	2,050	307	2,357	2,357	-	-	-				-	-	-	39,260
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	8,920	1,338	10,258	10,258	-	-	-	-	-	-	-	-	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	1,643	757	18	10	-	56	15,686	2,754	20,925	20,074	851	-	-	876	-	-	-	17,516	29	144,820
1b.0	TOTAL PERIOD 1b COST	10,049	878	143	344	-	482	15,686	6,835	34,418	33,566	851	-	-	2,091	-	-	-	90,398	110,759	144,820
PERIOD	1c - Preparations for SAFSTOR Dormancy																				
Period 1c I	Direct Decommissioning Activities																				
1c.1.1	Prepare support equipment for storage	-	486	-	-	-	-	-	73	559	559	-	-	-	-	-	-	-	-	3,000	
1c.1.2 1c.1.3	Install containment pressure equal. lines Interim survey prior to dormancy	-	48	-	-	-	-	733	$\frac{7}{220}$	55 953	55 953	-	-	-	-	-	-	-	-	700 10,874	
1c.1.4	Secure building accesses							100	220	a	000									10,071	
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	33	5	37	37	-	-	-	-	-	-	-	-	-	244
1c.1	Subtotal Period 1c Activity Costs	-	534	-	-	-	-	765	305	1,605	1,605	-	-	-	-	-	-	-	-	14,574	244
Period 1c (1c.3.1	Collateral Costs Process decommissioning water waste	149		97	259		331		206	1,041	1,041				942				56,524	184	_
1c.3.1 1c.3.3	Small tool allowance	149	- 4	- 97	259	-	331	-	206	1,041	1,041 5	-	-	-	942		-	-	56,524 -	184	-
1c.3	Subtotal Period 1c Collateral Costs	149	4	97		-	331	-	206	1,046	1,046	-	-	-	942	-	-	-	56,524	184	
	Period-Dependent Costs																				
1c.4.1 1c.4.2	Insurance Property taxes	-	-	-	-	-	-	399 3,029	40 303	439 3,331	439 3,331	-	-	-	-	-	-	-	-	-	
1c.4.2 1c.4.3	Health physics supplies	-	191	-	-	-	-	5,025	48	239	239	-	-		-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	133		-	-	-	-	20	153	153	-	-	-	-	-	-	-	-	-	-
1c.4.5 1c.4.6	Disposal of DAW generated Plant energy budget		-	3	2		10	409	3 61	18 471	18 471	-	-		154	-	-	-	3,073	5	
1c.4.6 1c.4.7	NRC Fees	-	-	-	-	-	-	117	12	129	129	-	-		-	-	-	-	-		-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	561	56	618	-	618	-	-	-	-	-	-	-	-	-

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 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	Class A Cu. Feet	Burial Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1c I	Period-Dependent Costs (continued)																				
1c.4.9	Site O&M Cost	-	-	-	-	-	-	42	6	48	48	-	-	-	-		-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	199	30	229	-	229	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14	-	14	-	-	-	-	-	-	-	-	-
1c.4.12 1c.4.13	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	2,072 9,018	311 1,353	2,383 10,371	2,383 10,371	-	-	-	-	-	-	-	-	-	39,691 106,720
1c.4.15	Subtotal Period 1c Period-Dependent Costs	-	324	3	2	-	10	15,858	2,244	18,441	17,580	861	-	-	154	-	-	-	3,073	5	
1c.0	TOTAL PERIOD 1c COST	149	862	100	261	-	341	16,624	2,755	21,092	20,231	861	-	-	1,096	-	-	-	59,597	14,762	146,656
PERIOD	1 TOTALS	10,197	2,758	255	613	-	862	93,743	18,836	127,264	122,137	5,127	-	-	3,796	-	-	-	162,185	125,541	887,385
PERIOD :	2a - SAFSTOR Dormancy with Wet Spent Fuel	Storage																			
	Direct Decommissioning Activities																				
2a.1.1	Quarterly Inspection									a											
2a.1.2 2a.1.3	Semi-annual environmental survey Prepare reports									a											
2a.1.5 2a.1.4	Bituminous roof replacement	_	_	_	_	_	_	2,622	393	a 3,015	3,015	_	_	_	_	_	_	_	_	_	_
2a.1.5	Maintenance supplies	-	-	-	-	-	-	2,039	510	2,548	2,548	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	4,661	903	5,564	5,564	-	-	-	-	-	-	-	-	-	-
	Collateral Costs																				
2a.3.1	Spent Fuel Capital and Transfer Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	14,625 $14,625$	2,194	16,819 16,819	-	16,819 16,819	-	-	-	-	-	-	-	-	-
2a.3		-	-	-	-	-	-	14,625	2,194	16,819	-	16,819	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs							10.005	1.000	11.000	10.055	1.010									
2a.4.1 2a.4.2	Insurance Property taxes	-		-	-	-	-	10,627 $25,523$	1,063 2,552	11,690 28,075	10,677 $28,075$	1,013	-	-	-	-	-	-	-	-	-
2a.4.2	Health physics supplies	-	2,707		-	-	-	20,020	677	3,384	3,384	-	-	-	-	-	-		-	-	-
2a.4.4	Disposal of DAW generated	-	-,	64	35	-	198		61	359	359	-	-	-	3,094	-	-	-	61,879	101	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	4,765	715	5,480	2,740	2,740	-	-	· -	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	3,901	390	4,291	4,291	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	28,642	2,864	31,506	-	31,506	-	-	-	-	-	-	-	-	-
2a.4.8	Site O&M Cost	-	-	-	-	-	-	2,421	363	2,784	2,784	10.050	-	-	-	-	-	-	-	-	-
2a.4.9 2a.4.10	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	11,610 701	1,742 105	13,352 806	-	13,352 806	-	-	-	-	-	-	-	-	-
2a.4.10 2a.4.11	Security Staff Cost		-					43,395	6,509	49,905	16,414	33,490			-	-			-	-	815,182
2a.4.12	Utility Staff Cost	_	_	_	_	-	-	62,966	9,445	72,411	17,607	54,804	-	_	_	-	-		-	_	719,369
2a.4	Subtotal Period 2a Period-Dependent Costs	-	2,707		35	-	198	194,552	26,486	224,042	86,331	137,711	-	-	3,094	-	-	-	61,879	101	
2a.0	TOTAL PERIOD 2a COST	-	2,707	64	35	-	198	213,838	29,583	246,425	91,895	154,530	-	-	3,094	-	-	-	61,879	101	1,534,551
PERIOD :	2b - SAFSTOR Dormancy with Dry Spent Fuel	Storage																			
	Direct Decommissioning Activities																				
2b.1.1	Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3 2b.1.4	Prepare reports Bituminous roof replacement		_		_		_	336	50	a 386	386	_		_	_	_		_	_	_	_
2b.1.4 2b.1.5	Maintenance supplies	-	-	-	-	-	-	261	65	326	326		-	-	-	-	-		-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	597	116	712		-	-	-	-	-	-	-	-	-	-
	Collateral Costs																				
2b.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	4,250	638	4,888	-	4,888	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	4,250	638	4,888	-	4,888	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs							1 0 4 9	104	1 905	1 905										
2b.4.1 2b.4.2	Insurance Property taxes	-		-	-	-	-	1,243 939	124 94	1,367 1,033	1,367 1,033	-	-	-			-	-	-	-	-
2b.4.2 2b.4.3	Health physics supplies	-	171	-	-	-	-	-	43	213	213	-	-	-			-	-	-	-	-
2b.4.4	Disposal of DAW generated	-		4	2	-	12	-	4	23	23	-	-	-	194	-	-	-	3,883	6	-
2b.4.5	Plant energy budget	-	-	-	-	-	-	305	46	351	351	-	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	481	48	529	529	-	-	-	-	-	-	-	-	-	-
2b.4.7 2b.4.8	Emergency Planning Fees Site O&M Cost	-	-	-	-	-	-	3,668 310	367 47	4,035 357	- 357	4,035	-	-	-	-	-	-	-	-	-
40.4.0	DILE OWN COST	-	-	-	-	-	-	910	41	997	997	-	-	-	-	-	-	-	-	-	-

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	llars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs		Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C	GTCC Cu. Feet	Processed	Craft Manhours	Contractor
Period 2h I	Period-Dependent Costs (continued)																				
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	90	13	103	-	103	-	-	-	-	-	-	-	-	
2b.4.10	Security Staff Cost	-	-	-	-	-	-	2,998	450	3,447	2,102	1,345	-	-	-	-	-	-	-	-	52,920
2b.4.11	Utility Staff Cost	-	-		-	-		3,241	486	3,728	2,255	1,473	-	-	-	-	-	-		-	39,200
2b.4	Subtotal Period 2b Period-Dependent Costs	-	171	. 4	2	-	12	13,275	1,721	15,185	8,229	6,956	-	-	194	-	-	-	3,883	6	92,120
2b.0	TOTAL PERIOD 2b COST	-	171	. 4	2	-	12	18,121	2,474	20,785	8,941	11,844	-	-	194	-	-	-	3,883	6	92,120
PERIOD 2	2c - SAFSTOR Dormancy without Spent Fuel	Storage																			
	Direct Decommissioning Activities																				
2c.1.1	Quarterly Inspection									a											
2c.1.2	Semi-annual environmental survey									a											
2c.1.3	Prepare reports							960	20	a 299	900										
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	260 202	39 51	253	299 253	-	-	-	-	-	-	-	-	-	-
2c.1.5 2c.1	Maintenance supplies Subtotal Period 2c Activity Costs	-	-	-	-	-	-	462	90	551	551	-	-	-	-	-	-	-	-	-	-
	•	-	-	-	•	-	-	402	90	551	991	-	-	-	-	-	-	-	•	•	-
	Period-Dependent Costs							0.00	0.0	1.050	1.050										
2c.4.1 2c.4.2	Insurance Property taxes	-	-	-	-	-	-	962 727	96 73	1,058 800	1,058 800	-	-	-	-	-	-	-	-	-	-
2c.4.2 2c.4.3	Health physics supplies	-	128	-	-	-	-	141	32	160	160	-	-	-	-	-	-	-	-	-	•
2c.4.4	Disposal of DAW generated		120	3	- 9		9		3	17	17				144				2,879	5	
2c.4.5	Plant energy budget	_	-	-			-	236	35	272	272	_		_	-	_	_	_	2,010		-
2c.4.6	NRC Fees	_	-	-	_	_	_	358	36	394	394	_	-	_	_	-	-	_	-	_	_
2c.4.7	Site O&M Cost	-	-	-	-	-	-	240	36	276	276	-		-	-	-	-	-	-	-	-
2c.4.8	Security Staff Cost	-	-	-	-	-	-	1,415	212	1,627	1,627	-	-	-	-	-	-	-	-	-	22,757
2c.4.9	Utility Staff Cost	-	-	-	-	-	-	1,518	228	1,745	1,745	-	-	-	-	-	-	-	-	-	19,359
2c.4	Subtotal Period 2c Period-Dependent Costs	-	128	3	2	-	9	5,456	751	6,349	6,349	-	-	-	144	-	-	-	2,879	5	42,116
2c.0	TOTAL PERIOD $2c$ COST	-	128	3	2	-	9	5,918	840	6,900	6,900	-	-	-	144	-	-	-	2,879	5	42,116
PERIOD 2	2 TOTALS	-	3,006	71	39	-	220	237,877	32,898	274,110	107,736	166,374	-	-	3,432	-	-	-	68,640	112	1,668,787
PERIOD 8	3a - Reactivate Site Following SAFSTOR Dorn	mancy																			
Period 3a I	Direct Decommissioning Activities																				
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	545
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	257	39	296	296	-	-	-	-	-	-	-	-	-	1,927
3a.1.3	Perform detailed rad survey									a											
3a.1.4	End product description	-	-	-	-	-	-	56		64	64	-	-	-	-	-	-	-	-	-	419
3a.1.5	Detailed by-product inventory Define major work sequence	-	-	-	-	-	-	73		84 482	84 482	-	-	-	-	-	-	-	-	-	545 3,143
3a.1.6 3a.1.7	Perform SER and EA	-	-	-	-	-	-	419 173	26	199	199	-	-	-	-	-	-	-	-	-	1,299
3a.1.8	Perform Site-Specific Cost Study		-	-		_	-	279	42	321	321	-				_	-	-		-	2,095
3a.1.9	Prepare/submit License Termination Plan	_	_	_	_	_	_	229	34	263	263	_	_	-	-	-	_	_	-	-	1,716
3a.1.10	Receive NRC approval of termination plan									a											,,
Activity Sp	pecifications																				
3a.1.11.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	412		474	426	-	47	-	-	-	-	-	-	-	3,088
3a.1.11.2	Plant systems	-	-	-	-	-	-	233	35	268	241	-	27	-	-	-	-	-	-	-	1,746
3a.1.11.3		-	-	-	-	-	-	397	60	456	456	-	-	-	-	-	-	-	-	-	2,975
	Reactor vessel	-	-	-	-	-	-	363	54	418		-	-	-	-	-	-	-	-	-	2,724
	Sacrificial shield	-	-	-	-	-	-	28	4	32	32	-	-	-	-	-	-	-	-	-	210
3a.1.11.6	Moisture separators/reheaters	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
3a.1.11.7	Reinforced concrete Main Turbine	-	-	-	-	-	-	89	13 18	103 134	51 134	-	51	-	-	-	-	-	-	-	670 875
3a.1.11.8	Main Condensers	-	-	-	-	-	-	117 117	18	134	134	-	-	-	-	-	-	•	-	-	875 875
	Pressure suppression structure	-	-	-	-	-	-	117		129	129	-	-	-	-	-	-		-	-	838
3a.1.11.11	* *	-	-	-	-	-	-	89		103	103	-	-	-	-	-			-	-	670
3a.1.11.12	Plant structures & buildings	-	-	-	-	-	-	174	26	201	100	-	100	-	-	-	-		-	-	1,307
3a.1.11.13	Waste management	-	-	-	-	-	-	257	39	296	296	-	-	-	-	-			-	-	1,927
3a.1.11.14	Facility & site closeout	-	-	-	-	-	-	50	8	58	29		29	-	-	-	-	-	-	-	377
3a.1.11		-	-	-	-	-	-	2,495	374	2,869	2,614	-	255	-	-	-	-	-	-	-	18,701

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	llars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Rurial	Volumes		Burial /		Utility and
Activity		Decon	Removal			Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Planning &	& Site Preparations																				
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	134	20	154	154	-	-	-	-	-	-	-	-	-	1,006
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
3a.1.14	Design water clean-up system	-	-	-	-	-	-	78		90	90	-	-	-	-	-	-	-	-	-	587
3a.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645		-	-	-	-	-	-	-	-	-	-
3a.1.16	Procure casks/liners & containers Subtotal Period 3a Activity Costs	-	-	-	-	-	-	69 9,635	$10 \\ 1,445$	79 11,080	79 10,826	-	255	-	-	-	-	-	-	-	515 32,497
3a.1	Subtotal Feriod 5a Activity Costs	-	-	-	-	-	-	9,039	1,440	11,000	10,626	-	200	-	-	-	•	-	-	-	52,491
	Period-Dependent Costs																				
3a.4.1	Insurance	-	-	-	-	-	-	661	66	727	727	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	500	50	550	550	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	407 527	-	-	-	-	-	102	509	509 606	-	-	-	-	-	-	-	-	-	-
3a.4.4 3a.4.5	Heavy equipment rental Disposal of DAW generated	-	527	10	-	-	31	-	79 10	606 56	56	-	-	-	401	-	-	-	9,613	16	-
3a.4.6	Plant energy budget		-	10		, -	- 31	1,623	243	1,867	1,867	-	_	-	401	-	-		5,015	-	-
3a.4.7	NRC Fees		-	-	-		-	332	33	366	366			-		-				-	
3a.4.8	Site O&M Cost	-	_	_	_	_	_	165	25	190	190	_	-	_	-	-	-		_	_	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	311	47	358	358	-	-	-	-	-	-	-	-	-	6,257
3a.4.10	Utility Staff Cost	-	-	-	-	-	-	16,174	2,426	18,600	18,600	-	-	-	-	-	-	-	-	-	200,229
3a.4	Subtotal Period 3a Period-Dependent Costs	-	934	10	5	-	31	19,766	3,081	23,827	23,827	-	-	-	481	-	-	-	9,613	16	
3a.0	TOTAL PERIOD 3a COST	-	934	10	5	5 -	31	29,401	4,526	34,907	34,653	-	255	-	481	-	-	-	9,613	16	238,983
PERIOD :	3b - Decommissioning Preparations																				
	Direct Decommissioning Activities																				
D. t. 1. 1 W	I. d. D d																				
3b.1.1.1	Vork Procedures Plant systems							265	40	304	274		30								1,983
3b.1.1.1	Reactor internals	-	-	-	-	-	-	203	34	257	257	-	30	-	-	-	-	-	-	-	1,676
3b.1.1.2	Remaining buildings							75	11	87	22		65								566
3b.1.1.4	CRD housings & NIs	-	_	_	_	_	_	56	8	64	64	_	-	-	-	_	-		-	_	419
3b.1.1.5	Incore instrumentation	-	-	-	_	-	_	56	8	64	64	-		-	-	-	-	-	-	-	419
3b.1.1.6	Removal primary containment	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	203	30	233	233	-	-	-	-	-	-	-	-	-	1,521
3b.1.1.8	Facility closeout	-	-	-	-	-	-	67	10	77	39	-	39	-	-	-	-	-	-	-	503
3b.1.1.9	Sacrificial shield	-	-	-	-	-	-	67	10	77	77	-	-	-	-	-	-	-	-	-	503
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	56	8	64	32	-	32	-	-	-	-	-	-	-	419
3b.1.1.11	Main Turbine	-	-	-	-	-	-	116		134	134	-	-	-	-	-	-	-	-	-	872
3b.1.1.12 3b.1.1.13	Main Condensers Moisture separators & reheaters	-	-	-	-	-	-	117 112	18 17	134 129	134 129	-	-	-	-	-	-	-	-	-	875 838
3b.1.1.14	Radwaste building		-	-		-	-	153	23	175	158	-	18	-	-	-	-		-		1,144
3b.1.1.15	Reactor building	_	_	_	_	_	_	153	23	175	158	_	18	-	-	-	_			_	1,144
3b.1.1	Total	-	_	_	_	_	_	1,830	275	2,105	1,903	_	201	_	-	-	-		_	_	13,718
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	1,830	275	2,105	1,903	-	201	-	-	-	-	-	-	-	13,718
Period 3b	Additional Costs																				
3b.2.1	Site Characterization	-	-	-	-	-	-	2,724	817	3,542		-	-	-	-	-	-	-	-	12,779	
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	2,724	817	3,542	3,542	-	-	-	-	-	-	-	-	12,779	4,547
Period 3b (Collateral Costs																				
3b.3.1	Decon equipment	883	-	-	-	-	-	-	132	1,015		-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,163		1,338	1,338	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,100		-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	883	1,100	-	-	-	-	1,163	472	3,618	3,618	-	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
3b.4.1	Decon supplies	27		-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	332	33	365	365	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	251	25	276		-	-	-	-	-	-	-	-	-	-
3b.4.4 3b.4.5	Health physics supplies Heavy equipment rental	-	220 264		-	-	-	-	55 40	275 304	275 304	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	264	- 6	-	- }	17	-	40 5	304	304	-	-	-	266	-	-	-	5,315	- 9	-
3b.4.7	Plant energy budget	-	-	-	-	, - -	-	814	122	936		-	-	-	200		-		5,515	-	-
3b.4.8	NRC Fees	-	-	-	-		-	167	17	183		-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Cost	-	-	-	-	-	-	83		95		-	-	-	-	-	-	-	-	-	-

