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U.S. Nuclear Regulatory Commission
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Clinton Power Station
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Submittal of Updated Clinton Power Station Site-Specific SAFSTOR Decommissioning Cost Estimate

Reference: Letter from P. R. Simpson (Exelon Generation Company) to U.S. NRC, "Submittal of Clinton Power Station Site-Specific SAFSTOR Decommissioning Cost Estimate," dated August 27, 2009

In the referenced letter, Exelon Generation Company, LLC (EGC) submitted a site-specific SAFSTOR Decommissioning Cost Estimate (DCE) for Clinton Power Station (CPS). Attached is an updated DCE that has been performed in accordance with EGC's normal practice of updating DCEs every five years.

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

Respectfully,

Patrick R. Simpson
Manager – Licensing
Exelon Generation Company, LLC

Attachment: Clinton Power Station Decommissioning Cost Estimate

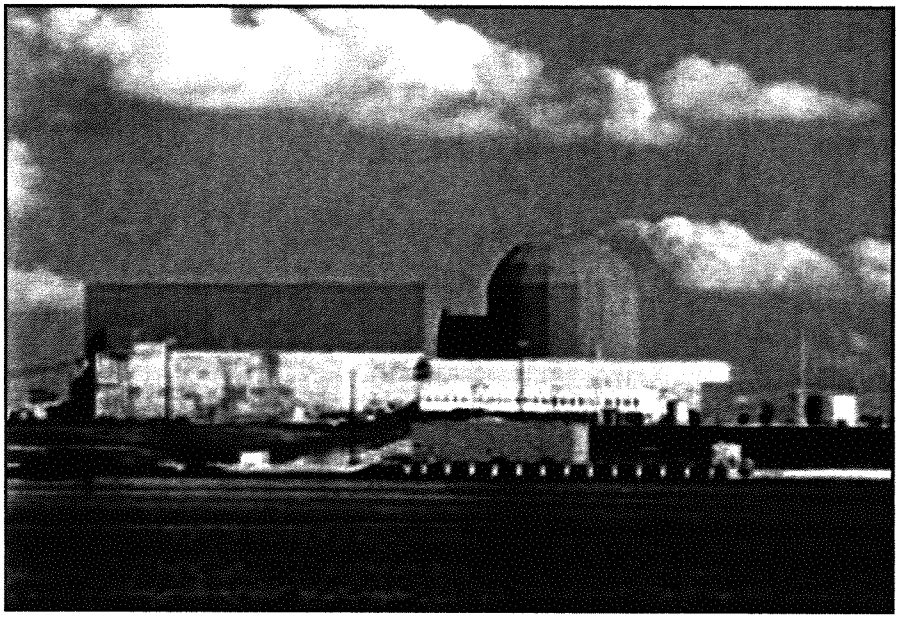
ATTACHMENT

Clinton Power Station
Decommissioning Cost Estimate

DECOMMISSIONING COST ANALYSIS

for the

CLINTON POWER STATION



prepared for

Exelon Generation Company, LLC

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

December 2012

APPROVALS

Project Manager	William A. Cloutier **William A. Cloutier, Jr.**	12/03/2012 **Date**
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Technical Manager	**Francis W. Seymore**	12/3/12 **Date**

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No.	Date	Item Revised	Reason for Revision
0	12-03-2012		Original Issue

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the Clinton Power Station (Clinton) for the identified decommissioning scenarios following a scheduled cessation of plant operations. The analysis relies upon site-specific, technical information, developed in an evaluation in 2007[1] for AmerGen Energy, LLC, and updated to reflect current assumptions pertaining to the disposition of the nuclear unit and relevant industry experience in undertaking such projects. In 2008, the operating license was amended to reflect Exelon Generating Company, LLC (Exelon) as the licensee authorized to own and operate the station. Therefore, the updated estimates are designed to provide Exelon with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

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

The estimates are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The estimates incorporate a minimum cooling period of approximately five and one-half years for the spent fuel that resides in the fuel building's storage pool when operations cease. In the DECON and SAFSTOR scenarios, any residual fuel remaining in the pool after the cooling period is relocated to the ISFSI to await transfer to a DOE facility (the fuel is assumed to remain in the storage pool for the Delayed DECON scenario and transferred directly from the pool to an off-site DOE facility). The estimates also include the dismantling of non-essential structures and limited restoration of the site.

Alternatives and Regulations

The Nuclear Regulatory Commission (NRC or Commission) provided initial decommissioning requirements in its rule adopted on June 27, 1988.[2] In this rule,

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1 "Decommissioning Cost Analysis for the Clinton Power Station," Document No. E16-1555-005, Rev. 0, TLG Services, Inc., October 2007

2 U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72 "General Requirements for

the NRC set forth financial criteria for decommissioning licensed nuclear power facilities. The regulations addressed planning needs, timing, funding methods, and environmental review requirements for decommissioning. The rule also defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB.

> DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."[3]
>
> SAFSTOR is defined as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use."[4] Decommissioning is to be completed within 60 years, although longer time periods will be considered when necessary to protect public health and safety.
>
> ENTOMB is defined as "the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactive material decays to a level permitting unrestricted release of the property."[5] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years.

The 60-year restriction has limited the practicality for the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. In 1997, the Commission directed its staff to re-evaluate this alternative and identify the technical requirements and regulatory actions that would be necessary for entombment to become a viable option. The resulting evaluation provided several recommendations, however, rulemaking has been deferred 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.

Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, Federal Register Volume 53, Number 123 (p 24018 et seq.), June 27, 1988

3 Ibid. Page FR24022, Column 3

4 Ibid.

5 Ibid. Page FR24023, Column 2

In 1996, the NRC 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]

Decommissioning Scenarios

The following scenarios were evaluated and are representative of the alternatives available to the owner:

1. DECON: The plant's operating license currently expires on September 29, 2026. However, for purposes of this study, the license is assumed to be renewed for an additional 20 years (until 2046). The first scenario assumes that an ISFSI is constructed to support continued plant operations and expanded once the plant is shut down to accommodate any residual spent fuel in the pool and facilitate decontamination and dismantling activities within the fuel building. Spent fuel storage operations continue at the site until the transfer of the fuel to the DOE is complete, assumed to be in the year 2064.

2. Delayed DECON: In the second scenario, the unit is prepared for an abbreviated period of storage. The spent fuel discharged to the storage pool once operations cease remains in the pool until it can be transferred to a DOE facility. Decommissioning is delayed until the transfer of the fuel to the DOE is complete (i.e., in the year 2064). The unit is then decommissioned.

3. SAFSTOR: The nuclear unit is placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent possible; termination of the license would conclude within the required 60-year period. As in the DECON scenario, spent fuel is relocated to an ISFSI until it can be transferred to a DOE facility. Dormancy continues following the removal of spent fuel from the site, timed to allow final

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6 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

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

decommissioning and license termination to be completed within 60 years of final shutdown.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines [8] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference describes a unit factor method for determining decommissioning activity costs. The unit factors used in this analysis incorporate site-specific costs and the latest available information on worker productivity in decommissioning.

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."[9] 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.

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

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

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

throughout the program. Inclusion of contingency is necessary to provide assurance that sufficient funding will be available to accomplish the intended tasks.

Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Policy Act" in 1980,[10] and its Amendments of 1985,[11] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. With the exception of Texas (which has issued a license to Waste Control Specialists for operation of a new facility in Andrews, Texas), no new compact facilities have been successfully sited, licensed, and constructed.

The disposal facility in Barnwell, South Carolina is currently closed to generators outside the Atlantic Compact (comprising the states of Connecticut, New Jersey and South Carolina). The commercial disposal facility on the Hanford Nuclear Reservation near Richland, Washington accepts low-level radioactive waste from the Northwest (Alaska, Hawaii, Idaho, Montana, Oregon, Utah, Washington and Wyoming) and Rocky Mountain (Colorado, Nevada, and New Mexico) Compact states. This leaves Energy*Solutions*' disposal facility in Clive, Utah as the only available option for the disposal of the majority of the low-level radioactive waste generated in decommissioning Clinton.

For the purpose of this analysis, Exelon's "Life of Plant Agreement" with Energy*Solutions* is used as the basis for estimating the disposal cost for the majority of the radioactive waste (Class A[12]). Energy*Solutions* does not have a license to dispose of the more highly radioactive waste (Classes B and C), for example, generated in the dismantling of the reactor vessel.

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

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

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

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

for shallow-land disposal. This material is packaged in the same multipurpose canisters used for spent fuel storage/transport and designated for geologic disposal.

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

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act" [13] (NWPA) in 1982, assigning the responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. Two permanent disposal facilities were envisioned, as well as an interim storage facility. To recover the cost, the legislation created a Nuclear Waste Fund through which money is collected from the sale of electricity generated by the power plants. The NWPA, along with the individual disposal contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. By January 1998, the DOE had failed to accept any spent fuel or high level waste, as required by the NWPA and utility contracts. Delays continue and, as a result, generators have initiated legal action against the DOE in an attempt to obtain compensation for DOE's breach of contract.[14] For purposes of this analysis, acceptance of commercial spent fuel by the DOE is assumed to begin in 2025.

Once an interim storage or disposal facility is operational, fuel acceptance will be prioritized and spent fuel assemblies will need to meet certain acceptance criteria, including heat output. These conditions require that the fuel discharged upon the

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

14 Settlement: Exelon and the U.S. Department of Justice, in close consultation with the DOE, under which the government will reimburse Exelon for costs associated with storage of spent fuel at the company's nuclear stations pending DOE fulfilling its contractual obligation to accept commercial spent nuclear fuel. Additional amounts reimbursed annually for future costs. August 5, 2004

cessation of operations be actively cooled and stored for a minimum period at the generating site prior to transfer (a minimum of five years as defined in 10CFR§961 for standard fuel). As such, the NRC requires that licensees establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy, pursuant to 10CFR§50.54(bb).[15] This funding requirement is fulfilled through inclusion of certain cost elements in the decommissioning estimates, for example, associated with the isolation and continued operation of the plant's fuel storage pool and/or ISFSI.

At shutdown, the plant's storage pool is expected to contain freshly discharged assemblies from the most recent refueling cycles, as well as the final reactor core. Within five and one-half years of final shutdown, the spent fuel in the storage pool is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios). Once the storage pool is emptied, the fuel 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 transfer to the DOE can be completed.

The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. With a large fleet of reactors, Exelon is able to re-assign allocations between its units to minimize on-site storage costs. Assuming spent fuel from the older units is given priority and with a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year), the assemblies residing at Clinton at the time of shutdown would be scheduled for pickup in the years 2063 and 2064 (assuming the cessation of plant operations in 2046). This equates to 66 multi-purpose canisters (at 89 assemblies per canister).

It is expected that an ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K [16]), will be constructed to support continued plant operations. The facility is assumed to be expanded following the cessation of plant operations to support future decommissioning operations. As such, the fuel (in the DECON and SAFSTOR scenarios) is packaged for interim storage at the ISFSI.

Exelon's strongly held position is that the DOE has a contractual obligation to accept Clinton'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

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

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

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.

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 cost to dismantle site structures with a work force already mobilized is more efficient and less costly than if the process were deferred. Experience at shutdown generating stations has shown that plant facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and the demolition work force. Consequently, this 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 Clinton 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.

SUMMARY OF DECOMMISSIONING COST ELEMENTS
DECON
(thousands of 2012 dollars)

Cost Element	Total
Decontamination	25,126
Removal	191,180
Packaging	27,715
Transportation	13,229
Waste Disposal	80,391
Off-site Waste Processing	14,464
Program Management [1]	421,449
Spent Fuel Pool Isolation	12,176
Spent Fuel (Direct Costs) [2]	144,449
Insurance and Regulatory Fees	19,482
Energy	19,467
Characterization and Licensing Surveys	27,911
Property Taxes	44,649
Miscellaneous Equipment	6,738
Site O&M	3,397
Total [3]	1,051,824

Cost Element	Total
NRC License Termination	732,894
Spent Fuel Management	217,632
Site Restoration	101,298
Total [3]	1,051,824

[1] Includes security and 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

SUMMARY OF DECOMMISSIONING COST ELEMENTS
DELAYED DECON
(thousands of 2012 dollars)

Cost Element	Total
Decontamination	32,855
Removal	185,721
Packaging	17,477
Transportation	9,194
Waste Disposal	42,172
Off-site Waste Processing	17,240
Program Management [1]	578,327
Spent Fuel Pool Isolation	12,176
Spent Fuel (Direct Costs) [2]	74,086
Insurance and Regulatory Fees	27,942
Energy	31,969
Characterization and Licensing Surveys	29,549
Property Taxes	53,473
Miscellaneous Equipment	13,600
Site O&M	9,718
Total [3]	1,135,501

Cost Element	Total
NRC License Termination	666,212
Spent Fuel Management	367,871
Site Restoration	101,418
Total [3]	1,135,501

[1] Includes security and 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

SUMMARY OF DECOMMISSIONING COST ELEMENTS
SAFSTOR
(thousands of 2012 dollars)

Cost Element	Total
Decontamination	32,644
Removal	187,109
Packaging	16,349
Transportation	7,989
Waste Disposal	38,122
Off-site Waste Processing	17,343
Program Management [1]	609,045
Spent Fuel Pool Isolation	12,176
Spent Fuel (Direct Costs) [2]	140,812
Insurance and Regulatory Fees	57,273
Energy	38,925
Characterization and Licensing Surveys	29,549
Property Taxes	92,510
Miscellaneous Equipment	26,121
Site O&M	22,606
Total [3]	1,328,572

Cost Element	Total
NRC License Termination	949,951
Spent Fuel Management	277,213
Site Restoration	101,408
Total [3]	1,328,572

[1] Includes security and 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 Clinton Power Station (Clinton), for the scenarios described in Section 2, following a scheduled cessation of plant operations. The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2007,[1] for AmerGen Energy, LLC, and updated to reflect current assumptions pertaining to the disposition of the nuclear unit and relevant industry experience in undertaking such projects. In 2008, the operating license was amended to reflect Exelon Generation Company LLC (Exelon) as the authorized licensee for the station. Therefore, the updated estimates are designed to provide Exelon with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station. It is not a detailed engineering document, but a financial analysis prepared in advance of the detailed engineering that will be required to carry out the decommissioning

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the cost to decommission Clinton, to provide a sequence or schedule for the associated activities, and to develop waste stream projections from the decontamination and dismantling activities. The plant's operating license currently expires on September 29, 2026. However, for purposes of this study, the license is assumed to be renewed for an additional 20 years (until 2046).

1.2 SITE DESCRIPTION

Clinton is located in east central Illinois, approximately 60 miles northeast of Springfield. The station is comprised of a single boiling water reactor with supporting facilities.

The Nuclear Steam Supply System (NSSS) consists of a BWR/6 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 provides 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 a part of the nuclear system process barrier and are located inside the containment structure. The design reactor thermal power level is 3473 Megawatts thermal (MWt). The corresponding net electrical output is approximately 1138.5 Megawatts electric (MWe).

The BWR-Mark III containment structure at Clinton consists of a lined, reinforced concrete cylinder with a hemispherical domed roof and a flat base slab. The drywell consists of a cylindrical reinforced concrete structure that surrounds the reactor vessel. The lower portion of the drywell is submerged in the suppression pool. The drywell and suppression pool are connected by three rows of circular vents which are located below the normal water level of the suppression pool.

Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of the steam produced in the reactor into mechanical shaft power and then into electrical energy. The turbine consists of one high-pressure, double-flow turbine element, and two double-flow, low-pressure turbine elements all aligned in tandem. The generator is driven at 1800 rpm and rated at 1100 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 Lake Clinton via the intake tunnels by the circulating water pumps. After passing through the plant condensers, the water is routed through the 3.4 mile long discharge flume back to the 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

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

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 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 new 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).

1.3.1 Nuclear Waste Policy Act

Congress passed the "Nuclear Waste Policy Act"[7] (NWPA) in 1982, assigning the responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. Two permanent disposal facilities were envisioned, as well as an interim storage facility. To recover the cost, the legislation created a Nuclear Waste Fund through which money is collected from the sale of electricity generated by the power plants. NWPA, along with the individual disposal contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. By January 1998, the DOE had failed to initiate the disposal of spent nuclear fuel and high level waste, as required by the NWPA and utility contracts. Delays continue and, as a result, generators have initiated legal action against the DOE in an attempt to resolve the impasse.[8] For purposes of this analysis, acceptance of commercial spent fuel by the DOE is assumed to begin in 2025.

Once an interim storage or disposal facility is operational, fuel acceptance will be prioritized and spent fuel assemblies will need to meet certain acceptance criteria, including heat output. These conditions require that the fuel discharged upon the cessation of operations be actively cooled and stored for a minimum period at the generating site prior to transfer (a minimum of five years as defined in 10CFR§961 for standard fuel). As such, the NRC requires that licensees establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy, pursuant to 10CFR§50.54(bb).[9] This funding requirement is fulfilled through inclusion of certain cost elements in the decommissioning estimates, for example, associated with the isolation and continued operation of the plant's fuel storage pool and/or ISFSI.

At shutdown, the plant's storage pool is expected to contain freshly discharged assemblies from the most recent refueling cycles, as well as the final reactor core. Within five and one-half years of final shutdown, the spent fuel in the storage pool is expected to be transferred to the ISFSI (DECON and SAFSTOR scenarios). Once the storage pool is emptied, the fuel 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 transfer to the DOE can be completed.

The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. With a large fleet of reactors, Exelon is able to re-assign allocations between its units to minimize on-site storage costs. Assuming spent fuel from the older units is given priority and with a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year), the assemblies residing at Clinton at the time of shutdown would be scheduled for pickup in the years 2063 and 2064 (assuming the cessation of plant operations in 2046). This equates to 66 multi-purpose canisters (at 89 assemblies per canister).

It is expected that an ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K [10]), will be constructed to support continued plant operations. The facility is assumed to be expanded following the cessation of plant operations to support future decommissioning operations. As such, the fuel (in the DECON and SAFSTOR scenarios) is packaged for interim storage at the ISFSI.

Exelon's strongly held position is that the DOE has a contractual obligation to accept Clinton'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 Acts

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Policy Act" in 1980,[11] 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 (which has issued a license to Waste Control Specialists for the operation of a new facility in Andrews, Texas), no new compact facilities have been successfully sited, licensed, and constructed.

The disposal facility in Barnwell, South Carolina is currently closed to generators outside the Atlantic Compact (comprising the states of Connecticut, New Jersey and South Carolina). The commercial disposal facility on the Hanford Nuclear Reservation near Richland, Washington accepts low-level radioactive waste from the Northwest (Alaska, Hawaii, Idaho, Montana, Oregon, Utah, Washington and Wyoming) and Rocky Mountain (Colorado, Nevada, and New Mexico) Compact states. This leaves Energy*Solutions*' disposal facility in Clive, Utah as the only available option for the disposal of the majority of the low-level radioactive waste generated in decommissioning Clinton.

For the purpose of this analysis, Exelon's "Life of Plant Agreement" with Energy*Solutions* is used as the basis for estimating the disposal cost for the majority of the radioactive waste (Class A[13]). Energy*Solutions* does not have a license to dispose of the more highly radioactive waste (Classes B and C), for example, generated in the dismantling of the reactor vessel.

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.

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

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination,"[14] amending 10 CFR §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 Clinton 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).[15] An additional limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water.[16]

On October 9, 2002, the NRC signed an agreement with the EPA on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding (MOU) [17] provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC authority. The MOU also includes provisions for NRC and EPA consultation for certain sites when, at the time of license termination, (1) groundwater contamination exceeds EPA-permitted levels; (2) NRC contemplates restricted release of the site; and/or (3) residual radioactive soil concentrations exceed levels defined in the MOU.

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

2. DECOMMISSIONING ALTERNATIVES

Detailed cost estimates were developed to decommission Clinton 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.

Three decommissioning scenarios were evaluated for the nuclear unit. The scenarios selected are representative of alternatives available to the owner and are defined as follows:

1. DECON: The plant's operating license currently expires on September 29, 2026. However, for purposes of this study, the license is assumed to be renewed for an additional 20 years (until 2046). The first scenario assumes that an ISFSI is constructed to support continued plant operations and expanded once the plant is shut down to accommodate any residual spent fuel in the pool and facilitate decontamination and dismantling activities within the fuel building. Spent fuel storage operations continue at the site until the transfer of the fuel to the DOE is complete, assumed to be in the year 2064.

2. Delayed DECON: In the second scenario, the unit is prepared for an abbreviated period of storage. The spent fuel discharged to the storage pool once operations cease remains in the pool until it can be transferred to a DOE facility. Decommissioning is delayed until the transfer of the fuel to the DOE is complete (i.e., in the year 2064). The unit is then decommissioned.

3. SAFSTOR: The nuclear unit is placed into safe-storage in the third scenario. However, decommissioning is deferred beyond the fuel storage period to the maximum extent possible; termination of the license would conclude within the maximum required 60-year period. As in the DECON scenario, spent fuel is relocated to an ISFSI until it can be transferred to a DOE facility. Dormancy continues following the removal of spent fuel from the site, timed to allow final decommissioning and license termination to be completed within 60 years of final shutdown.

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 de-activation and closure. During the first phase, notification is to be provided to the NRC certifying the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee would then be prohibited from reactor operation.

The second phase encompasses activities during the storage period or during major decommissioning activities, or a combination of the two. The third phase pertains to the activities involved in license termination. The decommissioning estimates developed for Clinton 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 to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local 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, i.e., without specific NRC approval. Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing GTCC, as defined by 10 CFR §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, 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 primary shield cores.
- An ISFSI is designed, licensed and constructed to support continued plant operation and expanded following the cessation of operations to offload the spent fuel pool in support of the decommissioning program.
- 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 area 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 plant operations.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.2 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 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.
- Transfer of the steam separator and dryer assemblies to the dryer-separator 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 in-core guide tubes. Some of the material is expected to exceed Class C disposal requirements. As such, those segments are packaged in modified fuel storage canisters for geologic disposal.

- Removal and segmentation of the remaining internals including the jet pump assemblies, orificed fuel supports, and core support 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 the reactor vessel lower head. The lower reactor head and vessel supporting structure are 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.
- 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 2063 and to be completed by the end of the year 2064.

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 dryer-separator pool, reactor well, and spent fuel storage pool.
- Surveys of the decontaminated areas of the containment structure.
- Removal of the contaminated equipment and material from the turbine and radwaste buildings, and any other contaminated facility. Use radiation and contamination control techniques until radiation surveys indicate that the structures 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 a central processing area. Material certified to be free of contamination is released for unrestricted disposition, e.g., as scrap, recycle, or general disposal. Contaminated material is characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)."[18] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies commercially available instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a

format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will amend the operating license (to reduce the license to the ISFSI) if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the site (not associated with 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 will 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, turbine and radwaste 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 cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process were deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public as well as to future workers. Abandonment creates a breeding ground for vermin infestation as well as other biological hazards.

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

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

2.1.4 ISFSI Operations and Decommissioning

The ISFSI will continue to operate under a general license (10 CFR §50) following the completion of the decommissioning process. Assuming the DOE starts accepting fuel in 2025, transfer of spent fuel from Clinton is anticipated to begin in 2063 and continue through the year 2064.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the §50 license if it determines that the remediation of the ISFSI has been performed in accordance with an ISFSI license termination plan and that the final radiation survey and associated documentation demonstrate that the facility is suitable for release. Once the requirements are satisfied, the NRC can terminate the license for the ISFSI.

This study assumes that, once the casks are emptied and dismantled, and the license for the facility terminated, the pad can be dismantled using conventional techniques for the demolition of reinforced concrete. The area will then be graded and landscaped to conform to the surrounding environment.

2.2 SAFSTOR AND DELAYED DECOMMISSIONING

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, although a shorter time period is expected for these activities due to the more limited work scope. 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 fuel 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 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 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. Activities are scheduled around the fuel handling systems to the greatest extent possible.

- In the SAFSTOR scenario, the ISFSI built to support operations is expanded to permit offloading of the spent fuel pool in support of the decommissioning program.
- 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, contaminated systems with decontamination 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 phases 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 environmental and radiation 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 from the pool or the ISFSI (depending upon the scenario). After a period of storage (such that license termination is accomplished within 60 years of final shutdown), 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 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 ^{60}Co 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 ^{94}Nb, ^{59}Ni, and ^{63}Ni. 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 (^{152}Eu and ^{154}Eu). 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, presuming the

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

3. COST ESTIMATE

The cost estimates prepared for decommissioning Clinton 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 in 2007. 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 Cost Estimates,"[19] and the DOE "Decommissioning Handbook."[20] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) 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.[21]

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

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

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 FINANCIAL COMPONENTS OF THE COST MODEL

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

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

3.3.1 Contingency

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook[22] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, 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%

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 value reported for the DECON alternative is 18.5%. Values for the other alternatives are delineated within the detailed cost tables in Appendices D and E.

3.3.2 Financial Risk

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

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

3.4 SITE-SPECIFIC CONSIDERATIONS

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

3.4.1 Spent Fuel Management

The cost to dispose of spent fuel generated from plant operations is not reflected within the estimates to decommission the Clinton 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 fulfilled through inclusion of 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 Clinton site by the year 2064. In the Delayed DECON scenario, the ISFSI is only used to store fuel placed during plant operations. Spent fuel off-loaded from the reactor 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

The current administration has cut the budget for the geological repository program, but has also appointed a Blue Ribbon Commission on America's Nuclear Future to make recommendations for a new plan for nuclear waste disposal. That Commission's charter includes a

requirement that the Commission consider "options for safe storage of used nuclear fuel while final disposition pathways are selected and deployed." For example, it is possible that the NRC could license an interim storage facility, such as that proposed by Private Fuel Storage, within a relatively short time frame, at least by 2025.

Spent Fuel Management Model

The Exelon nuclear fleet consists of 21 units at 11 sites in Illinois, Pennsylvania, and New Jersey, 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 still 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").[23] 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.[24]

ISFSIs are constructed as necessary to maintain full-core discharge capability at the individual sites. Once the DOE begins repository operations, queue allocations are used to ship spent fuel from Exelon's operating sites. Spent fuel shipments are then made from decommissioning sites in the order of retirement.

Canister Design

The design and capacity of the ISFSI is based upon the Holtec FW vertical cask system, with an 89 fuel assembly capacity. A unit cost of $1.256 million is used for pricing the dry storage cask system. The DOE is assumed to provide the MPC for fuel transferred directly from the pool to the DOE, with the same 89 fuel assembly capacity, 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 $777,243 and $91,366 are used for operation and maintenance of the spent fuel pool and the ISFSI, respectively.

ISFSI Design Considerations

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, equivalent to 8 modules, 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, as well as the demolition of the ISFSI facility, is included in the estimate.

3.4.2 Reactor Vessel and Internal Components

The NSSS (reactor vessel and reactor recirculation system components) will be decontaminated using chemical agents prior to the start of cutting operations (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, the DOE

has indicated it will accept this waste for disposal at the future high-level waste repository.[25] However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has been packaged and disposed of as high-level waste, at a cost equivalent to that envisioned for the spent fuel. It is not anticipated that 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 Clinton 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 Clinton 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. Additionally, with BWRs, the diameter of the reactor vessel may severely limit overland transport. Consequently, the study assumes the reactor vessel will require segmentation, as a bounding condition.

3.4.3 Primary System Components

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

3.4.4 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The turbine rotors and shafts will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. The main condensers will also be disassembled and moved to a laydown area. 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.

3.4.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessel and internal components will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49.[26] 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.[27]

3.4.6 Low-Level Radioactive Waste Disposal

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

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 and weight, 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, 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 EnergySolutions for its facility in Clive, Utah.

EnergySolutions facility 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.

3.4.7 Site Conditions Following Decommissioning

The NRC will terminate (or amend) the site license if it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process will end at this point. Building codes and environmental regulations will dictate the next step in the decommissioning process, as well as 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 the remediation of any significant volume of contaminated soil. This assumption may be affected by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

3.5 ASSUMPTIONS

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

3.5.1 Estimating Basis

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

3.5.2 Labor Costs

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

Exelon will hire a Decommissioning Operations Contractor (DOC) to manage the decommissioning. The owner will provide site security, radiological health and safety, quality assurance and overall site administration during the decommissioning and demolition phases. Contract personnel will provide engineering services (e.g., for preparing the activity specifications, work procedures, activation, and structural analyses) under the direction of Exelon.

3.5.3 Design Conditions

Any fuel cladding failure that occurred during the lifetime of the plant is assumed to have released fission products at sufficiently low levels that the buildup of quantities of long-lived isotopes (e.g., ^{137}Cs, ^{90}Sr, 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.[28] Actual estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the Clinton components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from CR-0130[29] and CR-0672,[30] 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 was included within the estimates. Disposition of any blades stored in the pool from operations was considered an operating expense and therefore not accounted for in the estimates.

Activation of the reactor building structure is confined to the sacrificial shield.

3.5.4 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.

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, were 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; 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.

3.6 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 2012 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 3.1
DECON ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2012 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	17,328	3,108	824	11	3,537	24,808
2047	72,522	15,915	4,021	2,111	21,635	116,205
2048	82,398	30,222	3,865	27,911	25,575	169,972
2049	80,423	31,147	3,038	34,186	19,431	168,224
2050	74,912	21,280	2,453	9,005	10,072	117,721
2051	74,400	20,364	2,398	6,667	9,204	113,033
2052	54,352	9,808	1,555	5,688	7,050	78,453
2053	45,486	4,263	642	495	4,938	55,823
2054	30,768	14,665	320	0	4,497	50,249
2055	30,768	14,665	320	0	4,497	50,249
2056	7,151	1,446	32	0	4,237	12,866
2057	4,553	0	0	0	4,196	8,749
2058	4,553	0	0	0	4,196	8,749
2059	4,553	0	0	0	4,196	8,749
2060	4,565	0	0	0	4,208	8,773
2061	4,553	0	0	0	4,196	8,749
2062	4,553	0	0	0	4,196	8,749
2063	5,631	3,234	0	0	4,196	13,062
2064	5,852	4,569	0	2	12,740	23,163
2065	2,117	565	0	251	2,543	5,476
Total	611,436	175,251	19,467	86,328	159,342	1,051,824

TABLE 3.2
DELAYED DECON ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2012 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	13,638	316	824	11	1,997	16,785
2047	62,743	6,925	3,198	766	23,413	97,045
2048	23,061	1,405	1,258	488	10,127	36,338
2049	13,811	435	640	17	6,698	21,600
2050	13,811	435	640	17	6,698	21,600
2051	13,811	435	640	17	6,698	21,600
2052	13,848	436	641	17	6,717	21,659
2053	13,811	435	640	17	6,698	21,600
2054	13,811	435	640	17	6,698	21,600
2055	13,811	435	640	17	6,698	21,600
2056	13,848	436	641	17	6,717	21,659
2057	13,811	435	640	17	6,698	21,600
2058	13,811	435	640	17	6,698	21,600
2059	13,811	435	640	17	6,698	21,600
2060	13,848	436	641	17	6,717	21,659
2061	13,811	435	640	17	6,698	21,600
2062	13,811	435	640	17	6,698	21,600
2063	15,967	6,904	640	17	6,698	30,225
2064	11,456	5,870	462	12	5,446	23,245
2065	44,043	1,631	3,198	38	2,432	51,340
2066	65,594	14,715	3,118	10,838	7,138	101,402
2067	68,629	18,005	3,038	21,574	11,818	123,064
2068	63,676	9,798	2,482	7,892	5,751	89,598
2069	62,801	8,646	2,398	5,998	4,904	84,747
2070	54,091	5,152	1,516	3,008	3,787	67,555
2071	31,630	11,618	398	8	1,781	45,435
2072	27,254	14,864	321	0	1,496	43,936
2073	13,776	7,513	162	0	756	22,208
Total	751,821	119,452	31,969	50,886	181,373	1,135,501

TABLE 3.3
SAFSTOR ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2012 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2046	14,530	2,992	824	11	3,537	21,894
2047	66,210	17,326	3,198	766	27,853	115,353
2048	26,597	12,015	1,258	488	13,021	53,380
2049	17,364	11,093	640	17	10,499	39,612
2050	17,364	11,093	640	17	10,499	39,612
2051	17,364	11,093	640	17	10,499	39,612
2052	9,159	3,149	398	10	5,989	18,705
2053	6,428	319	320	8	4,540	11,615
2054	6,428	319	320	8	4,540	11,615
2055	6,428	319	320	8	4,540	11,615
2056	6,445	320	321	8	4,553	11,647
2057	6,428	319	320	8	4,540	11,615
2058	6,428	319	320	8	4,540	11,615
2059	6,428	319	320	8	4,540	11,615
2060	6,445	320	321	8	4,553	11,647
2061	6,428	319	320	8	4,540	11,615
2062	6,428	319	320	8	4,540	11,615
2063	7,506	3,554	320	8	4,540	15,928
2064	7,732	4,201	321	8	4,547	16,809
2065	3,721	313	320	7	2,319	6,680
2066	3,721	313	320	7	2,319	6,680
2067	3,721	313	320	7	2,319	6,680
2068	3,731	314	321	7	2,325	6,698
2069	3,721	313	320	7	2,319	6,680
2070	3,721	313	320	7	2,319	6,680
2071	3,721	313	320	7	2,319	6,680
2072	3,731	314	321	7	2,325	6,698
2073	3,721	313	320	7	2,319	6,680
2074	3,721	313	320	7	2,319	6,680

TABLE 3.3 (continued)
SAFSTOR ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2012 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2075	3,721	313	320	7	2,319	6,680
2076	3,731	314	321	7	2,325	6,698
2077	3,721	313	320	7	2,319	6,680
2078	3,721	313	320	7	2,319	6,680
2079	3,721	313	320	7	2,319	6,680
2080	3,731	314	321	7	2,325	6,698
2081	3,721	313	320	7	2,319	6,680
2082	3,721	313	320	7	2,319	6,680
2083	3,721	313	320	7	2,319	6,680
2084	3,731	314	321	7	2,325	6,698
2085	3,721	313	320	7	2,319	6,680
2086	3,721	313	320	7	2,319	6,680
2087	3,721	313	320	7	2,319	6,680
2088	3,731	314	321	7	2,325	6,698
2089	3,721	313	320	7	2,319	6,680
2090	3,721	313	320	7	2,319	6,680
2091	3,721	313	320	7	2,319	6,680
2092	3,731	314	321	7	2,325	6,698
2093	3,721	313	320	7	2,319	6,680
2094	3,721	313	320	7	2,319	6,680
2095	3,721	313	320	7	2,319	6,680
2096	3,731	314	321	7	2,325	6,698
2097	3,721	313	320	7	2,319	6,680
2098	3,721	313	320	7	2,319	6,680
2099	3,721	313	320	7	2,319	6,680
2100	16,519	723	1,234	17	2,355	20,849
2101	49,887	4,719	3,198	39	2,432	60,275
2102	69,056	18,204	3,067	17,612	10,357	118,297
2103	67,580	15,503	2,794	15,624	9,398	110,899

TABLE 3.3 (continued)
SAFSTOR ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2012 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2104	62,972	8,651	2,405	5,985	4,954	84,966
2105	62,753	8,608	2,393	5,952	4,934	84,640
2106	40,805	5,083	557	25	2,371	48,842
2107	27,471	14,904	320	0	1,492	44,187
2108	27,546	14,945	321	0	1,496	44,308
2109	151	82	2	0	8	242
Total	803,188	182,094	38,925	46,938	257,427	1,328,572

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 3.4.1.

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. 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.[31]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

The schedule reflects the results of a precedence network developed for the site decommissioning activities, i.e., a PERT (Program Evaluation and Review Technique) Software Package. The work activity durations used in the precedence network reflect the actual man-hour estimates from the cost 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 building is isolated until such time that all spent fuel has been discharged from the spent fuel pool to the DOE or to the ISFSI. Decontamination and dismantling of the storage pool are initiated once the transfer of spent fuel to the ISFSI 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 Clinton. 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 building for final decontamination.

In Figure 4.1, the schedule is based upon years following the final shutdown date of September 29, 2046. 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
ACTIVITY SCHEDULE

ID	Task Name
1	Clinton schedule
2	Shutdown Unit 1
3	Period 1a Unit 1 - Shutdown through transition
4	Certificate of permanent cessation of operations submitted
5	Fuel storage pool operations
6	Dry fuel storage operations
7	Reconfigure plant
8	Prepare activity specifications
9	Perform site characterization
10	PSDAR submitted
11	Written certificate of permanent removal of fuel submitted
12	Site specific decommissioning cost estimate submitted
13	DOC staff mobilized
14	Period 1b Unit 1 - Decommissioning preparations
15	Fuel storage pool operations
16	Reconfigure plant (continued)
17	Dry fuel storage operations
18	Prepare detailed work procedures
19	Decon NSSS
20	Isolate spent fuel pool
21	Period 2a Unit 1 - Large component removal
22	Fuel storage pool operations
23	Dry fuel storage operations
24	Preparation for reactor vessel removal
25	Reactor vessel & internals
26	Remaining large NSSS components disposition
27	Non-essential systems

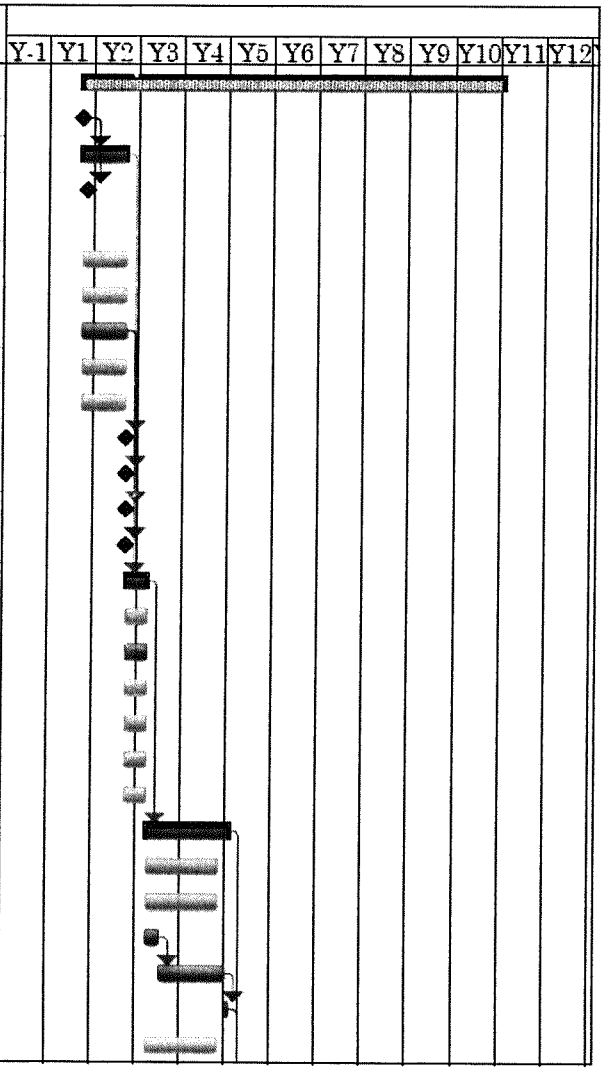


FIGURE 4.1 (continued)
ACTIVITY SCHEDULE

ID	Task Name
28	Main turbine/generator
29	Main condenser
30	License termination plan submitted
31	Period 2b Unit 1 - Decontamination (wet fuel)
32	Fuel storage pool operations
33	Dry fuel storage operations
34	Remove systems not supporting wet fuel storage
35	Decon buildings not supporting wet fuel storage
36	License termination plan approved
37	Fuel storage pool available for decommissioning
38	Period 2d Unit 1 - Decontamination following wet fuel storage
39	Dry fuel storage operations
40	Remove remaining systems
41	Decon wet fuel storage area
42	Period 2e Unit 1 - Plant license termination
43	Dry fuel storage operations
44	Final Site Survey
45	NRC review & approval
46	Part 50 license terminated
47	Period 3b Unit 1 - Site restoration
48	Dry fuel storage operations
49	Building demolitions, backfill and landscaping
50	END

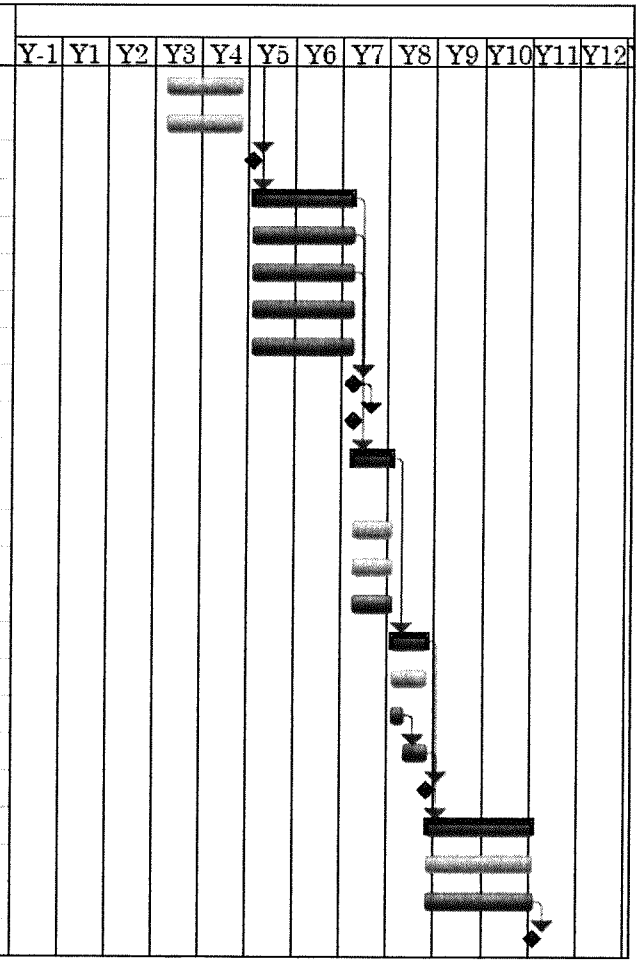


FIGURE 4.2
DECOMMISSIONING TIMELINE
DECON
(not to scale)

(Shutdown September 29, 2046)

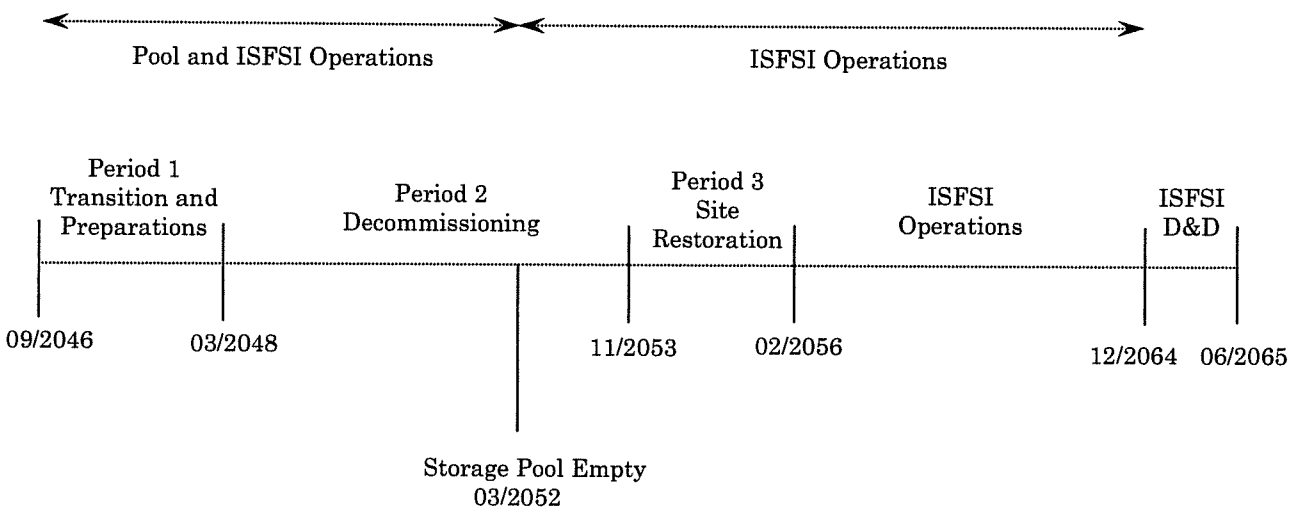


FIGURE 4.3
DECOMMISSIONING TIMELINE
DELAYED DECON
(not to scale)

(Shutdown September 29, 2046)