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b Period-Dependent Costs (continued) 3b.4.10 Security Staff Cost 3b.4.11 DOC Staff Cost 3b.4.12 Utility Staff Cost		-		- - -	-		156 3,658 8,109	23 549 1,216	179 4,207 9,325	179 4,207 9,325	-	-	- - -		:	-	- - -	- - - - 017	-	3,137 42,874 100,389
3b.4 Subtotal Period 3b Period-Dependent Costs 3b.0 TOTAL PERIOD 3b COST	27	484	6	3	-	17 17	13,568	2,105 3,668	16,210	16,210	-	- 001	-	266	-	-	-	5,315	9	,
3b.0 TOTAL PERIOD 3b COST PERIOD 3 TOTALS	910 910			o 8	-	48	19,286 48,688	8,194	25,474 60,382	25,273 59,926	•	201 456	-	266 746	-	-	-	5,315 14,927	12,788 12,803	
PERIOD 4a - Large Component Removal	310	2,010	10	O	-	40	40,000	0,104	00,502	03,320	-	400	-	740	_	-		14,021	12,000	400,040
Period 4a Direct Decommissioning Activities																				
Nuclear Steam Supply System Removal																				
Ad.1.1.1 Recirculation System Piping & Valves 4a.1.1.2 Recirculation Pumps & Motors 4a.1.1.3 CRDMs & NIs Removal 4a.1.1.4 Reactor Vessel Internals 4a.1.1.5 Vessel & Internals GTCC Disposal 4a.1.1.6 Reactor Vessel 4a.1.1 Totals	25 13 56 191 - 146 431	1,138 3,101	16	23 41 124 1,887 - 1,700 3,774	- - - - - -	157 273 420 9,386 9,123 5,571 24,929	329 - 329 657	80 95 497 9,713 1,368 8,721 20,475	395 488 2,840 32,919 10,491 25,449 72,582	395 488 2,840 32,919 10,491 25,449 72,582		- - - - - -		1,064 2,594 5,536 1,878 - 18,660 29,733	1,753 - 1,753	- - - 686 - - -	2,450	$121,654 \\ 211,420 \\ 325,500 \\ 439,019 \\ 482,647 \\ 1,914,414 \\ 3,494,654$	1,846 1,136 18,886 31,175 - 31,175 84,218	1,379 - 1,379
Removal of Major Equipment 4a.1.2 Main Turbine/Generator 4a.1.3 Main Condensers	-	547 1,070	3,165 2,256	1,736 1,238	- -	8,822 6,288	-	2,919 2,251	17,190 13,102	17,190 13,102	:	:	-	131,716 93,880	- -	- -		6,838,856 4,874,376	8,523 16,783	
Cascading Costs from Clean Building Demolition 4a.1.4.1 Reactor Building 4a.1.4.2 Auxiliary Building 4a.1.4.3 IRSF Building 4a.1.4.4 Service Building 4a.1.4.5 Solid Radwaste Building 4a.1.4.6 Turbine Building 4a.1.4.1 Totals		1,181 488 88 188 268 705 2,917	-	- - - - - -		-	- - - - - -	177 73 13 28 40 106 438	1,358 561 101 216 309 811 3,355	1,358 561 101 216 309 811 3,355	- - - - - -	- - - - - -		- - - - - -	- - - - - -		- - - - -		11,181 4,723 939 2,230 2,559 7,337 28,970	-
Disposal of Plant Systems		20 350 9 40 188 250 174 77 838 946 938 79 560 68 308 532 2,460 220 34 24 64 43 254 119 726 1,324 66	89	49		250 		3 166 1 1 6 28 101 26 28 684 1,354 352 31 273 29 189 423 1,420 89 14 4 10 6 38 46 347 562 10 17	23 903 10 46 216 546 201 151 3,845 7,746 1,870 168 1,485 1,038 2,364 7,823 477 74 28 73 49 292 242 1,880 3,040 76 88	903 - 546 - 151 3,845 7,746 1,870 168 1,485 158 1,038 2,364 7,823 477 74 - - - - - - - - - - - - -		23		3,727 1,808 1,808 22,553 53,399 5,591 546 6,560 588 5,368 13,899 38,293 1,606 258 - - - 745 8,181 10,783 - - - - - - - - - - - - -	- - -			193,777 	317 5,415 141 638 3,125 3,771 2,875 1,158 13,994 16,796 14,495 1,194 8,922 1,076 5,043 8,849 39,957 3,457 538 422 1,072 708 4,257 1,853 11,537 20,035 1,110 681	

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 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	Class A Cu. Feet	Burial Class B Cu. Feet	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of	Plant Systems (continued)																				
4a.1.5.30	Service Air	-	26	-	-	-	-	-	4	30	-	-	30	-	-	-	-	-	-	427	-
4a.1.5.31	Sewage Treatment	-	104		-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	1,741	-
4a.1.5.32	Standby Gas Treatment	-	49	18	11	-	58	-	30	166	166	-	-	-	862	-	-	-	44,774	787	-
4a.1.5.33	Station Heat Recovery	-	669	254	130	-	661	-	377	2,091	2,091	-	-	-	9,845	-	-	-	512,043	10,593	
4a.1.5.34 4a.1.5.35	Switchgear Heat Removal Turbine Bldg Closed Cooling Water	-	11 481	197	105	-	534		2 289	13 1,606	1,606	-	13		7,935	-	-	-	413,833	180 7,723	
4a.1.5.36	Turbine Bidg Closed Cooling Water Turbine Building Equipment Drains		85	19	103		58		39	212	212			-	862	-	-	-	44,802	1,338	-
4a.1.5.37	Turbine Building Floor Drains	_	86	9	4	-	21	-	28	149	149	-	_	-	315	-	-	-	16,508	1,329	-
4a.1.5.38	Turbine Generator	-	249	115	76	-	384	-	181	1,005	1,005	-	-	-	5,774	-	-	-	297,530	4,132	-
4a.1.5.39	Turbine Oil	-	721	150	88	-	449	-	321	1,730	1,730	-	- <u>-</u>	-	6,935	-	-	-	348,242	11,349	
4a.1.5.40	Wastewater Treatment	-	153	4.000		-	10.044	-	23	176	40.057	-	176	-	- 907.005	-	-	-	10.720.070	2,499	
4a.1.5	Totals	-	13,414		2,725	-	13,844	-	7,571	42,236	40,857	-	1,380	-	207,085	-	-	-	10,732,070	215,940	
4a.1.6	Scaffolding in support of decommissioning	-	2,908	64	35	-	177	-	783	3,967	3,967	-	-	-	2,649	-	-	-	137,534	50,760	-
4a.1	Subtotal Period 4a Activity Costs	431	31,523	21,816	9,507	-	54,061	657	34,437	152,432	151,053	-	1,380	-	465,064	1,753	686	2,450	26,077,490	405,194	2,758
Period 4a A	Additional Costs																				
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,908	572	2,480	2,480	-	-	-	-	-	-	-	-	30,069	-
4a.2.2	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-		-	-
4a.2.3	Operational Tools and Equipment	-	-	9	13	-	189	1.050	50	261	261	-	-	-	5,855	-	-	-	146,375	16	
4a.2	Subtotal Period 4a Additional Costs	-	-	9	13	-	189	1,958	630	2,798	2,798	-	-	-	5,855	-	-	-	146,375	30,085	-
Period 4a (Collateral Costs																				
4a.3.1	Process decommissioning water waste	12	-	12	32	-	40	-	22	118	118	-	-	-	115	-	-		6,870	22	-
4a.3.3	Small tool allowance	-	431	-	-	-	-	-	65	496	446	-	50	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	12	431	12	32	-	40	-	87	614	564	-	50	-	115	-	-	-	6,870	22	-
Period 4a I	Period-Dependent Costs																				
4a.4.1	Decon supplies	79	-	-	-	-	-	-	20	99	99	-	_	-	-	-	-	-	_	-	-
4a.4.2	Insurance	-	-	-	-	-	-	971	97	1,068	1,068	-	-	-	-	-	-		-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	734	73	807	726	-	81	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	2,691	-	-	-	-	-	673	3,364	3,364	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,972	-	-	-	-	-	446	3,418	3,418	-	-	-		-	-	-	-	-	-
4a.4.6 4a.4.7	Disposal of DAW generated Plant energy budget	-	-	153	83	-	471	2,265	146 340	853 2,604	853 2,604	-	-	-	7,359	-	-	-	147,187	240	-
4a.4.7 4a.4.8	NRC Fees	-	-	-			-	615	61	676	676	-	-		-	-	-	-	-	-	-
4a.4.9	Site O&M Cost	_	-	-	-	-	-	242	36	279	279	-	_	_	-	-	-		_	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	589	88	677	677	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,332	800	6,132	6,132	-	-	-	-	-	-	-	-	-	95,714
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	18,601	2,790	21,392	21,392	-	-	-	-	-	-	-	-	-	211,337
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	32,396	4,859	37,255	37,255	-	-	-		-	-	-	-	-	382,857
4a.4	Subtotal Period 4a Period-Dependent Costs	79	5,663	153	83	•	471	61,745	10,430	78,624	78,544	•	81	-	7,359	-	-	-	147,187	240	689,909
4a.0	TOTAL PERIOD 4a COST	523	37,617	21,990	9,635	-	54,761	64,360	45,583	234,469	232,959	-	1,510	-	478,392	1,753	686	2,450	26,377,920	435,542	692,667
	4b - Site Decontamination																				
Period 4b I 4b.1.1	Direct Decommissioning Activities Remove spent fuel racks	976	96	195	242	-	1,231	-	875	3,615	3,615	-	-		18,378	-	•	-	954,202	1,632	-
Disposal of	Plant Systems																				
4b.1.2.1	Aux Diesel Bldg Floor Drains	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	147	
4b.1.2.2	Auxiliary Diesel Generator	-	82		-	-	-	-	12	94	-	-	94	-		-	-	-	-	1,341	
4b.1.2.3	Containment Monitoring	-	25	2	1	-	5	-	8	40	40	-	-	-	78	-	-	-	4,043	409	
4b.1.2.4 4b.1.2.5	Control Rod Drive Diesel Oil	-	217 69	20	12	-	62	-	73 10	383 80	383	•	80	-	920	-	-	-	47,858	3,493 1,104	
4b.1.2.6	Diesei Oil Domestic Water		30	-	-	-	-	-	10 5	80 35	-	-	80 35	-	-		-	-	-	1,104	
4b.1.2.7	Domestic Water - RCA		45	7	3	-	17	-	17	89	89	-	-	-	255		-		13,307	670	
4b.1.2.8	Electrical	-	611		-	-		-	92	702	-	-	702	-	-	-	-	-	-	9,872	
4b.1.2.9	Electrical - Contaminated	-	856	112	75	-	382	-	332	1,758	1,758	-	-	-	5,707	-	-	-	296,337	13,329	-
4b.1.2.10	Electrical - RCA	-	5,832	1,072	690	-	3,507	-	2,545	13,646	13,646	-	-	-	52,355	-	-	-	2,718,307	89,972	
4b.1.2.11	Fire Protection	-	254	-	-	-	-	-	38	292	-	-	292	-	-	-	-	-	-	4,263	
4b.1.2.12 4b.1.2.13	Fire Protection - RCA Fuel Pool Cooling & Cleanup	-	1,184	312 297	163 166	-	828 843	-	559 469	3,045 2,588	3,045 2,588	-	-	-	12,306 12,562		-	-	641,747 653,382	18,258 13,068	
40.1.2.13	ruei i ooi Coomig & Cleanup	-	814	291	100	-	043	-	409	2,008	2,008	-	-	-	12,002	-	-	-	000,082	15,008	-

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nas or 2014 ao	iiais)											
Activity	7	Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Disposal o	of Plant Systems (continued)																				
4b.1.2.14	HVAC-Auxiliary Building	-	308	75	50	-	254	-	156	842	842	-	-	-	3,793	-	-	-	196,915	4,533	-
4b.1.2.15	HVAC-Control Rm\Aux Equip Area	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	729	-
4b.1.2.16		-	17	-	-	-		-	3	19	-	-	19	-	-	-	-	-		284	-
4b.1.2.17	HVAC-Off Gas Building	-	72 938		19	-	99	-	49	268	268	-	-	-	1,478	-	-	-	76,733	1,141	-
4b.1.2.18 4b.1.2.19	HVAC-Primary Containment HVAC-Radwaste Building	-	938 114	227 23	144 15	-	733 77		462 52	2,504 281	2,504 281	-	-	-	10,961 1,146	-	-	-	568,155 59,487	14,102 1,699	-
4b.1.2.20	HVAC-Turbine Building	-	868	174	117	-	592	-	400	2,151	2,151	-	-	-	8,842	-	-		459,063	12,212	
4b.1.2.21	High Pressure Core Spray	-	311	190	105	-	535	-	246	1,386	1,386	-	-	-	7,949	-	-	-	414,391	5,148	
4b.1.2.22	Instrument Air	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	152	-
4b.1.2.23	Instrument Air - RCA	-	165	19	9	-	45	-	56	293	293	-	-	-	659	-	-	-	34,507	2,558	
4b.1.2.24 4b.1.2.25	Low Pressure Core Spray Nuclear Boiler	-	148 1,477	88 526	49 319	-	246 1,623		115 876	646 4,821	646 4,821	-	-		3,664 $24,184$	-	-	-	191,058 1,258,120	2,446 24,096	-
4b.1.2.26	Off Gas		584	149	89	-	452		287	1,561	1,561	-	-	-	6,743	-	-		350,523	9,243	-
4b.1.2.27	Primary Containment Vent & Purge	_	462	208	137	-	694	-	330	1,830	1,830	_	-	-	10,400	-	_	-	537,713	7,646	_
4b.1.2.28	Process Radiation Monitoring	-	15	1	0	-	2	-	4	23	23	-	-	-	32	-	-	-	1,669	254	-
4b.1.2.29	Process Sampling	-	55	4	3	-	13	-	18	93	93	-	-	-	201	-	-	-	10,453	901	-
4b.1.2.30	Radioactive Waste Disposal	-	2,585	478	271	-	1,379	-	1,080	5,793	5,793	-	-	-	21,136	-	-	-	1,069,308	40,463	-
4b.1.2.31	Radwaste Area Floor Drains	-	400	0	0	-	0	-	1	1 000	1,000	-	-	-	11.695	-	-	-	315	31	-
4b.1.2.32 4b.1.2.33	Reactor Bldg Closed Cooling Water Reactor Building Equipment Drains	-	409 67	294 11	154 6	-	782 28	-	350 26	1,988 137	1,988 137	-	-	-	11,625 428	-	-	-	605,888 21,778	6,817 1,052	-
4b.1.2.34	Reactor Building Floor Drains	-	7	1	0	-	1	-	20	12	12	-	-	-	21	-	-		1,101	109	
4b.1.2.35	Reactor Core Isolation Cooling	-	207	37	21	-	105	-	85	454	454	-	-	-	1,564	-	-		81,526	3,268	-
4b.1.2.36	Reactor Recirculation	-	119	48	31	-	160	-	79	436	436	-	-	-	2,381	-	-	-	123,665	1,970	-
4b.1.2.37	Reactor Water Clean-up	-	780	87	43	-	217	-	264	1,391	1,391	-	-	-	3,219	-	-	-	168,302	12,041	-
4b.1.2.38	Residual Heat Removal	-	1,539	898	507	-	2,574	-	1,194	6,712	6,712	-	-	-	38,296	-	-	-	1,995,503	25,652	-
4b.1.2.39 4b.1.2.40	Service Air - RCA Service Water	-	373 97	54	25	-	127	-	134 15	713 112	713	-	112	-	1,889	-	-	-	98,774	5,643 1,595	-
4b.1.2.40 4b.1.2.41	Service Water Service Water - RCA	-	862	316	180	-	915	-	503	2,775	2,775	-	112	-	13,626	-	-	-	709,225	13,633	-
4b.1.2.42	Standby Liquid Control	-	48	8	4	-	19	-	18	97	97	-	-	-	281	-	-		14,698	719	-
4b.1.2.43	Well Water	-	107	-	-	-	-	-	16	123	-	-	123	-	-	-	-	-	-	1,732	-
4b.1.2	Totals	-	22,816	5,763	3,408	-	17,317	-	10,988	60,291	58,763	-	1,529	-	258,706	-	-	-	13,423,850	358,295	-
4b.1.3	Scaffolding in support of decommissioning	-	4,362	95	52	-	266	-	1,174	5,950	5,950	-	-	-	3,973	-	-	-	206,301	76,140	-
Decontam	ination of Site Buildings																				
4b.1.4.1	Reactor Building	3,002	3,630	411	607	-	2,133	-	3,074	12,858	12,858	-	-	-	37,178	-	-	-	2,243,740	99,203	-
4b.1.4.2	Auxiliary Building	1,461	640	476	210	-	1,031	-	1,227	5,045	5,045	-	-	-	15,307	-	-	-	822,445	32,558	-
4b.1.4.3	IRSF Building	81	21 23	1	5	-	13	-	50 67	172	172 228	-	-	-	227	-	-	-	18,719	1,534	-
4b.1.4.4 4b.1.4.5	Service Building Solid Radwaste Building	112 495	350	31	29		18 103		368	$\frac{228}{1,377}$	1,377	-		-	313 1,635		-	-	25,878 106,769	2,027 12,901	-
4b.1.4.6	Turbine Building	1,790	750	120	169	-	569	-	1,262	4,659	4,659	_	-	_	9,386	-	_	-	621,456	38,195	_
4b.1.4	Totals	6,941	5,414	1,040	1,028	-	3,866	-	6,049	24,338	24,338	-	-	-	64,047	-	-	-	3,839,006	186,417	-
4b.1	Subtotal Period 4b Activity Costs	7,916	32,687	7,094	4,731	-	22,680	-	19,086	94,195	92,666	-	1,529	-	345,104	-	-	-	18,423,360	622,483	-
Period 4h	Additional Costs																				
4b.2.1	License Termination Survey Planning	-		-	_	-	_	983	295	1,277	1,277	-	-	_	_				-	-	6,240
4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,418	1,025	4,443	4,443	-	-	-	-	-	-		-	53,874	
4b.2.3	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
4b.2.4	License Termination ISFSI	-	231	336	442	-	1,502	1,700	1,053	5,264	5,264	-	-	-	24,629	-	-	-	1,947,877	9,942	
4b.2.5	Underground Services Excavation	-	542	- 7	-	-	1.050	-	81	623	623	-	-	-	-	-	-	-		3,627	-
4b.2.6 4b.2	Soil Remediation Subtotal Period 4b Additional Costs	-	58 832		221 663	-	1,978 3,480	6,151	543 3,005	2,808 14,473	2,808 14,473	-	-		34,081 58,710	-		-	2,736,453 4,684,331	745 68,187	11,514
							-,	-, -	-,	,	,				,-				, ,	,	,-
Period 4b 4b.3.1	Collateral Costs Process decommissioning water waste	38	_	39	104		132	_	72	385	385				377			_	22,642	74	-
4b.3.1 4b.3.3	Small tool allowance	- 38	654		104	-	132	-	72 98	752	385 752	-	-		311 -	-	-	-	22,642	- 14	-
4b.3.4	Decommissioning Equipment Disposition	-	-	170	93	-	472	-	149	884	884	-	-	-	7,054		-	-	366,237	88	
4b.3	Subtotal Period 4b Collateral Costs	38	654		197	-	605	-	319	2,021	2,021	-	-	-	7,431	-	-	-	388,880	162	
Period 4h	Period-Dependent Costs																				
4b.4.1	Decon supplies	1,769		-	-	-	-		442	2,212	2,212	-	-	-	-	-		-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,714	171	1,885	1,885	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	4.970	-	-	-	-	1,295	130	1,425	1,425	-	•	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	4,379	-	-	-	-	-	1,095	5,474	5,474	-	-	-	-	-	-	-	-	-	-

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(nas or 2014 aoi												
		D.	D 1	D 1	7 0.	Off-Site	LLRW	0.1	m . 1	m . 1	NRC	Spent Fuel	Site	Processed	CI. A		Volumes	amaa	Burial/	C C	Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 4b I	Period-Dependent Costs (continued)																				
4b.4.5	Heavy equipment rental	-	5,193	-	-	-	-	-	779	5,972	5,972	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	213	115	-	655	-	202	1,185	1,185	-	-	-	10,221	-	-	-	204,423	333	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	3,155	473	3,629	3,629	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,085	109	1,194	1,194	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost	-	-	-	-	-	-	428	64	492	492	-	-	-	-	-	-	-	-	-	-
4b.4.10 4b.4.11	Liquid Radwaste Processing Equipment/Services Security Staff Cost	-	-	-	-	-	-	1,039 9,411	$156 \\ 1,412$	1,195 $10,822$	1,195 $10,822$	-	-	-	-	-	-	-	-	-	168,929
4b.4.11	DOC Staff Cost	-			-	-	-	31,966	4,795	36,761	36,761	_	-	-	-	-	-	-	-	-	362,183
4b.4.13	Utility Staff Cost	-	_	_	_	-	_	54,148	8,122	62,270	62,270	_	-	_	_	_	-	_	_	-	637,874
4b.4	Subtotal Period 4b Period-Dependent Costs	1,769	9,572	213	115	-	655	104,242	17,950	134,515	134,515	-	-	-	10,221	-	-	-	204,423	333	1,168,986
4b.0	TOTAL PERIOD 4b COST	9,724	43,745	7,858	5,706	-	27,420	110,392	40,359	245,204	243,676	-	1,529	-	421,466	-	-	-	23,700,990	691,165	1,180,500
PERIOD 4	4f - License Termination																				
	Direct Decommissioning Activities																				
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license									a											
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	•	-	-
	Additional Costs																				
4f.2.1 4f.2	License Termination Survey Subtotal Period 4f Additional Costs		-	-	-			14,037 $14,037$	4,211 $4,211$	18,248 18,248	18,248 18,248	-	-		-	-	-	-		218,104 218,104	3,120 3,120
	Collateral Costs																				
4f.3.1	DOC staff relocation expenses	_	_	_	_	_	_	1,163	175	1,338	1,338	_		_		_	_	_	_	_	_
4f.3	Subtotal Period 4f Collateral Costs		-	-				1,163	175	1,338	1,338	-	-			-		-		-	-
Period 4f F	Period-Dependent Costs																				
4f.4.1	Insurance	-	_	-	-	-	-	504	50	554	554	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	-	-	-	-	-	381	38	419	419	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies	-	898	-	-	-	-	-	224	1,122	1,122	-	-	-	-	-	-	-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	4	-	22		7	39	39	-	-	-	339	-	-	-	6,771	11	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	247	37	284	284	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees Site O&M Cost	-	-	-	-	-	-	306 126	31 19	336 144	336 144	-	-	-	-	-	-	-	-	-	-
4f.4.7 4f.4.8	Security Staff Cost	-		-	-	-	-	686	103	789	789	-	-	-	-	-	-	-	-	-	- 11,914
4f.4.9	DOC Staff Cost	-	_	_	_	-	_	4,219	633	4,852	4,852	_		_	_	_	-		_	-	47,260
4f.4.10	Utility Staff Cost	-	-	-	_	-	_	5,177	777	5,953	5,953	_	-	_	_	-	-		_	_	57,586
4f.4	Subtotal Period 4f Period-Dependent Costs	-	898	7	4	-	22	11,645	1,918	14,494	14,494	-	-	-	339	-	-	-	6,771	11	116,760
4f.0	TOTAL PERIOD 4f COST	-	898	7	4	-	22	27,018	6,356	34,304	34,304	-	-	-	339	-	-	-	6,771	218,115	119,880
PERIOD 4	4 TOTALS	10,247	82,260	29,855	15,345	-	82,203	201,770	92,298	513,977	510,939	-	3,039	-	900,197	1,753	686	2,450	50,085,680	1,344,822	1,993,047
PERIOD	5b - Site Restoration																				
Period 5b I	Direct Decommissioning Activities																				
	n of Remaining Site Buildings																				
5b.1.1.1	Reactor Building	-	6,790	-	-	-	-	-	1,018	7,808	-	-	7,808	-	-	-	-	-	-	64,458	-
5b.1.1.2 5b.1.1.3	Auxiliary Building Capital Improvements 2009	-	4,415 $1,552$	-	-	-	-	-	662 233	5,077 $1,785$	-	-	5,077 1,785	-	-	-	-	-	-	42,962 20,778	-
5b.1.1.4	Capital Improvements 2009 Capital Improvements 2014	-	1,552		-	-	-	-	233	1,785	-	-	1,785	-				-	-	20,778	-
5b.1.1.5	Chemical Feed Building		39	-	-	-	-		6	45	-	-	45	-					-	482	-
5b.1.1.6	Diesel Generator Room	-	554	-	-	-	-	-	83	637	-	-	637	-	-	-		-	-	6,000	-
5b.1.1.7	Discharge Structure	-	23		-	-	-	-	3	26	-	-	26	-	-	-	-	-	-	190	-
5b.1.1.8	IRSF Building	-	819		-	-	-	-	123	941	-	-	941	-	-	-	-	-	-	8,924	-
5b.1.1.9	Lake Screen House	-	1,295	-	-	-	-	-	194	1,489	-	-	1,489	-	-	-	-	-	-	13,877	-
5b.1.1.10		-	462	-	-	-	-	-	69	532	-	-	532	-	-	-	-	-	-	5,396	-
5b.1.1.11	Miscellaneous Yard Structures	-	2,352		-	-	-	-	353	2,705	-	-	2,705	-	-	-	•	-	-	27,035	-
5b.1.1.12 5b.1.1.13	New Service Building Outfall Structure	-	2,166 9		-	-	-	-	325 1	2,491 11	-	-	2,491 11	-	-	-	-	-	-	23,587 113	-
5b.1.1.14	River Screen House		387	-	-	-	-	-	58	445	-	-	445	-					-	4,231	-
	Security Modifications 2009	-	736		-	-	-		110	846		-	846	-	-				-	3,834	-
	•																			-,	