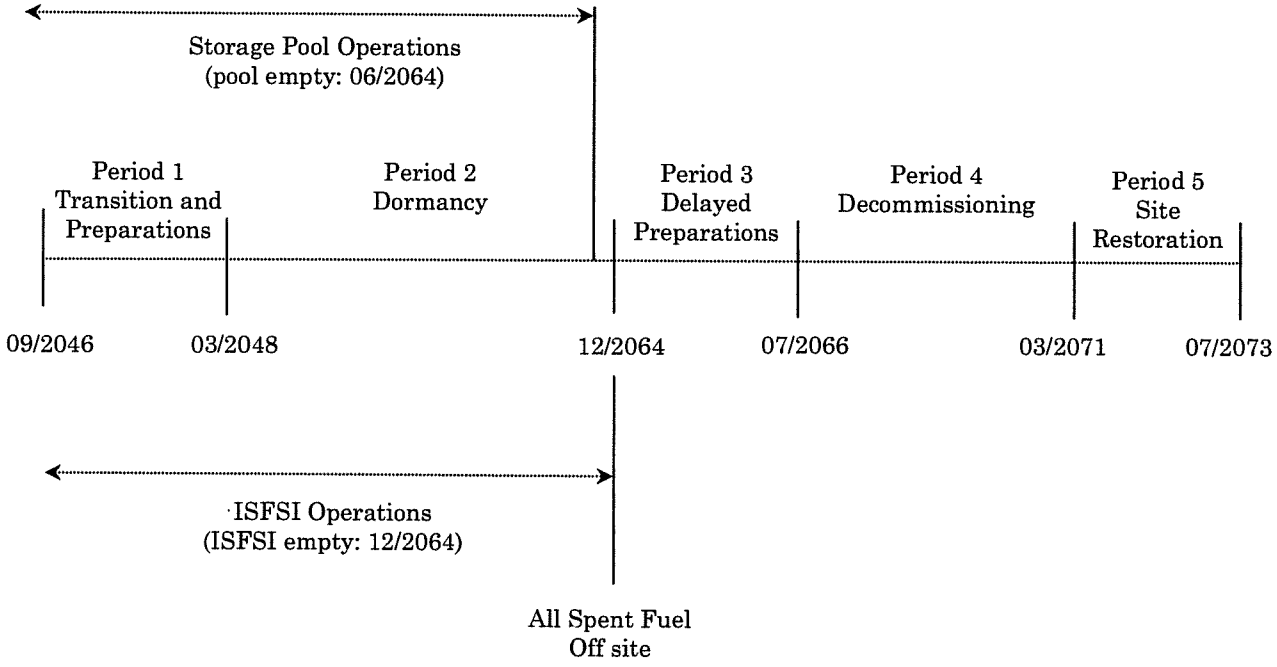
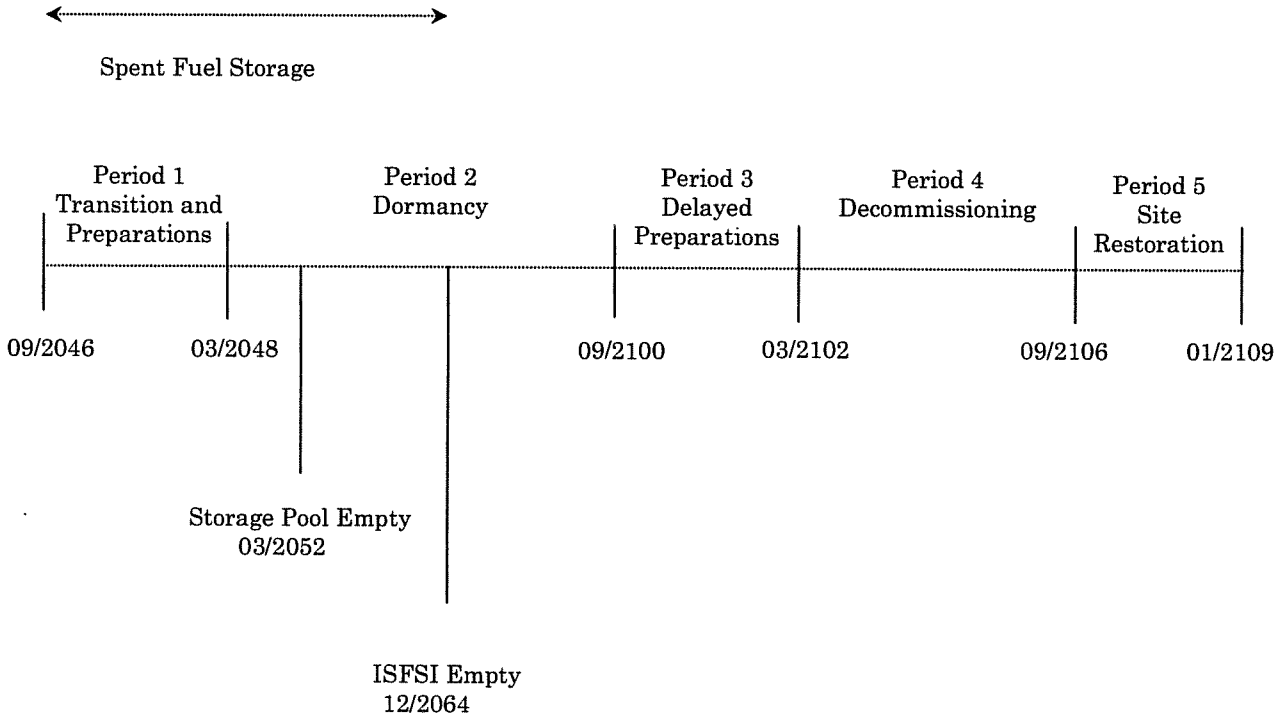


FIGURE 4.4
DECOMMISSIONING TIMELINE
SAFSTOR
(not to scale)

(Shutdown September 29, 2046)



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,[32] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations delineates the production, utilization, and disposal of radioactive materials and processes. In particular, §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 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, long-lived radionuclides will still control the disposition requirements.

The waste material generated in the decontamination and dismantling of Clinton is primarily generated during Period 2 of the DECON alternative and Period 4 of the deferred alternatives. Material that is considered potentially contaminated when removed from the radiologically controlled area is sent to processing facilities in Tennessee for conditioning and disposal. Heavily contaminated components and activated materials are routed for controlled disposal. The disposal volumes reported in the tables reflect the savings resulting from reprocessing and recycling.

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'* facility 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.

TABLE 5.1
DECOMMISSIONING WASTE SUMMARY
DECON

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions* Containerized	A	219,548	13,142,220
	Energy*Solutions* Bulk	A	59,509	3,452,391
	Future Disposal Facility	B	2,180	253,736
	Future Disposal Facility	C	1,320	110,235
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,785	351,100
Total [2]			284,343	17,309,682
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	487,391	20,285,930
Scrap Metal				151,932,000

[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)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions* Containerized	A	126,122	7,772,117
	Energy*Solutions* Bulk	A	54,048	2,934,429
	Future Disposal Facility	B	751	97,700
	Future Disposal Facility	C	1,075	102,750
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,785	351,100
Total [2]			183,781	11,258,096
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	582,901	24,179,990
Scrap Metal				151,932,000

[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	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions* Containerized	A	125,048	7,617,500
	Energy*Solutions* Bulk	A	55,969	2,972,850
	Future Disposal Facility	B	751	97,700
	Future Disposal Facility	C	1,038	100,425
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,785	351,100
Total [2]			184,591	11,139,575
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	584,403	24,323,490
Scrap Metal				151,932,000

[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 Clinton relied upon the site-specific, technical information developed for a previous analysis prepared in 2007. While not an engineering study, the estimates provide Exelon with sufficient information to assess their 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 remains in the storage pools in the Delayed-DECON alternative.

The cost projected to promptly decommission (DECON) Clinton is estimated to be $1,051.8 million. The majority of this cost (approximately 69.7%) is associated with the physical decontamination and dismantling of the nuclear unit so that the license can be terminated. Another 20.7% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 9.6% 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. It is assumed, for purposes of this analysis, 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 area. Over the five and one-half year period, the spent fuel will be packaged into transportable steel canisters for 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.

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 Energy*Solutions* 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.

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

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

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

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

TABLE 6.1
SUMMARY OF DECOMMISSIONING COST ELEMENTS
DECON
(thousands of 2012 dollars)

Cost Element	Total	Percentage
Decontamination	25,126	2.4
Removal	191,180	18.2
Packaging	27,715	2.6
Transportation	13,229	1.3
Waste Disposal	80,391	7.6
Off-site Waste Processing	14,464	1.4
Program Management [1]	421,449	40.1
Spent Fuel Pool Isolation	12,176	1.2
Spent Fuel (Direct Costs) [2]	144,449	13.7
Insurance and Regulatory Fees	19,482	1.9
Energy	19,467	1.9
Characterization/Licensing Surveys	27,911	2.7
Property Taxes	44,649	4.2
Miscellaneous Equipment	6,738	0.6
Site O&M	3,397	0.3
Total [3]	1,051,824	100.0

Cost Element	Total	Percentage
NRC License Termination	732,894	69.7
Spent Fuel Management	217,632	20.7
Site Restoration	101,298	9.6
Total [3]	1,051,824	100.0

[1] Includes security and 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

TABLE 6.2
SUMMARY OF DECOMMISSIONING COST ELEMENTS
DELAYED DECON
(thousands of 2012 dollars)

Cost Element	Total	Percentage
Decontamination	32,855	2.9
Removal	185,721	16.4
Packaging	17,477	1.5
Transportation	9,194	0.8
Waste Disposal	42,172	3.7
Off-site Waste Processing	17,240	1.5
Program Management [1]	578,327	50.9
Spent Fuel Pool Isolation	12,176	1.1
Spent Fuel (Direct Costs) [2]	74,086	6.5
Insurance and Regulatory Fees	27,942	2.5
Energy	31,969	2.8
Characterization/Licensing Surveys	29,549	2.6
Property Taxes	53,473	4.7
Miscellaneous Equipment	13,600	1.2
Site O&M	9,718	0.9
Total [3]	1,135,501	100.0

Cost Element	Total	Percentage
NRC License Termination	666,212	58.7
Spent Fuel Management	367,871	32.4
Site Restoration	101,418	8.9
Total [3]	1,135,501	100.0

[1] Includes security and 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

TABLE 6.3
SUMMARY OF DECOMMISSIONING COST ELEMENTS
SAFSTOR
(thousands of 2012 dollars)

Cost Element	Total	Percentage
Decontamination	32,644	2.5
Removal	187,109	14.1
Packaging	16,349	1.2
Transportation	7,989	0.6
Waste Disposal	38,122	2.9
Off-site Waste Processing	17,343	1.3
Program Management [1]	609,045	45.8
Spent Fuel Pool Isolation	12,176	0.9
Spent Fuel (Direct Costs) [2]	140,812	10.6
Insurance and Regulatory Fees	57,273	4.3
Energy	38,925	2.9
Characterization/Licensing Surveys	29,549	2.2
Property Taxes	92,510	7.0
Miscellaneous Equipment	26,121	2.0
Site O&M	22,606	1.7
Total [3]	1,328,572	100.0

Cost Element	Total	Percentage
NRC License Termination	949,951	71.5
Spent Fuel Management	277,213	20.9
Site Restoration	101,408	7.6
Total [3]	1,328,572	100.0

[1] Includes security and 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

7. REFERENCES

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

8. Settlement: Exelon and the U.S. Department of Justice, in close consultation with the DOE, under which the government will reimburse Exelon for costs associated with storage of spent fuel at the company's nuclear stations pending DOE fulfilling its contractual obligation to accept commercial spent nuclear fuel. Additional amounts reimbursed annually for future costs. August 5, 2004

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

7. REFERENCES
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11. "Low-Level Radioactive Waste Policy," Public Law 96-573, 1980

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

13. U.S. Code of Federal Regulations, Title 10, Part 61.55 "Waste Classification"

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

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16. 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"

17. "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

18. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG-1575, Rev. 1, EPA 402-R-97-016, Rev. 1, August 2000

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

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

21. "Building Construction Cost Data 2012," Robert Snow Means Company, Inc., Kingston, Massachusetts

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

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25. "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

26. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178

27. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-427719 Rules Tariff, March 2004, Radioactive Materials Tariff, August 2011

28. 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

29. 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

30. 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

31. "Microsoft Project 2010," Microsoft Corporation, Redmond, WA

32. "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 pounds will be removed in one piece using a crane or small hoist. They will be disconnected from the inlet and outlet piping. The heat exchanger will be sent to the waste processing area.

2. CALCULATIONS

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

Duration adjustment(s):	
+ Respiratory protection adjustment (50% of critical duration)	128
+ Radiation/ALARA adjustment (37% of critical duration)	95
Adjusted work duration	478
+ Protective clothing adjustment (30% of adjusted duration)	143
Productive work duration	621
+ Work break adjustment (8.33 % of productive duration)	52
Total work duration (minutes)	673

***** Total duration = 11.217 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	$46.15	$1,552.99
Craftsmen	2.00	11.217	$55.37	$1,242.17
Foreman	1.00	11.217	$58.54	$656.64
General Foreman	0.25	11.217	$60.07	$168.45
Fire Watch	0.05	11.217	$46.15	$25.88
Health Physics Technician	1.00	11.217	$70.20	$787.43
Total labor cost				$4,433.56

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
Blotting paper 50 @ $0.59 sq ft [1]	$29.50
Tarpaulin 12 mils, oil resistant, fire retardant 50 @ $0.27/sq ft [2]	$13.50
Gas torch consumables 1 @ $10.56/hr x 1 hr [3]	$10.56
Subtotal cost of equipment and materials	$53.56
Overhead & profit on equipment and materials @ 16.25 %	$8.70
Total costs, equipment & material	$62.26

TOTAL COST: Removal of contaminated heat exchanger <3000 pounds:	$4,495.82
Total labor cost:	$4,433.56
Total equipment/material costs:	$62.26
Total craft labor man-hours required per unit:	81.884

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. www.mcmaster.com online catalog, McMaster Carr Spill Control (7193T88)
  2. R.S. Means (2012) Division 01 56, Section 13.60-0600, page 22
  3. R.S. Means (2012) Division 01 54 33, Section 40-6360, page 674

- Material and consumable costs were adjusted using the regional indices for Bloomington, Illinois.

APPENDIX B

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

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit
Removal of clean instrument and sampling tubing, $/linear foot	0.50
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	5.32
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	7.51
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	14.41
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	28.05
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	36.41
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	53.58
Removal of clean pipe >36 inches diameter, $/linear foot	63.69
Removal of clean valve >2 to 4 inches	95.96
Removal of clean valve >4 to 8 inches	144.07
Removal of clean valve >8 to 14 inches	280.50
Removal of clean valve >14 to 20 inches	364.08
Removal of clean valve >20 to 36 inches	535.81
Removal of clean valve >36 inches	636.90
Removal of clean pipe hanger for small bore piping	32.02
Removal of clean pipe hanger for large bore piping	117.22
Removal of clean pump, <300 pound	241.72
Removal of clean pump, 300-1000 pound	666.04
Removal of clean pump, 1000-10,000 pound	2,649.79
Removal of clean pump, >10,000 pound	5,120.32
Removal of clean pump motor, 300-1000 pound	279.86
Removal of clean pump motor, 1000-10,000 pound	1,103.10
Removal of clean pump motor, >10,000 pound	2,481.96
Removal of clean heat exchanger <3000 pound	1,420.74
Removal of clean heat exchanger >3000 pound	3,570.42
Removal of clean feedwater heater/deaerator	10,080.07
Removal of clean moisture separator/reheater	20,743.01
Removal of clean tank, <300 gallons	311.12
Removal of clean tank, 300-3000 gallon	983.41
Removal of clean tank, >3000 gallons, $/square foot surface area	8.15

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit
Removal of clean electrical equipment, <300 pound	132.25
Removal of clean electrical equipment, 300-1000 pound	455.66
Removal of clean electrical equipment, 1000-10,000 pound	911.31
Removal of clean electrical equipment, >10,000 pound	2,157.46
Removal of clean electrical transformer < 30 tons	1,498.33
Removal of clean electrical transformer > 30 tons	4,314.91
Removal of clean standby diesel generator, <100 kW	1,530.41
Removal of clean standby diesel generator, 100 kW to 1 MW	3,415.99
Removal of clean standby diesel generator, >1 MW	7,071.76
Removal of clean electrical cable tray, $/linear foot	12.34
Removal of clean electrical conduit, $/linear foot	5.39
Removal of clean mechanical equipment, <300 pound	132.25
Removal of clean mechanical equipment, 300-1000 pound	455.66
Removal of clean mechanical equipment, 1000-10,000 pound	911.31
Removal of clean mechanical equipment, >10,000 pound	2,157.46
Removal of clean HVAC equipment, <300 pound	159.92
Removal of clean HVAC equipment, 300-1000 pound	547.50
Removal of clean HVAC equipment, 1000-10,000 pound	1,091.18
Removal of clean HVAC equipment, >10,000 pound	2,157.46
Removal of clean HVAC ductwork, $/pound	0.52
Removal of contaminated instrument and sampling tubing, $/linear foot	1.71
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	22.81
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	38.91
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	61.96
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	121.25
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	145.70
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	201.88
Removal of contaminated pipe >36 inches diameter, $/linear foot	238.74
Removal of contaminated valve >2 to 4 inches	478.50
Removal of contaminated valve >4 to 8 inches	569.79

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit
Removal of contaminated valve >8 to 14 inches	1,162.49
Removal of contaminated valve >14 to 20 inches	1,477.66
Removal of contaminated valve >20 to 36 inches	1,968.80
Removal of contaminated valve >36 inches	2,337.37
Removal of contaminated pipe hanger for small bore piping	157.65
Removal of contaminated pipe hanger for large bore piping	504.04
Removal of contaminated pump, <300 pound	1,014.32
Removal of contaminated pump, 300-1000 pound	2,299.75
Removal of contaminated pump, 1000-10,000 pound	7,348.76
Removal of contaminated pump, >10,000 pound	17,897.28
Removal of contaminated pump motor, 300-1000 pound	978.26
Removal of contaminated pump motor, 1000-10,000 pound	2,992.60
Removal of contaminated pump motor, >10,000 pound	6,718.78
Removal of contaminated heat exchanger <3000 pound	4,495.82
Removal of contaminated heat exchanger >3000 pound	13,023.67
Removal of contaminated feedwater heater/deaerator	31,565.43
Removal of contaminated moisture separator/reheater	68,525.37
Removal of contaminated tank, <300 gallons	1,686.40
Removal of contaminated tank, >300 gallons, $/square foot	32.27
Removal of contaminated electrical equipment, <300 pound	788.85
Removal of contaminated electrical equipment, 300-1000 pound	1,870.74
Removal of contaminated electrical equipment, 1000-10,000 pound	3,602.26
Removal of contaminated electrical equipment, >10,000 pound	6,977.40
Removal of contaminated electrical cable tray, $/linear foot	38.03
Removal of contaminated electrical conduit, $/linear foot	17.94
Removal of contaminated mechanical equipment, <300 pound	877.99
Removal of contaminated mechanical equipment, 300-1000 pound	2,067.28
Removal of contaminated mechanical equipment, 1000-10,000 pound	3,974.28
Removal of contaminated mechanical equipment, >10,000 pound	6,977.40
Removal of contaminated HVAC equipment, <300 pound	877.99

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit
Removal of contaminated HVAC equipment, 300-1000 pound	2,067.28
Removal of contaminated HVAC equipment, 1000-10,000 pound	3,974.28
Removal of contaminated HVAC equipment, >10,000 pound	6,977.40
Removal of contaminated HVAC ductwork, $/pound	2.38
Removal/plasma arc cut of contaminated thin metal components, $/linear in.	4.06
Additional decontamination of surface by washing, $/square foot	8.71
Additional decontamination of surfaces by hydrolasing, $/square foot	35.59
Decontamination rig hook up and flush, $/ 250 foot length	7,431.42
Chemical flush of components/systems, $/gallon	17.64
Removal of clean standard reinforced concrete, $/cubic yard	138.42
Removal of grade slab concrete, $/cubic yard	185.40
Removal of clean concrete floors, $/cubic yard	362.29
Removal of sections of clean concrete floors, $/cubic yard	1,077.74
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	233.53
Removal of contaminated heavily rein concrete w/#9 rebar, $/cubic yard	2,155.48
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	295.12
Removal of contaminated heavily rein concrete w/#18 rebar, $/cubic yard	2,851.79
Removal heavily rein concrete w/#18 rebar & steel embedments, $/cubic yard	449.06
Removal of below-grade suspended floors, $/cubic yard	362.29
Removal of clean monolithic concrete structures, $/cubic yard	892.75
Removal of contaminated monolithic concrete structures, $/cubic yard	2,150.15
Removal of clean foundation concrete, $/cubic yard	701.09
Removal of contaminated foundation concrete, $/cubic yard	2,003.09
Explosive demolition of bulk concrete, $/cubic yard	30.36
Removal of clean hollow masonry block wall, $/cubic yard	101.08
Removal of contaminated hollow masonry block wall, $/cubic yard	368.53
Removal of clean solid masonry block wall, $/cubic yard	101.08
Removal of contaminated solid masonry block wall, $/cubic yard	368.53
Backfill of below-grade voids, $/cubic yard	32.64
Removal of subterranean tunnels/voids, $/linear foot	115.34

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit
Placement of concrete for below-grade voids, $/cubic yard	123.83
Excavation of clean material, $/cubic yard	3.20
Excavation of contaminated material, $/cubic yard	42.17
Removal of clean concrete rubble (tipping fee included), $/cubic yard	23.59
Removal of contaminated concrete rubble, $/cubic yard	26.58
Removal of building by volume, $/cubic foot	0.30
Removal of clean building metal siding, $/square foot	1.21
Removal of contaminated building metal siding, $/square foot	4.66
Removal of standard asphalt roofing, $/square foot	2.32
Removal of transite panels, $/square foot	2.13
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	13.35
Scabbling contaminated concrete floors, $/square foot	8.23
Scabbling contaminated concrete walls, $/square foot	21.84
Scabbling contaminated ceilings, $/square foot	75.05
Scabbling structural steel, $/square foot	6.74
Removal of clean overhead crane/monorail < 10 ton capacity	629.42
Removal of contaminated overhead crane/monorail < 10 ton capacity	1,926.24
Removal of clean overhead crane/monorail >10-50 ton capacity	1,510.62
Removal of contaminated overhead crane/monorail >10-50 ton capacity	4,622.18
Removal of polar crane > 50 ton capacity	6,291.22
Removal of gantry crane > 50 ton capacity	26,968.26
Removal of structural steel, $/pound	0.20
Removal of clean steel floor grating, $/square foot	4.38
Removal of contaminated steel floor grating, $/square foot	13.62
Removal of clean free standing steel liner, $/square foot	12.22
Removal of contaminated free standing steel liner, $/square foot	37.75
Removal of clean concrete-anchored steel liner, $/square foot	6.11
Removal of contaminated concrete-anchored steel liner, $/square foot	43.98
Placement of scaffolding in clean areas, $/square foot	14.56
Placement of scaffolding in contaminated areas, $/square foot	26.23

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit
Landscaping with topsoil, $/acre	27,956.74
Cost of CPC B-88 LSA box & preparation for use	2,023.74
Cost of CPC B-25 LSA box & preparation for use	1,850.93
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,507.79
Cost of CPC B-144 LSA box & preparation for use	10,334.90
Cost of LSA drum & preparation for use	192.28
Cost of cask liner for CNSI 8 120A cask (resins)	8,191.87
Cost of cask liner for CNSI 8 120A cask (filters)	8,033.05
Decontamination of surfaces with vacuuming, $/square foot	0.79

APPENDIX C

DETAILED COST ANALYSIS

DECON

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
1a.1.2	Notification of Cessation of Operations									a											
1a.1.3	Remove fuel & source material									n/a											
1a.1.4	Notification of Permanent Defueling									a											
1a.1.5	Deactivate plant systems & process waste									a											
1a.1.6	Prepare and submit PSDAR	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	574	86	661	661	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	937	140	1,077	1,077	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	387	58	445	445	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	624	94	718	718	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	512	77	588	588	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	614	92	707	636	-	71	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	520	78	598	539	-	60	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	62	9	72	72	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	887	133	1,020	1,020	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	812	122	933	933	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	62	9	72	72	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	200	30	230	115	-	115	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	200	30	230	230	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	390	58	448	224	-	224	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	574	86	661	661	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	112	17	129	65	-	65	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	5,330	800	6,130	5,596	-	534	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	300	45	345	345	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,900	435	3,335	3,335	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	175	26	201	201	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,200	330	2,530	2,530	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	154	23	177	177	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,917	2,237	17,154	16,620	-	534	-	-	-	-	-	-	-	78,609
Period 1a Additional Costs																					
1a.2.1	ISFSI Expansion	-	-	-	-	-	-	5,200	780	5,980	-	5,980	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	5,200	780	5,980	-	5,980	-	-	-	-	-	-	-	-	-
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	12,051	1,808	13,858	-	13,858	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	12,051	1,808	13,858	-	13,858	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,178	218	2,396	2,396	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	437	-	-	-	-	-	109	547	547	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	460	-	-	-	-	-	69	529	529	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	2	-	36	-	11	61	61	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,781	417	3,198	3,198	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,151	115	1,266	1,266	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,481	248	2,729	-	2,729	-	-	-	-	-	-	-	-	-

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes: Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 1a Period-Dependent Costs (continued)																					
1a.4.9	Site O&M Costs	-	-	-	-	-	-	316	47	363	363	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	777	117	893	-	893	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	91	14	105	-	105	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	7,158	1,074	8,232	8,232	-	-	-	-	-	-	-	-	-	157,471
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	33,930	5,089	39,019	39,019	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	897	13	2	-	36	50,862	7,528	59,337	55,610	3,727	-	-	610	-	-	-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	897	13	2	-	36	83,029	12,353	96,330	72,231	23,565	534	-	610	-	-	-	12,190	20	659,480
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	591	89	680	612	-	68	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	500	75	574	574	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	169	25	194	48	-	145	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	453	68	521	521	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	150	22	172	86	-	86	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	150	22	172	172	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	125	19	144	72	-	72	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	260	39	299	299	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	341	51	392	353	-	39	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	341	51	392	353	-	39	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	4,214	632	4,846	4,396	-	450	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	596	-	-	-	-	-	-	298	895	895	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	596	-	-	-	-	-	4,214	930	5,740	5,290	-	450	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,588	1,588	12,176	12,176	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	6,608	1,982	8,591	8,591	-	-	-	-	-	-	-	-	30,500	10,852
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	17,196	3,571	20,767	20,767	-	-	-	-	-	-	-	-	30,500	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	841	-	-	-	-	-	-	126	968	968	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	45	-	19	79	-	93	-	60	295	295	-	-	-	278	-	-	-	16,657	54	-
1b.3.4	Process decommissioning chemical flush waste	2	-	49	260	-	3,123	-	825	4,259	4,259	-	-	-	-	751	-	-	80,006	141	-
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	-	-	-	-	-	-	6,025	904	6,929	-	6,929	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,388	1,102	68	338	-	3,216	7,055	2,460	16,627	9,698	6,929	-	-	278	751	-	-	96,662	195	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	26	-	-	-	-	-	-	6	32	32	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	812	81	893	893	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	6,097	610	6,707	6,707	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	246	-	-	-	-	-	62	308	308	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	231	-	-	-	-	-	35	265	265	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	1	-	21	-	6	36	36	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,788	418	3,206	3,206	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	335	34	369	369	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	954	95	1,049	-	1,049	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Costs	-	-	-	-	-	-	158	24	182	182	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	389	58	448	-	448	-	-	-	-	-	-	-	-	-

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 1b Period-Dependent Costs (continued)																					
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	46	7	53	-	53	-	-	-	-	-	-	-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	3,589	538	4,127	4,127	-	-	-	-	-	-	-	-	-	78,951
1b.4.14	DOC Staff Cost	-	-	-	-	-	-	5,679	852	6,531	6,531	-	-	-	-	-	-	-	-	-	63,789
1b.4.15	Utility Staff Cost	-	-	-	-	-	-	17,086	2,563	19,649	19,649	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	26	477	7	1	-	21	37,934	5,389	43,855	42,305	1,549	-	-	358	-	-	-	7,159	12	356,066
1b.0	TOTAL PERIOD 1b COST	3,010	1,579	76	340	-	3,237	66,399	12,349	86,989	78,061	8,479	450	-	636	751	-	-	103,822	31,773	400,659
PERIOD 1 TOTALS		3,010	2,476	88	342	-	3,272	149,428	24,702	183,319	150,291	32,044	984	-	1,245	751	-	-	116,012	31,793	1,060,139
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	57	54	11	15	-	79	-	65	282	282	-	-	-	561	-	-	-	64,094	1,943	-
2a.1.1.2	Recirculation Pumps & Motors	57	49	14	40	14	281	-	120	576	576	-	-	250	2,473	-	-	-	251,240	1,998	-
2a.1.1.3	CRDMs & NIs Removal	231	191	535	141	-	161	-	278	1,538	1,538	-	-	-	6,985	-	-	-	131,119	8,471	-
2a.1.1.4	Reactor Vessel Internals	148	4,100	10,880	2,503	-	25,186	363	19,142	62,323	62,323	-	-	-	762	1,430	1,320	-	355,125	40,700	1,760
2a.1.1.5	Reactor Vessel	94	7,879	3,222	1,222	-	3,827	363	9,036	25,644	25,644	-	-	-	14,388	-	-	-	1,526,050	40,700	1,760
2a.1.1	Totals	587	12,274	14,663	3,922	14	29,534	727	28,642	90,363	90,363	-	-	250	25,169	1,430	1,320	-	2,327,628	93,813	3,520
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	431	324	70	417	52	-	226	1,521	1,521	-	-	14,933	748	-	-	-	714,386	7,862	-
2a.1.3	Main Condensers	-	1,338	1,118	242	1,437	180	-	743	5,058	5,058	-	-	51,490	2,581	-	-	-	2,463,233	24,681	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor Building	-	1,021	-	-	-	-	-	153	1,174	1,174	-	-	-	-	-	-	-	-	11,450	-
2a.1.4.2	Auxiliary Building	-	245	-	-	-	-	-	37	281	281	-	-	-	-	-	-	-	-	2,582	-
2a.1.4.3	Radwaste Building	-	579	-	-	-	-	-	87	666	666	-	-	-	-	-	-	-	-	6,493	-
2a.1.4.4	Turbine Building	-	577	-	-	-	-	-	87	664	664	-	-	-	-	-	-	-	-	6,771	-
2a.1.4.5	Fuel Building	-	268	-	-	-	-	-	40	309	309	-	-	-	-	-	-	-	-	2,912	-
2a.1.4	Totals	-	2,690	-	-	-	-	-	404	3,094	3,094	-	-	-	-	-	-	-	-	30,209	-
Disposal of Plant Systems																					
2a.1.5.1	Acid Feed & Handling	-	35	1	2	12	-	-	11	60	60	-	-	493	-	-	-	-	20,012	573	-
2a.1.5.2	Auxiliary Steam	-	652	12	27	192	-	-	197	1,080	1,080	-	-	7,613	-	-	-	-	309,178	10,682	-
2a.1.5.3	Breathing Air	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	877	-
2a.1.5.4	CO2 & Generator Purge	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	373	-
2a.1.5.5	Caustic Handling	-	18	0	1	5	-	-	5	29	29	-	-	186	-	-	-	-	7,571	285	-
2a.1.5.6	Chem Radwaste Reprocessing & Disposal	479	508	68	50	57	207	-	441	1,811	1,811	-	-	2,244	3,043	-	-	-	259,752	15,564	-
2a.1.5.7	Chilled Water - RCA	-	1,395	24	58	407	-	-	421	2,305	2,305	-	-	16,163	-	-	-	-	656,386	22,847	-
2a.1.5.8	Chilled Water Non-RCA	-	202	-	-	-	-	-	30	232	-	-	232	-	-	-	-	-	-	3,958	-
2a.1.5.9	Chlorination	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	988	-
2a.1.5.10	Circulating Water - RCA	-	207	14	34	237	-	-	94	585	585	-	-	9,402	-	-	-	-	381,817	3,590	-
2a.1.5.11	Circulating Water Non-RCA	-	57	-	-	-	-	-	8	65	-	-	65	-	-	-	-	-	-	1,093	-
2a.1.5.12	Cntnmnt Aux & Fuel Bldg Equip Drains	-	126	10	7	5	30	-	42	220	220	-	-	204	427	-	-	-	32,517	2,127	-
2a.1.5.13	Cntnmnt Aux & Fuel Bldg Floor Drains	-	199	16	11	20	41	-	66	353	353	-	-	803	584	-	-	-	65,560	3,408	-
2a.1.5.14	Component Cooling Water Non-RCA	-	137	-	-	-	-	-	21	158	-	-	158	-	-	-	-	-	-	2,681	-
2a.1.5.15	Condensate	-	1,182	320	245	347	973	-	659	3,726	3,726	-	-	13,775	13,946	-	-	-	1,350,699	21,288	-
2a.1.5.16	Condensate Booster	-	1,071	531	412	479	1,712	-	882	5,086	5,086	-	-	19,037	24,551	-	-	-	2,164,864	19,922	-
2a.1.5.17	Condensate Polishing	-	928	88	63	113	236	-	326	1,755	1,755	-	-	4,485	3,400	-	-	-	374,117	16,030	-
2a.1.5.18	Condenser Vacuum	-	227	15	36	255	-	-	102	636	636	-	-	10,118	-	-	-	-	410,897	3,912	-
2a.1.5.19	Containment Combustible Gas	-	100	7	6	20	17	-	34	184	184	-	-	791	249	-	-	-	46,272	1,727	-
2a.1.5.20	Cycled Condensate	-	835	74	56	109	204	-	292	1,570	1,570	-	-	4,325	2,961	-	-	-	341,535	14,418	-
2a.1.5.21	Drywell Cooling	-	634	32	36	144	78	-	208	1,132	1,132	-	-	5,706	1,113	-	-	-	294,892	10,426	-
2a.1.5.22	Drywell Purge	-	181	19	21	70	53	-	74	418	418	-	-	2,779	766	-	-	-	156,269	3,193	-
2a.1.5.23	ECCS Equipment Cooling	-	87	3	5	30	4	-	28	157	157	-	-	1,190	54	-	-	-	51,362	1,485	-
2a.1.5.24	Extraction Steam	-	626	108	88	141	341	-	287	1,591	1,591	-	-	5,581	4,893	-	-	-	504,016	11,115	-
2a.1.5.25	Feedwater	-	666	219	173	228	700	-	423	2,409	2,409	-	-	9,065	10,033	-	-	-	936,989	12,138	-
2a.1.5.26	Feedwater Heater Drains Turbine Cycle	-	1,636	218	176	303	664	-	669	3,666	3,666	-	-	12,028	9,536	-	-	-	1,028,074	28,824	-
2a.1.5.27	Feedwater Heater Misc.	-	272	28	18	18	79	-	96	512	512	-	-	720	1,133	-	-	-	93,621	4,674	-
2a.1.5.28	Filtered Water	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	90	-

Table C
Clinton Power Station
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2a.1.5.29	Generator Hydrogen Seal Oil	-	35	0	1	6	-	-	10	53	53	-	-	253	-	-	-	-	10,263	550	-
2a.1.5.30	Generator Stator Cooling	-	20	0	1	5	-	-	6	32	32	-	-	208	-	-	-	-	8,443	343	-
2a.1.5.31	High Pressure Core Spray	-	327	72	54	78	215	-	163	908	908	-	-	3,100	3,075	-	-	-	300,388	5,857	-
2a.1.5.32	Hydrogen	-	32	0	1	4	-	-	9	47	47	-	-	178	-	-	-	-	7,225	490	-
2a.1.5.33	Laundry Equip & Flr Drains RW Reprocess	-	268	22	20	54	60	-	95	519	519	-	-	2,132	890	-	-	-	135,602	4,682	-
2a.1.5.34	Leak Detection	-	52	2	1	1	3	-	14	72	72	-	-	30	49	-	-	-	4,050	933	-
2a.1.5.35	Local Instrument Panels	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	119	-
2a.1.5.36	Low Pressure Core Spray	-	125	43	30	39	122	-	77	437	437	-	-	1,544	1,749	-	-	-	162,078	2,270	-
2a.1.5.37	Machine Shop Equipment	-	13	0	1	6	-	-	4	23	23	-	-	225	-	-	-	-	9,119	216	-
2a.1.5.38	Machine Shop Ventilation	-	277	6	11	67	8	-	84	453	453	-	-	2,665	121	-	-	-	115,071	4,251	-
2a.1.5.39	Main Steam	-	1,116	147	113	178	438	-	447	2,441	2,441	-	-	7,087	6,277	-	-	-	644,023	19,541	-
2a.1.5.40	Main Steam Isolation Valve	-	31	2	1	1	6	-	10	50	50	-	-	28	81	-	-	-	5,723	515	-
2a.1.5.41	Make-up Demineralizer - RCA	-	255	4	9	62	-	-	75	405	405	-	-	2,474	-	-	-	-	100,485	4,066	-
2a.1.5.42	Make-up Demineralizer Non-RCA	-	234	-	-	-	-	-	35	269	-	-	269	-	-	-	-	-	-	4,440	-
2a.1.5.43	Makeup Condensate Storage	-	355	32	19	14	86	-	118	625	625	-	-	576	1,223	-	-	-	92,952	5,964	-
2a.1.5.44	Misc. Building Drains	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	372	-
2a.1.5.45	Miscellaneous Ventilation	-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	688	-
2a.1.5.46	Nuclear Boiler	0	21	1	1	0	4	-	7	34	34	-	-	18	51	-	-	-	3,604	378	-
2a.1.5.47	Oil Transfer	-	115	4	9	61	-	-	40	229	229	-	-	2,442	-	-	-	-	99,182	1,945	-
2a.1.5.48	Reactor Core Isolation Cooling	-	279	26	21	46	71	-	100	543	543	-	-	1,815	1,039	-	-	-	131,581	4,901	-
2a.1.5.49	Refrigeration Piping	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	435	-
2a.1.5.50	Sanitary	-	169	-	-	-	-	-	25	195	-	-	195	-	-	-	-	-	-	3,202	-
2a.1.5.51	Screen House & MU Pump House Ventilation	-	36	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	751	-
2a.1.5.52	Standby Liquid Control	-	35	1	2	11	-	-	11	58	58	-	-	417	-	-	-	-	16,953	569	-
2a.1.5.53	Switchgear Heat Removal	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	426	-
2a.1.5.54	Turbine Building Closed Cooling Water	-	204	3	8	54	-	-	60	329	329	-	-	2,149	-	-	-	-	87,291	3,298	-
2a.1.5.55	Turbine Electrohydraulic Control	-	11	0	0	2	-	-	3	17	17	-	-	84	-	-	-	-	3,425	189	-
2a.1.5.56	Turbine Gen Misc Drains & Vents	-	76	5	3	4	11	-	23	123	123	-	-	152	163	-	-	-	15,482	1,260	-
2a.1.5.57	Turbine Gland Seal Steam	-	441	65	71	269	164	-	209	1,219	1,219	-	-	10,670	2,353	-	-	-	566,794	7,790	-
2a.1.5.58	Turbine Oil	-	64	8	8	22	23	-	27	152	152	-	-	866	330	-	-	-	53,846	1,157	-
2a.1.5.59	Turbine Gen Aux & Misc Devices	-	290	182	160	287	591	-	306	1,816	1,816	-	-	11,408	8,487	-	-	-	944,075	5,569	-
2a.1.5	Totals	479	17,086	2,435	2,070	4,462	7,142	-	7,414	41,088	39,869	-	1,218	177,229	102,579	-	-	-	13,004,050	305,455	-
2a.1.6	Scaffolding in support of decommissioning	-	3,749	68	16	83	22	-	964	4,902	4,902	-	-	2,969	314	-	-	-	151,389	71,290	-
2a.1	Subtotal Period 2a Activity Costs	1,066	37,568	18,608	6,320	6,413	36,930	727	38,393	146,025	144,807	-	1,218	246,871	131,391	1,430	1,320	-	18,660,690	533,310	3,520
Period 2a Additional Costs																					
2a.2.1	Disposal of Stored Turbine Rotors	-	27	246	103	822	-	-	170	1,368	1,368	-	-	29,464	-	-	-	-	1,325,880	469	-
2a.2	Subtotal Period 2a Additional Costs	-	27	246	103	822	-	-	170	1,368	1,368	-	-	29,464	-	-	-	-	1,325,880	469	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	144	-	62	256	-	303	-	192	957	957	-	-	-	903	-	-	-	54,209	176	-
2a.3.2	Process decommissioning chemical flush waste	1	-	20	108	-	182	-	64	373	373	-	-	-	306	-	-	-	32,629	57	-
2a.3.3	Small tool allowance	-	514	-	-	-	-	-	77	591	532	-	59	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	22,595	3,389	25,984	-	25,984	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	145	514	82	362	-	485	22,595	3,723	27,906	1,862	25,984	59	-	1,210	-	-	-	86,838	233	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	95	-	-	-	-	-	-	24	118	118	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	2,053	205	2,258	2,258	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	16,141	1,614	17,755	15,980	-	1,776	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	2,989	-	-	-	-	-	747	3,737	3,737	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,428	-	-	-	-	-	514	3,943	3,943	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	194	37	-	552	-	163	947	947	-	-	-	9,452	-	-	-	189,048	308	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	4,871	731	5,601	5,601	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	1,117	112	1,229	1,229	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,507	351	3,857	-	3,857	-	-	-	-	-	-	-	-	-
2a.4.10	Site O&M Costs	-	-	-	-	-	-	582	87	669	669	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,432	215	1,647	-	1,647	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	168	25	194	-	194	-	-	-	-	-	-	-	-	-
2a.4.13	Security Staff Cost	-	-	-	-	-	-	11,158	1,674	12,832	12,832	-	-	-	-	-	-	-	-	-	243,241
2a.4.14	DOC Staff Cost	-	-	-	-	-	-	25,711	3,857	29,568	29,568	-	-	-	-	-	-	-	-	-	292,274

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2a Period-Dependent Costs (continued)																					
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	43,934	6,590	50,524	50,524	-	-	-	-	-	-	-	-	-	544,169
2a.4	Subtotal Period 2a Period-Dependent Costs	95	6,418	194	37	-	552	110,675	16,909	134,879	127,406	5,698	1,776	-	9,452	-	-	-	189,048	308	1,079,684
2a.0	TOTAL PERIOD 2a COST	1,305	44,527	19,130	6,822	7,235	37,968	133,997	59,194	310,178	275,443	31,682	3,053	276,335	142,053	1,430	1,320	-	20,262,450	534,320	1,083,204
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	Component Cooling Water - RCA	-	244	4	9	61	-	-	72	389	389	-	-	2,412	-	-	-	-	97,965	3,955	-
2b.1.1.2	Containment Monitoring	-	72	2	1	3	5	-	20	103	103	-	-	101	75	-	-	-	8,389	1,281	-
2b.1.1.3	Control Rod Drive	-	526	39	27	35	111	-	172	909	909	-	-	1,377	1,585	-	-	-	145,976	9,093	-
2b.1.1.4	Diesel Fuel Oil	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	1,276	-
2b.1.1.5	Diesel General	-	59	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	1,150	-
2b.1.1.6	Diesel-Generator Room Ventilation	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,848	-
2b.1.1.7	Drains-Laundry to Radwaste	-	22	2	1	1	5	-	7	38	38	-	-	36	66	-	-	-	5,199	376	-
2b.1.1.8	Electrical - Clean Non-RCA	-	1,735	-	-	-	-	-	260	1,995	-	-	1,995	-	-	-	-	-	-	33,545	-
2b.1.1.9	Electrical - Clean RCA	-	7,621	113	270	1,884	-	-	2,240	12,127	12,127	-	-	74,814	-	-	-	-	3,038,244	126,569	-
2b.1.1.10	Equip Drain Radwaste Reprocessing	-	1,517	122	94	185	338	-	518	2,774	2,774	-	-	7,348	4,917	-	-	-	573,204	26,185	-
2b.1.1.11	Fire Protection Non-RCA	-	182	-	-	-	-	-	27	210	-	-	210	-	-	-	-	-	-	3,585	-
2b.1.1.12	Floor Drain Radwaste Reprocessing	-	933	98	77	141	283	-	346	1,878	1,878	-	-	5,587	4,102	-	-	-	456,741	16,177	-
2b.1.1.13	HVAC - Auxiliary Building	-	37	2	3	14	4	-	13	73	73	-	-	540	62	-	-	-	25,439	664	-
2b.1.1.14	HVAC - Control Room	-	282	-	-	-	-	-	42	324	-	-	324	-	-	-	-	-	-	5,842	-
2b.1.1.15	HVAC - Fuel Building	-	393	9	16	95	13	-	119	645	645	-	-	3,783	182	-	-	-	163,916	5,998	-
2b.1.1.16	HVAC - Laboratory	-	631	15	26	152	21	-	191	1,036	1,036	-	-	6,038	307	-	-	-	262,576	9,743	-
2b.1.1.17	HVAC - Off Gas Building	-	167	10	10	38	23	-	56	304	304	-	-	1,510	326	-	-	-	79,883	2,791	-
2b.1.1.18	HVAC - Radwaste Building	-	896	27	43	234	46	-	280	1,524	1,524	-	-	9,277	661	-	-	-	414,217	13,900	-
2b.1.1.19	HVAC - Service Building	-	65	-	-	-	-	-	10	74	-	-	74	-	-	-	-	-	-	1,265	-
2b.1.1.20	HVAC - Turbine Building	-	736	18	32	187	25	-	225	1,223	1,223	-	-	7,422	359	-	-	-	321,762	11,269	-
2b.1.1.21	Hoists Cranes & Elevators	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	123	-
2b.1.1.22	Instrument Air - RCA	-	556	4	10	72	-	-	152	795	795	-	-	2,875	-	-	-	-	116,761	8,528	-
2b.1.1.23	Instrument Air Non-RCA	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	429	-
2b.1.1.24	Off Gas	-	237	17	14	38	41	-	79	426	426	-	-	1,521	591	-	-	-	95,329	4,032	-
2b.1.1.25	Plant Service Water - RCA	-	238	5	11	78	-	-	73	405	405	-	-	3,090	-	-	-	-	125,493	3,884	-
2b.1.1.26	Plant Service Water Non-RCA	-	184	-	-	-	-	-	28	212	-	-	212	-	-	-	-	-	-	3,643	-
2b.1.1.27	Process Radiation Monitoring	-	138	8	4	7	17	-	41	215	215	-	-	278	242	-	-	-	25,093	2,295	-
2b.1.1.28	Reactor Recirculation	24	67	8	6	4	27	-	38	174	174	-	-	149	381	-	-	-	27,659	1,576	-
2b.1.1.29	Reactor Water Clean-up	295	390	41	30	30	127	-	290	1,202	1,202	-	-	1,174	1,824	-	-	-	150,960	9,432	-
2b.1.1.30	Residual Heat Removal	618	706	176	125	166	508	-	674	2,974	2,974	-	-	6,580	7,268	-	-	-	680,043	15,173	-
2b.1.1.31	Screen Wash	-	7	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	146	-
2b.1.1.32	Service Air - RCA	-	325	4	9	64	-	-	93	496	496	-	-	2,553	-	-	-	-	103,666	5,156	-
2b.1.1.33	Service Air Non-RCA	-	17	-	-	-	-	-	3	19	-	-	19	-	-	-	-	-	-	329	-
2b.1.1.34	Shutdown Service Water - RCA	-	125	2	5	38	-	-	38	209	209	-	-	1,505	-	-	-	-	61,135	2,025	-
2b.1.1.35	Shutdown Service Water Non-RCA	-	119	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	2,328	-
2b.1.1.36	Solid Radwaste Reprocessing & Disposal	523	751	60	47	94	165	-	517	2,156	2,156	-	-	3,748	2,393	-	-	-	286,150	21,027	-
2b.1.1.37	Standby Gas Treatment	-	86	2	3	13	5	-	25	134	134	-	-	517	66	-	-	-	24,740	1,453	-
2b.1.1.38	Suppression Pool Cleanup & Transfer	-	146	19	13	16	54	-	56	304	304	-	-	630	771	-	-	-	69,389	2,544	-
2b.1.1.39	Suppression Pool Make-up	-	64	14	12	19	45	-	33	188	188	-	-	747	652	-	-	-	67,245	1,156	-
2b.1.1.40	Turb OG RW Cntrl & DG Bldg Equip Drains	-	286	23	14	12	60	-	93	487	487	-	-	464	864	-	-	-	67,963	4,790	-
2b.1.1.41	Turb OG RW Cntrl & DG Bldg Floor Drains	-	421	36	26	54	93	-	144	775	775	-	-	2,153	1,349	-	-	-	162,948	7,273	-
2b.1.1	Totals	1,460	21,166	879	938	3,732	2,015	-	7,030	37,221	33,962	-	3,259	148,229	29,044	-	-	-	7,658,084	373,854	-
2b.1.2	Scaffolding in support of decommissioning	-	4,686	85	20	104	27	-	1,205	6,128	6,128	-	-	3,711	393	-	-	-	189,236	89,113	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	3,280	4,147	766	629	195	2,304	-	3,453	14,774	14,774	-	-	7,734	35,553	-	-	-	2,661,920	127,854	-
2b.1.3.2	Auxiliary Building	397	220	42	50	29	107	-	297	1,143	1,143	-	-	1,171	1,968	-	-	-	217,924	10,195	-
2b.1.3.3	Control Building	458	164	43	50	1	113	-	310	1,140	1,140	-	-	56	2,074	-	-	-	184,549	10,270	-
2b.1.3.4	Diesel Generator Building	133	43	12	14	-	31	-	88	321	321	-	-	-	568	-	-	-	49,962	2,913	-
2b.1.3.5	Radwaste Building	1,555	653	156	184	27	409	-	1,090	4,074	4,074	-	-	1,067	7,510	-	-	-	701,180	36,393	-
2b.1.3.6	Turbine Building	1,390	692	143	170	69	369	-	1,010	3,842	3,842	-	-	2,735	6,755	-	-	-	699,593	34,351	-
2b.1.3	Totals	7,213	5,919	1,161	1,097	321	3,334	-	6,249	25,294	25,294	-	-	12,763	54,427	-	-	-	4,515,127	221,976	-