Table D-2
LaSalle County Station, Unit 2
Delayed DECON Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed			olumes		Burial /		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Demolition	of Remaining Site Buildings (continued)																				
5b.1.1.16	Security Modifications 2014	_	40	-	_	_	_	-	6	46	_	-	46	_	-	_	-	-	-	528	_
5b.1.1.17	Service Building		1,778		-	-	-	-	267	2,045	-		2,045	-	-	-	-	-	-	21,582	
5b.1.1.18	Sewage Treatment Plant	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	591	-
5b.1.1.19	Sewage Treatment Plant Upgrades	-	320	-	-	-	-	-	48	368	-	-	368	-	-	-	-	-	-	3,346	-
5b.1.1.20	Solid Radwaste Building	-	2,428	-	-	-	-	-	364	2,792	-	-	2,792	-	-	-	-	-	-	23,167	-
5b.1.1.21	Training Center	-	1,467	-	-	-	-	-	220	1,687	-	-	1,687	-	-	-	-	-	-	16,863	-
5b.1.1.22	Turbine Building	-	6,492	-	-	-	-	-	974	7,466	-	-	7,466	-	-	-	-	-	-	68,584	-
5b.1.1.23	Turbine Pedestal	-	2,536	-	-	-	-	-	380	2,917	-	-	2,917	-	-	-	-	-	-	22,592	-
5b.1.1.24	Wastewater Treatment Plant	-	73	-	-	-	-	-	11	83	-	-	83	-	-	-	-	-	-	911	-
5b.1.1	Totals	-	36,779	-	-	-	-	-	5,517	42,296	-	-	42,296	-	-	-	-	-	-	380,083	-
Site Closed	out Activities																				
5b.1.2	BackFill Site	-	861	-	-	-	-	-	129	991	-	-	991	-	-	-	-	-	-	1,535	-
5b.1.3	Grade & landscape site	-	198	-	-	-	-	-	30	228	-	-	228	-	-	-	-	-	-	499	-
5b.1.4	Final report to NRC	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	654
5b.1	Subtotal Period 5b Activity Costs	-	37,839	-	-	-	-	87	5,689	43,615	100	-	43,515	-	-	-	-	-	-	382,117	654
Period 5b	Additional Costs																				
5b.2.1	Site Restoration ISFSI	-	655	-	-	-	-	28	102	785	-	-	785	-	-	-	-	-	-	6,995	80
5b.2.2	Concrete Crushing	-	1,260	-	-	-	-	6	190	1,456	-	-	1,456	-	-	-	-	-	-	5,872	-
5b.2.3	Cofferdam Construction and Teardown	-	989	-	-	-	-	-	148	1,138	-	-	1,138	-	-	-	-	-	-	8,720	-
5b.2	Subtotal Period 5b Additional Costs	-	2,905	-	-	-	-	33	441	3,379	-	-	3,379	-	-	-	-	-	-	21,586	80
	Collateral Costs																				
5b.3.1	Small tool allowance	-	425	-	-	-	-	-	64	488	-	-	488	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	425	-	-	-	-	-	64	488	-	-	488	-	-	-	-	-	-	-	-
Period 5b	Period-Dependent Costs																				
5b.4.2	Property taxes	-	-	-	-	-	-	998	100	1,098	-	-	1,098	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	5,685	-	-	-	-	-	853	6,538	-	-	6,538	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	324	49	373	-	-	373	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Cost	-	-	-	-	-	-	329	49	379	-	-	379	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	1,618	243	1,861	-	-	1,861	-	-	-	-	-	-	-	27,619
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	10,124	1,519	11,642	-	-	11,642	-	-	-	-	-	-	-	110,391
5b.4.8	Utility Staff Cost	-		-	-	-	-	5,084	763	5,847	-	-	5,847	-	-	-	-	-	-	-	54,154
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,685	•	-	-	-	18,477	3,574	27,737	•	-	27,737	-	-	•	-	-	-	-	192,164
5b.0	TOTAL PERIOD 5b COST	-	46,854	-	-	-	-	18,598	9,768	75,219	100	-	75,119	-	-	-	-	-	-	403,703	192,898
PERIOD	5 TOTALS	-	46,854	-	-	-	-	18,598	9,768	75,219	100	-	75,119	-	-	-	-	-	-	403,703	192,898
TOTAL C	OST TO DECOMMISSION	21,354	137,396	30,197	16,005	-	83,333	600,675	161,994	1,050,952	800,838	171,500	78,614	_	908,171	1,753	686	2,450	50,331,430	1,886,981	5,145,764

Table D-2 LaSalle County Station, Unit 2 Delayed DECON Decommissioning Cost Estimate (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours

TOTAL COST TO DECOMMISSION WITH 18.22% CONTINGENCY:	\$1,050,952	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 76.2% OR:	\$800,838	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 16.32% OR:	\$171,500	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 7.48% OR:	\$78,614	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	910,610	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,450	cubic feet
TOTAL SCRAP METAL REMOVED:	67,341	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,886,981	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

APPENDIX E

DETAILED COST ANALYSIS

SAFSTOR

	Page
LaSalle County Station, Unit 1	E-2
LaSalle County Station, Unit 2	E-12

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
		D	D 1	D 1 2	7 0	Off-Site	LLRW	0/1	m . 1	/D / 1	NRC	Spent Fuel	Site	Processed	Cl. A		Volumes	C/T/C/C	Burial /	C 6	Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
PERIOD 1a	- Shutdown through Transition																				
Period 1a Dir	rect Decommissioning Activities																				
	AFSTOR site characterization survey	-	-	-	-	-	-	481	144	625	625	-	-	-	-	-	-	-	-	-	-
	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	173	26	199 a	199	-	-	-	-	-	-	-	-	-	1,300
	Remove fuel & source material Notification of Permanent Defueling									n/a a											
1a.1.6 D	Deactivate plant systems & process waste							205	40	a	205										2.000
	Prepare and submit PSDAR Review plant dwgs & specs.		-	-	-	-	-	267 173	40 26	307 199	307 199	-	-	-	-	-	-	-	-	-	2,000 1,300
1a.1.9 P	Perform detailed rad survey							100	20	a											,
	Estimate by-product inventory End product description	-		-		-	-	133 133	20 20	153 153	153 153	-	-		-	-	-	-		-	1,000 1,000
1a.1.12 D	Detailed by-product inventory	-	-	-	-	-	-	200	30	230	230	-	-	-	-	-	-	-	-	-	1,500
	Define major work sequence Perform SER and EA		-		-	-	-	133 414	20 62	153 476	153 476	-	-		-	-	-	-		-	1,000 3,100
	Perform Site-Specific Cost Study	-	•	-	-	-	-	667	100	767	767	-	-	-	-	-	-	-	-	-	5,000
Activity Spec								050	00												4.000
1a.1.16.1 P	Prepare plant and facilities for SAFSTOR Plant systems			-	-	-	-	656 556	98 83	755 639	755 639	-	-	-	-	-	-	-		-	4,920 4,167
	Plant structures and buildings	-	-	-	-	-	-	416	62	479	479	-	-	-	-	-	-	-	-	-	3,120
	Vaste management Pacility and site dormancy	-		-		-	-	$\frac{267}{267}$	40 40	307 307	307 307	-	-		-	-	-	-		-	2,000 2,000
	otal	-	-	-	-	-	-	2,162	324	2,486	2,486	-	-	-	-	-	-	-	-	-	16,207
	rk Procedures							150	24	100	100										1 100
1a.1.17.1 P. 1a.1.17.2 F	Tant systems Facility closeout & dormancy	-	-	-	-	-		158 160	$\frac{24}{24}$	182 184	182 184	-	-	-		-	-	-		-	1,183 1,200
	'otal	-	•	-	-	-	-	318	48	366	366	-	-	-	-	-	-	-	-	-	2,383
1a.1.19 D	Procure vacuum drying system Orain/de-energize non-cont. systems Orain & dry NSSS	-	-	-	-	-	-	13	2	15 a a	15	-	-	-	-	-	-	-	-	-	100
	Orain/de-energize contaminated systems Oecon/secure contaminated systems									a a											
	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,268	862	6,131	6,131	-	-	-	-	-	-	-	-	-	35,890
	ditional Costs							9.150	459	9.699		2.622									
	SFSI Expansion Spent Fuel Pool Isolation	-		-	-	-	-	3,150 10,813	473 1,622	3,623 12,434	12,434	3,623	-	-	-	-	-	-		-	-
1a.2 S	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	13,963	2,094	16,057	12,434	3,623	-	-	-	-	-	-	-	-	-
	llateral Costs Spent Fuel Capital and Transfer							19.10	1.966	15.051		15,071									
	Subtotal Period 1a Collateral Costs	-	-	-	-		-	13,105 $13,105$	1,966	$15,071 \\ 15,071$	-	15,071		-	-	-	-	-	-	-	-
	riod-Dependent Costs																				
	nsurance Property taxes	•			-		-	2,050	205	2,255	2,255	-	-	•	-	-	-	-		-	-
1a.4.3 H	Health physics supplies	-	491		-	-			123	614	614	-	-	-		-	-	-	-	-	-
1a.4.4 H	Heavy equipment rental Disposal of DAW generated	-	527	' - 13	- 7	-	- 39	-	79 12	606 71	606 71	-	-	-	610	-	-	-	12,190	20	-
	Asposal of DAW generated Plant energy budget	-	-	-	- '	-	- 39	1,623	243	1,867	1,867	-	-	-	- 610	-	-	-	12,190	-	
1a.4.7 N	VRC Fees	-	-	-	-	-	-	1,181	118	1,299	1,299	- 0.450	-	-	-	-	-	-	-	-	-
	Emergency Planning Fees Site O&M Cost		-	-	-	-	-	2,227 165	$\frac{223}{25}$	2,450 190	190	2,450	-	-	-	-	-	-	-	-	
1a.4.10 S	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
	SFSI Operating Costs Security Staff Cost		-	-	-	-	-	48 610	7 91	55 701	701	55	-	-	-	-	-	-	-	-	12,264
1a.4.13 U	Jtility Staff Cost	-	-	-	-	-	-	35,778	5,367	41,144	41,144	-	-	-	-	-	-	-	-	-	423,400
1a.4 S	Subtotal Period 1a Period-Dependent Costs	-	1,018	3 13	7	-	39	44,472	6,612	52,160	48,746	3,415	-	-	610	-	-	-	12,190	20	435,664
1a.0 T	OTAL PERIOD 1a COST	-	1,018	3 13	7	-	39	76,808	11,534	89,419	67,311	22,108	-	-	610	-	-	-	12,190	20	471,554

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C	GTCC Cu. Feet	Processed	Craft Manhours	Contractor Manhours
PERIOD) 1b - SAFSTOR Limited DECON Activities																				
Period 1b	Direct Decommissioning Activities																				
Decontan	nination of Site Buildings																				
1b.1.1.1	Reactor Building	3,298	-	-	•	-	-	-	1,649	4,947	4,947	-	-	-	-	-	-	-	-	49,197	
1b.1.1.2 1b.1.1.3	Auxiliary Building Off Gas Building	365 163	-	-	-	-		-	182 81	547 244	$547 \\ 244$	-	-			-	-	-	-	5,731 2,566	-
1b.1.1.4	Turbine Building	1,915	-	-	-	-	-	-	958	2,873	2,873	-	-	-	-	-	-	-	-	30,081	-
1b.1.1	Totals	5,741	-	-	-	•	•	-	2,870	8,611	8,611	-	-	-	-	-	-	-		87,576	•
1b.1	Subtotal Period 1b Activity Costs	5,741	-	-	-	-	-	-	2,870	8,611	8,611	-	-	-	-	-	-	-	-	87,576	-
	Collateral Costs																				
1b.3.1 1b.3.2	Decon equipment Process decommissioning water waste	883 164	-	106	285	-	363	-	132 226	1,015 1,145	1,015 1,145	-	-	-	1,035	-	-	-	62,116	202	-
1b.3.4	Small tool allowance	-	94		-	-	-		14	108	108	-	-	-	1,035		-		02,110	-	-
1b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	3,267	490	3,757	-	3,757	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,047	94	106	285	-	363	3,267	863	6,025	2,268	3,757	-	-	1,035	-	-	-	62,116	202	-
	Period-Dependent Costs																				
1b.4.1 1b.4.2	Decon supplies Insurance	1,459	-	-	-	-	-	394	365 39	1,824 434	1,824 434	-	-	-	-	-	-	-	-	-	-
1b.4.2 1b.4.3	Property taxes	-		-	-	-	-	2,996	300	3,295	3,295	-	-	-	-			-	-	-	-
1b.4.4	Health physics supplies	-	522	-	-	-	-	-,	130	652	652	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	131			-	-	-	20	151	151	-	-	-	-	-	-	-		-	-
1b.4.6 1b.4.7	Disposal of DAW generated Plant energy budget	-	-	18	10	-	55	405	17 61	99 465	99 465	-	-	-	857	-	-	-	17,148	28	-
1b.4.7 1b.4.8	NRC Fees	-		-	-	-	-	172	17	189	189	-	-	-	-		-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	555	56	611	-	611	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Cost	-	-	-	-	-	-	41	6	47	47	-	-	-	-	-	-	-	-	-	-
1b.4.11 1b.4.12	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	197 12	$\frac{30}{2}$	227 14	-	227 14	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	152	23	175	175		-	-	_		-	-	-	-	3,058
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	8,920	1,338	10,258	10,258	-	-	-	-	-	-	-	-	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	1,459	653	18	10	-	55	13,844	2,403	18,441	17,590	851	-	-	857	-	-	-	17,148	28	108,618
1b.0	TOTAL PERIOD 1b COST	8,246	747	124	295	-	418	17,111	6,136	33,077	28,469	4,609	-	-	1,893	-	-	-	79,265	87,805	108,618
PERIOD	1 1c - Preparations for SAFSTOR Dormancy																				
Period 1c	Direct Decommissioning Activities																				
1c.1.1	Prepare support equipment for storage	-	486	-	-	-	-	-	73	559	559	-	-	-	-	-	-	-	-	3,000	
1c.1.2	Install containment pressure equal. lines	-	48	-	-	-	-	- 733	$\frac{7}{220}$	55 953	55 953	-	-	-	-	-	-	-	-	700	
1c.1.3 1c.1.4	Interim survey prior to dormancy Secure building accesses	-	-	-	-	-	-	199	220	999 a	999	-	-	-	-	-	-	-	-	10,874	-
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	78	12	89	89	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	534	-	-	-	-	811	312	1,657	1,657	-	-	-	-	-	-	-	-	14,574	583
Period 1c	Collateral Costs																				
1c.3.1	Process decommissioning water waste	149	-	97	259		331	-	206	1,041	1,041	-	-	-	942	-	-	-	56,524	184	
1c.3.3	Small tool allowance Spent Fuel Capital and Transfer	-	4	-	-	-	-	2 202	1 495	5 3,799	5	3,799	-	-	-	-	-	-	-	-	-
1c.3.4 1c.3	Subtotal Period 1c Collateral Costs	149	4	97	259	-	331	3,303 3,303	702	4,845	1,046	3,799 3,799		-	942	-	-		56,524	184	-
Period 1c	Period-Dependent Costs																				
1c.4.1	Insurance	-	-	-	-	-	-	399	40	439	439	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	- 101	-	-	-	-	3,029	303	3,331	3,331	-	-	-	-	-	-	-	-	-	-
1c.4.3 1c.4.4	Health physics supplies Heavy equipment rental	-	191 133		-	-		-	48 20	239 153	239 153	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	3	2	-	10	-	3	18		-	-	-	154	-	-	-	3,073	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	409	61	471	471	-	-	-	-	-	-	-	· -	-	-
1c.4.7 1c.4.8	NRC Fees Emergency Planning Fees	-	-	-	-	-	-	174 561	17 56	191 618	191	618	-	-	-	-	-	-	-		-
10.4.0	Emergency Flamming Fees	-	-	•	-	-	-	100	96	018	-	618	-	-	-	-	-	-	-	-	-

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Rurial	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging		Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Period 1	c Period-Dependent Costs (continued)																				
1c.4.9	Site O&M Cost	-	-	-	-	-	-	42	6	48	48	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-	-	199 12	$\frac{30}{2}$	229 14	-	229 14	-	-	-	-	-	-	-	-	-
1c.4.11 1c.4.12	Security Staff Cost	-				-	-	154	23	177	177	14		-	-					-	3,091
1c.4.13	Utility Staff Cost	-	-	-	-	-	-	9,018	1,353	10,371	10,371	-	-	-	-	-	-	-	-	-	106,720
1c.4	Subtotal Period 1c Period-Dependent Costs	-	324	3	2	-	10	13,996	1,962	16,297	15,436	861	-	-	154	-	-	-	3,073	5	
1c.0	TOTAL PERIOD 1c COST	149	862	100	261	-	341	18,110	2,975	22,798	18,139	4,659	-	-	1,096	-	-	-	59,597	14,762	110,395
PERIOR	O 1 TOTALS	8,395	2,627	237	563	-	798	112,030	20,645	145,294	113,919	31,376	-	-	3,598	-	-	-	151,052	102,588	690,566
PERIOR	2a - SAFSTOR Dormancy with Wet Spent Fue	el Storage																			
Period 2a	a Direct Decommissioning Activities																				
2a.1.1	Quarterly Inspection									a											
2a.1.2	Semi-annual environmental survey									a											
2a.1.3	Prepare reports							1.01	0.4	a	105										
2a.1.4 2a.1.5	Bituminous roof replacement Maintenance supplies	-	-	-	-	-	-	161 556	24 139	185 695	185 695	-	-	-	-	-	-	-	-	-	-
2a.1.5 2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-		717	163	880	880			-	-	-	-		-	-	-
20.1	passour remarkation of costs								100	000	000										
Period 2a	a Collateral Costs																				
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	52,455	7,868	60,324	-	60,324	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	52,455	7,868	60,324	-	60,324	-	-	-	-	-	-	-	-	-
	a Period-Dependent Costs																				
2a.4.1	Insurance	-	-	-	-	-	-	3,565	357	3,922	2,912	1,010	-	-	-	-	-	-	-	-	-
2a.4.2 2a.4.3	Property taxes Health physics supplies	-	738	-	-	-	-	20,187	2,019 185	22,206 923	22,206 923	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	18	10	-	54		17	98	98	-	-	-	844	-	-		16,876	28	-
2a.4.5	Plant energy budget	-	_	-	-	-	-	1,300	195	1,494	747	747	_	-	-	_	-		-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	1,158	116	1,274	1,274	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	7,812	781	8,593	-	8,593	-	-	-	-	-	-	-	-	-
2a.4.8	Site O&M Cost	-	-	-	-	-	-	660	99	759	759	-	-	-	-	-	-	-	-	-	-
2a.4.9 2a.4.10	Spent Fuel Pool O&M ISFSI Operating Costs	-	-	-	-	-		3,166 191	475 29	3,641 220	-	3,641 220	-	-	-	-	-	-	-	-	-
2a.4.10	Security Staff Cost	-	-	-	-	-	-	11,835	1,775	13,610	4,477	9,134	-	-	-	-	-		-	-	222,322
2a.4.12	Utility Staff Cost	-	_	-	_	-	_	17,173	2,576	19,748	4,802	14,947	_	-	_	-	-		_	-	196,191
2a.4	Subtotal Period 2a Period-Dependent Costs	-	738	18	10	-	54	67,047	8,622	76,489	38,198	38,291	-	-	844	-	-	-	16,876	28	
2a.0	TOTAL PERIOD 2a COST	-	738	18	10	-	54	120,219	16,654	137,693	39,078	98,615	-	-	844	-	-	-	16,876	28	418,514
PERIOR	2b - SAFSTOR Dormancy with Dry Spent Fue	el Storage																			
Period 2b	b Direct Decommissioning Activities																				
2b.1.1	Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3 2b.1.4	Prepare reports Bituminous roof replacement							571	86	a 657	657										
2b.1.4 2b.1.5	Maintenance supplies	-	-	-	-	-	-	1,975	494	2,469	2,469	-	-	-	-		-	-	-	-	-
2b.1.0	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	2,546	579	3,126	3,126	-	-	-	-	-	-	-	-	-	-
Period 2h	o Collateral Costs																				
2b.3.1	Spent Fuel Capital and Transfer	-	_	-	_	-	-	11,563	1,734	13,297	_	13,297	_	-	-	_	_		-	_	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	11,563	1,734	13,297	-	13,297	-	-	-	-	-	-	-	-	-
	b Period-Dependent Costs																				
2b.4.1	Insurance	-	-	-	-	-	-	9,404	940	10,344	10,344	-	-	-	-	-	-		-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	7,105	710	7,815	7,815	-	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	1,292	- 31	17	-	94	-	323	1,615	1,615	-	-	-	1 400	-	-	-	29,375	- 40	-
2b.4.4 2b.4.5	Disposal of DAW generated Plant energy budget	-	-	- 31	17	-	94	2,308	29 346	170 2,654	170 2,654	-	-	-	1,469	-	-		29,375	48	-
2b.4.6	NRC Fees	-		-	-	-	-	3,924	392	4,317	4,317	-	-	-	-		-		-	-	-
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	27,749	2,775	30,524	-	30,524	-	-	-	-	-		-	-	-
2b.4.8	Site O&M Cost	-	-	-	-	-	-	2,346	352	2,698	2,698	-	-	-	-	-	-	-	-	-	-