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
2b.1	Subtotal Period 2b Activity Costs	8,673	31,771	2,125	2,055	4,157	5,377	-	14,485	68,643	65,384	-	3,259	164,703	83,863	-	-	-	12,362,450	684,943	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	179	-	79	325	-	386	-	243	1,211	1,211	-	-	-	1,150	-	-	-	68,996	224	-
2b.3.2	Process decommissioning chemical flush waste	5	-	142	747	-	1,286	-	450	2,630	2,630	-	-	-	2,159	-	-	-	230,113	404	-
2b.3.3	Small tool allowance	-	627	-	-	-	-	-	94	721	721	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	27,114	4,067	31,181	-	31,181	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	184	627	220	1,073	-	1,672	27,114	4,854	35,744	4,563	31,181	-	-	3,309	-	-	-	299,110	628	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	2,330	-	-	-	-	-	-	583	2,913	2,913	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,117	112	1,228	1,228	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	5,101	510	5,611	5,611	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	3,731	-	-	-	-	-	933	4,664	4,664	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	3,972	-	-	-	-	-	596	4,567	4,567	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	226	43	-	642	-	190	1,101	1,101	-	-	-	10,996	-	-	-	219,910	359	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	4,502	675	5,178	5,178	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,308	131	1,439	1,439	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	4,106	411	4,517	-	4,517	-	-	-	-	-	-	-	-	-
2b.4.10	Site O&M Costs	-	-	-	-	-	-	681	102	783	783	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,677	252	1,928	-	1,928	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	197	30	227	-	227	-	-	-	-	-	-	-	-	-
2b.4.14	Security Staff Cost	-	-	-	-	-	-	13,065	1,960	15,024	15,024	-	-	-	-	-	-	-	-	-	284,806
2b.4.15	DOC Staff Cost	-	-	-	-	-	-	28,955	4,343	33,298	33,298	-	-	-	-	-	-	-	-	-	328,709
2b.4.16	Utility Staff Cost	-	-	-	-	-	-	49,282	7,392	56,674	56,674	-	-	-	-	-	-	-	-	-	610,137
2b.4	Subtotal Period 2b Period-Dependent Costs	2,330	7,702	226	43	-	642	110,416	18,281	139,641	132,970	6,672	-	-	10,996	-	-	-	219,910	359	1,223,651
2b.0	TOTAL PERIOD 2b COST	11,187	40,101	2,571	3,171	4,157	7,691	137,530	37,620	244,028	202,917	37,853	3,259	164,703	98,168	-	-	-	12,881,470	685,930	1,223,651
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	926	78	181	218	-	1,086	-	805	3,293	3,293	-	-	-	15,584	-	-	-	882,760	1,537	-
Disposal of Plant Systems																					
2d.1.2.1	Electrical - Contaminated	-	1,247	18	33	198	25	-	354	1,876	1,876	-	-	7,867	356	-	-	-	339,642	21,342	-
2d.1.2.2	Fire Protection - RCA	-	831	14	33	231	-	-	249	1,358	1,358	-	-	9,172	-	-	-	-	372,484	13,597	-
2d.1.2.3	Fuel Handling & Transfer	-	30	4	3	4	12	-	12	65	65	-	-	174	169	-	-	-	16,628	543	-
2d.1.2.4	Fuel Pool Cooling & Cleanup	-	1,194	186	129	167	526	-	493	2,695	2,695	-	-	6,629	7,541	-	-	-	696,897	20,779	-
2d.1.2.5	Fuel Support	-	119	20	17	28	66	-	55	304	304	-	-	1,100	945	-	-	-	98,187	2,153	-
2d.1.2.6	HVAC - Containment Building	-	926	49	64	282	117	-	317	1,755	1,755	-	-	11,204	1,674	-	-	-	549,850	14,882	-
2d.1.2.7	Potable Water	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	238	-
2d.1.2.8	Process Sampling	-	692	40	21	22	86	-	205	1,066	1,066	-	-	891	1,228	-	-	-	106,361	11,482	-
2d.1.2	Totals	-	5,051	330	300	933	831	-	1,687	9,132	9,118	-	14	37,037	11,912	-	-	-	2,180,049	85,015	-
Decontamination of Site Buildings																					
2d.1.3.1	Fuel Building	972	924	48	57	65	116	-	769	2,951	2,951	-	-	2,574	2,105	-	-	-	285,159	32,714	-
2d.1.3	Totals	972	924	48	57	65	116	-	769	2,951	2,951	-	-	2,574	2,105	-	-	-	285,159	32,714	-
2d.1.4	Scaffolding in support of decommissioning	-	937	17	4	21	5	-	241	1,226	1,226	-	-	742	79	-	-	-	37,847	17,823	-
2d.1	Subtotal Period 2d Activity Costs	1,898	6,991	576	579	1,018	2,039	-	3,502	16,603	16,588	-	14	40,354	29,679	-	-	-	3,385,815	137,089	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	954	286	1,240	1,240	-	-	-	-	-	-	-	-	-	6,240
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	954	286	1,240	1,240	-	-	-	-	-	-	-	-	-	6,240
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	90	-	40	165	-	195	-	122	611	611	-	-	-	582	-	-	-	34,913	113	-
2d.3.3	Small tool allowance	-	140	-	-	-	-	-	21	161	161	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	138	38	167	44	-	56	444	444	-	-	6,000	635	-	-	-	305,961	88	-
2d.3	Subtotal Period 2d Collateral Costs	90	140	178	203	167	239	-	199	1,216	1,216	-	-	6,000	1,217	-	-	-	340,875	202	-

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	258	-	-	-	-	-	-	65	323	323	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	438	44	481	481	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	846	85	931	931	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	893	-	-	-	-	-	223	1,116	1,116	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,557	-	-	-	-	-	234	1,791	1,791	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	90	17	-	256	-	76	440	440	-	-	-	4,391	-	-	-	87,820	143	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	942	141	1,083	1,083	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	435	44	479	479	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,610	161	1,771	-	1,771	-	-	-	-	-	-	-	-	-
2d.4.10	Site O&M Costs	-	-	-	-	-	-	267	40	307	307	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	334	50	384	384	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	77	12	89	-	89	-	-	-	-	-	-	-	-	-
2d.4.13	Security Staff Cost	-	-	-	-	-	-	2,829	424	3,253	3,253	-	-	-	-	-	-	-	-	-	58,710
2d.4.14	DOC Staff Cost	-	-	-	-	-	-	7,814	1,172	8,986	8,986	-	-	-	-	-	-	-	-	-	88,286
2d.4.15	Utility Staff Cost	-	-	-	-	-	-	14,155	2,123	16,278	16,278	-	-	-	-	-	-	-	-	-	168,626
2d.4	Subtotal Period 2d Period-Dependent Costs	258	2,450	90	17	-	256	29,746	4,893	37,711	35,851	1,860	-	-	4,391	-	-	-	87,820	143	315,621
2d.0	TOTAL PERIOD 2d COST	2,246	9,581	844	799	1,185	2,535	30,700	8,880	56,770	54,896	1,860	14	46,354	35,287	-	-	-	3,814,510	137,434	321,861
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	175	52	227	227	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license									a											
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	175	52	227	227	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	13,733	4,120	17,852	17,852	-	-	-	-	-	-	-	-	223,573	3,120
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	13,733	4,120	17,852	17,852	-	-	-	-	-	-	-	-	223,573	3,120
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	385	39	424	424	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	745	74	819	819	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	819	-	-	-	-	-	205	1,024	1,024	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	7	1	-	20	-	6	35	35	-	-	-	351	-	-	-	7,020	11	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	414	62	477	477	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	436	44	479	479	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	1,417	142	1,559	-	1,559	-	-	-	-	-	-	-	-	-
2f.4.8	Site O&M Costs	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	68	10	78	-	78	-	-	-	-	-	-	-	-	-
2f.4.10	Security Staff Cost	-	-	-	-	-	-	2,440	366	2,805	2,805	-	-	-	-	-	-	-	-	-	50,514
2f.4.11	DOC Staff Cost	-	-	-	-	-	-	5,194	779	5,974	5,974	-	-	-	-	-	-	-	-	-	56,731
2f.4.12	Utility Staff Cost	-	-	-	-	-	-	7,251	1,088	8,339	8,339	-	-	-	-	-	-	-	-	-	80,046
2f.4	Subtotal Period 2f Period-Dependent Costs	-	819	7	1	-	20	18,585	2,849	22,283	20,646	1,637	-	-	351	-	-	-	7,020	11	187,291
2f.0	TOTAL PERIOD 2f COST	-	819	7	1	-	20	33,522	7,176	41,546	39,909	1,637	-	-	351	-	-	-	7,020	223,585	190,411
PERIOD 2 TOTALS		14,738	95,028	22,552	10,793	12,577	48,214	335,750	112,871	652,523	573,165	73,032	6,326	487,391	275,859	1,430	1,320	-	36,965,450	1,581,269	2,819,129
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	5,791	-	-	-	-	-	869	6,659	-	-	6,659	-	-	-	-	-	-	65,001	-
3b.1.1.2	Auxiliary Building	-	2,202	-	-	-	-	-	330	2,533	-	-	2,533	-	-	-	-	-	-	23,242	-
3b.1.1.3	Circulating Water Screenhouse	-	3,609	-	-	-	-	-	541	4,150	-	-	4,150	-	-	-	-	-	-	38,418	-
3b.1.1.4	Control Building	-	5,265	-	-	-	-	-	790	6,054	-	-	6,054	-	-	-	-	-	-	56,578	-
3b.1.1.5	Diesel Generator Building	-	1,858	-	-	-	-	-	279	2,136	-	-	2,136	-	-	-	-	-	-	20,234	-

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes: Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Demolition of Remaining Site Buildings (continued)																					
3b.1.1.6	Make-Up Water Pump House	-	380	-	-	-	-	-	57	437	-	-	437	-	-	-	-	-	-	5,100	-
3b.1.1.7	Miscellaneous Site Work	-	1,785	-	-	-	-	-	268	2,053	-	-	2,053	-	-	-	-	-	-	21,227	-
3b.1.1.8	Miscellaneous Structures	-	2,782	-	-	-	-	-	417	3,199	-	-	3,199	-	-	-	-	-	-	44,561	-
3b.1.1.9	Radwaste Building	-	5,212	-	-	-	-	-	782	5,994	-	-	5,994	-	-	-	-	-	-	58,440	-
3b.1.1.10	Service Building	-	402	-	-	-	-	-	60	462	-	-	462	-	-	-	-	-	-	5,585	-
3b.1.1.11	Transformer and Tank Pads	-	173	-	-	-	-	-	26	199	-	-	199	-	-	-	-	-	-	2,463	-
3b.1.1.12	Turbine Building	-	5,324	-	-	-	-	-	799	6,123	-	-	6,123	-	-	-	-	-	-	63,415	-
3b.1.1.13	Turbine Pedestal	-	1,223	-	-	-	-	-	184	1,407	-	-	1,407	-	-	-	-	-	-	12,474	-
3b.1.1.14	Fuel Building	-	2,442	-	-	-	-	-	366	2,808	-	-	2,808	-	-	-	-	-	-	26,720	-
3b.1.1	Totals	-	38,447	-	-	-	-	-	5,767	44,215	-	-	44,215	-	-	-	-	-	-	443,457	-
Site Closeout Activities																					
3b.1.2	BackFill Site	-	109	-	-	-	-	-	16	125	-	-	125	-	-	-	-	-	-	201	-
3b.1.3	Grade & landscape site	-	2,154	-	-	-	-	-	323	2,477	-	-	2,477	-	-	-	-	-	-	4,449	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	195	29	224	224	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	40,710	-	-	-	-	195	6,136	47,041	224	-	46,817	-	-	-	-	-	-	448,106	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	1,515	-	-	-	-	9	229	1,753	-	-	1,753	-	-	-	-	-	-	7,355	-
3b.2.2	Screenhouse Cofferdam	-	1,096	-	-	-	-	-	164	1,260	-	-	1,260	-	-	-	-	-	-	10,159	-
3b.2.3	Discharge Flume Backfill	-	4,096	-	-	-	-	-	614	4,710	-	-	4,710	-	-	-	-	-	-	23,931	-
3b.2.4	Unit 2 Excavation Backfill	-	1,344	-	-	-	-	-	202	1,546	-	-	1,546	-	-	-	-	-	-	13,128	-
3b.2	Subtotal Period 3b Additional Costs	-	8,051	-	-	-	-	9	1,209	9,269	-	-	9,269	-	-	-	-	-	-	54,573	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	448	-	-	-	-	-	67	515	-	-	515	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	448	-	-	-	-	-	67	515	-	-	515	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	1,171	117	1,288	-	1,288	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	2,264	226	2,491	-	2,491	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,959	-	-	-	-	-	894	6,853	-	-	6,853	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	630	95	725	-	-	725	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	544	54	599	-	599	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	4,309	431	4,740	-	4,740	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	207	31	238	-	238	-	-	-	-	-	-	-	-	-
3b.4.8	Site O&M Costs	-	-	-	-	-	-	715	107	822	-	-	822	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	7,417	1,113	8,530	(0)	7,250	1,279	-	-	-	-	-	-	-	153,586
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	15,261	2,289	17,551	-	-	17,551	-	-	-	-	-	-	-	160,674
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	11,470	1,721	13,191	0	3,034	10,157	-	-	-	-	-	-	-	128,776
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,959	-	-	-	-	43,990	7,078	57,027	0	19,640	37,387	-	-	-	-	-	-	-	443,036
3b.0	TOTAL PERIOD 3b COST	-	55,169	-	-	-	-	44,194	14,490	113,852	224	19,640	93,988	-	-	-	-	-	-	502,679	444,596
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	8,250	1,238	9,488	-	9,488	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	8,250	1,238	9,488	-	9,488	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	4,582	458	5,040	-	5,040	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	8,857	886	9,743	-	9,743	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	2,670	267	2,937	-	2,937	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	16,856	1,686	18,542	-	18,542	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Operating Costs	-	-	-	-	-	-	809	121	931	-	931	-	-	-	-	-	-	-	-	-
3c.4.7	Security Staff Cost	-	-	-	-	-	-	24,610	3,692	28,302	-	28,302	-	-	-	-	-	-	-	-	499,114
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	10,478	1,572	12,050	-	12,050	-	-	-	-	-	-	-	-	124,779
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	68,863	8,681	77,544	-	77,544	-	-	-	-	-	-	-	-	623,893
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	77,113	9,919	87,032	-	87,032	-	-	-	-	-	-	-	-	623,893

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	625	-	-	7,415	-	1,175	9,214	9,214	-	-	-	-	-	-	1,785	351,100	-	-
3d.1.1	Totals	-	-	625	-	-	7,415	-	1,175	9,214	9,214	-	-	-	-	-	-	1,785	351,100	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	625	-	-	7,415	-	1,175	9,214	9,214	-	-	-	-	-	-	1,785	351,100	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	23	2	25	-	25	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	44	4	48	-	48	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	11	1	12	-	12	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	83	8	92	-	92	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	4	1	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	122	18	140	-	140	-	-	-	-	-	-	-	-	2,469
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	52	8	60	-	60	-	-	-	-	-	-	-	-	617
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	338	43	381	-	381	-	-	-	-	-	-	-	-	3,086
3d.0	TOTAL PERIOD 3d COST	-	-	625	-	-	7,415	338	1,217	9,595	9,214	381	-	-	-	-	-	1,785	351,100	-	3,086
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	ISFSI License Termination	-	42	8	35	-	202	1,431	282	2,000	-	2,000	-	-	1,953	-	-	-	163,052	3,623	2,560
3e.2	Subtotal Period 3e Additional Costs	-	42	8	35	-	202	1,431	282	2,000	-	2,000	-	-	1,953	-	-	-	163,052	3,623	2,560
Period 3e Collateral Costs																					
3e.3.1	Small tool allowance	-	0	-	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-
3e.3	Subtotal Period 3e Collateral Costs	-	0	-	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	170	17	187	-	187	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	329	33	361	-	361	-	-	-	-	-	-	-	-	-
3e.4.4	NRC ISFSI Fees	-	-	-	-	-	-	79	8	87	-	87	-	-	-	-	-	-	-	-	-
3e.4.5	Security Staff Cost	-	-	-	-	-	-	244	37	280	-	280	-	-	-	-	-	-	-	-	4,971
3e.4.6	Utility Staff Cost	-	-	-	-	-	-	324	49	373	-	373	-	-	-	-	-	-	-	-	3,771
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,146	143	1,289	-	1,289	-	-	-	-	-	-	-	-	8,743
3e.0	TOTAL PERIOD 3e COST	-	43	8	35	-	202	2,577	425	3,290	-	3,290	-	-	1,953	-	-	-	163,052	3,623	11,303
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	ISFSI Demolition and Site Restoration	-	1,440	-	-	-	-	50	224	1,714	-	1,714	-	-	-	-	-	-	-	19,129	160
3f.2	Subtotal Period 3f Additional Costs	-	1,440	-	-	-	-	50	224	1,714	-	1,714	-	-	-	-	-	-	-	19,129	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	17	-	-	-	-	-	3	19	-	19	-	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	17	-	-	-	-	-	3	19	-	19	-	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.2	Property taxes	-	-	-	-	-	-	167	17	184	-	184	-	-	-	-	-	-	-	-	-
3f.4.4	Security Staff Cost	-	-	-	-	-	-	124	19	143	-	143	-	-	-	-	-	-	-	-	2,527
3f.4.5	Utility Staff Cost	-	-	-	-	-	-	134	20	154	-	154	-	-	-	-	-	-	-	-	1,569
3f.4	Subtotal Period 3f Period-Dependent Costs	-	-	-	-	-	-	425	55	480	-	480	-	-	-	-	-	-	-	-	4,096
3f.0	TOTAL PERIOD 3f COST	-	1,457	-	-	-	-	475	282	2,214	-	2,214	-	-	-	-	-	-	-	19,129	4,256
PERIOD 3 TOTALS		-	56,669	633	35	-	7,617	124,696	26,332	215,982	9,438	112,555	93,988	-	1,953	-	-	1,785	514,152	525,432	1,087,133

Table C
Clinton Power Station
DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
TOTAL COST TO DECOMMISSION		17,749	154,173	23,273	11,171	12,577	59,103	609,874	163,905	1,051,824	732,894	217,632	101,298	487,391	279,057	2,180	1,320	1,785	37,595,610	2,138,494	4,966,400

TOTAL COST TO DECOMMISSION WITH 18.46% CONTINGENCY:	$1,051,824	thousands of 2012 dollars
TOTAL NRC LICENSE TERMINATION COST IS 69.68% OR:	$732,894	thousands of 2012 dollars
SPENT FUEL MANAGEMENT COST IS 20.69% OR:	$217,632	thousands of 2012 dollars
NON-NUCLEAR DEMOLITION COST IS 9.63% OR:	$101,298	thousands of 2012 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	282,557	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,785	cubic feet
TOTAL SCRAP METAL REMOVED:	75,966	tons
TOTAL CRAFT LABOR REQUIREMENTS:	2,138,494	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

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / 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	-	-	-	-	-	-	527	158	686	686	-	-	-	-	-	-	-	-	-	-
1a.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
1a.1.3	Notification of Cessation of Operations									a											
1a.1.4	Remove fuel & source material									n/a											
1a.1.5	Notification of Permanent Defueling									a											
1a.1.6	Deactivate plant systems & process waste									a											
1a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	End product description	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	187	28	215	215	-	-	-	-	-	-	-	-	-	1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	387	58	445	445	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	624	94	718	718	-	-	-	-	-	-	-	-	-	5,000
Activity Specifications																					
1a.1.16.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	614	92	707	707	-	-	-	-	-	-	-	-	-	4,920
1a.1.16.2	Plant systems	-	-	-	-	-	-	520	78	598	598	-	-	-	-	-	-	-	-	-	4,167
1a.1.16.3	Plant structures and buildings	-	-	-	-	-	-	390	58	448	448	-	-	-	-	-	-	-	-	-	3,120
1a.1.16.4	Waste management	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.16.5	Facility and site dormancy	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.16	Total	-	-	-	-	-	-	2,024	304	2,327	2,327	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Procedures																					
1a.1.17.1	Plant systems	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,183
1a.1.17.2	Facility closeout & dormancy	-	-	-	-	-	-	150	22	172	172	-	-	-	-	-	-	-	-	-	1,200
1a.1.17	Total	-	-	-	-	-	-	298	45	342	342	-	-	-	-	-	-	-	-	-	2,383
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	12	2	14	14	-	-	-	-	-	-	-	-	-	100
1a.1.19	Drain/de-energize non-cont. systems									a											
1a.1.20	Drain & dry NSSS									a											
1a.1.21	Drain/de-energize contaminated systems									a											
1a.1.22	Decon/secure contaminated systems									a											
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,009	830	5,840	5,840	-	-	-	-	-	-	-	-	-	35,890
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,178	218	2,396	2,396	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	437	-	-	-	-	-	109	547	547	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	460	-	-	-	-	-	69	529	529	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	2	-	36	-	11	61	61	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,781	417	3,198	3,198	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,151	115	1,266	1,266	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,481	248	2,729	-	2,729	-	-	-	-	-	-	-	-	-
1a.4.9	Site O&M Costs	-	-	-	-	-	-	316	47	363	363	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	777	117	893	-	893	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	91	14	105	-	105	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	7,158	1,074	8,232	8,232	-	-	-	-	-	-	-	-	-	157,471
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	33,930	5,089	39,019	39,019	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	897	13	2	-	36	50,862	7,528	59,337	55,610	3,727	-	-	610	-	-	-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	897	13	2	-	36	55,871	8,358	65,177	61,450	3,727	-	-	610	-	-	-	12,190	20	616,761

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1b - SAFSTOR Limited DECON Activities																					
Period 1b Direct Decommissioning Activities																					
Decontamination of Site Buildings																					
1b.1.1.1	Reactor Building	3,261	-	-	-	-	-	-	1,630	4,891	4,891	-	-	-	-	-	-	-	-	56,016	-
1b.1.1.2	Auxiliary Building	374	-	-	-	-	-	-	187	561	561	-	-	-	-	-	-	-	-	6,485	-
1b.1.1.3	Control Building	433	-	-	-	-	-	-	216	649	649	-	-	-	-	-	-	-	-	7,503	-
1b.1.1.4	Diesel Generator Building	126	-	-	-	-	-	-	63	189	189	-	-	-	-	-	-	-	-	2,182	-
1b.1.1.5	Radwaste Building	1,463	-	-	-	-	-	-	732	2,195	2,195	-	-	-	-	-	-	-	-	25,369	-
1b.1.1.6	Turbine Building	1,309	-	-	-	-	-	-	654	1,963	1,963	-	-	-	-	-	-	-	-	22,689	-
1b.1.1.7	Fuel Building	946	-	-	-	-	-	-	473	1,419	1,419	-	-	-	-	-	-	-	-	16,275	-
1b.1.1	Totals	7,912	-	-	-	-	-	-	3,956	11,868	11,868	-	-	-	-	-	-	-	-	136,519	-
1b.1	Subtotal Period 1b Activity Costs	7,912	-	-	-	-	-	-	3,956	11,868	11,868	-	-	-	-	-	-	-	-	136,519	-
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,588	1,588	12,176	12,176	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	10,588	1,588	12,176	12,176	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	841	-	-	-	-	-	-	126	968	968	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	240	-	100	416	-	493	-	316	1,565	1,565	-	-	-	1,471	-	-	-	88,241	287	-
1b.3.4	Small tool allowance	-	127	-	-	-	-	-	19	146	146	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,081	127	100	416	-	493	-	461	2,679	2,679	-	-	-	1,471	-	-	-	88,241	287	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	2,202	-	-	-	-	-	-	550	2,752	2,752	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	403	40	444	444	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	3,032	303	3,335	3,335	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	663	-	-	-	-	-	166	829	829	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	115	-	-	-	-	-	17	132	132	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	28	5	-	80	-	24	138	138	-	-	-	1,374	-	-	-	27,476	45	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	693	104	797	797	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	167	17	183	183	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	474	47	522	-	522	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Costs	-	-	-	-	-	-	79	12	90	90	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	194	29	223	-	223	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	1,785	268	2,052	2,052	-	-	-	-	-	-	-	-	-	39,260
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	8,459	1,269	9,728	9,728	-	-	-	-	-	-	-	-	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	2,202	778	28	5	-	80	15,308	2,850	21,252	20,482	770	-	-	1,374	-	-	-	27,476	45	144,820
1b.0	TOTAL PERIOD 1b COST	11,195	905	129	422	-	573	25,896	8,855	47,976	47,205	770	-	-	2,844	-	-	-	115,716	136,851	144,820
PERIOD 1c - Preparations for SAFSTOR Dormancy																					
Period 1c Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-	441	-	-	-	-	-	66	507	507	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	39	-	-	-	-	-	6	45	45	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	9,827	-
1c.1.4	Secure building accesses									a											
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	480	-	-	-	-	806	303	1,588	1,588	-	-	-	-	-	-	-	-	13,527	583
Period 1c Collateral Costs																					
1c.3.1	Process decommissioning water waste	186	-	78	324	-	384	-	246	1,218	1,218	-	-	-	1,145	-	-	-	68,715	223	-
1c.3.3	Small tool allowance	-	3	-	-	-	-	-	1	4	4	-	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	186	3	78	324	-	384	-	246	1,222	1,222	-	-	-	1,145	-	-	-	68,715	223	-

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 1c Period-Dependent Costs																					
1c.4.1	Insurance	-	-	-	-	-	-	403	40	444	444	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	-	-	-	-	-	3,032	303	3,335	3,335	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-	165	-	-	-	-	-	41	206	206	-	-	-	-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	115	-	-	-	-	-	17	132	132	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	3	1	-	9	-	3	15	15	-	-	-	152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	693	104	797	797	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	167	17	183	183	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	474	47	522	-	522	-	-	-	-	-	-	-	-	-
1c.4.9	Site O&M Costs	-	-	-	-	-	-	79	12	90	90	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	194	29	223	-	223	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
1c.4.12	Security Staff Cost	-	-	-	-	-	-	1,785	268	2,052	2,052	-	-	-	-	-	-	-	-	-	39,260
1c.4.13	Utility Staff Cost	-	-	-	-	-	-	8,459	1,269	9,728	9,728	-	-	-	-	-	-	-	-	-	105,560
1c.4	Subtotal Period 1c Period-Dependent Costs	-	279	3	1	-	9	15,308	2,153	17,754	16,983	770	-	-	152	-	-	-	3,039	5	144,820
1c.0	TOTAL PERIOD 1c COST	186	763	81	325	-	393	16,114	2,702	20,564	19,794	770	-	-	1,297	-	-	-	71,755	13,755	145,403
PERIOD 1 TOTALS		11,381	2,565	222	749	-	1,002	97,882	19,915	133,717	128,449	5,268	-	-	4,751	-	-	-	199,661	150,625	906,985
PERIOD 2a - SAFSTOR Dormancy with Wet Spent Fuel 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									a											
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	2,560	384	2,944	2,944	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	2,216	554	2,770	2,770	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	4,776	938	5,714	5,714	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,250	1,688	12,938	-	12,938	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	11,250	1,688	12,938	-	12,938	-	-	-	-	-	-	-	-	-
Period 2a Period-Dependent Costs																					
2a.4.1	Insurance	-	-	-	-	-	-	9,476	948	10,424	-	10,424	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	-	-	-	-	-	33,456	3,346	36,802	-	36,802	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	2,840	-	-	-	-	-	710	3,550	3,550	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	77	15	-	217	-	64	373	373	-	-	-	3,724	-	-	-	74,482	121	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	9,002	1,350	10,352	-	10,352	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	4,455	445	4,900	4,900	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	30,784	3,078	33,863	-	33,863	-	-	-	-	-	-	-	-	-
2a.4.8	Site O&M Costs	-	-	-	-	-	-	5,107	766	5,873	-	5,873	-	-	-	-	-	-	-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	12,572	1,886	14,458	-	14,458	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	1,478	222	1,700	-	1,700	-	-	-	-	-	-	-	-	-
2a.4.11	Security Staff Cost	-	-	-	-	-	-	83,330	12,499	95,829	-	95,829	-	-	-	-	-	-	-	-	1,797,720
2a.4.12	Utility Staff Cost	-	-	-	-	-	-	109,381	16,407	125,788	-	125,788	-	-	-	-	-	-	-	-	1,333,520
2a.4	Subtotal Period 2a Period-Dependent Costs	-	2,840	77	15	-	217	299,040	41,722	343,911	8,823	335,088	-	-	3,724	-	-	-	74,482	121	3,131,240
2a.0	TOTAL PERIOD 2a COST	-	2,840	77	15	-	217	315,066	44,347	362,562	14,537	348,025	-	-	3,724	-	-	-	74,482	121	3,131,240
PERIOD 2b - SAFSTOR Dormancy with Dry Spent Fuel Storage																					
Period 2b Direct Decommissioning Activities																					
2b.1.1	Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3	Prepare reports									a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	92	14	106	106	-	-	-	-	-	-	-	-	-	-
2b.1.5	Maintenance supplies	-	-	-	-	-	-	80	20	100	100	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	172	34	206	206	-	-	-	-	-	-	-	-	-	-
Period 2b Collateral Costs																					
2b.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,625	394	3,019	-	3,019	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	2,625	394	3,019	-	3,019	-	-	-	-	-	-	-	-	-

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes: Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2b Period-Dependent Costs																					
2b.4.1	Insurance	-	-	-	-	-	-	302	30	332	-	332	-	-	-	-	-	-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	583	58	641	-	641	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	50	-	-	-	-	-	12	62	62	-	-	-	-	-	-	-	-	-	-
2b.4.4	Disposal of DAW generated	-	-	1	0	-	4	-	1	6	6	-	-	-	64	-	-	-	1,290	2	-
2b.4.5	Plant energy budget	-	-	-	-	-	-	162	24	187	-	187	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	153	15	168	168	-	-	-	-	-	-	-	-	-	-
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	1,110	111	1,221	-	1,221	-	-	-	-	-	-	-	-	-
2b.4.8	Site O&M Costs	-	-	-	-	-	-	184	28	212	-	212	-	-	-	-	-	-	-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	53	8	61	-	61	-	-	-	-	-	-	-	-	-
2b.4.10	Security Staff Cost	-	-	-	-	-	-	1,620	243	1,863	-	1,863	-	-	-	-	-	-	-	-	32,863
2b.4.11	Utility Staff Cost	-	-	-	-	-	-	1,581	237	1,818	-	1,818	-	-	-	-	-	-	-	-	19,474
2b.4	Subtotal Period 2b Period-Dependent Costs	-	50	1	0	-	4	5,749	768	6,572	237	6,335	-	-	64	-	-	-	1,290	2	52,337
2b.0	TOTAL PERIOD 2b COST	-	50	1	0	-	4	8,546	1,196	9,797	443	9,354	-	-	64	-	-	-	1,290	2	52,337
PERIOD 2 TOTALS		-	2,890	78	15	-	221	323,612	45,543	372,359	14,980	357,379	-	-	3,789	-	-	-	75,772	124	3,183,577
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	574	86	661	661	-	-	-	-	-	-	-	-	-	4,600
3a.1.3	Perform detailed rad survey									n											
3a.1.4	End product description	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3a.1.5	Detailed by-product inventory	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	937	140	1,077	1,077	-	-	-	-	-	-	-	-	-	7,500
3a.1.7	Perform SER and EA	-	-	-	-	-	-	387	58	445	445	-	-	-	-	-	-	-	-	-	3,100
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	624	94	718	718	-	-	-	-	-	-	-	-	-	5,000
3a.1.9	Prepare/submit License Termination Plan	-	-	-	-	-	-	512	77	588	588	-	-	-	-	-	-	-	-	-	4,096
3a.1.10	Receive NRC approval of termination plan									n											
Activity Specifications																					
3a.1.11.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	920	138	1,058	953	-	106	-	-	-	-	-	-	-	7,370
3a.1.11.2	Plant systems	-	-	-	-	-	-	520	78	598	539	-	60	-	-	-	-	-	-	-	4,167
3a.1.11.3	Reactor internals	-	-	-	-	-	-	887	133	1,020	1,020	-	-	-	-	-	-	-	-	-	7,100
3a.1.11.4	Reactor vessel	-	-	-	-	-	-	812	122	933	933	-	-	-	-	-	-	-	-	-	6,500
3a.1.11.5	Sacrificial shield	-	-	-	-	-	-	62	9	72	72	-	-	-	-	-	-	-	-	-	500
3a.1.11.6	Moisture separators/reheaters	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3a.1.11.7	Reinforced concrete	-	-	-	-	-	-	200	30	230	115	-	115	-	-	-	-	-	-	-	1,600
3a.1.11.8	Main Turbine	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
3a.1.11.9	Main Condensers	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
3a.1.11.10	Pressure suppression structure	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
3a.1.11.11	Drywell	-	-	-	-	-	-	200	30	230	230	-	-	-	-	-	-	-	-	-	1,600
3a.1.11.12	Plant structures & buildings	-	-	-	-	-	-	390	58	448	224	-	224	-	-	-	-	-	-	-	3,120
3a.1.11.13	Waste management	-	-	-	-	-	-	574	86	661	661	-	-	-	-	-	-	-	-	-	4,600
3a.1.11.14	Facility & site closeout	-	-	-	-	-	-	112	17	129	65	-	65	-	-	-	-	-	-	-	900
3a.1.11	Total	-	-	-	-	-	-	5,574	836	6,410	5,841	-	569	-	-	-	-	-	-	-	44,633
Planning & Site Preparations																					
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	300	45	345	345	-	-	-	-	-	-	-	-	-	2,400
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	2,900	435	3,335	3,335	-	-	-	-	-	-	-	-	-	-
3a.1.14	Design water clean-up system	-	-	-	-	-	-	175	26	201	201	-	-	-	-	-	-	-	-	-	1,400
3a.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,200	330	2,530	2,530	-	-	-	-	-	-	-	-	-	-
3a.1.16	Procure casks/liners & containers	-	-	-	-	-	-	154	23	177	177	-	-	-	-	-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	14,786	2,218	17,003	16,434	-	569	-	-	-	-	-	-	-	77,559
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	517	52	569	569	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	999	100	1,099	1,099	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	382	-	-	-	-	-	96	478	478	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	460	-	-	-	-	-	69	529	529	-	-	-	-	-	-	-	-	-	-

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3a Period-Dependent Costs (continued)																					
3a.4.5	Disposal of DAW generated	-	-	11	2	-	30	-	9	52	52	-	-	-	514	-	-	-	10,287	17	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	2,781	417	3,198	3,198	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	362	36	399	399	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Costs	-	-	-	-	-	-	316	47	363	363	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	3,161	474	3,635	3,635	-	-	-	-	-	-	-	-	-	65,179
3a.4.10	Utility Staff Cost	-	-	-	-	-	-	20,817	3,123	23,939	23,939	-	-	-	-	-	-	-	-	-	258,629
3a.4	Subtotal Period 3a Period-Dependent Costs	-	842	11	2	-	30	28,952	4,422	34,259	34,259	-	-	-	514	-	-	-	10,287	17	323,807
3a.0	TOTAL PERIOD 3a COST	-	842	11	2	-	30	43,738	6,640	51,262	50,693	-	569	-	514	-	-	-	10,287	17	401,366
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	591	89	680	612	-	68	-	-	-	-	-	-	-	4,733
3b.1.1.2	Reactor internals	-	-	-	-	-	-	500	75	574	574	-	-	-	-	-	-	-	-	-	4,000
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	169	25	194	48	-	145	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD housings & NIs	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5	Incore instrumentation	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	Removal primary containment	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	453	68	521	521	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	150	22	172	86	-	86	-	-	-	-	-	-	-	1,200
3b.1.1.9	Sacrificial shield	-	-	-	-	-	-	150	22	172	172	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	125	19	144	72	-	72	-	-	-	-	-	-	-	1,000
3b.1.1.11	Main Turbine	-	-	-	-	-	-	260	39	299	299	-	-	-	-	-	-	-	-	-	2,080
3b.1.1.12	Main Condensers	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
3b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.14	Radwaste building	-	-	-	-	-	-	341	51	392	353	-	39	-	-	-	-	-	-	-	2,730
3b.1.1.15	Reactor building	-	-	-	-	-	-	341	51	392	353	-	39	-	-	-	-	-	-	-	2,730
3b.1.1	Total	-	-	-	-	-	-	4,089	613	4,702	4,252	-	450	-	-	-	-	-	-	-	32,741
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	4,089	613	4,702	4,252	-	450	-	-	-	-	-	-	-	32,741
Period 3b Additional Costs																					
3b.2.1	Site Characterization	-	-	-	-	-	-	6,608	1,982	8,591	8,591	-	-	-	-	-	-	-	-	30,500	10,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	6,608	1,982	8,591	8,591	-	-	-	-	-	-	-	-	30,500	10,852
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	841	-	-	-	-	-	-	126	968	968	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	841	1,100	-	-	-	-	1,030	446	3,417	3,417	-	-	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	26	-	-	-	-	-	-	6	32	32	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	259	26	285	285	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	501	50	551	551	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	211	-	-	-	-	-	53	264	264	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	231	-	-	-	-	-	35	265	265	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	1	-	17	-	5	29	29	-	-	-	292	-	-	-	5,834	10	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	1,394	209	1,603	1,603	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	182	18	200	200	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Costs	-	-	-	-	-	-	158	24	182	182	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	1,585	238	1,822	1,822	-	-	-	-	-	-	-	-	-	32,679
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	5,195	779	5,974	5,974	-	-	-	-	-	-	-	-	-	58,560
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	10,437	1,566	12,002	12,002	-	-	-	-	-	-	-	-	-	129,669
3b.4	Subtotal Period 3b Period-Dependent Costs	26	442	6	1	-	17	19,710	3,008	23,211	23,211	-	-	-	292	-	-	-	5,834	10	220,907
3b.0	TOTAL PERIOD 3b COST	867	1,542	6	1	-	17	31,437	6,050	39,920	39,470	-	450	-	292	-	-	-	5,834	30,510	264,500
PERIOD 3 TOTALS		867	2,384	17	3	-	47	75,174	12,690	91,182	90,163	-	1,019	-	806	-	-	-	16,121	30,526	665,866

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Recirculation System Piping & Valves	13	49	11	12	-	79	-	41	204	204	-	-	-	561	-	-	-	64,094	1,078	-
4a.1.1.2	Recirculation Pumps & Motors	13	44	14	38	14	281	-	97	501	501	-	-	250	2,473	-	-	-	251,240	1,145	-
4a.1.1.3	CRDMs & NIs Removal	51	191	535	107	-	161	-	183	1,229	1,229	-	-	-	6,985	-	-	-	131,119	4,475	-
4a.1.1.4	Reactor Vessel Internals	96	3,718	5,512	1,252	-	9,024	317	9,087	29,007	29,007	-	-	-	1,388	751	1,075	-	341,610	35,033	1,533
4a.1.1.5	Vessel & Internals GTCC Disposal	-	-	-	-	-	7,415	-	1,112	8,527	8,527	-	-	-	-	-	-	1,785	351,100	-	-
4a.1.1.6	Reactor Vessel	84	7,497	2,784	1,222	-	3,827	317	8,630	24,372	24,372	-	-	-	14,388	-	-	-	1,526,050	35,033	1,533
4a.1.1	Totals	257	11,499	8,867	2,631	14	20,787	633	19,151	63,839	63,839	-	-	250	25,795	751	1,075	1,785	2,665,213	76,766	3,067
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	381	323	63	439	-	-	203	1,408	1,408	-	-	15,719	-	-	-	-	707,358	6,934	-
4a.1.3	Main Condensers	-	1,199	1,114	217	1,512	-	-	670	4,712	4,712	-	-	54,200	-	-	-	-	2,439,000	22,050	-
Cascading Costs from Clean Building Demolition																					
4a.1.4.1	Reactor Building	-	1,021	-	-	-	-	-	153	1,174	1,174	-	-	-	-	-	-	-	-	11,450	-
4a.1.4.2	Auxiliary Building	-	245	-	-	-	-	-	37	281	281	-	-	-	-	-	-	-	-	2,582	-
4a.1.4.3	Radwaste Building	-	579	-	-	-	-	-	87	666	666	-	-	-	-	-	-	-	-	6,493	-
4a.1.4.4	Turbine Building	-	577	-	-	-	-	-	87	664	664	-	-	-	-	-	-	-	-	6,771	-
4a.1.4.5	Fuel Building	-	268	-	-	-	-	-	40	309	309	-	-	-	-	-	-	-	-	2,912	-
4a.1.4	Totals	-	2,690	-	-	-	-	-	404	3,094	3,094	-	-	-	-	-	-	-	-	30,209	-
Disposal of Plant Systems																					
4a.1.5.1	Acid Feed & Handling	-	35	1	2	12	-	-	11	60	60	-	-	493	-	-	-	-	20,012	573	-
4a.1.5.2	Auxiliary Steam	-	652	12	27	192	-	-	197	1,080	1,080	-	-	7,613	-	-	-	-	309,178	10,682	-
4a.1.5.3	Breathing Air	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	877	-
4a.1.5.4	CO2 & Generator Purge	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	373	-
4a.1.5.5	Caustic Handling	-	18	0	1	5	-	-	5	29	29	-	-	186	-	-	-	-	7,571	285	-
4a.1.5.6	Chem Radwaste Reprocessing & Disposal	-	459	50	40	85	141	-	174	950	950	-	-	3,392	2,056	-	-	-	252,395	7,957	-
4a.1.5.7	Chilled Water - RCA	-	1,395	24	58	407	-	-	421	2,305	2,305	-	-	16,163	-	-	-	-	656,386	22,847	-
4a.1.5.8	Chilled Water Non-RCA	-	202	-	-	-	-	-	30	232	-	-	232	-	-	-	-	-	-	3,958	-
4a.1.5.9	Chlorination	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	988	-
4a.1.5.10	Circulating Water - RCA	-	207	14	34	237	-	-	94	585	585	-	-	9,402	-	-	-	-	381,817	3,590	-
4a.1.5.11	Circulating Water Non-RCA	-	57	-	-	-	-	-	8	65	-	-	65	-	-	-	-	-	-	1,093	-
4a.1.5.12	Cntnmnt Aux & Fuel Bldg Equip Drains	-	114	7	6	9	21	-	37	193	193	-	-	344	306	-	-	-	31,322	1,880	-
4a.1.5.13	Cntnmnt Aux & Fuel Bldg Floor Drains	-	179	9	8	29	19	-	56	300	300	-	-	1,157	278	-	-	-	62,722	3,022	-
4a.1.5.14	Component Cooling Water Non-RCA	-	137	-	-	-	-	-	21	158	-	-	158	-	-	-	-	-	-	2,681	-
4a.1.5.15	Condensate	-	1,064	155	166	580	416	-	497	2,879	2,879	-	-	23,020	5,962	-	-	-	1,272,859	18,802	-
4a.1.5.16	Condensate Booster	-	963	337	317	762	1,036	-	695	4,109	4,109	-	-	30,263	14,866	-	-	-	2,071,290	17,575	-
4a.1.5.17	Condensate Polishing	-	837	53	48	159	126	-	277	1,502	1,502	-	-	6,320	1,812	-	-	-	359,429	14,284	-
4a.1.5.18	Condenser Vacuum	-	227	15	36	255	-	-	102	636	636	-	-	10,118	-	-	-	-	410,897	3,912	-
4a.1.5.19	Containment Combustible Gas	-	90	2	4	27	-	-	27	150	150	-	-	1,079	-	-	-	-	43,821	1,537	-
4a.1.5.20	Cycled Condensate	-	755	43	42	152	103	-	248	1,343	1,343	-	-	6,039	1,481	-	-	-	328,957	12,882	-
4a.1.5.21	Drywell Cooling	-	572	10	25	176	-	-	174	958	958	-	-	6,996	-	-	-	-	284,127	9,171	-
4a.1.5.22	Drywell Purge	-	162	5	13	92	-	-	57	330	330	-	-	3,669	-	-	-	-	149,002	2,830	-
4a.1.5.23	ECCS Equipment Cooling	-	79	2	5	32	-	-	25	142	142	-	-	1,252	-	-	-	-	50,856	1,311	-
4a.1.5.24	Extraction Steam	-	565	64	65	210	176	-	233	1,313	1,313	-	-	8,333	2,526	-	-	-	481,604	9,893	-
4a.1.5.25	Feedwater	-	598	127	126	368	367	-	328	1,913	1,913	-	-	14,601	5,262	-	-	-	891,180	10,721	-
4a.1.5.26	Feedwater Heater Drains Turbine Cycle	-	1,474	125	130	443	330	-	550	3,052	3,052	-	-	17,605	4,731	-	-	-	983,039	25,639	-
4a.1.5.27	Feedwater Heater Misc.	-	246	17	14	32	46	-	82	436	436	-	-	1,264	661	-	-	-	88,853	4,161	-
4a.1.5.28	Filtered Water	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	90	-
4a.1.5.29	Generator Hydrogen Seal Oil	-	35	0	1	6	-	-	10	53	53	-	-	253	-	-	-	-	10,263	550	-
4a.1.5.30	Generator Stator Cooling	-	20	0	1	5	-	-	6	32	32	-	-	208	-	-	-	-	8,443	343	-
4a.1.5.31	High Pressure Core Spray	-	294	32	36	133	83	-	123	701	701	-	-	5,277	1,194	-	-	-	281,966	5,172	-
4a.1.5.32	Hydrogen	-	32	0	1	4	-	-	9	47	47	-	-	178	-	-	-	-	7,225	490	-
4a.1.5.33	Laundry Equip & Flr Drains RW Reprocess	-	242	12	15	69	24	-	80	442	442	-	-	2,760	350	-	-	-	131,644	4,191	-
4a.1.5.34	Leak Detection	-	46	0	0	2	-	-	12	61	61	-	-	87	-	-	-	-	3,522	839	-
4a.1.5.35	Local Instrument Panels	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	119	-
4a.1.5.36	Low Pressure Core Spray	-	113	16	18	73	39	-	53	314	314	-	-	2,917	559	-	-	-	150,192	1,987	-
4a.1.5.37	Machine Shop Equipment	-	13	0	1	6	-	-	4	23	23	-	-	225	-	-	-	-	9,119	216	-
4a.1.5.38	Machine Shop Ventilation	-	250	4	10	71	-	-	75	410	410	-	-	2,806	-	-	-	-	113,939	3,670	-