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	ınds of 2014 de	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Jolumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs		Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C	GTCC Cu. Feet	Processed	Craft Manhours	Contractor Manhours
Period 2b	Period-Dependent Costs (continued)																				
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	679	102	781	-	781	-	-	-	-	-	-	-	-	-
2b.4.10	Security Staff Cost	-	-	-	-	-	-	22,680	3,402	26,082		10,179	-	-	•	-	-	-	-	-	400,371
2b.4.11 2b.4	Utility Staff Cost Subtotal Period 2b Period-Dependent Costs	-	1,292	31	17	-	94	24,523 $100,717$	3,678 13,051	28,201 115,201	17,058 62,574	11,143 52,627	-		1,469				29,375	48	296,571 696,943
	·																		ŕ		
2b.0 PERIOD	TOTAL PERIOD 2b COST 2c - SAFSTOR Dormancy without Spent Fue	- I Storage	1,292	31	17	-	94	114,826	15,364	131,624	65,699	65,924	-	-	1,469	-	-	-	29,375	48	696,943
	Direct Decommissioning Activities																				
2c.1.1	Quarterly Inspection									a											
2c.1.2	Semi-annual environmental survey									a											
2c.1.3	Prepare reports									a											
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	1,308	196	1,505		-	-	-	-	-	-	-	-	-	-
2c.1.5 2c.1	Maintenance supplies Subtotal Period 2c Activity Costs	-	-	-	-	-	-	4,525 5,833	1,131 1,327	5,656 7,161	5,656 7,161	-	-	-	-	-	-		-	-	-
	·	•	-		-	•	-	0,000	1,527	7,101	7,101	-	-	•	-	-	-	-	•	•	•
	Period-Dependent Costs Insurance							21,543	2,154	23,697	23,697										
2c.4.1 2c.4.2	Property taxes	-	-	-	-			16,277	2,154 1,628	17,904	17,904	-			-	-			-		-
2c.4.3	Health physics supplies	_	2,867	_	-	-	_	-	717	3,584	3,584	_	-	_	_	-	-		_	_	-
2c.4.4	Disposal of DAW generated	-	-	67	36	-	206	-	64	374	374	-	-	-	3,223	-	-		64,457	105	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	5,288	793	6,081	6,081	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	8,264	826	9,090	9,090	-	-	-	-	-	-	-	-	-	-
2c.4.7	Site O&M Cost	-	-	-	-	-	-	5,374	806	6,180		-	-	-	-	-	-	-	-	-	-
2c.4.8 2c.4.9	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	31,680 33,982	4,752 5,097	36,432 39,079	36,432 39,079	-	-	-	-	-	-	-	-	-	509,571 433,475
2c.4.5 2c.4	Subtotal Period 2c Period-Dependent Costs	-	2,867	67	36	-	206	122,407	16,837	142,422		-	-	-	3,223	-	-	-	64,457	105	943,047
2c.0	TOTAL PERIOD 2c COST	-	2,867	67	36	-	206	128,240	18,165	149,583	149,583	-	-	-	3,223	-	-	-	64,457	105	943,047
PERIOD	2 TOTALS	-	4,897	115	62	-	355	363,286	50,183	418,899	254,360	164,539	-	-	5,535	-	-	-	110,708	181	2,058,504
PERIOD	3a - Reactivate Site Following SAFSTOR Do	rmancy																			
Period 3a	Direct Decommissioning Activities																				
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	173	26	199		-	-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	614	92	706	706	-	-	-	-	-	-	-	-	-	4,600
3a.1.3 3a.1.4	Perform detailed rad survey End product description							133	20	a 153	153										1,000
3a.1.5	Detailed by-product inventory	-	-	-		-	-	173	26	199		-	-	-	-		-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	1,001	150	1,151		-	-	-	-	-	-	-	-	-	7,500
3a.1.7	Perform SER and EA	-	-	-	-	-	-	414	62	476		-	-	-	-	-	-	-	-	-	3,100
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	667	100	767		-	-	-	-	-	-	-	-	-	5,000
3a.1.9 3a.1.10	Prepare/submit License Termination Plan Receive NRC approval of termination plan	-	-	-	-	-	-	546	82	628 a	628	-	-	-	-	-	-	-	-	-	4,096
Activity S	pecifications																				
3a.1.11.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	983	147	1,131	1,018		113	-	-	-	-	-	-	-	7,370
3a.1.11.2	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	-	4,167
	Reactor internals	-	-	-	-	-	-	947	142	1,089		-	-	-	-	-	-	-	-	-	7,100
	Reactor vessel Sacrificial shield	-	-	-	-	-	-	867	130	997 77		-	-	-	•	-	-	-	-	-	6,500
	Moisture separators/reheaters	-	-	-	-	-	-	67 133	10 20	153		-	-	-		-	-	-	-	-	500 1,000
	Reinforced concrete	-	-	-	-	-	-	213	32	245		-	123	-			-		-	-	1,600
	Main Turbine	-	-	-	-	-	-	279	42	320		-	-	-	-	-	-	-	-	-	2,088
	Main Condensers	-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,088
	Pressure suppression structure	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
3a.1.11.11		-	-	-	-	-	-	213	32	245		-	-	-	•	-	-	-	-	-	1,600
	2 Plant structures & buildings	-	-	-	-	-	-	416 614	62	479 706		-	239	-	-	-	-	-	-	-	3,120
	3 Waste management 4 Facility & site closeout	-	-	-	-	-		120	92 18	138		-	- 69	-		-	-	-	-	-	4,600 900
3a.1.11		-	-	-	-	-	-	5,954	893	6,847	6,239	-	608	-	-	-			-	-	44,633
								5,001	000	0,011	3,200		550								11,000

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

Off-Site LLRW NRC Spent Fuel Site Processed Burial Volumes Burial / Utility and																					
Activity		Decon	Removal			Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. reei	Cu. reet	Cu. Feet	Cu. reet	Wt., Lbs.	Manhours	Manhours
	& Site Preparations																				
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	320	48	368	368	-	-	-	-	-	-	-	-	-	2,400
3a.1.13 3a.1.14	Plant prep. & temp. svces Design water clean-up system		-			-	-	3,000 187	450 28	3,450 215	3,450 215	-		-	-		-		-	-	1,400
3a.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	1,400
3a.1.16	Procure casks/liners & containers	-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	15,646	2,347	17,993	17,385	-	608	-	-	-	-	-	-	-	77,559
Period 3a	Period-Dependent Costs																				
3a.4.1	Insurance	-	-	-	-	-	-	661	66	727	727	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	500	50	550	550	-	-	-	-	-	-	-	-	-	-
3a.4.3 3a.4.4	Health physics supplies Heavy equipment rental	-	429 527		-	-	-	-	107 79	536 606	536 606	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	527	- 11	- 6	-	33	-	10	60	60	-		-	514		-		10,287	17	
3a.4.6	Plant energy budget	-	_	-	-	_	-	1,623	243	1,867	1,867	_	_	-	-	-	-	-	-	-	_
3a.4.7	NRC Fees	-	-	-	-	-	-	378	38	416	416	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	3,631	545	4,176	4,176	-	-	-	-	-	-	-	-	-	65,179
3a.4.10 3a.4	Utility Staff Cost Subtotal Period 3a Period-Dependent Costs	-	- 956	11	- 6	-	- 33	21,866 $28,825$	3,280 4,443	25,146 34,273	25,146 34,273	-	-	-	514	-	-	-	10,287	- 17	258,629 323,807
													200								
3a.0	TOTAL PERIOD 3a COST 3b - Decommissioning Preparations	-	956	11	6	-	33	44,471	6,790	52,266	51,658	-	608	-	514	-	-	-	10,287	17	401,366
	Direct Decommissioning Activities																				
	Ţ.																				
Detailed V 3b.1.1.1	Work Procedures Plant systems							631	95	726	653		73								4,733
3b.1.1.1	Reactor internals		-					534	80	614	614	-	- 13	-	-	-		-	-		4,000
3b.1.1.3	Remaining buildings	-	_	_	_	_	-	180	27	207	52	_	155	-	_		_		-	_	1,350
3b.1.1.4	CRD housings & NIs	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5	Incore instrumentation	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	Removal primary containment	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	484 160	73	557	557 92	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8 3b.1.1.9	Facility closeout Sacrificial shield	-	-	-	-	-	-	160	$\frac{24}{24}$	184 184	184	-	92	-	-	-	-	-	-	-	1,200 1,200
3b.1.1.10		_	-	_	-	-	-	133	20	153	77	_	77	-	-	-	-	-	-	-	1,000
	Main Turbine	-	-	-	-	-	-	277	42	319	319	-	-	-	-	-	-	-	-	-	2,080
3b.1.1.12	Main Condensers	-	-	-	-	-	-	279	42	320	320	-	-	-	-	-	-	-	-	-	2,088
3b.1.1.13		-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	2,000
	Radwaste building	-	-	-	-	-	-	364 364	55 55	419	377 377	-	42	-	-	-	-	-	-	-	2,730 2,730
3b.1.1.15 3b.1.1	Reactor building Total	-	-	-	-	-	-	4,368	655	419 5,023	4,542	-	42 480	-	-		-		-		32,741
3b.1.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	4,368	655	5,023	4,542	-	480	-	-	-	-	-	-	-	32,741
Period 3b	Additional Costs																				
3b.2.1	Site Characterization	-	-	-	-	-	-	6,502	1,951	8,453	8,453	-	-	-	-	-	-	-	-	30,500	10,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	6,502	1,951	8,453	8,453	-	-	-	-	-	-	-	-	30,500	10,852
	Collateral Costs																				
3b.3.1	Decon equipment	883	-	-	-	-	-	1 100	132	1,015	1,015	-	-	-	-	-	-	-	-	-	-
3b.3.2 3b.3.3	DOC staff relocation expenses Pipe cutting equipment	-	1,100	-	-	-	-	1,163	175 165	1,338 1,265	1,338 1,265	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	883			-			1,163	472	3,618	3,618	-	-		-	-		-		-	
Period 3h	Period-Dependent Costs																				
3b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	332	33	365	365	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	251	25	276	276	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	237		-	-	-	-	59	296	296	-	-	-	-	-	-	-	-	-	-
3b.4.5 3b.4.6	Heavy equipment rental Disposal of DAW generated	-	264	- e	- 9	-	19	-	40 6	304 34	304 34	-	-	-	292	-	-	-	5,834	10	-
3b.4.7	Plant energy budget	-		-		-	-	814	122	936	936	-	-	-	- 292	-	-		5,654	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	190	19	208	208	-	-	-		-	-	-	-	-	-
3b.4.9	Site O&M Cost	-	-	-	-	-	-	83	12	95	95	-	-	-	-	-	-	-	-	-	-

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

	Off Size																				
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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b l	Period-Dependent Costs (continued)																				
3b.4.10	Security Staff Cost	-	-	-	-	-	-	1,820	273	2,094	2,094	-	-	-	-	-	-	-	-	-	32,679
	DOC Staff Cost	-	-	-	-	-	-	5,326	799	6,125	6,125	-	-	-	-	-	-	-	-	-	58,560
3b.4.12 3b.4	Utility Staff Cost Subtotal Period 3b Period-Dependent Costs	27	501	- 6	- 3	-	19	10,963 19,778	1,644 3,039	12,608 23,373	12,608 23,373	-	-	-	292				5,834	10	129,669 220,907
	·				9								400								,
3b.0	TOTAL PERIOD 3b COST	910	,		3	-	19	31,811	6,117	40,467	39,987	-	480	-	292	-	-	-	5,834	30,510	
	3 TOTALS	910	2,557	17	9	-	52	76,282	12,907	92,734	91,645	-	1,089	-	806	-	-	-	16,121	30,526	665,866
	4a - Large Component Removal																				
Period 4a l	Direct Decommissioning Activities																				
	team Supply System Removal																				
4a.1.1.1 4a.1.1.2	Recirculation System Piping & Valves Recirculation Pumps & Motors	25 13	90 51		23 41	-	$\frac{157}{273}$	-	80 95	395 488	395 488	-	-	-	1,064 2,594	-	-	-	121,654 211,420	1,846 1,136	
	CRDMs & NIs Removal	56	1,138		124		420	-	497	2,840	2,840	-	-	-	5,536	-	-	-	325,500	18,886	
4a.1.1.4	Reactor Vessel Internals	189	3,084		1,775	-	7,412	326	8,669	29,706	29,706	_	-	-	1,878	2,046	406	-	438,355	30,925	
	Vessel & Internals GTCC Disposal	-	-	-	-	-	9,123		1,368	10,491	10,491	-	-	-	-	-	-	2,450		-	-
4a.1.1.6	Reactor Vessel	146	6,269		1,700	-	5,571	326	8,703	25,391	25,391	-	-	-	18,660	-	-	-	1,914,414	30,925	
4a.1.1	Totals	429	10,632	11,568	3,662	-	22,956	653	19,412	69,311	69,311	-	-	-	29,733	2,046	406	2,450	3,493,990	83,718	2,738
	f Major Equipment Main Turbine/Generator		547	3,165	1,736		0 000	_	2,919	17,190	17,190				131,716				6,838,856	8,523	
4a.1.2 4a.1.3	Main Condensers	-	1,070		1,736	-	8,822 6,288	-	2,919	13,102	13,102	-	-	-	93,880	-	-	-	4,874,376	16,783	
Cascading	Costs from Clean Building Demolition																				
	Reactor Building	-	1,179		-	-	-	-	177	1,356	1,356	-	-	-	-	-	-	-	-	11,163	
	Auxiliary Building	-	489		-	-	-	-	73	562	562	-	-	-	-	-	-	-	-	4,733	
	Off Gas Building Turbine Building	-	85 705		-	-	-	-	13 106	97 811	97 811	-	-	-	-	-	-	•	-	920 7,337	
	Totals	-	2,457		-	-	-	-	369	2,825	2,825			-	-	-	-	-	-	24,153	
	f Plant Systems																				
	Auxiliary Steam	-	124	29	16	-	81	-	57	307	307	-		-	1,201	-	-	-	62,558	1,924	
	CSCS Equipment Cooling	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	122	
	Circulating Water Circulating Water - RCA	-	208 258		- 33	-	169	-	31 118	239 644	644	-	239	-	2,504	-	-	•	130,688	3,464 3,946	
	Clean Condensate Storage		99	-	-		109	-	15	114	-		114		2,504	-	-	-	130,000	1,677	
	Clean Condensate Storage - RCA	-	29	4	2	-	10	-	10	55	55	-	-	-	146	-	-	-	7,618	428	
4a.1.5.7	Condensate	-	978		324	-	1,644	-	759	4,254	4,254	-	-	-	24,478	-	-	-	1,274,330	16,244	
4a.1.5.8	Condensate Booster	-	1,011	1,177	718	-	3,646	-	1,390	7,941	7,941	-	-	-	54,329	-	-	-	2,826,158	17,851	
	Condensate Polishing Demineralizer	-	946		73	-	370	-	354	1,880	1,880	-	-	-	5,589	-	-	-	286,960	14,655	
	Containment Combustible Gas Control Cycled Condensate Storage	-	97 311	17 55	9 31	-	$\frac{44}{156}$	-	$\frac{38}{127}$	205 680	205 680	-	-	-	647 $2,327$	-	-	•	33,798 121,304	1,474 4,862	
	Drywell Instrument Nitrogen	-	71		8	-	41		31	165	165	-	-	-	620		-		31,995	1,100	
	Extraction Steam	-	375	128	83	-	420	-	224	1,229	1,229	-	-	-	6,260	-	-	-	325,273	6,120	
	Feedwater	-	621	315	197	-	999	-	466	2,598	2,598	-	-	-	14,903	-	-	-	774,516	10,284	-
	Feedwater Heater Vents & Drains	-	2,966		567	-	2,880	-	1,643	9,022	9,022	-	-	-	42,923	-	-	-	2,232,839	48,063	
	Gland Steam	-	265	44	24	-	122	-	105	559	559	-	-	-	1,807	-	-	-	94,247	4,171	
	HVAC-River\Lake Screen House HVAC-Service Building	-	9 14	-	-	-		-	$\frac{1}{2}$	11 16	-	-	11 16	-	-	-	-	-	-	151 221	
	Hydrogen & Carbon Dioxide	-	126		15	-	79		56	306	306	-	-	-	1,168	-	-	-	60,856	1,940	
	Main Steam	-	144		11	-	56	-	54	285	285	-	-	-	833	-	-	-	43,458	2,243	
4a.1.5.21	Misc Bldgs Floor Drains	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	9	-
	Screen Wash	-	30		-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	506	
	Service Air	-	13 60		- 10	-	-	-	2	15	-	-	15	-	1.000	-	-	-	- 50 115	222	
	Standby Gas Treatment Station Heat Recovery	-	289		13 27	-	67 137		36 116	196 622	196 622	-	-	-	1,003 2,028	-	-	-	52,115 105,836	962 4,428	
	Switchgear Heat Removal	-	11		-	-	-	-	2	13	622	-	13	-	2,026	-	-	-	100,656	180	
	Turbine Bldg Closed Cooling Water	-	545		110	-	558	-	313	1,731	1,731	-	-	-	8,298	-	-	-	432,636	8,724	
4a.1.5.28	Turbine Building Equip Drains	-	101	22	13	-	67	-	46	249	249	-	-	-	993	-	-	-	51,593	1,596	-
	Turbine Building Floor Drains	-	39		2	-	10	-	13	68	68	-	-	-	146	-	-	-	7,632	606	
	Turbine Generator	-	208		68	-	346	-	159	884	884	-	-	-	5,174	-	-	-	267,870	3,470	
4a.1.5.31	Turbine Oil	-	617	138	82	-	419	-	285	1,542	1,542	-	-	-	6,488	-	-	-	324,845	9,769	-