Table D
Clinton Power Station
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
4a.1.5.39	Main Steam	-	1,006	89	85	264	233	-	371	2,048	2,048	-	-	10,489	3,342	-	-	-	615,663	17,380	-
4a.1.5.40	Main Steam Isolation Valve	-	28	2	1	1	4	-	9	45	45	-	-	49	62	-	-	-	5,527	460	-
4a.1.5.41	Make-up Demineralizer - RCA	-	255	4	9	62	-	-	75	405	405	-	-	2,474	-	-	-	-	100,485	4,066	-
4a.1.5.42	Make-up Demineralizer Non-RCA	-	234	-	-	-	-	-	35	269	-	-	269	-	-	-	-	-	-	4,440	-
4a.1.5.43	Makeup Condensate Storage	-	322	22	15	27	56	-	103	545	545	-	-	1,056	805	-	-	-	88,679	5,325	-
4a.1.5.44	Misc. Building Drains	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	372	-
4a.1.5.45	Miscellaneous Ventilation	-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	688	-
4a.1.5.46	Nuclear Boiler	-	19	1	1	1	3	-	6	30	30	-	-	35	36	-	-	-	3,464	338	-
4a.1.5.47	Oil Transfer	-	115	4	9	61	-	-	40	229	229	-	-	2,442	-	-	-	-	99,182	1,945	-
4a.1.5.48	Reactor Core Isolation Cooling	-	252	14	15	63	30	-	84	458	458	-	-	2,511	438	-	-	-	126,640	4,379	-
4a.1.5.49	Refrigeration Piping	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	435	-
4a.1.5.50	Sanitary	-	169	-	-	-	-	-	25	195	-	-	195	-	-	-	-	-	-	3,202	-
4a.1.5.51	Screen House & MU Pump House Ventilation	-	36	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	751	-
4a.1.5.52	Standby Liquid Control	-	35	1	2	11	-	-	11	58	58	-	-	417	-	-	-	-	16,953	569	-
4a.1.5.53	Switchgear Heat Removal	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	426	-
4a.1.5.54	Turbine Building Closed Cooling Water	-	204	3	8	54	-	-	60	329	329	-	-	2,149	-	-	-	-	87,291	3,298	-
4a.1.5.55	Turbine Electrohydraulic Control	-	11	0	0	2	-	-	3	17	17	-	-	84	-	-	-	-	3,425	189	-
4a.1.5.56	Turbine Gen Misc Drains & Vents	-	69	0	1	9	-	-	19	98	98	-	-	339	-	-	-	-	13,772	1,122	-
4a.1.5.57	Turbine Gland Seal Steam	-	396	19	48	337	-	-	159	960	960	-	-	13,399	-	-	-	-	544,147	6,883	-
4a.1.5.58	Turbine Oil	-	58	2	5	31	-	-	20	115	115	-	-	1,251	-	-	-	-	50,795	1,024	-
4a.1.5.59	Turbine-Gen Aux & Misc Devices	-	260	30	77	536	-	-	160	1,063	1,063	-	-	21,282	-	-	-	-	864,279	4,767	-
4a.1.5	Totals	-	15,826	1,329	1,525	6,093	3,255	-	5,940	33,968	32,749	-	1,218	241,997	46,726	-	-	-	12,473,930	273,260	-
4a.1.6	Scaffolding in support of decommissioning	-	3,360	68	16	83	22	-	867	4,417	4,417	-	-	2,969	314	-	-	-	151,389	63,809	-
4a.1	Subtotal Period 4a Activity Costs	257	34,955	11,701	4,451	8,141	24,064	633	27,235	111,437	110,219	-	1,218	315,135	72,835	751	1,075	1,785	18,436,890	473,027	3,067
Period 4a Additional Costs																					
4a.2.1	Disposal of Stored Turbine Rotors	-	27	246	103	822	-	-	170	1,368	1,368	-	-	29,464	-	-	-	-	1,325,880	469	-
4a.2	Subtotal Period 4a Additional Costs	-	27	246	103	822	-	-	170	1,368	1,368	-	-	29,464	-	-	-	-	1,325,880	469	-
Period 4a Collateral Costs																					
4a.3.1	Process decommissioning water waste	17	-	10	43	-	51	-	29	150	150	-	-	-	151	-	-	-	9,064	29	-
4a.3.3	Small tool allowance	-	457	-	-	-	-	-	69	526	474	-	53	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	17	457	10	43	-	51	-	97	676	623	-	53	-	151	-	-	-	9,064	29	-
Period 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	83	-	-	-	-	-	-	21	104	104	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	838	84	922	922	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	1,621	162	1,783	1,605	-	178	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	2,618	-	-	-	-	-	655	3,273	3,273	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	3,016	-	-	-	-	-	452	3,468	3,468	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	168	32	-	476	-	141	817	817	-	-	-	8,156	-	-	-	163,121	266	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	4,284	643	4,927	4,927	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	947	95	1,042	1,042	-	-	-	-	-	-	-	-	-	-
4a.4.9	Site O&M Costs	-	-	-	-	-	-	512	77	588	588	-	-	-	-	-	-	-	-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	640	96	736	736	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,126	769	5,895	5,895	-	-	-	-	-	-	-	-	-	105,714
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	20,329	3,049	23,378	23,378	-	-	-	-	-	-	-	-	-	233,417
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	34,075	5,111	39,186	39,186	-	-	-	-	-	-	-	-	-	422,857
4a.4	Subtotal Period 4a Period-Dependent Costs	83	5,634	168	32	-	476	68,372	11,354	86,119	85,941	-	178	-	8,156	-	-	-	163,121	266	761,989
4a.0	TOTAL PERIOD 4a COST	358	41,073	12,125	4,629	8,963	24,591	69,005	38,856	199,600	198,150	-	1,449	344,599	81,142	751	1,075	1,785	19,934,960	473,791	765,055
PERIOD 4b - Site Decontamination																					
Period 4b Direct Decommissioning Activities																					
4b.1.1	Remove spent fuel racks	839	78	181	218	-	1,086	-	761	3,163	3,163	-	-	-	15,584	-	-	-	882,760	1,537	-
Disposal of Plant Systems																					
4b.1.2.1	Component Cooling Water - RCA	-	244	4	9	61	-	-	72	389	389	-	-	2,412	-	-	-	-	97,965	3,955	-
4b.1.2.2	Containment Monitoring	-	64	0	1	5	-	-	17	87	87	-	-	187	-	-	-	-	7,595	1,149	-
4b.1.2.3	Control Rod Drive	-	474	26	21	53	66	-	149	790	790	-	-	2,113	951	-	-	-	139,851	8,125	-

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Disposal of Plant Systems (continued)																					
4b.1.2.4	Diesel Fuel Oil	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	1,276	-
4b.1.2.5	Diesel General	-	59	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	1,150	-
4b.1.2.6	Diesel-Generator Room Ventilation	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,848	-
4b.1.2.7	Drains-Laundry to Radwaste	-	20	1	1	2	3	-	6	32	32	-	-	67	39	-	-	-	4,925	334	-
4b.1.2.8	Electrical - Clean Non-RCA	-	1,735	-	-	-	-	-	260	1,995	-	-	1,995	-	-	-	-	-	-	33,545	-
4b.1.2.9	Electrical - Clean RCA	-	7,621	113	270	1,884	-	-	2,240	12,127	12,127	-	-	74,814	-	-	-	-	3,038,244	126,569	-
4b.1.2.10	Electrical - Contaminated	-	1,121	12	30	209	-	-	317	1,689	1,689	-	-	8,281	-	-	-	-	336,300	19,039	-
4b.1.2.11	Equip Drain Radwaste Reprocessing	-	1,370	74	72	254	178	-	443	2,391	2,391	-	-	10,072	2,566	-	-	-	553,918	23,392	-
4b.1.2.12	Fire Protection - RCA	-	806	14	33	229	-	-	242	1,323	1,323	-	-	9,085	-	-	-	-	368,934	13,156	-
4b.1.2.13	Fire Protection Non-RCA	-	182	-	-	-	-	-	27	210	-	-	210	-	-	-	-	-	-	3,585	-
4b.1.2.14	Floor Drain Radwaste Reprocessing	-	842	63	60	193	160	-	295	1,613	1,613	-	-	7,671	2,306	-	-	-	441,819	14,444	-
4b.1.2.15	Fuel Handling & Transfer	-	27	2	2	7	6	-	10	55	55	-	-	263	92	-	-	-	15,903	483	-
4b.1.2.16	Fuel Pool Cooling & Cleanup	-	1,078	93	89	287	238	-	395	2,180	2,180	-	-	11,395	3,413	-	-	-	656,370	18,444	-
4b.1.2.17	Fuel Support	-	106	12	13	42	33	-	44	248	248	-	-	1,649	472	-	-	-	93,750	1,905	-
4b.1.2.18	HVAC - Auxiliary Building	-	33	1	2	15	-	-	11	63	63	-	-	612	-	-	-	-	24,859	592	-
4b.1.2.19	HVAC - Containment Building	-	835	19	47	331	-	-	267	1,500	1,500	-	-	13,152	-	-	-	-	534,096	12,947	-
4b.1.2.20	HVAC - Control Room	-	282	-	-	-	-	-	42	324	-	-	324	-	-	-	-	-	-	5,842	-
4b.1.2.21	HVAC - Fuel Building	-	355	6	14	101	-	-	107	582	582	-	-	3,994	-	-	-	-	162,195	5,172	-
4b.1.2.22	HVAC - Laboratory	-	569	9	23	161	-	-	171	933	933	-	-	6,394	-	-	-	-	259,676	8,426	-
4b.1.2.23	HVAC - Off Gas Building	-	151	3	7	48	-	-	46	254	254	-	-	1,887	-	-	-	-	76,626	2,458	-
4b.1.2.24	HVAC - Radwaste Building	-	809	14	36	253	-	-	247	1,359	1,359	-	-	10,046	-	-	-	-	407,957	12,025	-
4b.1.2.25	HVAC - Service Building	-	65	-	-	-	-	-	10	74	-	-	74	-	-	-	-	-	-	1,265	-
4b.1.2.26	HVAC - Turbine Building	-	665	11	28	197	-	-	201	1,103	1,103	-	-	7,840	-	-	-	-	318,387	9,720	-
4b.1.2.27	Hoists Cranes & Elevators	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	123	-
4b.1.2.28	Instrument Air - RCA	-	556	4	10	72	-	-	152	795	795	-	-	2,875	-	-	-	-	116,761	8,528	-
4b.1.2.29	Instrument Air Non-RCA	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	429	-
4b.1.2.30	Off Gas	-	214	3	8	55	-	-	63	344	344	-	-	2,203	-	-	-	-	89,451	3,589	-
4b.1.2.31	Plant Service Water - RCA	-	238	5	11	78	-	-	73	405	405	-	-	3,090	-	-	-	-	125,493	3,884	-
4b.1.2.32	Plant Service Water Non-RCA	-	184	-	-	-	-	-	28	212	-	-	212	-	-	-	-	-	-	3,643	-
4b.1.2.33	Potable Water	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	238	-
4b.1.2.34	Process Radiation Monitoring	-	125	1	2	14	-	-	34	176	176	-	-	554	-	-	-	-	22,497	2,046	-
4b.1.2.35	Process Sampling	-	630	3	8	58	-	-	168	867	867	-	-	2,290	-	-	-	-	93,002	10,271	-
4b.1.2.36	Reactor Recirculation	-	61	6	5	7	19	-	22	120	120	-	-	276	272	-	-	-	26,618	1,046	-
4b.1.2.37	Reactor Water Clean-up	-	352	30	25	45	90	-	124	666	666	-	-	1,784	1,297	-	-	-	145,974	5,978	-
4b.1.2.38	Residual Heat Removal	-	636	79	82	294	198	-	273	1,562	1,562	-	-	11,692	2,842	-	-	-	636,067	11,114	-
4b.1.2.39	Screen Wash	-	7	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	146	-
4b.1.2.40	Service Air - RCA	-	325	4	9	64	-	-	93	496	496	-	-	2,553	-	-	-	-	103,666	5,156	-
4b.1.2.41	Service Air Non-RCA	-	17	-	-	-	-	-	3	19	-	-	19	-	-	-	-	-	-	329	-
4b.1.2.42	Shutdown Service Water - RCA	-	125	2	5	38	-	-	38	209	209	-	-	1,505	-	-	-	-	61,135	2,025	-
4b.1.2.43	Shutdown Service Water Non-RCA	-	119	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	2,328	-
4b.1.2.44	Solid Radwaste Reprocessing & Disposal	-	678	36	36	128	85	-	219	1,182	1,182	-	-	5,098	1,230	-	-	-	276,501	11,573	-
4b.1.2.45	Standby Gas Treatment	-	77	1	2	15	-	-	22	117	117	-	-	593	-	-	-	-	24,083	1,286	-
4b.1.2.46	Suppression Pool Cleanup & Transfer	-	132	10	9	28	25	-	46	250	250	-	-	1,103	362	-	-	-	65,367	2,264	-
4b.1.2.47	Suppression Pool Make-up	-	58	8	9	28	23	-	26	152	152	-	-	1,123	328	-	-	-	64,195	1,024	-
4b.1.2.48	Turb OG RW Cntrl & DG Bldg Equip Drains	-	258	15	11	20	40	-	81	425	425	-	-	808	566	-	-	-	64,966	4,267	-
4b.1.2.49	Turb OG RW Cntrl & DG Bldg Floor Drains	-	379	19	19	76	41	-	121	656	656	-	-	3,033	588	-	-	-	156,372	6,470	-
4b.1.2	Totals	-	24,881	703	1,008	5,351	1,207	-	7,262	40,412	37,139	-	3,273	212,512	17,323	-	-	-	9,611,517	418,603	-
4b.1.3	Scaffolding in support of decommissioning	-	5,040	102	24	124	33	-	1,301	6,625	6,625	-	-	4,453	471	-	-	-	227,083	95,713	-
Decontamination of Site Buildings																					
4b.1.4.1	Reactor Building	2,941	3,625	678	606	195	1,908	-	3,042	12,995	12,995	-	-	7,734	30,787	-	-	-	2,526,021	112,915	-
4b.1.4.2	Auxiliary Building	349	131	22	27	29	55	-	232	847	847	-	-	1,171	1,016	-	-	-	134,188	7,998	-
4b.1.4.3	Control Building	404	76	21	25	1	57	-	241	825	825	-	-	56	1,039	-	-	-	93,487	7,976	-
4b.1.4.4	Diesel Generator Building	117	19	6	7	-	15	-	69	234	234	-	-	-	284	-	-	-	24,996	2,274	-
4b.1.4.5	Radwaste Building	1,367	328	79	94	27	206	-	843	2,945	2,945	-	-	1,067	3,787	-	-	-	373,574	28,194	-
4b.1.4.6	Turbine Building	1,222	390	75	90	69	189	-	787	2,822	2,822	-	-	2,735	3,450	-	-	-	408,701	26,841	-
4b.1.4.7	Fuel Building	863	746	28	34	65	62	-	651	2,449	2,449	-	-	2,574	1,117	-	-	-	198,195	27,895	-
4b.1.4	Totals	7,264	5,316	909	883	386	2,492	-	5,865	23,116	23,116	-	-	15,337	41,480	-	-	-	3,759,162	214,093	-
4b.1	Subtotal Period 4b Activity Costs	8,103	35,316	1,896	2,133	5,861	4,818	-	15,189	73,316	70,043	-	3,273	232,302	74,857	-	-	-	14,480,520	729,946	-

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 4b Additional Costs																					
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	954	286	1,240	1,240	-	-	-	-	-	-	-	-	-	6,240
4b.2.2	ISFSI License Termination	-	38	7	35	-	202	1,306	262	1,849	-	1,849	-	-	1,938	-	-	-	162,750	2,363	2,560
4b.2	Subtotal Period 4b Additional Costs	-	38	7	35	-	202	2,260	548	3,090	1,240	1,849	-	-	1,938	-	-	-	162,750	2,363	8,800
Period 4b Collateral Costs																					
4b.3.1	Process decommissioning water waste	46	-	30	122	-	145	-	81	424	424	-	-	-	432	-	-	-	25,929	84	-
4b.3.3	Small tool allowance	-	684	-	-	-	-	-	103	786	786	-	-	-	-	-	-	-	-	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	138	38	167	44	-	56	444	444	-	-	6,000	635	-	-	-	305,961	88	-
4b.3	Subtotal Period 4b Collateral Costs	46	684	168	160	167	189	-	239	1,653	1,653	-	-	6,000	1,067	-	-	-	331,890	172	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	2,312	-	-	-	-	-	-	578	2,889	2,889	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,231	123	1,354	1,354	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	2,379	238	2,617	2,617	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	3,980	-	-	-	-	-	995	4,975	4,975	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	4,380	-	-	-	-	-	657	5,037	5,037	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	236	45	-	670	-	198	1,149	1,149	-	-	-	11,473	-	-	-	229,464	374	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	4,965	745	5,710	5,710	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,390	139	1,529	1,529	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Costs	-	-	-	-	-	-	751	113	864	864	-	-	-	-	-	-	-	-	-	-
4b.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	939	141	1,080	1,080	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	7,525	1,129	8,654	8,654	-	-	-	-	-	-	-	-	-	155,179
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	29,085	4,363	33,447	33,447	-	-	-	-	-	-	-	-	-	332,703
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	47,308	7,096	54,405	54,405	-	-	-	-	-	-	-	-	-	585,954
4b.4	Subtotal Period 4b Period-Dependent Costs	2,312	8,360	236	45	-	670	95,573	16,514	123,709	123,709	-	-	-	11,473	-	-	-	229,464	374	1,073,836
4b.0	TOTAL PERIOD 4b COST	10,461	44,397	2,307	2,373	6,029	5,879	97,833	32,489	201,768	196,645	1,849	3,273	238,302	89,335	-	-	-	15,204,630	732,856	1,082,636
PERIOD 4f - License Termination																					
Period 4f Direct Decommissioning Activities																					
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	175	52	227	227	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license									a											
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	175	52	227	227	-	-	-	-	-	-	-	-	-	-
Period 4f Additional Costs																					
4f.2.1	License Termination Survey	-	-	-	-	-	-	13,733	4,120	17,852	17,852	-	-	-	-	-	-	-	-	223,573	3,120
4f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	13,733	4,120	17,852	17,852	-	-	-	-	-	-	-	-	223,573	3,120
Period 4f Collateral Costs																					
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
Period 4f Period-Dependent Costs																					
4f.4.1	Insurance	-	-	-	-	-	-	385	39	424	424	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	-	-	-	-	-	745	74	819	819	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies	-	817	-	-	-	-	-	204	1,021	1,021	-	-	-	-	-	-	-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	1	-	20	-	6	35	35	-	-	-	347	-	-	-	6,948	11	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	414	62	477	477	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees	-	-	-	-	-	-	436	44	479	479	-	-	-	-	-	-	-	-	-	-
4f.4.7	Site O&M Costs	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
4f.4.8	Security Staff Cost	-	-	-	-	-	-	963	144	1,107	1,107	-	-	-	-	-	-	-	-	-	18,651
4f.4.9	DOC Staff Cost	-	-	-	-	-	-	5,194	779	5,974	5,974	-	-	-	-	-	-	-	-	-	56,731
4f.4.10	Utility Staff Cost	-	-	-	-	-	-	6,722	1,008	7,731	7,731	-	-	-	-	-	-	-	-	-	73,829
4f.4	Subtotal Period 4f Period-Dependent Costs	-	817	7	1	-	20	15,095	2,396	18,337	18,337	-	-	-	347	-	-	-	6,948	11	149,211
4f.0	TOTAL PERIOD 4f COST	-	817	7	1	-	20	30,032	6,723	37,600	37,600	-	-	-	347	-	-	-	6,948	223,585	152,331
PERIOD 4 TOTALS		10,818	86,287	14,439	7,003	14,992	30,490	196,870	78,068	438,967	432,396	1,849	4,722	582,901	170,824	751	1,075	1,785	35,146,530	1,430,232	2,000,022