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(nus 01 2014 uc												
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
4a.1.5	Totals	-	10,575	4,097	2,424	-	12,318	-	6,457	35,873	35,420	-	452	-	183,863	-	-	-	9,549,126	171,412	-
4a.1.6	Scaffolding in support of decommissioning	-	2,504	58	32	-	162	-	677	3,433	3,433	-	-	-	2,414	-	-	-	125,345	43,646	-
4a.1	Subtotal Period 4a Activity Costs	429	27,785	21,144	9,092	-	50,546	653	32,085	141,735	141,282	-	452	-	441,606	2,046	406	2,450	24,881,690	348,235	2,738
Period 4a 4a.2.1	Additional Costs Remedial Action Surveys		_		_			1,897	569	2,466	2,466			_	_					29,898	_
4a.2.2	Asbestos Abatement	_	_	-	_	_	_	50	8	58	58	_	_	_	-	_	-	-	-	-	-
4a.2.3	Operational Tools and Equipment	-	-	9	13	-	189	-	50	261	261	-	-	-	5,855	-	-	-	146,375	16	
4a.2	Subtotal Period 4a Additional Costs	-	-	9	13	-	189	1,947	627	2,784	2,784	-	-	-	5,855	-	-	-	146,375	29,914	-
	Collateral Costs			-	10		00			40	40				0.4				2.050	10	
4a.3.1 4a.3.3	Process decommissioning water waste Small tool allowance	4	- 375	7	18	-	23		11 56	62 431	62 388	-	43	-	64	-	-	-	3,850	13	-
4a.3	Subtotal Period 4a Collateral Costs	4	375	7	18	-	23	-	67	493	450	-	43	-	64	-	-	-	3,850	13	
Period 4a	Period-Dependent Costs																				
4a.4.1	Decon supplies	78	-	-	-	-	-	-	19	97	97	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	951	95	1,046	1,046	-	-	-	-	-	-	-	-	-	-
4a.4.3 4a.4.4	Property taxes Health physics supplies	-	2,417	-	-	-	-	719	72 604	791 3,021	712 3,021	-	19	-	-	-			-	-	-
4a.4.5	Heavy equipment rental		2,911	-	-	-	-	-	437	3,348	3,348	-	-	-	-	-		-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	141	76	-	434	-	134	786	786	-	-	-	6,780	-	-	-	135,610	221	-
4a.4.7 4a.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	2,218 868	333 87	2,551 955	2,551 955	-	-	-	-	-	-	-	-	-	-
4a.4.9	Site O&M Cost		-	-	-	-	-	237	36	273	273	-	-	-	-				-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	577	86	663	663	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,223	783	6,006	6,006	-	-	-	-	-	-	-	-	-	93,750
4a.4.12 4a.4.13	DOC Staff Cost Utility Staff Cost			-	-	-		18,220 31,731	2,733 4,760	20,953 36,491	20,953 36,491	-	-	-	-	-	-	-		-	207,000 375,000
4a.4	Subtotal Period 4a Period-Dependent Costs	78		141	76	-	434	60,743	10,179	76,979	76,900	-	79	-	6,780	-	-	-	135,610	221	675,750
4a.0	TOTAL PERIOD 4a COST	511	33,487	21,301	9,200	-	51,192	63,343	42,958	221,991	221,417	-	574	-	454,306	2,046	406	2,450	25,167,530	378,383	678,488
PERIOD	4b - Site Decontamination																				
Period 4h	Direct Decommissioning Activities																				
4b.1.1	Remove spent fuel racks	976	96	195	242	-	1,231	-	875	3,615	3,615	-	-	-	18,378	-	-	-	954,202	1,632	-
	of Plant Systems Aux Diesel Bldg Floor Drains		5						1	6			C							86	
4b.1.2.1 4b.1.2.2	Aux Diesel Bidg Floor Drains Auxiliary Diesel Generator	-	61	-	-	-	-	-	9	70	-	-	70	-	-	-			-	1,006	-
4b.1.2.3	Containment Monitoring	-	24	2	1	-	5	-	8	39	39	-	-	-	75	-	-	-	3,888	395	-
4b.1.2.4	Control Rod Drive	-	227	21	13	-	65	-	77	402	402	-	-	-	963	-	-	-	50,095	3,653	
4b.1.2.5 4b.1.2.6	Diesel Oil Electrical		51 322	-	-	-	-	-	8 48	59 371		-	59 371	-	-		-	-		823 5,201	-
4b.1.2.7	Electrical - Contaminated	-	773	104	69	-	352	-	302	1,600	1,600	-	-	-	5,260	-	-	-	273,105	12,036	-
4b.1.2.8	Electrical - RCA	-	5,255	985	635	-	3,225	-	2,314	12,414	12,414	-	-	-	48,150	-	-	-	2,499,995	81,135	-
4b.1.2.9	Fire Protection	-	139	-	-	-	-	-	21	160	1 005	-	160	-	- 7.910	-	-	-	- 277 000	2,339	-
	Fire Protection - RCA Fuel Pool Cooling & Cleanup	-	760 847	182 301	95 169	-	485 858	-	344 482	1,867 2,658	1,867 $2,658$	-	-	-	7,210 12,790	-			375,999 665,463	11,689 13,616	-
	HVAC-Auxiliary Building		235	54	36	-	185	-	116	626	626	-	-	-	2,759	-		-	143,239	3,337	-
	HVAC-Diesel Generator Room	-	8		-	-		-	1	9	-	-	9	-	-	-	-	-		127	-
	HVAC-Off Gas Building HVAC-Primary Containment	-	23 1,013	$\frac{4}{235}$	3 148	-	15 753	-	10 487	56 2,636	56 2,636	-	-	-	227 11,263	-	-	-	11,772 583,908	332 15,268	-
	HVAC-Frimary Containment HVAC-Radwaste Building	-	1,013	255	148	-	795 7	-	407	2,636	2,636	-	-	-	105	-	-		5,437	100	
4b.1.2.17	HVAC-Turbine Building	-	868	174	117	-	592	-	400	2,151	2,151	-	-	-	8,842	-	-	-	459,063	12,212	-
	High Pressure Core Spray	-	366 5	200	112	-	567	-	270	1,514	1,514	-	-	-	8,429	-	-	-	439,323	6,022	
	Instrument Air Instrument Air - RCA	-	5 155	18	- 8	-	41	-	$\frac{1}{52}$	$\frac{6}{274}$	- 274	-	- 6		609	-	-		31,863	94 2,413	-
4b.1.2.21	Low Pressure Core Spray	-	175	93	51	-	261		126	706	706	-	-		3,878	-		-	202,203	2,868	-
	Nuclear Boiler	-	1,781	604	369	-	1,876	-	1,030	5,661	5,661	-	-	-	27,962	-	-	-	1,454,480	29,004	-
	Off Gas Primary Containment Vent & Purge	-	693 473	166 219	100 145	-	506 734	-	331 345	1,796 1,916	1,796 1,916	-	-	-	7,545 $10,959$	-	-	-	392,222 569,165	10,952 7,859	
	Process Radiation Monitoring	-	23	1	145	-	3	-	345 7	34	34		-	-	10,959	-	-	-	2,101	7,859 395	

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging		Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Disposal of	Plant Systems (continued)																				
	Process Sampling	-	32	2	1	-	6	-	10	50	50	-	-	-	86	-	-	-	4,496	531	-
	Radioactive Waste Disposal	-	1,692		162	-	823	-	682	3,649	3,649	-	-	-	12,585	-	-	-	638,228	26,413	-
	Reactor Bldg Closed Cooling Water	-	391	291	153	-	778	-	344	1,957	1,957	-	-	-	11,570	-	-	-	602,953	6,573	-
	Reactor Building Equipment Drains Reactor Building Floor Drains	-	74 7	11 1	6	-	30	-	28 2	150 12	150 12	-	-	-	455 21	-	-	-	23,195 1,101	1,167 109	-
	Reactor Core Isolation Cooling	-	247	42	23		119		99	531	531			-	1,773		-	-	92,418		
	Reactor Recirculation	_	46		2	-	10	-	15	77	77	-	-	-	148	_	-	_	7,742	738	-
	Reactor Water Clean-up	-	960	105	51	-	261	-	323	1,700	1,700	-	-	-	3,864	-	-	-	202,069	14,838	-
	Residual Heat Removal	-	1,795	932	529	-	2,689	-	1,294	7,239	7,239	-	-	-	40,005	-	-	-	2,084,289	29,708	-
	Service Air - RCA	-	269		17	-	87	-	95	504	504	-	-	-	1,283	-	-	-	67,085	4,079	-
	Service Water	-	57		104	-	-	-	9	65		-	65	-	10.000	-	-	-		938	-
	Service Water - RCA Standby Liquid Control	-	785 58	286 9	164	-	832 22	-	$\frac{458}{22}$	2,526 116	2,526 116	-	-	-	12,398 329	-	-	-	645,252 17,192	12,468 874	-
	Totals		20,703	5,376	3,186	-	16,189		10,173	55,627	54,880		747	-	241,581		-	-	12,549,340	325,300	-
10.1.2	Totals		20,100	0,010	0,100		10,100		10,170	00,021	01,000				211,001				12,515,510	525,500	
4b.1.3	Scaffolding in support of decommissioning	-	3,757	87	48	-	243	-	1,016	5,150	5,150	-	-	-	3,621	-	-	-	188,018	65,468	-
	nation of Site Buildings																				
	Reactor Building	3,002	3,635		599	-	1,831	-	2,998	12,469	12,469	-	-	-	30,252	-	-	-	2,170,184	99,260	-
	Auxiliary Building Off Gas Building	336 152	67 34	4 2	14 10	-	36 24	-	196 92	654 313	654 313	-	-	-	628 421	-	-	-	50,818 34,784	6,145 2,798	-
	Turbine Building	1,782	748		169	-	567		1,257	4,643	4,643			-	9,367		-	-	619,740		-
	Totals	5,272	4,484	530	791	-	2,459	-	4,544	18,080	18,080	-	-	-	40,667			-	2,875,526	146,256	-
	Subtotal Period 4b Activity Costs	6,248	29,038	6,188	4,267		20,121	_	16,608	82,471	81,725	_	747	_	304,247	_	_	-	16,567,090	538,657	-
		3,2-3	,	-,	-,		,		,	,	,								,,		
	Additional Costs License Termination Survey Planning							983	295	1,277	1,277										C 940
	Remedial Action Surveys	-	-	-	-	-	-	3,393	1,018	4,410	4,410		-	-	-	-		-	-	53,475	6,240
	Asbestos Abatement	-	-	-	-	-	-	50	1,010	58	58	-	-	-	-	-	-	-	-	-	-
	License Termination ISFSI	-	302	336	502	-	1,502	2,303	1,236	6,180	6,180		-	-	24,637	-	-	-	1,948,035	14,596	5,418
	Underground Services Excavation	-	542	-	-	-	-	-	81	623	623	-	-	-	-	-	-	-	-	3,627	-
4b.2	Subtotal Period 4b Additional Costs	-	844	336	502	-	1,502	6,728	2,637	12,549	12,549	-	-	-	24,637	-	-	-	1,948,035	71,698	11,658
Period 4b C	Collateral Costs																				
	Process decommissioning water waste	13	-	22	59	-	75	-	36	206	206	-	-	-	215	-	-	-	12,892	42	-
	Small tool allowance	-	566	-	-	-	-	-	85	651	651	-	-	-		-	-	-	-	-	-
	Decommissioning Equipment Disposition	-	-	170	93	-	472 548	-	149	884	884	-	-	-	7,054	-	-	-	366,237	88	-
4b.3	Subtotal Period 4b Collateral Costs	13	566	192	152	-	548	-	270	1,741	1,741	-	-	-	7,269	-	-	-	379,129	130	-
	Period-Dependent Costs																				
	Decon supplies	1,584	-	-	-	-	-	1.701	396	1,980	1,980	-	-	-	-	-	-	-	-	-	-
	Insurance Property taxes	-		-	-	-	-	1,701 1,285	170 129	1,871 1,414	1,871 1,414	-	-	-	-	-	-	-	-	-	-
	Health physics supplies		3,896	-	-	-	-	1,200	974	4,869	4,869	-	-	-	-				-	-	-
	Heavy equipment rental	-	5,155	-	-	-	-	-	773	5,928	5,928		-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	189	102	-	580	-	179	1,051	1,051	-	-	-	9,063	-	-	-	181,258	296	-
	Plant energy budget	-	-	-	-	-	-	3,132	470	3,602	3,602	-	-	-	-	-	-	-	-	-	-
	NRC Fees	-	-	-	-	-	-	1,553	155	1,708	1,708	-	-	-	-	-	-	-	-	-	-
	Site O&M Cost	-	-	-	-	-	-	424	64	488	488	-	-	-	-	-	-	-	-	-	-
	Liquid Radwaste Processing Equipment/Services Security Staff Cost			-	-	-	-	1,031 1,468	$155 \\ 220$	1,186 1,688	1,186 1,688	-	-	-	-	-		-	-	-	29,511
	DOC Staff Cost			-	-	-	-	20,847	3,127	23,974	23,974	-	-	-	-		-		-	-	252,189
	Utility Staff Cost	-	-	-	-	-	-	36,331	5,450	41,780	41,780	-	-	-	-	-	-	-	-	-	450,720
	Subtotal Period 4b Period-Dependent Costs	1,584	9,050	189	102	-	580	67,773	12,261	91,540	91,540	-	-	-	9,063	-	-	-	181,258	296	732,420
4b.0	TOTAL PERIOD 4b COST	7,845	39,498	6,904	5,023	-	22,752	74,501	31,777	188,302	187,555	-	747	-	345,216	-	-	-	19,075,510	610,780	744,078
PERIOD 4	4e - Delay before License Termination																				
Period 4e P	Period-Dependent Costs																				
	Insurance	-	-	-	-	-	-	968	97	1,064	1,064	-	-	-	-	-	-	-	-	-	-
	Property taxes	-	-	-	-	-	-	731	73	804	804	-	-	-	-	-	-	-	-	-	-
	Health physics supplies	-	129			-	-	-	32	162	162	-	-	-	-	-	-	-	- 0.15		-
4e.4.4	Disposal of DAW generated	-	-	3	2	-	9	-	3	17	17	-	-	-	146	-	-	-	2,917	5	-

Table E-1
LaSalle County Station, Unit 1
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	olumes		Burial/		Utility and
Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs		Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor
Period 4e P	Period-Dependent Costs (continued)																				
	NRC Fees	-	-	-	-	-	-	371	37	408	408	-	-	-		-	-	-	-	-	-
	Site O&M Cost	-	-	-	-	-	-	241	36	278	278	-	-	-	-	-	-	-	-	-	-
	Utility Staff Cost Subtotal Period 4e Period-Dependent Costs	-	129	- 3	- 2	-	- 9	1,608 3,919	241 520	1,849 4,582	1,849 4,582	-	-	-	146		-		2,917	- 5	21,360 21,360
	TOTAL PERIOD 4e COST		129	3	- 9		0	3,919	520	4,582	4,582				146				2,917		
	If - License Termination	•	123	5	2		3	5,515	520	4,002	4,502	•	•	-	140	-	-	-	2,317	3	21,500
	Direct Decommissioning Activities ORISE confirmatory survey	_	-	_	-	_	-	172	52	224	224	-	_	-	_	_	_	-	_	_	-
4f.1.2	Terminate license									a											
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
	additional Costs																				
	License Termination Survey Subtotal Period 4f Additional Costs	-	-	-	-	-	-	12,428 $12,428$	3,728 3,728	16,156 16,156	16,156 16,156	-	-	-	-	-	-	-	-	192,095 192,095	,
		-	•	-	•	•	•	12,420	5,720	10,130	10,150	•	•		-	-	•	-	•	132,033	5,120
	collateral Costs DOC staff relocation expenses			_	_	-	_	1,163	175	1,338	1,338	_							_		
	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	-	-	-
Period 4f P	eriod-Dependent Costs																				
	Insurance	-	-	-	-	-	-	506	51	556	556	-	-	-	-	-	-	-	-	-	-
	Property taxes Health physics supplies	-	827	-	-	-	-	382	38 207	420 1,033	420 1,033	-	-	-			-		-	-	-
	Disposal of DAW generated	-	-	7	4	-	22	-	7	39	39	-	-	-	340	-	-	-	6,795		-
	Plant energy budget	-	-	-	-	-	-	248	37	285	285	-	-	-	-	-	-	-	-	-	-
	NRC Fees Site O&M Cost	-	-	-	-	-	-	462 126	46 19	508 145	508 145	-		-	-	-	-	-	-	-	-
	Security Staff Cost	-		-	-	-	-	689	103	792	792	-	-	-			-		-	-	11,957
	DOC Staff Cost	-	-	-	-	-	-	4,235	635	4,870	4,870	-	-	-	-	-	-	-	-	-	47,430
	Utility Staff Cost Subtotal Period 4f Period-Dependent Costs	-	827	7	4	-	22	5,196 11,843	779 $1,922$	5,975 $14,624$	5,975 $14,624$	-	-	-	340	-	-	-	6,795	11	57,793 117,180
4f.0	TOTAL PERIOD 4f COST	-	827	7	4	-	22	25,606	5,877	32,342	32,342	-	-	-	340	-	-	-	6,795	192,106	120,300
PERIOD 4		8,356	73,942	28,215	14,228		73,975	167,369	81,131	447,216	445,895	-	1,321	_	800,007	2,046	406	2,450			
PERIOD 5	5b - Site Restoration																				
	Direct Decommissioning Activities																				
	of Remaining Site Buildings																				
	Reactor Building	_	6,786	-	_	_	-	-	1,018	7,803	_	-	7,803	-			_	_	_	64,472	-
5b.1.1.2	Auxiliary Building	-	4,423		-	-	-	-	663	5,087	-	-	5,087	-	-	-	-	-	-	43,048	
	Diesel Generator Room	-	554	-	-	-	-	-	83	637	-	-	637	-	-	-	-	-	-	6,000	
	Off Gas Building Turbine Building	-	772 6,492	-	-	-	-	-	116 974	888 7,466	-	-	888 7,466	-		-	-		-	8,484 68,584	
	Turbine Pedestal	-	3,474	-	-	-	-	-	521	3,995	-	-	3,995	-			-	-	-	30,829	
5b.1.1	Totals	-	22,501	-	-	-	-	-	3,375	25,876	-	-	25,876	-	-	-	-	-	-	221,416	-
	out Activities																				
	Grade & landscape site Final report to NRC	-	198		-			208	30 31	228 239	239	-	228	-	-	-	-	-	-	499	1,560
	Subtotal Period 5b Activity Costs	-	22,699		-	-	-	208	3,436	26,343	239	-	26,104	-	-	-	-	-	-	221,916	
Period 5b A	Additional Costs																				
	Site Restoration ISFSI	-	1,344		-	-	-	28	206	1,577	-	-	1,577	-	-	-	-	-	-	15,775	
	Concrete Crushing Subtotal Period 5b Additional Costs		845 2,189		-	-	-	4 32	127 333	976 2,553	-	-	976 2,553	-	-	-	-	-	-	3,936 19,711	
		-	2,100	-	-	-	-	02	000	2,000	-	-	2,000	-	-	-	-	-	-	10,111	80
	Collateral Costs Small tool allowance		257				-		39	200			202								
5b.3.1		-			-	-			.39	296	-	-	296	-	-	-	-	-	-	-	-

Table E-1 LaSalle County Station, Unit 1 SAFSTOR Decommissioning Cost Estimate (thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial '	Volumes		Burial /		Utility and
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Pariod 5h	Period-Dependent Costs																				
5b.4.2	Property taxes	-	_	_	_	-	-	998	100	1,098	-	_	1,098	-	-		_	-	-	-	
5b.4.3	Heavy equipment rental	-	5,685	-	-	-	-	-	853	6,538	-	-	6,538	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	324	49	373	-	-	373	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Cost	-	-	-	-	-	-	329	49	379	-	-	379	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	1,618	243	1,861	-	-	1,861	-	-	-	-	-	-	-	27,619
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	10,124	1,519	11,642	-	-	11,642	-	-	-	-	-	-	-	110,391
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	5,084	763	5,847	-	-	5,847	-	-	-	-	-	-	-	54,154
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,685	-	-	-	-	18,477	3,574	27,737	-	-	27,737	-	-	-	-	-	-	-	192,164
5b.0	TOTAL PERIOD 5b COST	-	30,830	-	-	-	-	18,717	7,382	56,929	239	-	56,690	-	-	-	-	-	-	241,626	193,804
PERIOD	5 TOTALS	-	30,830	-	-	-	-	18,717	7,382	56,929	239	-	56,690	-	-	-	-	-	-	241,626	193,804
TOTAL C	COST TO DECOMMISSION	17,661	114,853	28,584	14,863	-	75,179	737,683	172,249	1,161,072	906,058	195,915	59,100	-	809,947	2,046	406	2,450	44,530,630	1,556,194	5,172,966

TOTAL COST TO DECOMMISSION WITH 17.42% CONTINGENCY:	\$1,161,072	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 78.04% OR:	\$906,058	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 16.87% OR:	\$195,915	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 5.09% OR:	\$59,100	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	812,399	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,450	cubic feet
TOTAL SCRAP METAL REMOVED:	51,861	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,556,194	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 E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A		Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet			Cu. Feet			Manhours	
PERIOD	1a - Shutdown through Transition																				
Period 1a	Direct Decommissioning Activities																				
1a.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	481	144	625	625	-	-	-	-	-	-	-	-	-	<u>.</u>
1a.1.2 1a.1.3	Prepare preliminary decommissioning cost Notification of Cessation of Operations	-	-	-	-	-	-	73	11	84 a	84	-	-	-	-	-	-	-	-	-	545
1a.1.4	Remove fuel & source material									n/a											
1a.1.5 1a.1.6	Notification of Permanent Defueling Deactivate plant systems & process waste									a a											
1a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
1a.1.8 1a.1.9	Review plant dwgs & specs. Perform detailed rad survey	-	-	-	-	-	-	73	11	84 a	84	-	-	-	-	-	-	-	-	-	545
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
1a.1.11 1a.1.12	End product description Detailed by-product inventory	-	-	-	-	-	-	56 84	8 13	64 96	64 96	-	-		-	-	-	-			419 629
1a.1.13	Define major work sequence	-	-	-	-	-	-	56	8	64	64	-	-	-	-	-	-	-	-	-	419
1a.1.14 1a.1.15	Perform SER and EA Perform Site-Specific Cost Study	-	-	-	-	-	-	173 279	26 42	199 321	199 321	-	-	-	-	-	-	-	-	-	1,299 2,095
																					_,
	pecifications Prepare plant and facilities for SAFSTOR	_		_	_	-	-	275	41	316	316	-	-		_	-	_	-	-	_	2,061
1a.1.16.2	Plant systems	-	-	-	-	-	-	233	35	268	268	-	-	-	-	-	-	-	-	-	1,746
1a.1.16.3 1a.1.16.4	Plant structures and buildings Waste management	-	-	-		-	-	$174 \\ 112$	26 17	201 129	201 129	-	-	-	-	-	-	-			1,307 838
1a.1.16.5	Facility and site dormancy	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-		838
1a.1.16	Total	-	-	-	-	-	-	906	136	1,042	1,042	-	-	-	-	-	-	-	-	-	6,791
	Work Procedures							0.0	10	=0	=0										100
1a.1.17.1 1a.1.17.2	Plant systems Facility closeout & dormancy	-	-	-		-		66 67	10 10	76 77	76 77	-	-		-	-	-	-			496 503
1a.1.17	Total	-	-	-	-	-	-	133	20	153	153	-	-	-	-	-	-	-	-	-	999
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	6	1	6	6	-	-	-	-	-	-	-	-	-	42
1a.1.19	Drain/de-energize non-cont. systems Drain & dry NSSS									a											
1a.1.20 1a.1.21	Drain & dry NSSS Drain/de-energize contaminated systems									a a											
1a.1.22	Decon/secure contaminated systems							2.40		a	2.002										47.000
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	2,487	445	2,932	2,932	-	-	-	-	-	-	-	-	-	15,038
Period 1a . 1a.2.1	Additional Costs ISFSI Expansion		_		_		_	3,150	473	3,623	_	3,623		_						_	_
1a.2.2	Spent Fuel Pool Isolation	-	-	-	-	-	-	7,208	1,081	8,290	8,290	-	-	-	-	-	-	-	-		-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	10,358	1,554	11,912	8,290	3,623	-	-	-	-	-	-	-	-	-
	Collateral Costs							10.10-	1.000												
1a.3.1 1a.3	Spent Fuel Capital and Transfer Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	13,105 $13,105$	1,966 1,966	15,071 $15,071$	-	15,071 15,071	-	-	-	-	-	-	-	-	-
Period 1a	Period-Dependent Costs																				
1a.4.1	Insurance	-	-	-	-	-	-	2,050	205	2,255	2,255	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes Health physics supplies	-	491	-	-	-	-	-	123	614	614	-	-	-	-	-	-	-	-	-	-
1a.4.3 1a.4.4	Heavy equipment rental	-	527			-	-	-	79	606	606	-	-	-	-		-	-			
1a.4.5	Disposal of DAW generated	-	-	13	7	-	39	-	12	71	71	-	-	-	610	-	-	-	12,190	20	-
1a.4.6 1a.4.7	Plant energy budget NRC Fees	-	-	-		-		1,623 834	243 83	1,867 917	1,867 917				-	-	-				-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,227	223	2,450	-	2,450	-	-	-	-	-	-	-	-	-
1a.4.9	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	165 791	25 119	190 910	190	910	-	-	-	-	-	-	-	-	-
1a.4.10 1a.4.11	ISFSI Operating Costs					-	-	48	119 7	910 55		910 55	-	-	-	-	-	-	-		-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	8,222	1,233	9,455	9,455	-	-	-	-	-	-	-	-	-	157,471
1a.4.13 1a.4	Utility Staff Cost Subtotal Period 1a Period-Dependent Costs	-	1,018	- 3 13	- 7	- ' -	- 39	35,778 51,737	5,367 7,719	41,144 60,533	41,144 57,118	3,415	-	-	610	-	-	-	12,190	20	423,400 580,871
		-											-	-		-	-	-	,		
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	7	-	39	77,687	11,683	90,447	68,339	22,108	-	-	610	-	-	-	12,190	20	595,909

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	llars)											
Activity Index		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	Class A Cu. Feet	Class B	Volumes Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD	1b - SAFSTOR Limited DECON Activities																				
Period 1b	Direct Decommissioning Activities																				
Decontam 1b.1.1.1 1b.1.1.2 1b.1.1.3 1b.1.1.4 1b.1.1.5 1b.1.1.6 1b.1.1	nination of Site Buildings Reactor Building Auxiliary Building IRSF Building Service Building Solid Radwaste Building Turbine Building Totals	3,298 1,619 78 108 487 1,739 7,330	- - - - -			- - - - -		- - - - -	1,649 809 39 54 244 870 3,665	4,947 2,428 117 163 731 2,609 10,996	4,947 2,428 117 163 731 2,609 10,996	: : : :	- - - - - -			- - - - -		- - - - -	-	49,197 24,021 1,210 1,692 7,355 27,018 110,493	: : : :
1b.1	Subtotal Period 1b Activity Costs	7,330	-	-	-	_	-	-	3,665	10,996	10,996	-	_	<u>-</u>	_	_	-	_	-	110,493	-
	Collateral Costs Decon equipment Process decommissioning water waste Small tool allowance Spent Fuel Capital and Transfer Subtotal Period 1b Collateral Costs	883 192 - - 1,075	- - 120 - 120	-	- 335 - - - 335	-	426 - - 426	- - - 3,267 3,267	132 265 18 490 906	1,015 1,343 139 3,757 6,254	1,015 1,343 139 - 2,497	- - - - 3,757 3,757	- - - -	- - - -	1,215 - - 1,215	- - - -	- - - -	- - - -	72,882 - - 72,882	237 - - 237	- - - - -
Period 1b 1b.4.1 1b.4.2 1b.4.3 1b.4.4 1b.4.5 1b.4.6 1b.4.7 1b.4.8 1b.4.9 1b.4.10 1b.4.11 1b.4.12 1b.4.13 1b.4.14	Period-Dependent Costs Decon supplies Insurance Property taxes Health physics supplies Heavy equipment rental Disposal of DAW generated Plant energy budget NRC Fees Emergency Planning Fees Site O&M Cost Spent Fuel Pool O&M ISFSI Operating Costs Security Staff Cost Utility Staff Cost Subtotal Period 1b Period-Dependent Costs	1,643	626 131	18	10		- - - 56 - - - - - - - - - - -	394 2,996 - - 405 116 555 41 197 12 2,050 8,920 15,686	411 39 300 157 20 17 61 12 56 6 30 2 307 1,338 2,754	2,054 434 3,295 783 151 102 465 128 611 47 227 14 2,357 10,258 20,925	2,054 434 3,295 783 151 102 465 128 - 47 - 2,357 10,258 20,074	- - - - - - 611 - 227 14	- - - - - - - - - - - - - - - - - - -		876 				17,516	- - - 29 - - - - - - - - - -	39,260 105,560 144,820
1b.0	TOTAL PERIOD 1b COST	10,049	878	143	344	-	482	18,953	7,325	38,175	33,566	4,609	-	-	2,091	-	-	-	90,398	110,759	144,820
PERIOD	1c - Preparations for SAFSTOR Dormancy																				
Period 1c 1c.1.1 1c.1.2 1c.1.3 1c.1.4 1c.1.5	Direct Decommissioning Activities Prepare support equipment for storage Install containment pressure equal. lines Interim survey prior to dormancy Secure building accesses Prepare & submit interim report	: : :	486 48 -	- - -	- - -		- - -	- - 733 33	73 7 220 5	559 55 953 a 37	559 55 953 37	:		- - -	- - -	- - -	- - -	- - -		3,000 700 10,874	- - - 244
1c.1	Subtotal Period 1c Activity Costs	-	534	-	-	-	-	765	305	1,605	1,605	-	-	-	-	-	-	-	-	14,574	244
Period 1c 1c.3.1 1c.3.3 1c.3.4 1c.3	Collateral Costs Process decommissioning water waste Small tool allowance Spent Fuel Capital and Transfer Subtotal Period 1c Collateral Costs	149 - - 149	- 4 - 4	-	259 - - 259	-	331 - - 331	- - 3,303 3,303	206 1 495 702	1,041 5 3,799 4,845	1,041 5 - 1,046	- - 3,799 3,799	- - - - -	- - - -	942 - - 942	- - -	- - - -	- - -	56,524 - - 56,524	184 - - 184	
Period 1c 1c.4.1 1c.4.2 1c.4.3 1c.4.4 1c.4.5 1c.4.6	Period-Dependent Costs Insurance Property taxes Health physics supplies Heavy equipment rental Disposal of DAW generated Plant energy budget		- - 191 133 - -			- - - - -	10	399 3,029 - - - - 409	40 303 48 20 3 61	439 3,331 239 153 18 471	439 3,331 239 153 18 471	:	- - - - -		154	- - - - -		- - - - -	3,073	5	

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								`	nus 01 2014 u0	,											
Activity		Decon	Removal	Packaging	Transport	Off-Site Processing	LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Burial Class B	Volumes Class C	GTCC	Burial /	l Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet			Cu. Feet				Manhours
	Period-Dependent Costs (continued)																				
1c.4.7	NRC Fees	-	-	-	-	-	-	117	12	129	129	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	561	56	618	-	618	-	-	-	-	-	-	-	-	-
c.4.9 c.4.10	Site O&M Cost Spent Fuel Pool O&M	-	-	-	-	-	-	42 199	6 30	48 229	48	229	-	-	-	-	-	-	-	-	-
	ISFSI Operating Costs	-	-	-	-	-	-	12	2	14		14	-	-	-		-			-	-
c.4.12	Security Staff Cost	-	-	-	-	-	-	2,072	311	2,383	2,383	-	-	-	-	-	-	-	-	-	39,691
c.4.13	Utility Staff Cost	-	-	-	-	-	-	9,018	1,353	10,371	10,371	-	-	-	-	-	-	-			106,720
c.4	Subtotal Period 1c Period-Dependent Costs	-	324	3	2	-	10	15,858	2,244	18,441	17,580	861	-	-	154	-	-	-	3,07	3 5	146,411
.c.0	TOTAL PERIOD 1c COST	149	862	100	261	-	341	19,927	3,251	24,891	20,231	4,659	-	-	1,096	-	-	-	59,59	7 14,762	146,656
ERIOD	1 TOTALS	10,197	2,758	255	613	-	862	116,568	22,260	153,513	122,137	31,376	•	-	3,796	-	-	-	162,18	5 125,541	887,385
PERIOD :	2a - SAFSTOR Dormancy with Wet Spent Fue	el Storage																			
	Direct Decommissioning Activities																				
a.1.1 a.1.2	Quarterly Inspection Semi-annual environmental survey									a a											
a.1.2	Prepare reports									a a											
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	715	107	822	822	-	-	-	-	-	-	-	-	-	-
a.1.5	Maintenance supplies	-	-	-	-	-	-	556	139	695	695	-	-	-	-	-	-	-	-	-	-
a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	1,271	246	1,517	1,517	-	-	-	-	-	-	-	-	-	-
	Collateral Costs																				
2a.3.1 2a.3	Spent Fuel Capital and Transfer Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	52,455 $52,455$	7,868 7,868	60,324 $60,324$	-	60,324 60,324	-	-	-	-	-	-	-	-	-
eriod 2a l	Period-Dependent Costs																				
a.4.1	Insurance	-	-	-	-	-	-	3,563	356	3,920	2,912	1,008	-	-	-	-	-	-	-	-	-
a.4.2	Property taxes	-	-	-	-	-	-	20,186	2,019	22,205	22,205	-	-	-	-	-	-	-	-	-	-
a.4.3	Health physics supplies	-	738	-	-	-		-	185	923	923	-	-	-	<u>-</u>	-	-	-		<u>.</u> .	-
1.4.4	Disposal of DAW generated	-	-	18	10	-	54	1 200	17	98	98	- 747	-	-	844	-	-	-	16,87	6 28	-
ı.4.5 ı.4.6	Plant energy budget NRC Fees	-	-	-	-	-	-	1,300 1,064	195 106	1,494 1,170	747 1,170	747	-	-	-	-	-		_	-	-
.4.7	Emergency Planning Fees	-	-	-	-	-	-	7,812	781	8,593	1,170	8,593	-	-	-	-	-		-	-	-
.4.8	Site O&M Cost	-	-	-	-	-	-	660	99	759	759	-,	-	-	-	-	-	-	-	-	-
.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	3,166	475	3,641	-	3,641	-	-	-	-	-	-	-	-	-
a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	191	29	220	-	220	-	-	-	-	-	-	-	-	
a.4.11	Security Staff Cost	-	-	-	-	-	-	11,835	1,775	13,610	4,477	9,134	-	-	-	-	-	-	-	-	222,322
a.4.12 a.4	Utility Staff Cost Subtotal Period 2a Period-Dependent Costs	-	738	. 18	10	-	- 54	17,173 66,950	2,576 8,613	19,748 $76,382$	4,802 38,093	14,947 38,289	-	-	844	-	-	-	16,87	- 6 28	196,191 418,514
		_											-	-			-	-	,		
ı.0 	TOTAL PERIOD 2a COST	-	738	18	10	-	54	120,676	16,727	138,223	39,610	98,613	-	-	844	-	-	-	16,87	6 28	418,514
	2b - SAFSTOR Dormancy with Dry Spent Fue	el Storage																			
	Direct Decommissioning Activities																				
b.1.1 b.1.2	Quarterly Inspection Semi-annual environmental survey									a a											
b.1.3	Prepare reports									a											
b.1.4	Bituminous roof replacement	-	-	-	-	-	-	2,243	336	2,579	2,579	-	-	-	-	-	-	-	-	-	-
0.1.5	Maintenance supplies	-	-	-	-	-	-	1,744	436	2,180	2,180	-	-	-	-	-	-	-	-	-	-
b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	3,986	772	4,759	4,759	-	-	-	-	-	-	-	-	-	-
eriod 2b (b.3.1	Collateral Costs Spent Fuel Capital and Transfer				_	_	_	11,563	1,734	13,297		13,297									
b.3.1 b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	11,563	1,734 1,734	13,297	-	13,297	-	-	-	-	-	-	-	-	-
	Period-Dependent Costs																				
b.4.1	Insurance	-	-	-	-	-	-	8,302	830	9,132	9,132	-	-	-	-	-	-	-	-	-	-
b.4.2	Property taxes	-	- 1 141	-	-	-	-	6,272	627	6,900	6,900	-	-	-	-	-	•	-	-	-	-
	Health physics supplies Disposal of DAW generated	-	1,141	27	- 15	-	- 83	-	$\frac{285}{26}$	1,426 150	1,426 150	-	-	-	1,297	-	-	-	25,93	4 42	-
b.4.4 b.4.5	Plant energy budget	-		-	- 10	-	- 00	2,038	306	2,343	2,343	-	-	-	1,297	-		-	20,90	4 42	-
	NRC Fees	-	-	-	-	-	-	3,211	321	3,532	3,532	-	-	-	-	-	-	-	-	-	-
								,			*										

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nas or 2014 ac	Jiidi 5)											
Activity		Decon	Removal				LLRW Disposal	Other	Total	Total	NRC Lic. Term.	Spent Fuel Management	Site Restoration	Processed Volume	Class A	Class B	Volumes Class C	GTCC	Burial / Processed	Craft	Utility and Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Period 2b	Period-Dependent Costs (continued)																				
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	24,499	2,450	26,948	-	26,948	-	-	-	-	-	-	-	-	-
2b.4.8	Site O&M Cost	-	-	-	-	-	-	2,071	311	2,382	2,382	-	-	-	-	-	-	-	-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	599	90	689	14.040	689	-	-	-	-	-	-	-	-	959.460
2b.4.10 2b.4.11	Security Staff Cost Utility Staff Cost	-	-	-	-	-	-	20,023 $21,650$	3,003 3,247	23,026 24,897	14,040 15,060	8,987 9,838	-	-	-	-	-	-	-	-	353,469 261,829
2b.4.11 2b.4	Subtotal Period 2b Period-Dependent Costs	-	1,141	27	15	- -	83	88,665	11,496	101,426	54,964	46,462	-	-	1,297				25,934	42	
2b.0	TOTAL PERIOD 2b COST	_	1,141		15	_	83	104,214	14,003	119,482	59,723	59,759	_	_	1,297		_	_	25,934	42	,
	2c - SAFSTOR Dormancy without Spent Fuel	Storago	1,141	21	10		05	104,214	14,000	110,402	65,126	65,165			1,201				20,334	12	010,237
		Storage																			
2c.1.1	Direct Decommissioning Activities Quarterly Inspection																				
2c.1.1 2c.1.2	Semi-annual environmental survey									a a											
2c.1.3	Prepare reports									a											
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	6,077	912	6,988	6,988	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	4,725	1,181	5,906	5,906	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	10,801	2,093	12,894	12,894	-	-	-	-	-	-	-	-	-	-
Period 2c	Period-Dependent Costs																				
2c.4.1	Insurance	-	-	-	-	-	-	22,494	2,249	24,744	24,744	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	16,995	1,700	18,695	18,695	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	2,994		-	-	-	-	748	3,742	3,742	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	70	38	-	216		67	390	390	-	-	-	3,365	-	-	-	67,303	110	-
2c.4.5 2c.4.6	Plant energy budget NRC Fees	-	-	-	-	-	-	5,521 8,375	828 837	6,350 9,212	6,350 9,212	-	-	-	-	-	-	-	-	-	-
2c.4.6 2c.4.7	Site O&M Cost	-	-	-	-	-	-	5,611	842	6,453	6,453	-	-	-	-	-	-	-	-	-	-
2c.4.7	Security Staff Cost	-	-	-	-	-	-	33,079	4,962	38,041	38,041		-	-			-		-	-	532,071
2c.4.9	Utility Staff Cost	_	_	_	-	-	_	35,482	5,322	40,804	40,804	-	_	_	_	_	-	_	-	-	452,615
2c.4	Subtotal Period 2c Period-Dependent Costs	-	2,994	1 70	38	-	216	127,558	17,556	148,431	148,431	-	-	-	3,365	-	-	-	67,303	110	
2c.0	TOTAL PERIOD 2c COST	-	2,994	1 70	38	-	216	138,360	19,648	161,325	161,325	-	-	-	3,365	-	-	-	67,303	110	984,687
PERIOD	2 TOTALS	-	4,873	3 115	62	-	353	363,249	50,378	419,030	260,658	158,372	-	-	5,506	-	-	-	110,113	180	2,018,498
PERIOD	3a - Reactivate Site Following SAFSTOR Dorn	nancy																			
Period 3a	Direct Decommissioning Activities																				
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	545
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	257	39	296	296	-	-	-	-	-	-	-	-	-	1,927
3a.1.3	Perform detailed rad survey							7.0	0	a 64	64										410
3a.1.4 3a.1.5	End product description Detailed by-product inventory	-	-	-	-	-	-	56 73	8 11	84 84	64 84	-	-	-	-	-	-	-	-	-	419 545
3a.1.6	Define major work sequence						-	419	63	482	482										3,143
3a.1.7	Perform SER and EA	_	_	_	-	-	_	173	26	199	199	-	_	_	_	_	-	_	-	-	1,299
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	279	42	321	321	-	-	-	-	-	-	-	-	-	2,095
3a.1.9	Prepare/submit License Termination Plan	-	-	-	-	-	-	229	34	263	263	-	-	-	-	-	-	-	-	-	1,716
3a.1.10	Receive NRC approval of termination plan									a											
Activity S	Specifications																				
	Re-activate plant & temporary facilities	-	-	-		-	-	412	62	474	426	-	47	-	-	-	-	-	-	-	3,088
	Plant systems	-	-	-	-	-	-	233	35	268	241	-	27	-	-	-	-	-	-	-	1,746
	Reactor internals	-	-	-	-	-	-	397	60	456	456	-	-	-	-	-	-	-	-	-	2,975
	Reactor vessel	-	-	-	-	-	-	363	54	418	418	-	-	-	-	-	-	-	-	-	2,724
	Sacrificial shield Moisture separators/reheaters	-	-	-	-	-	-	28 56	4 8	32 64	32 64	-	-	-	-	-	-	-	-	-	210 419
	Reinforced concrete	-		-	-	-	-	56 89	13	103	51	-	- 51	-	-		-	-	-	-	670
	Main Turbine	-		-	-	-	-	117	18	134	134	-	-	-	-		-	-	-	-	875
	Main Condensers	_	-	_	_	-	-	117	18	134	134	-	-	-	_		_	-	_	_	875
3a.1.11.10	0 Pressure suppression structure	-	-	-	-	-	-	112	17	129	129	-	-	-	-	-	-	-	-	-	838
	1 Drywell	-	-	-	-	-	-	89	13	103	103	-	-	-	-	-	-	-	-	-	670
	2 Plant structures & buildings	-	-	-	-	-	-	174	26	201	100	-	100	-	-	-	-	-	-	-	1,307
	3 Waste management	-	-	-	-	-	-	257	39	296	296	-	-	-	-	-	-	-	-	-	1,927
3a.1.11.1	4 Facility & site closeout	-	-	-	-	-	-	50	8	58	29	-	29	-	-	-	-	-	-	-	377

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Dunial V	Volumes		Burial /		Utility and
Activit	ty	Decon	Removal	Packaging	Transport			Other	Total	Total	Lic. Term.	Management		Volume	Class A		Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
3a.1.11	Total	-	-	-	-	-	-	2,495	374	2,869	2,614		255	-	-	-	-	-	-	-	18,701
Planning	g & Site Preparations																				
3a.1.12	Prepare dismantling sequence	-		-	-	-	-	134	20	154	154	-	-	-		-	-	-	-	-	1,006
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450		-	-	-	-	-	-	-	-	-	-
3a.1.14 3a.1.15	Design water clean-up system Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	$\frac{78}{2,300}$	12 345	90 2,645		-	•	-	-	-	-	-	-	-	587
3a.1.16	Procure casks/liners & containers	-		-	-	-		69	10	79		-	-					-	-	-	515
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	9,635	1,445	11,080	10,826	-	255	-	-	-	-	-	-	-	32,497
	a Period-Dependent Costs							001	00	TOT.	707										
3a.4.1 3a.4.2	Insurance Property taxes	-		-	-	-	-	661 500	66 50	727 550		-	-	-			-	-	-	-	-
3a.4.3	Health physics supplies	-	407	-	-	-	-	-	102	509		-	-	-		-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	527			<u>-</u>	-	-	79	606		-	-	-	-	-	-	-	-	-	-
3a.4.5 3a.4.6	Disposal of DAW generated Plant energy budget	-	-	10	5	-	31	1,623	10 243	56 1,867	56 1,867	-	-	-	481	-	-	-	9,613	16	<u>-</u>
3a.4.0	NRC Fees	-		-	-	-	-	332	33	366		-	-	-				-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	311	47	358		-	-	-	-	-	-	-	-	-	6,257
3a.4.10 3a.4	Utility Staff Cost Subtotal Period 3a Period-Dependent Costs	-	934	10	- 5	- i -	31	16,174 19,766	2,426 3,081	18,600 23,827		-	-	-	481		-	-	9,613	16	200,229 206,486
3a.0	TOTAL PERIOD 3a COST	_	934				31	29,401	4,526	34,907	34,653		255	_	481				9,613	16	
	D 3b - Decommissioning Preparations	-	204	10	9		51	23,401	4,520	54,507	04,000	•	200	-	401	-	-		3,013	10	200,300
	b Direct Decommissioning Activities																				
	Work Procedures							905	40	20.4	974		30								1.000
3b.1.1.1 3b.1.1.2	Plant systems Reactor internals	-		-	-	-	-	$\frac{265}{224}$	40 34	304 257		-	30 -	-			-	-	-	-	1,983 1,676
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	75	11	87	22	-	65	-	-	-	-	-	-	-	566
3b.1.1.4		-	-	-	-	-	-	56	8	64		-	-	-	-	-	-	-	-	-	419
3b.1.1.5 3b.1.1.6		-		-	-	-	-	56 112	8 17	64 129		-	-	-	-	-		-	-	-	419 838
3b.1.1.7		-	-	-	-	-	-	203	30	233		-	-	-	-	-	-	-	-	-	1,521
3b.1.1.8		-	-	-	-	-	-	67	10	77		-	39	-	-	-	-	-	-	-	503
3b.1.1.9		-	-	-	-	-	-	67 56	10 8	77 64		-	32	-	-	-	-	-	-	-	503
3b.1.1.10 3b.1.1.11		-		-	-	-	-	116	8 17	134		-	- 32	-				-	-	-	419 872
3b.1.1.12	2 Main Condensers	-	-	-	-	-	-	117	18	134	134	-	-	-	-	-	-	-	-	-	875
3b.1.1.13		-	-	-	-	-	-	112	17	129		-	-	-	-	-	-	-	-	-	838
3b.1.1.14	4 Radwaste building 5 Reactor building	-		-	-	-		153 153	23 23	175 175		-	18 18	-	-	-		-	-	-	1,144 1,144
3b.1.1	Total	-	-	-	-	-	-	1,830	275	2,105		-	201	-	-	-	-	-	-	-	13,718
3b.1	Subtotal Period 3b Activity Costs	•	-	-	-	-		1,830	275	2,105	1,903	-	201	-	-	-	•	-	-	-	13,718
	b Additional Costs																				
3b.2.1 3b.2	Site Characterization Subtotal Period 3b Additional Costs	-	-	-	-	-	-	2,724 $2,724$	817 817	$3,542 \\ 3,542$				-	-	-	-	-	-	12,779 12,779	
Period 3	b Collateral Costs																				
3b.3.1	Decon equipment	883	-	-		-	-	-	132	1,015			-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	1 100	-	-	-	-	1,163	175	1,338			÷	-	-	-	-	-	-	-	•
3b.3.3 3b.3	Pipe cutting equipment Subtotal Period 3b Collateral Costs	883	1,100 1,100		-	-	-	1,163	$\frac{165}{472}$	1,265 $3,618$			-	-	-	-	-	-	-	-	-
Period 3	b Period-Dependent Costs																				
3b.4.1	Decon supplies	27		-	-	-	-	-	7	34		-	-	-	-	-	-	-	-	-	-
3b.4.2 3b.4.3	Insurance Property taxes	-	-	-	-	-	-	$\frac{332}{251}$	33 25	365 276		-	-	-	-	-	-	-	-	-	-
3b.4.3 3b.4.4	Health physics supplies		220	- -		-	-	201	25 55	276		-	-		-	-	-	-	-		-
3b.4.5	Heavy equipment rental	-	264	-		-	-	-	40	304	304	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	3	-	17	- 01.4	5	31		-	-	-	266	-	-	-	5,315	9	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	814	122	936	936	-	-	-	-	-	-	-	-	-	-

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

Martin M									(thousa		,											
Part	Activity	7	Decon	Removal	Packaging	Transport			Other	Total	Total		-			Class A			GTCC	-	Craft	Utility and Contractor
Section Sect	Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Wt., Lbs.	Manhours	Manhours				
See 19 1	Period 3b	Period-Dependent Costs (continued)																				
\$ 1.0	3b.4.8		-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	-
\$1.1 \$1.0 \$1.0 \$1.0 \$1.0 \$1.0 \$1.0 \$1.0			-	-	-	-	-	-					-	-	-	-	-	-	-	-	-	- 9.19
18-12 Marke Services 18-12				-		-	-	-					-	-	-			-		-		
## Manual Anthon Services 27 54 6 3 17 1,769 2,769 2,779 2,7	3b.4.12		-	-	_	-	_	-					_	-	_	_	_	-	-	_		100,38
### PARTICULAR 18 18 18 18 18 18 18 1	3b.4		27	484	6	3	-	17					-	-		266	-	-	-	5,315	9	146,400
Property	3b.0	TOTAL PERIOD 3b COST	910	1,584	6	3	-	17	19,286	3,668	25,474	25,273	-	201	-	266	-	-	-	5,315	12,788	164,666
Number December Decem	PERIOD	3 TOTALS	910	2,518	16	8	-	48	48,688	8,194	60,382	59,926	-	456	-	746	-	-	-	14,927	12,803	403,648
Notes Design Supple Stream Remail 14.1.1 Remains Stream Frange & Valves 2 91 91 1 1 1 1 1 1 1	PERIOD	4a - Large Component Removal																				
44.1.1 Secret Manuel Affaire 20 10 21 21 20 577 70 80 80 40 100	Period 4a	Direct Decommissioning Activities																				
44.1.1 Secret Manuel Affaire 20 10 21 21 20 577 70 80 80 40 100	Nuclear S	team Supply System Removal																				
ALLIA	4a.1.1.1	Recirculation System Piping & Valves	25	90			-		-	80	395	395	-	-	-	1,064	-	-	-	121,654	1,846	-
Section 1.1 1.2	4a.1.1.2	Recirculation Pumps & Motors			16	41	-	273	-		488		-	-	-	2,594	-	-	-	211,420	1,136	-
Second	4a.1.1.3						-						-	-	-				-			
Secret Veneral 146 6,299 2,770 1,700 5,71 2,96 8,700 2,981 2,981 1,500 1,500 3,050,000													-	-								1,36
1. Totals 1. Totals 1. Totals 1. Totals 1. 1. Totals 1. Tota													-	-	-							1.00
## 1.1 May Controllers	4a.1.1.6 4a.1.1												-	-		,						2,73
## 1.1 May Controllers	D 1	CM: F																				
ALL Man Condenseres 1,70 2,50 1,205 0,285 2,50 1,100 2,100 2,505 1,205 2,5				5.47	9 165	1 796		0 000		2.010	17 100	17 100				191 716				C 090 05C	0 509	
Company Content Cont			-										-	-	-		-	-	-			-
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Analysis				1 101						155	1.950	1.050									11 101	
Ali			-		-	-	-	-	-			,	-	-	-	-	-	-	-	-		-
4a.1.4 dervies Bullding 188					-	-	-	-						-		-	-	-		-		-
An An An An An An An An			-		_	-	_	-	-				_	-	_	-	-	-	_	_		_
Diagonal of Plant Systems	4a.1.4.5		_			-	-	-	-				-	-	-	-	-	-	-	-		-
Disposal of Plant Systems	4a.1.4.6	Turbine Building	-	705	-	-	-	-	-	106	811	811	-	-	-	-	-	-	-	-	7,337	-
4a.1.5.1 Acid & Caustic	4a.1.4	Totals	-	2,917	-	-	-	-	-	438	3,355	3,355	-	-	-	-	-	-	-	-	28,970	-
4a.1.5.2 Auxilary Steam	Disposal o	of Plant Systems																				
4a.1.5.1 CSCS Requipment Cooling 4b.1.5.1 CSCS Requipment Cooling 4b.1.5.2 CSCS Requipment Cooling 4b.1.5.2 CSCS Requipment Cooling 4b.1.5.3 CSCS Requipment Cooling 4b.1.5.4 CSCS Requipment Cooling 4b.1.5.5 CSCS Requipment Cooling	4a.1.5.1	•	-	20	-	-	-	-		3		-	-	23	-	-	-	-	-	-	317	-
4a.1.5. Cleudating Water 188 - - 6 46 - 46 - - 638 44.1.5. Cleudating Water 188 - - 28 216 - 216 - - 1.008 9.4.00 3.771 41.1.5. Cleudating Water RCA 250 48 24 122 101 546 546 - 1.008 9.4.00 3.771 41.1.5. Cleudating Water RCA 250 - - - - - - - - -	4a.1.5.2		-	350	89	49	-	250	-	166		903	-		-	3,727	-	-	-	193,777		-
4a.1.5.5 Circulating Water RCA 188 - - - - 28 216 - - - 1.808 - - - 1.808 - - - 1.808 - - - 1.808 - - - - 1.808 - - - - - - - - -			-	-		-	-	-	-	1		-	-		-	-	-	-	-	-		-
4a.1.5.6 Circulating Water RCA			-			-	-			-			-		-	-	-	-	-			-
4a.1.5.7 Clean Condensate Storage			-			- 04	-						-		-	1 000	-	-	-			-
4a.15.8 Clean Condensate Storage -RCA							-						-				-					-
4a.1.5.10 Condensate Booster			_				_						-		_		_	-	_			_
4a.1.5.10 Condensate Booster 9.946 1.158 705 3.583 1.354 7.746 7.746 5.3,399 2.777.870 1.6,796 4.1.5.11 Condensate Polishing Demineralizer 9.38 1.37 73 3.70 3.50 1.870 1.870 5.5,591 2.877.870 1.495 4.1.5.12 Containment Combustible Gas Control 79 1.4 7 37 3.71 3.1 1.68 1.68 5.5,591 2.870.89.14,495 2.84 1.194 4.1.5.13 Cycled Condensate Storage 5.60 1.39 8.4 4.28 2.73 1.485 1.485 5.5 6.560 3.31,736 8.922 4.1.5.14 1.5.14 1.5.14 1.5.14 1.5.14 1.5.14 1.5.14 1.5.14 1.5.14 1.5.15 1			-										_	-	_		_	-	_			_
4a.1.5.12 Containment Combustible Gas Control 4a.1.5.13 Cycled Condensate Storage 560 139 84 428 273 1,485 1,485			_				-	,	-			,	-	-	-	,	-	-	-			-
4a.1.5.13 Cycled Cordensate Storage	4a.1.5.11	Condensate Polishing Demineralizer	-	938	137	73	-	370	-	352	1,870	1,870	-	-	-	5,591	-	-	-	287,088	14,495	-
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4a.1.5.19 HVAC-Machine Shop\TB Sandblast - 34 5 3 - 17 - 14 74 74 258 13,382 538 - 4a.1.5.20 HVAC-River\Lake Screen House - 24 422 4 4.1.5.21 HVAC-Service Building - 64			-	,			-						-	-	-			-				-
4a.1.5.20 HVAC-River\Lake Screen House 4a.1.5.21 HVAC-Service Building 4a.1.5.22 HVAC-Service Building 4a.1.5.23 HVAC-Service Building 4a.1.5.24 HVAC-Service Building 4a.1.5.25 Lake Makeup & Blowdown 4a.1.5.25 Lake Makeup & Blowdown 4a.1.5.26 Min Steam 4a.1.5.27 Min Steam 4a.1.5.27 Min Steam 4a.1.5.28 Min Steam 4a.1.5.29 Min Steam 4a.1.5.20 Min			-				-						-	-	-			-	-			-
4a.1.5.21 HVAC-Service Building - 64 1,072 1,072 1,072			-			-	-			4		-	-	28	-			-	-			-
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4a.1.5.26 Misc Bldgs Floor Drains - 1,324 284 143 - 726 - 562 3,040 3,040 - - - 10,783 - - - 562,851 20,035 - - - - - - - - -			-				-						-	-	-		-	-	-			-
			-				-						-	-	-		-	-	-			-
			-	1,324 66		143	-	726	-	562 10	3,040 76	3,040	-	76	-	10,783	-	-	-	562,851	20,035 1,110	-

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nds of 2014 do	ollars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Johnnes		Burial /		Utility and
Activit	v	Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index		Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet		Wt., Lbs.	Manhours	Manhours
Dienocal	of Plant Systems (continued)																				
4a.1.5.28	* '		46	7	3	-	16		17	88	88	_	_	_	237	-	-		12,405	681	-
4a.1.5.29		-	24	-	-	-	-	-	4	28	-	-	28	-	-	-	-	-	-	407	-
4a.1.5.30		-	26	-	-	-	-	-	4	30	-	-	30	-	-	-	-	-	-	427	-
4a.1.5.31 4a.1.5.32	e	-	104 49	18	- 11	-	- 58		16 30	120 166	166	-	120	-	862	-	-	-	44,774	1,741 787	-
4a.1.5.33	· · · · · · · · · · · · · · · · · · ·		669	254	130	-	661		377	2,091	2,091	-	-	-	9,845	-	-	-	512,043	10,593	-
4a.1.5.34	Switchgear Heat Removal	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	180	-
4a.1.5.35		-	481	197	105	-	534	-	289	1,606	1,606	-	-	-	7,935	-	-	-	413,833	7,723	-
4a.1.5.36	0 1 1	-	85 86	19 9	11	-	58 21	-	39 28	212 149	212 149	-	-	-	862 315	-	-	-	44,802 16,508	1,338 1,329	-
4a.1.5.37 4a.1.5.38			249	115	76	-	384		181	1,005	1,005	-	-	-	5,774	-	-		297,530	4,132	-
4a.1.5.39		-	721	150	88	-	449	-	321	1,730	1,730	-	-	-	6,935	-	-	-	348,242	11,349	-
4a.1.5.40		-	153	-	-	-	-	-	23	176	-	-	176	-	-	-	-	-	-	2,499	-
4a.1.5	Totals	-	13,414	4,682	2,725	-	13,844	-	7,571	42,236	40,857	-	1,380	-	207,085	-	-	-	10,732,070	215,940	-
4a.1.6	Scaffolding in support of decommissioning	-	2,908	64	35	-	177	-	783	3,967	3,967	-	-	-	2,649	-	-	-	137,534	50,760	-
4a.1	Subtotal Period 4a Activity Costs	429	31,488	21,735	9,395	-	52,130	653	33,395	149,225	147,845	-	1,380	-	465,064	2,046	406	2,450	26,076,820	404,694	2,738
Period 4s	Additional Costs																				
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,908	572	2,480	2,480	-	-	-	-	-	-	-	-	30,069	-
4a.2.2	Asbestos Abatement	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	-
4a.2.3	Operational Tools and Equipment Subtotal Period 4a Additional Costs	-	-	9	13	-	189	1.050	50	261	261	-	-	-	5,855	-	-	-	146,375	16	-
4a.2	Subtotal Period 4a Additional Costs	-	-	9	13	-	189	1,958	630	2,798	2,798	-	-	-	5,855	•	-	-	146,375	30,085	-
Period 4a	Collateral Costs																				
4a.3.1	Process decommissioning water waste	4	-	7	18	-	23	-	11	64	64	-	-	-	67	-	-	-	4,008	13	-
4a.3.3	Small tool allowance	- ,	431	- 7	-	-	-	-	65	495	446	-	50	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	4	431	7	18	-	23	-	76	559	510	-	50	-	67	-	-	-	4,008	13	-
Period 4a	Period-Dependent Costs																				
4a.4.1	Decon supplies	78	-	-	-	-	-	-	19	97	97	-	-	-	-	-	-	-	-	-	-
4a.4.2 4a.4.3	Insurance Property taxes	-	-	-	-	-	-	957 723	96 72	1,052 795	1,052 716	-	- 80	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	2,678	-	-	-	-	-	670	3,348	3,348	-	-	-	-	-	-	-	-	_	-
4a.4.5	Heavy equipment rental	-	2,928	-	-	-	-	-	439	3,367	3,367	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	153	83	-	470	-	145	851	851	-	-	-	7,339	-	-	-	146,784	239	-
4a.4.7 4a.4.8	Plant energy budget NRC Fees	-	-	-	-	-	-	2,231 606	335 61	2,565 666	2,565 666	-	-	-	-	-	-	-	-		-
4a.4.9	Site O&M Cost		-	-	-	-	-	239	36	274	274	-		-	-	-	-	-	-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	580	87	667	667	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,252	788	6,040	6,040	-	-	-	-	-	-	-	-	-	94,286
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	18,324	2,749	21,072	21,072	-	-	-	-	-	-	-	-	-	208,183
4a.4.13 4a.4	Utility Staff Cost Subtotal Period 4a Period-Dependent Costs	78	5,606	153	83	-	470	31,912 60,823	4,787 10,283	36,699 77,495	36,699 77,416	-	80		7,339	-	-	-	146,784	239	377,143 679,611
4a.0	TOTAL PERIOD 4a COST	512		21,903	9,510	_	52,812	63,433	44,383	230,078	228,569		1,509	_	478,325	2,046	406	2,450		435,032	682,349
	2 4b - Site Decontamination	512	57,024	21,300	3,010		52,012	00,400	44,000	200,010	220,000		1,000		410,020	2,040	400	2,400	20,010,000	490,002	002,040
Period 4b 4b.1.1	Direct Decommissioning Activities Remove spent fuel racks	976	96	195	242	-	1,231	-	875	3,615	3,615	-	-	-	18,378	-	-	-	954,202	1,632	-
Disposal	of Plant Systems																				
4b.1.2.1	Aux Diesel Bldg Floor Drains	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	147	-
4b.1.2.2	Auxiliary Diesel Generator	-	82	-		-	٠.	-	12	94	- 40	-	94	-	-	-	-	-	- 4.042	1,341	-
4b.1.2.3 4b.1.2.4	Containment Monitoring Control Rod Drive	-	25 217	2 20	1 12	-	5 62		8 73	40 383	40 383	-	-		78 920	•		-	4,043 47,858	409 3,493	-
4b.1.2.4 4b.1.2.5	Diesel Oil	-	69	-	-	-	-	-	10	80	-	-	80	-	-	-	-	-	41,000	1,104	-
4b.1.2.6	Domestic Water	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	499	-
4b.1.2.7	Domestic Water - RCA	-	45	7	3	-	17	-	17	89	89	-	-	-	255	-	-	-	13,307	670	-
4b.1.2.8 4b.1.2.9	Electrical Electrical - Contaminated	-	611 856	112	- 75	-	382	-	92 332	702 1,758	1,758	-	702	-	5,707	-	-	-	296,337	9,872 13,329	-
4b.1.2.10		-	5,832	1,072	690	-	3,507	-	2,545	13,646	13,646	-	-	-	52,355		-	-	2,718,307	89,972	-
	Fire Protection	-	254		-	-	-	-	38	292	-	-	292	-	-	-	-	-	-	4,263	-

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	ands of 2014 do	llars)											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial	Volumes		Burial /		Utility and
Activity		Decon	Removal			Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Disposal of Plant	Systems (continued)																				
4b.1.2.12 Fire I		-	1,184		163		828	-	559	3,045	3,045	-	-	-	12,306	-	-	-	641,747	18,258	-
	Pool Cooling & Cleanup	-	814		166		843	-	469	2,588	2,588	-	-	-	12,562	-	-	-	653,382	13,068	-
	C-Auxiliary Building	-	308		50	-	254	-	156	842	842	-	-	-	3,793	-	-	-	196,915	4,533	-
	C-Control Rm\Aux Equip Area C-Diesel Generator Room	-	44 17		-	-	-	-	7	51 19	-	-	51 19	-	-	-	-	-	-	729	-
	C-Diesei Generator Room C-Off Gas Building	-	72		19		99	-	49	268	268	-	19	-	1,478	-	-		76,733	284 1,141	-
	C-Primary Containment	-	938		144		733	-	462	2,504	2,504	-	-	-	10,961	-	-	_	568,155	14,102	-
	C-Radwaste Building	_	114				77	-	52	281	281	-	_	-	1,146	-	_	_	59,487	1,699	-
	C-Turbine Building	-	868				592	-	400	2,151	2,151	-	-	-	8,842	-	-	-	459,063	12,212	-
	Pressure Core Spray	-	311	190	105	-	535	-	246	1,386	1,386	-	-	-	7,949	-	-	-	414,391	5,148	-
	ument Air	-	9		-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	152	
	ument Air - RCA	-	165			-	45	-	56	293	293	-	-	-	659	-	-	-	34,507	2,558	
	Pressure Core Spray	-	148		49	-	246	-	115	646	646	-	-	-	3,664	-	-	-	191,058	2,446	
4b.1.2.25 Nucle 4b.1.2.26 Off G	ear Boiler	-	1,477 584		319 89		1,623 452	-	876 287	4,821 1,561	4,821 1,561	-	-	-	24,184 6,743	-	-	-	$\begin{array}{c} 1,258,120 \\ 350,523 \end{array}$	24,096 9,243	-
	ary Containment Vent & Purge	-	462		137		694	-	330	1,830	1,830	-	-	-	10,400	-	-		537,713	7,646	
	ess Radiation Monitoring	_	15		0		2	-	4	23	23	-	_	-	32	-	-	_	1,669	254	_
	ess Sampling	_	55		3	-	13	-	18	93	93	-	_	-	201	-	-	_	10,453	901	_
	pactive Waste Disposal	-	2,585		271		1,379		1,080	5,793	5,793	-	-	-	21,136	-	-	-	1,069,308	40,463	-
4b.1.2.31 Radw	vaste Area Floor Drains	-	2	0	0	-	0	-	1	3	3	-	-	-	6	-	-	-	315	31	-
	tor Bldg Closed Cooling Water	-	409		154	-	782	-	350	1,988	1,988	-	-	-	11,625	-	-	-	605,888	6,817	-
	tor Building Equipment Drains	-	67	11	6	-	28	-	26	137	137	-	-	-	428	-	-	-	21,778	1,052	-
	tor Building Floor Drains	-	7	1	0	-	1	-	2	12	12	-	-	-	21	-	-	-	1,101	109	-
	tor Core Isolation Cooling tor Recirculation	-	207 119		21	-	105	-	85 79	454 436	454 436	-	-	-	1,564 2,381	-	-	-	81,526 123,665	3,268 1,970	
	tor Water Clean-up	-	780		31 43		160 217	-	264	1,391	1,391	-	-	-	3,219	-	-	-	168,302	12,041	-
	dual Heat Removal		1,539		507		2,574		1,194	6,712	6,712				38,296				1,995,503	25,652	
	ice Air - RCA	-	373		25		127	-	134	713	713	-	-	-	1,889	-	-	_	98,774	5,643	-
	ice Water	-	97		-	-	-	-	15	112	-	-	112	-	-	-	-	-	-	1,595	-
4b.1.2.41 Servi	ice Water - RCA	-	862	316	180	-	915	-	503	2,775	2,775	-	-	-	13,626	-	-	-	709,225	13,633	-
	dby Liquid Control	-	48		4	-	19	-	18	97	97	-	-	-	281	-	-	-	14,698	719	
	Water	-	107		· ·	-		-	16	123	-	-	123	-		-	-	-	·	1,732	
4b.1.2 Total	ls	-	22,816	5,763	3,408	-	17,317	-	10,988	60,291	58,763	-	1,529	-	258,706	-	-	-	13,423,850	358,295	-
4b.1.3 Scaffo	olding in support of decommissioning	-	4,362	95	52	-	266	-	1,174	5,950	5,950	-	-	-	3,973	-	-	-	206,301	76,140	-
Decontamination	of Site Buildings																				
	tor Building	3,002	3,630				1,827	-	2,995	12,455	12,455	-	-	-	30,151	-	-	-	2,166,716	99,187	-
	liary Building	1,461	640				1,031	-	1,227	5,045	5,045	-	-	-	15,307	-	-	-	822,445		
	Building	81	21		5		13	-	50	172	172	-	-	-	227	-	-	-	18,719		
	ice Building Radwaste Building	112 495	23 350		29	-	18	-	67 368	228 1,377	228 1,377	-	-	-	313	-	-	-	25,878 106,769	2,027	-
	ine Building	1,790	750				103 569	-	1,262	4,659	4,659	-	-	-	1,635 9,386	-	-	-	621,456		-
4b.1.4 Total	_	6,941	5,414				3,560	-	5,970	23,935	23,935	-	_	-	57,020	_	-	_	3,761,982	186,401	_
													1 700								
	otal Period 4b Activity Costs	7,916	32,687	7,086	4,721	· •	22,374	-	19,007	93,792	92,263	-	1,529	-	338,078	-	-	-	18,346,340	622,467	-
Period 4b Additio								000	202	1.055	1.055										0.010
	nse Termination Survey Planning edial Action Surveys	-	-	-	-	-	-	983 3,418	295 1,025	1,277 4,443	1,277 4,443	-	-	-	-	-	-	-	-	- 59 974	6,240
	stos Abatement	-		-	-	-	-	50	1,025	4,443	4,443	-	-	-	-	-	-	-	-	53,874	
	stos Abatement nse Termination ISFSI		302	336	502	-	1,502	2,303	1,236	6,180	6,180	-	-	-	24,637		-	-	1,948,035	14,596	5,418
	erground Services Excavation	-	542		- 502		1,502	2,303	81	623	623	-	-	-	24,057		-		1,340,033	3,627	5,410
4b.2.6 Soil F	Remediation	-	58		221		1,978	-	543	2,808	2,808	-	-		34,081			-	2,736,453		-
4b.2 Subto	otal Period 4b Additional Costs	-	902	343	723	-	3,480	6,753	3,188	15,390	15,390	-	-	-	58,717	-	-	-	4,684,488	72,841	11,658
Period 4b Collate																					
	ess decommissioning water waste	14	-	24		-	84	-	40	229	229	-	-	-	238	-	-	-	14,298	46	
	l tool allowance	-	655		-	-	-	-	98	753	753	-	-	-	7.054	-	-	-	900 995	-	-
4b.3.4 Decor 4b.3 Subto	mmissioning Equipment Disposition otal Period 4b Collateral Costs	14	655	170 194			472 556	-	149 288	884 1,866	884 1,866	-	-	-	7,054 7,292		-	-	366,237 380,535	88 135	
			230	-01	200		230		_50	-,	-,- 30				.,				,	-50	
Period 4b Period- 4b.4.1 Decor	Dependent Costs n supplies	1,769	_	_	-	_	_	-	442	2,212	2,212	_	_		_	_	_	_	_	-	_
4b.4.1 Decor 4b.4.2 Insur		1,769	-	-	-	-	-	1,714	171	1,885	1,885	-	-	-	-	-	-		-	-	-
IIISUI								1,117	111	1,000	1,000	•		=							

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

								(thousa	nas of 2014 ao	iiuis,											
						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	Volumes		Burial /		Utility and
Activity Index		Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Processing Costs	Disposal Costs	Other Costs	Total Contingency	Total Costs	Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	Contractor Manhours
Period 4b	Period-Dependent Costs (continued)																				
4b.4.3	Property taxes	-	-	-	-	-	-	1,295	130	1,425	1,425	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	4,400		-	-	-	-	1,100	5,500	5,500	-	-	-	-	-	-	-	-	-	-
4b.4.5 4b.4.6	Heavy equipment rental Disposal of DAW generated	-	5,193	213	115	-	655	-	779 202	5,972	5,972 1,185	-	-	-	10 991	-	-	-	204,423	333	-
b.4.6	Plant energy budget	-	-	213	119	-	699	3,155	473	1,185 3,629	3,629	-	-	-	10,221	-	-	-	204,425	-	-
4b.4.8	NRC Fees						-	1,085	109	1,194	1,194									-	
1b.4.9	Site O&M Cost	-	-	-	-	-	-	428	64	492	492	-	-	-	-	_	-		_	-	-
4b.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,039	156	1,195	1,195	-	-	-	-	-	-		-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	9,411	1,412	10,822	10,822	-	-	-	-	-	-	-	-	-	168,929
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	31,966	4,795	36,761	36,761	-	-	-	-	-	-	-	-	-	362,183
4b.4.13	Utility Staff Cost	-	-	-		-	-	54,148	8,122	62,270	62,270	-	-	-	-	-	-	-	-	-	637,874
lb.4	Subtotal Period 4b Period-Dependent Costs	1,769	9,593	213	115	-	655	104,242	17,955	134,542	134,542	-	-	-	10,221	-	-	-	204,423	333	1,168,986
4b.0	TOTAL PERIOD 4b COST	9,700	43,837	7,835	5,718	-	27,065	110,995	40,438	245,589	244,060	-	1,529	-	414,308	-	-	-	23,615,780	695,776	1,180,644
PERIOD	4f - License Termination																				
Period 4f l 4f.1.1	Direct Decommissioning Activities ORISE confirmatory survey							172	52	224	224										
4f.1.1 4f.1.2	Terminate license	-	-	-	-	-	-	172	92	224 a	224	-	-	-	-	-	-	-	-	-	-
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	172	52	224	224	-	-	-	-	-	-	-	-	-	-
Period 4f A	Additional Costs																				
4f.2.1	License Termination Survey	-	-	-	-	-	-	14,037	4,211	18,248	18,248	-	-	-	-	-	-	-	-	218,104	3,120
4f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	14,037	4,211	18,248	18,248	-	-	-	-	-	-	-	-	218,104	3,120
Period 4f	Collateral Costs																				
f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	-	-	-
f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,163	175	1,338	1,338	-	-	-	-	-	-	-	•	-	-
	Period-Dependent Costs																				
lf.4.1	Insurance	-	-	-	-	-	-	504	50	554	554	-	-	-	-	-	-	-	-	-	-
f.4.2 f.4.3	Property taxes Health physics supplies	-	898	-	-	-	-	381	$\frac{38}{224}$	419 1,122	419 1,122	-	-	-	-	-	-	-	-	-	-
f.4.4	Disposal of DAW generated	-		7	- 1	-	22		224 7	39	39			-	339	-		_	6,771	11	-
f.4.5	Plant energy budget	-	-	- '	-	-	-	247	37	284	284	-	-	-	-	-	-	_	0,771	-	_
.4.6	NRC Fees	-	-	-	-	-	-	306	31	336	336	-	-	-	-	_	-	_	-	-	-
f.4.7	Site O&M Cost	-	-	-	-	-	-	126	19	144	144	-	-	-	-	-	-		-	-	-
f.4.8	Security Staff Cost	-	-	-	-	-	-	686	103	789	789	-	-	-	-	-	-	-	-	-	11,91
f.4.9	DOC Staff Cost	-	-	-	-	-	-	4,219	633	4,852	4,852	-	-	-	-	-	-	-	-	-	47,260
f.4.10	Utility Staff Cost	-	-		-	-	-	5,177	777	5,953	5,953	-	-	-	-	-	-	-	-		57,580
:.4	Subtotal Period 4f Period-Dependent Costs	-	898	7	4	-	22	11,645	1,918	14,494	14,494	-	-	-	339	-	-	-	6,771	11	116,760
2.0	TOTAL PERIOD 4f COST	-	898	7	4	-	22	27,018	6,356	34,304	34,304	-	-	-	339	-	-	-	6,771	218,115	119,880
ERIOD	4 TOTALS	10,212	82,259	29,745	15,232	-	79,899	201,446	91,177	509,970	506,933	-	3,037	-	892,971	2,046	406	2,450	49,996,540	1,348,923	1,982,874
ERIOD	5b - Site Restoration																				
eriod 5b	Direct Decommissioning Activities																				
	n of Remaining Site Buildings Reactor Building		6,790						1,018	7,808			7,808							64,458	
	Auxiliary Building		4,415		-	-	-	-	1,018	7,808 5,077	-	-	7,808 5,077	-	-	-	-	-	-	42,962	-
b.1.1.3	Capital Improvements 2009		1,552		-	-	-		233	1,785	-	-	1,785	-	-		-	-	-	20,778	-
b.1.1.4	Capital Improvements 2003	-	1,002	-	_	_	-		1	6	-	-	6	_	_		-		-	54	-
	Chemical Feed Building	-	39	-	-	-	-	-	6	45	-	-	45	-	-	-	-	-	-	482	-
b.1.1.6	Diesel Generator Room	-	554	-	-	-	-	-	83	637	-	-	637	-	-	-	-	-	-	6,000	-
b.1.1.7	Discharge Structure	-	23		-	-	-	-	3	26	-	-	26	-	-	-	-	-	-	190	-
b.1.1.8	IRSF Building	-	819		-	-	-	-	123	941	-	-	941	-	-	-	-	-	-	8,924	-
b.1.1.9	Lake Screen House	-	1,295		-	-	-	-	194	1,489	-	-	1,489	-	-	-	-	-	-	13,877	-
	Main Access Facility	-	462		-	-	-	-	69	532	-	-	532	-	-	-	-	-	-	5,396	-
b.1.1.11	Miscellaneous Yard Structures New Service Building	-	2,352 2,166		-	-	-	-	353 325	2,705	-	-	2,705 2,491	-	-	-	-	-	-	27,035 $23,587$	-
5b.1.1.12 5b.1.1.13	New Service Building Outfall Structure	-	2,166		-	-	-		325 1	2,491 11	-	-	2,491	-	-		-	-	-	23,587	-
ου.1.1.10	Outrain Districture	-	9	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	119	-

Table E-2
LaSalle County Station, Unit 2
SAFSTOR Decommissioning Cost Estimate
(thousands of 2014 dollars)

						Off-Site	LLRW				NRC	Spent Fuel	Site	Processed		Burial V	olumes		Burial /		Utility and
Activity		Decon	Removal	Packaging			Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Cu. Feet	Wt., Lbs.	Manhours	Manhours
Demolition	n of Remaining Site Buildings (continued)																				
	River Screen House	_	387	-	-	_	_	-	58	445	_	-	445	_	_	-	_	-	-	4,231	-
5b.1.1.15		_	736	-	-	_	_	-	110	846	_	-	846	_	_	-	_	-	-	3,834	_
5b.1.1.16	· ·	-	40	-	-	-	-	-	6	46	-		46	-		-	-	-	-	528	-
	· · · · · · · · · · · · · · · · · · ·	-	1,778	-	-	-	-	-	267	2,045	-		2,045	-		-	-	-	-	21,582	-
5b.1.1.18	· ·	-	43	-	-	_	-	-	6	49	-	_	49	_	_	-	_	-	-	591	-
5b.1.1.19		-	320	-	-	-	-	-	48	368	-		368	-		-	-	-	-	3,346	
5b.1.1.20	Solid Radwaste Building	-	2,428	-	-	-	-	-	364	2,792	-	-	2,792	-	-	-	-	-	-	23,167	-
5b.1.1.21	Training Center	-	1,467	-	-	-	-	-	220	1,687			1,687	-			-	-	-	16,863	
5b.1.1.22	Turbine Building	-	6,492	-	-	-	-	-	974	7,466	-		7,466	-		-	-	-	-	68,584	-
5b.1.1.23	Turbine Pedestal	-	2,536	-	-	-	-	-	380	2,917	-		2,917	-		-	-	-	-	22,592	
5b.1.1.24	Wastewater Treatment Plant	-	73	-	-	-	-	-	11	83	-		83	-		-	-	-	-	911	
5b.1.1	Totals	-	36,779	-	-	_	-	-	5,517	42,296	-	_	42,296	_	_	-	_	-	-	380,083	
			· ·						,	,			•							,	
Site Close	out Activities																				
5b.1.2	BackFill Site	-	861	-	-	-	-	-	129	991	-	-	991	-	-	-	-	-	-	1,535	-
5b.1.3	Grade & landscape site	-	198	-	-	-	-	-	30	228	-	-	228	-	-	-	-	-	-	499	-
5b.1.4	Final report to NRC	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	654
5b.1	Subtotal Period 5b Activity Costs	-	37,839	-	-	-	-	87	5,689	43,615	100	-	43,515	-	-	-	-	-	-	382,117	654
	Additional Costs																				
5b.2.1	Site Restoration ISFSI	-	1,344	-	-	-	-	28	206	1,577	-	-	1,577	-	-	-	-	-	-	15,775	80
5b.2.2	Concrete Crushing	-	1,260	-	-	-	-	6	190	1,456	-	-	1,456	-	-	-	-	-	-	5,872	-
5b.2.3	Cofferdam Construction and Teardown	-	989	-	-	-	-	-	148	1,138	-	-	1,138	-	-	-	-	-	-	8,720	-
5b.2	Subtotal Period 5b Additional Costs	-	3,594	-	-	-	-	33	544	4,171	-	-	4,171	-	-	-	-	-	-	30,367	80
Donied Sh	Collateral Costs																				
			405						05	500			700								
5b.3.1	Small tool allowance Subtotal Period 5b Collateral Costs	-	435 435	-	-	-	-	-	65 65	500 500	-	•	500 500	-	-	-	-	-	-	-	-
5b.3	Subtotal Period of Collateral Costs	-	430	-	-	-	-	-	69	900	-	-	900	-	-	-	-	-	-	-	-
Period 5b	Period-Dependent Costs																				
5b.4.2	Property taxes	_	_	-	-	_	_	998	100	1,098	_	-	1.098	_	_	-	_	-	-	-	-
5b.4.3	Heavy equipment rental	-	5,685	-	-	-	-	-	853	6,538	-		6,538	-		-	-	-	-	-	
5b.4.4	Plant energy budget	-	´-	-	-	_	-	324	49	373	-	_	373	_	_	-	_	-	-	-	-
5b.4.5	Site O&M Cost	-	_	-	-	_	-	329	49	379	-	_	379	_	_	-	_	-	-	-	-
5b.4.6	Security Staff Cost	_	-	-	-	_	-	1.618	243	1,861	-	_	1,861	_	-	-	-	_	_	-	27,619
5b.4.7	DOC Staff Cost	_	_	-	-	_	_	10,124	1,519	11,642	_	-	11,642	_	_	-	_	-	-	-	110,391
5b.4.8	Utility Staff Cost	_	-	-	-	_	-	5,084	763	5,847	-	_	5,847	_	-	-	-	_	_	-	54,154
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,685	-	-	-	-	18,477	3,574	27,737	-	-	27,737	-	-	-	-	-	-	-	192,164
5b.0	TOTAL PERIOD 5b COST	-	47,552	-	-	-	-	18,598	9,873	76,023	100	-	75,922	-	-	-	-	-	-	412,483	192,898
PERIOD	5 TOTALS	_	47,552	_	_	-	_	18,598	9,873	76,023	100	_	75,922	_	-	_	_	_	_	412,483	192,898
			,					,	2,3.0	,. 20	200		,0							, 100	,000
TOTAL C	COST TO DECOMMISSION	21,319	139,960	30,131	15,915	-	81,162	748,549	181,882	1,218,918	949,754	189,748	79,416	_	903,019	2,046	406	2,450	50,283,770	1,899,930	5,485,303

Table E-2 LaSalle County Station, Unit 2 SAFSTOR Decommissioning Cost Estimate (thousands of 2014 dollars)

			Off-Site			LLRW				NRC	Spent Fuel	Site	Processed		Burial V	olumes		Burial /		Utility and	
Activity		Decon	Removal	Packaging	Transport	Processing	Disposal	Other	Total	Total	Lic. Term.	Management	Restoration	Volume	Class A	Class B	Class C	GTCC	Processed	Craft	Contractor
Index	Activity Description	Cost	Cost	Costs	Costs	Costs	Costs	Costs	Contingency	Costs	Costs	Costs	Costs	Cu. Feet	Wt., Lbs.	Manhours	Manhours				

TOTAL COST TO DECOMMISSION WITH 17.54% CONTINGENCY:	\$1,218,918	thousands of 2014 dollars
TOTAL NRC LICENSE TERMINATION COST IS 77.92% OR:	\$949,754	thousands of 2014 dollars
SPENT FUEL MANAGEMENT COST IS 15.57% OR:	\$189,747	thousands of 2014 dollars
NON-NUCLEAR DEMOLITION COST IS 6.52% OR:	\$79,416	thousands of 2014 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	905,471	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	2,450	cubic feet
TOTAL SCRAP METAL REMOVED:	67,341	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,899,930	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

APPENDIX F

ISFSI DECOMMISSIONING

	$\underline{\text{Page}}$
DECON and SAFSTOR Alternative	F-2
Delayed DECON Alternative	F-3

Table F-1 LaSalle County Station ISFSI Decommissioning Cost Estimate DECON and SAFSTOR Decommissioning Alternatives

(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	530	530	-	-	1,384
Decontamination (activated HSM disposition)	603	672	1,003	3,005	19	5,302	49,274	6,365	-
License Termination (radiological surveys)	-	-	-	-	2,634	2,634	-	22,827	-
Subtotal	603	672	1,003	3,005	3,183	8,466	49,274	29,192	1,384
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	384	384	-	-	776
Insurance	-	-	-	-	112	112	-	-	-
Property Taxes	-	-	-	-	326	326	-	-	-
Security Staff Cost	-	-	-	-	276	276	-	-	4,937
Oversight Staff Cost	-	-	-	-	324	324	-	-	3,740
Subtotal	-	-	-	-	1,422	1,422	-	-	9,453
Total (w/o contingency)	603	672	1,003	3,005	4,606	9,889	49,274	29,192	10,837
Total (w/25% contingency)						12,361			

The application of contingency (25%) is consistent with the evaluation criteria referenced by the NRC in NUREG-1757 ("Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. NRC's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Vol. 3, Rev. 1, February 2012)

Table F-2 LaSalle County Station ISFSI Decommissioning Cost Estimate Delayed DECON Decommissioning Alternative

(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	293	293	-	-	1,096
Decontamination (activated HSM disposition)	463	672	884	3,004	19	5,041	49,258	5,239	-
License Termination (radiological surveys)	-	-	1	-	1,666	1,666	-	14,645	-
Subtotal	463	672	884	3,004	1,978	6,999	49,258	19,884	1,096
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	384	384	-	-	776
Insurance	-	-	-	-	112	112	-	-	-
Property Taxes	-	-	-	-	326	326	-	-	-
Security Staff Cost	-	-	-	-	276	276	-	-	4,937
Oversight Staff Cost	-	-	-	-	324	324	-	-	3,740
Subtotal	-	-	-	-	1,422	1,422	-	-	9,453
Total (w/o contingency)	463	672	884	3,004	3,400	8,422	49,258	19,884	10,549
Total (w/25% contingency)						10,527			

The application of contingency (25%) is consistent with the evaluation criteria referenced by the NRC in NUREG-1757 ("Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. NRC's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Vol. 3, Rev. 1, February 2012)