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 5b - Site Restoration																					
Period 5b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
5b.1.1.1	Reactor Building	-	5,791	-	-	-	-	-	869	6,659	-	-	6,659	-	-	-	-	-	-	65,001	-
5b.1.1.2	Auxiliary Building	-	2,202	-	-	-	-	-	330	2,533	-	-	2,533	-	-	-	-	-	-	23,242	-
5b.1.1.3	Circulating Water Screenhouse	-	3,609	-	-	-	-	-	541	4,150	-	-	4,150	-	-	-	-	-	-	38,418	-
5b.1.1.4	Control Building	-	5,265	-	-	-	-	-	790	6,054	-	-	6,054	-	-	-	-	-	-	56,578	-
5b.1.1.5	Diesel Generator Building	-	1,858	-	-	-	-	-	279	2,136	-	-	2,136	-	-	-	-	-	-	20,234	-
5b.1.1.6	Make-Up Water Pump House	-	380	-	-	-	-	-	57	437	-	-	437	-	-	-	-	-	-	5,100	-
5b.1.1.7	Miscellaneous Site Work	-	1,785	-	-	-	-	-	268	2,053	-	-	2,053	-	-	-	-	-	-	21,227	-
5b.1.1.8	Miscellaneous Structures	-	2,782	-	-	-	-	-	417	3,199	-	-	3,199	-	-	-	-	-	-	44,561	-
5b.1.1.9	Radwaste Building	-	5,212	-	-	-	-	-	782	5,994	-	-	5,994	-	-	-	-	-	-	58,440	-
5b.1.1.10	Service Building	-	402	-	-	-	-	-	60	462	-	-	462	-	-	-	-	-	-	5,585	-
5b.1.1.11	Transformer and Tank Pads	-	173	-	-	-	-	-	26	199	-	-	199	-	-	-	-	-	-	2,463	-
5b.1.1.12	Turbine Building	-	5,324	-	-	-	-	-	799	6,123	-	-	6,123	-	-	-	-	-	-	63,415	-
5b.1.1.13	Turbine Pedestal	-	1,223	-	-	-	-	-	184	1,407	-	-	1,407	-	-	-	-	-	-	12,474	-
5b.1.1.14	Fuel Building	-	2,442	-	-	-	-	-	366	2,808	-	-	2,808	-	-	-	-	-	-	26,720	-
5b.1.1	Totals	-	38,447	-	-	-	-	-	5,767	44,215	-	-	44,215	-	-	-	-	-	-	443,457	-
Site Closeout Activities																					
5b.1.2	BackFill Site	-	109	-	-	-	-	-	16	125	-	-	125	-	-	-	-	-	-	201	-
5b.1.3	Grade & landscape site	-	2,154	-	-	-	-	-	323	2,477	-	-	2,477	-	-	-	-	-	-	4,449	-
5b.1.4	Final report to NRC	-	-	-	-	-	-	195	29	224	224	-	-	-	-	-	-	-	-	-	1,560
5b.1	Subtotal Period 5b Activity Costs	-	40,710	-	-	-	-	195	6,136	47,041	224	-	46,817	-	-	-	-	-	-	448,106	1,560
Period 5b Additional Costs																					
5b.2.1	Concrete Crushing	-	1,515	-	-	-	-	9	229	1,753	-	-	1,753	-	-	-	-	-	-	7,355	-
5b.2.2	Screenhouse Cofferdam	-	1,096	-	-	-	-	-	164	1,260	-	-	1,260	-	-	-	-	-	-	10,159	-
5b.2.3	Discharge Flume & Unit 2 Excavation Backfill	-	5,440	-	-	-	-	-	816	6,256	-	-	6,256	-	-	-	-	-	-	37,059	-
5b.2.4	ISFSI Site Restoration	-	718	-	-	-	-	50	115	884	-	884	-	-	-	-	-	-	-	8,042	160
5b.2	Subtotal Period 5b Additional Costs	-	8,769	-	-	-	-	60	1,324	10,153	-	884	9,269	-	-	-	-	-	-	62,614	160
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	455	-	-	-	-	-	68	523	-	-	523	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	455	-	-	-	-	-	68	523	-	-	523	-	-	-	-	-	-	-	-
Period 5b Period-Dependent Costs																					
5b.4.2	Property taxes	-	-	-	-	-	-	2,264	226	2,491	-	2,491	-	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	5,959	-	-	-	-	-	894	6,853	-	-	6,853	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	630	95	725	-	-	725	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Costs	-	-	-	-	-	-	715	107	822	-	-	822	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	2,927	439	3,366	-	-	3,366	-	-	-	-	-	-	-	56,709
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	15,261	2,289	17,551	-	-	17,551	-	-	-	-	-	-	-	160,674
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	8,479	1,272	9,751	-	-	9,751	-	-	-	-	-	-	-	92,151
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,959	-	-	-	-	30,277	5,322	41,558	-	2,491	39,067	-	-	-	-	-	-	-	309,534
5b.0	TOTAL PERIOD 5b COST	-	55,894	-	-	-	-	30,531	12,851	99,275	224	3,374	95,677	-	-	-	-	-	-	510,721	311,254
PERIOD 5 TOTALS		-	55,894	-	-	-	-	30,531	12,851	99,275	224	3,374	95,677	-	-	-	-	-	-	510,721	311,254
TOTAL COST TO DECOMMISSION		**23,067**	**150,020**	**14,756**	**7,770**	**14,992**	**31,761**	**724,069**	**169,067**	**1,135,501**	**666,212**	**367,871**	**101,418**	**582,901**	**180,170**	**751**	**1,075**	**1,785**	**35,438,080**	**2,122,228**	**7,067,703**

Table D
Clinton Power Station
Delayed DECON Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			

TOTAL COST TO DECOMMISSION WITH 17.49% CONTINGENCY:	$1,135,501	thousands of 2012 dollars
TOTAL NRC LICENSE TERMINATION COST IS 58.67% OR:	$666,212	thousands of 2012 dollars
SPENT FUEL MANAGEMENT COST IS 32.4% OR:	$367,871	thousands of 2012 dollars
NON-NUCLEAR DEMOLITION COST IS 8.93% OR:	$101,418	thousands of 2012 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	181,996	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,785	cubic feet
TOTAL SCRAP METAL REMOVED:	75,966	tons
TOTAL CRAFT LABOR REQUIREMENTS:	2,122,228	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

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes: Class A Cu. Feet	Burial Volumes: Class B Cu. Feet	Burial Volumes: Class C Cu. Feet	Burial Volumes: GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	527	158	686	686	-	-	-	-	-	-	-	-	-	-
1a.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,380
1a.1.3	Notification of Cessation of Operations									a											
1a.1.4	Remove fuel & source material									n/a											
1a.1.5	Notification of Permanent Defueling									a											
1a.1.6	Deactivate plant systems & process waste									a											
1a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,380
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	End product description	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	187	28	215	215	-	-	-	-	-	-	-	-	-	1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	387	58	445	445	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	624	94	718	718	-	-	-	-	-	-	-	-	-	5,000
Activity Specifications																					
1a.1.16.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	614	92	707	707	-	-	-	-	-	-	-	-	-	4,920
1a.1.16.2	Plant systems	-	-	-	-	-	-	520	78	598	598	-	-	-	-	-	-	-	-	-	4,167
1a.1.16.3	Plant structures and buildings	-	-	-	-	-	-	390	58	448	448	-	-	-	-	-	-	-	-	-	3,120
1a.1.16.4	Waste management	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.16.5	Facility and site dormancy	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
1a.1.16	Total	-	-	-	-	-	-	2,024	304	2,327	2,327	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Procedures																					
1a.1.17.1	Plant systems	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,183
1a.1.17.2	Facility closeout & dormancy	-	-	-	-	-	-	150	22	172	172	-	-	-	-	-	-	-	-	-	1,200
1a.1.17	Total	-	-	-	-	-	-	298	45	342	342	-	-	-	-	-	-	-	-	-	2,383
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	12	2	14	14	-	-	-	-	-	-	-	-	-	100
1a.1.19	Drain/de-energize non-cont. systems									a											
1a.1.20	Drain & dry NSSS									a											
1a.1.21	Drain/de-energize contaminated systems									a											
1a.1.22	Decon/secure contaminated systems									a											
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,009	830	5,840	5,840	-	-	-	-	-	-	-	-	-	35,890
Period 1a Additional Costs																					
1a.2.1	ISFSI Expansion	-	-	-	-	-	-	5,200	780	5,980	-	5,980	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	5,200	780	5,980	-	5,980	-	-	-	-	-	-	-	-	-
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	12,051	1,808	13,858	-	13,858	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	12,051	1,808	13,858	-	13,858	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,178	218	2,396	2,396	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	437	-	-	-	-	-	109	547	547	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	460	-	-	-	-	-	69	529	529	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	2	-	36	-	11	61	61	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,781	417	3,198	3,198	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,151	115	1,266	1,266	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	2,481	248	2,729	-	2,729	-	-	-	-	-	-	-	-	-
1a.4.9	Site O&M Costs	-	-	-	-	-	-	316	47	363	363	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	777	117	893	-	893	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	91	14	105	-	105	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	7,158	1,074	8,232	8,232	-	-	-	-	-	-	-	-	-	157,471
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	33,930	5,089	39,019	39,019	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	897	13	2	-	36	50,862	7,528	59,337	55,610	3,727	-	-	610	-	-	-	12,190	20	580,871

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
1a.0	TOTAL PERIOD 1a COST	-	897	13	2	-	36	73,122	10,946	85,016	61,450	23,565	-	-	610	-	-	-	12,190	20	616,761
PERIOD 1b - SAFSTOR Limited DECON Activities																					
Period 1b Direct Decommissioning Activities																					
Decontamination of Site Buildings																					
1b.1.1.1	Reactor Building	3,261	-	-	-	-	-	-	1,630	4,891	4,891	-	-	-	-	-	-	-	-	56,016	-
1b.1.1.2	Auxiliary Building	374	-	-	-	-	-	-	187	561	561	-	-	-	-	-	-	-	-	6,485	-
1b.1.1.3	Control Building	433	-	-	-	-	-	-	216	649	649	-	-	-	-	-	-	-	-	7,503	-
1b.1.1.4	Diesel Generator Building	126	-	-	-	-	-	-	63	189	189	-	-	-	-	-	-	-	-	2,182	-
1b.1.1.5	Radwaste Building	1,463	-	-	-	-	-	-	732	2,195	2,195	-	-	-	-	-	-	-	-	25,369	-
1b.1.1.6	Turbine Building	1,309	-	-	-	-	-	-	654	1,963	1,963	-	-	-	-	-	-	-	-	22,689	-
1b.1.1.7	Fuel Building	946	-	-	-	-	-	-	473	1,419	1,419	-	-	-	-	-	-	-	-	16,275	-
1b.1.1	Totals	7,912	-	-	-	-	-	-	3,956	11,868	11,868	-	-	-	-	-	-	-	-	136,519	-
1b.1	Subtotal Period 1b Activity Costs	7,912	-	-	-	-	-	-	3,956	11,868	11,868	-	-	-	-	-	-	-	-	136,519	-
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,588	1,588	12,176	12,176	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	10,588	1,588	12,176	12,176	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	841	-	-	-	-	-	-	126	968	968	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	240	-	100	416	-	493	-	316	1,565	1,565	-	-	-	1,471	-	-	-	88,241	287	-
1b.3.4	Small tool allowance	-	127	-	-	-	-	-	19	146	146	-	-	-	-	-	-	-	-	-	-
1b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	3,013	452	3,465	-	3,465	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,081	127	100	416	-	493	3,013	913	6,144	2,679	3,465	-	-	1,471	-	-	-	88,241	287	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	2,202	-	-	-	-	-	-	550	2,752	2,752	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	403	40	444	444	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	3,032	303	3,335	3,335	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	663	-	-	-	-	-	166	829	829	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	115	-	-	-	-	-	17	132	132	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	28	5	-	80	-	24	138	138	-	-	-	1,374	-	-	-	27,476	45	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	693	104	797	797	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	167	17	183	183	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	474	47	522	-	522	-	-	-	-	-	-	-	-	-
1b.4.10	Site O&M Costs	-	-	-	-	-	-	79	12	90	90	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	194	29	223	-	223	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
1b.4.13	Security Staff Cost	-	-	-	-	-	-	1,785	268	2,052	2,052	-	-	-	-	-	-	-	-	-	39,260
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	8,459	1,269	9,728	9,728	-	-	-	-	-	-	-	-	-	105,560
1b.4	Subtotal Period 1b Period-Dependent Costs	2,202	778	28	5	-	80	15,308	2,850	21,252	20,482	770	-	-	1,374	-	-	-	27,476	45	144,820
1b.0	TOTAL PERIOD 1b COST	11,195	905	129	422	-	573	28,909	9,307	51,440	47,205	4,235	-	-	2,844	-	-	-	115,716	136,851	144,820
PERIOD 1c - Preparations for SAFSTOR Dormancy																					
Period 1c Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-	441	-	-	-	-	-	66	507	507	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	39	-	-	-	-	-	6	45	45	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	9,827	-
1c.1.4	Secure building accesses									a											
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	73	11	84	84	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	480	-	-	-	-	806	303	1,588	1,588	-	-	-	-	-	-	-	-	13,527	583
Period 1c Collateral Costs																					
1c.3.1	Process decommissioning water waste	186	-	78	324	-	384	-	246	1,218	1,218	-	-	-	1,145	-	-	-	68,715	223	-
1c.3.3	Small tool allowance	-	3	-	-	-	-	-	1	4	4	-	-	-	-	-	-	-	-	-	-
1c.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	3,013	452	3,465	-	3,465	-	-	-	-	-	-	-	-	-

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
1c.3	Subtotal Period 1c Collateral Costs	186	3	78	324	-	384	3,013	698	4,687	1,222	3,465	-	-	1,145	-	-	-	68,715	223	-
Period 1c Period-Dependent Costs																					
1c.4.1	Insurance	-	-	-	-	-	-	403	40	444	444	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	-	-	-	-	-	3,032	303	3,335	3,335	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-	165	-	-	-	-	-	41	206	206	-	-	-	-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	115	-	-	-	-	-	17	132	132	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	3	1	-	9	-	3	15	15	-	-	-	152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	693	104	797	797	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	167	17	183	183	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	474	47	522	-	522	-	-	-	-	-	-	-	-	-
1c.4.9	Site O&M Costs	-	-	-	-	-	-	79	12	90	90	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	194	29	223	-	223	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	23	3	26	-	26	-	-	-	-	-	-	-	-	-
1c.4.12	Security Staff Cost	-	-	-	-	-	-	1,785	268	2,052	2,052	-	-	-	-	-	-	-	-	-	39,260
1c.4.13	Utility Staff Cost	-	-	-	-	-	-	8,459	1,269	9,728	9,728	-	-	-	-	-	-	-	-	-	105,560
1c.4	Subtotal Period 1c Period-Dependent Costs	-	279	3	1	-	9	15,308	2,153	17,754	16,983	770	-	-	152	-	-	-	3,039	5	144,820
1c.0	TOTAL PERIOD 1c COST	186	763	81	325	-	393	19,127	3,154	24,029	19,794	4,235	-	-	1,297	-	-	-	71,755	13,755	145,403
PERIOD 1 TOTALS		11,381	2,565	222	749	-	1,002	121,158	23,407	160,485	128,449	32,035	-	-	4,751	-	-	-	199,661	150,625	906,985
PERIOD 2a - SAFSTOR Dormancy with Wet Spent Fuel 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									a											
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	633	95	728	728	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	548	137	685	685	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	1,181	232	1,413	1,413	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	49,709	7,456	57,166	-	57,166	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	49,709	7,456	57,166	-	57,166	-	-	-	-	-	-	-	-	-
Period 2a Period-Dependent Costs																					
2a.4.1	Insurance	-	-	-	-	-	-	3,174	317	3,491	2,276	1,215	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	-	-	-	-	-	21,272	2,127	23,400	4,400	19,000	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	702	-	-	-	-	-	176	878	878	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	19	4	-	54	-	16	92	92	-	-	-	921	-	-	-	18,419	30	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	2,226	334	2,560	1,280	1,280	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	1,102	110	1,212	1,212	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	7,613	761	8,374	-	8,374	-	-	-	-	-	-	-	-	-
2a.4.8	Site O&M Costs	-	-	-	-	-	-	1,263	189	1,452	1,452	-	-	-	-	-	-	-	-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	3,109	466	3,575	-	3,575	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	365	55	420	-	420	-	-	-	-	-	-	-	-	-
2a.4.11	Security Staff Cost	-	-	-	-	-	-	20,607	3,091	23,698	7,791	15,906	-	-	-	-	-	-	-	-	444,561
2a.4.12	Utility Staff Cost	-	-	-	-	-	-	27,049	4,057	31,106	6,627	24,480	-	-	-	-	-	-	-	-	329,769
2a.4	Subtotal Period 2a Period-Dependent Costs	-	702	19	4	-	54	87,779	11,700	100,258	26,008	74,250	-	-	921	-	-	-	18,419	30	774,330
2a.0	TOTAL PERIOD 2a COST	-	702	19	4	-	54	138,670	19,389	158,837	27,421	131,416	-	-	921	-	-	-	18,419	30	774,330
PERIOD 2b - SAFSTOR Dormancy with Dry Spent Fuel Storage																					
Period 2b Direct Decommissioning Activities																					
2b.1.1	Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3	Prepare reports									a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	2,019	303	2,322	2,322	-	-	-	-	-	-	-	-	-	-
2b.1.5	Maintenance supplies	-	-	-	-	-	-	1,748	437	2,185	2,185	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	3,767	740	4,507	4,507	-	-	-	-	-	-	-	-	-	-

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2b Collateral Costs																					
2b.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	8,250	1,238	9,488	-	9,488	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	8,250	1,238	9,488	-	9,488	-	-	-	-	-	-	-	-	-
Period 2b Period-Dependent Costs																					
2b.4.1	Insurance	-	-	-	-	-	-	6,600	660	7,260	-	7,260	-	-	-	-	-	-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	12,758	1,276	14,034	14,034	-	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	1,087	-	-	-	-	-	272	1,358	1,358	-	-	-	-	-	-	-	-	-	-
2b.4.4	Disposal of DAW generated	-	-	29	6	-	82	-	24	141	141	-	-	-	1,411	-	-	-	28,221	46	-
2b.4.5	Plant energy budget	-	-	-	-	-	-	3,550	533	4,083	4,083	-	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	3,346	335	3,680	3,680	-	-	-	-	-	-	-	-	-	-
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	24,282	2,428	26,710	-	26,710	-	-	-	-	-	-	-	-	-
2b.4.8	Site O&M Costs	-	-	-	-	-	-	4,028	604	4,632	-	4,632	-	-	-	-	-	-	-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	1,166	175	1,341	-	1,341	-	-	-	-	-	-	-	-	-
2b.4.10	Security Staff Cost	-	-	-	-	-	-	35,451	5,318	40,768	-	40,768	-	-	-	-	-	-	-	-	718,971
2b.4.11	Utility Staff Cost	-	-	-	-	-	-	34,591	5,189	39,780	22,422	17,358	-	-	-	-	-	-	-	-	426,057
2b.4	Subtotal Period 2b Period-Dependent Costs	-	1,087	29	6	-	82	125,771	16,812	143,788	45,719	98,069	-	-	1,411	-	-	-	28,221	46	1,145,029
2b.0	TOTAL PERIOD 2b COST	-	1,087	29	6	-	82	137,789	18,790	157,782	50,226	107,556	-	-	1,411	-	-	-	28,221	46	1,145,029
PERIOD 2c - SAFSTOR Dormancy without Spent Fuel Storage																					
Period 2c 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	-	-	-	-	-	-	5,647	847	6,494	6,494	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	4,888	1,222	6,111	6,111	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	10,536	2,069	12,605	12,605	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	18,459	1,846	20,305	20,305	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	35,682	3,568	39,251	39,251	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	2,859	-	-	-	-	-	715	3,573	3,573	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	75	14	-	212	-	63	364	364	-	-	-	3,635	-	-	-	72,692	119	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	9,929	1,489	11,418	11,418	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	8,575	858	9,433	9,433	-	-	-	-	-	-	-	-	-	-
2c.4.7	Site O&M Costs	-	-	-	-	-	-	11,266	1,690	12,956	12,956	-	-	-	-	-	-	-	-	-	-
2c.4.8	Security Staff Cost	-	-	-	-	-	-	60,439	9,066	69,504	69,504	-	-	-	-	-	-	-	-	-	1,117,114
2c.4.9	Utility Staff Cost	-	-	-	-	-	-	51,402	7,710	59,112	59,112	-	-	-	-	-	-	-	-	-	651,650
2c.4	Subtotal Period 2c Period-Dependent Costs	-	2,859	75	14	-	212	195,751	27,004	225,916	225,916	-	-	-	3,635	-	-	-	72,692	119	1,768,764
2c.0	TOTAL PERIOD 2c COST	-	2,859	75	14	-	212	206,287	29,073	238,520	238,520	-	-	-	3,635	-	-	-	72,692	119	1,768,764
PERIOD 2 TOTALS		-	4,648	123	24	-	348	482,745	67,252	555,139	316,168	238,972	-	-	5,967	-	-	-	119,331	195	3,688,123
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	574	86	661	661	-	-	-	-	-	-	-	-	-	4,600
3a.1.3	Perform detailed rad survey									a											
3a.1.4	End product description	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3a.1.5	Detailed by-product inventory	-	-	-	-	-	-	162	24	187	187	-	-	-	-	-	-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	937	140	1,077	1,077	-	-	-	-	-	-	-	-	-	7,500
3a.1.7	Perform SER and EA	-	-	-	-	-	-	387	58	445	445	-	-	-	-	-	-	-	-	-	3,100
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	624	94	718	718	-	-	-	-	-	-	-	-	-	5,000
3a.1.9	Prepare/submit License Termination Plan	-	-	-	-	-	-	512	77	588	588	-	-	-	-	-	-	-	-	-	4,096
3a.1.10	Receive NRC approval of termination plan									a											

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Activity Specifications																					
3a.1.11.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	920	138	1,058	953	-	106	-	-	-	-	-	-	-	7,370
3a.1.11.2	Plant systems	-	-	-	-	-	-	520	78	598	539	-	60	-	-	-	-	-	-	-	4,167
3a.1.11.3	Reactor internals	-	-	-	-	-	-	887	133	1,020	1,020	-	-	-	-	-	-	-	-	-	7,100
3a.1.11.4	Reactor vessel	-	-	-	-	-	-	812	122	933	933	-	-	-	-	-	-	-	-	-	6,500
3a.1.11.5	Sacrificial shield	-	-	-	-	-	-	62	9	72	72	-	-	-	-	-	-	-	-	-	500
3a.1.11.6	Moisture separators/reheaters	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3a.1.11.7	Reinforced concrete	-	-	-	-	-	-	200	30	230	115	-	115	-	-	-	-	-	-	-	1,600
3a.1.11.8	Main Turbine	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
3a.1.11.9	Main Condensers	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
3a.1.11.10	Pressure suppression structure	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
3a.1.11.11	Drywell	-	-	-	-	-	-	200	30	230	230	-	-	-	-	-	-	-	-	-	1,600
3a.1.11.12	Plant structures & buildings	-	-	-	-	-	-	390	58	448	224	-	224	-	-	-	-	-	-	-	3,120
3a.1.11.13	Waste management	-	-	-	-	-	-	574	86	661	661	-	-	-	-	-	-	-	-	-	4,600
3a.1.11.14	Facility & site closeout	-	-	-	-	-	-	112	17	129	65	-	65	-	-	-	-	-	-	-	900
3a.1.11	Total	-	-	-	-	-	-	5,574	836	6,410	5,841	-	569	-	-	-	-	-	-	-	44,633
Planning & Site Preparations																					
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	300	45	345	345	-	-	-	-	-	-	-	-	-	2,400
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	2,900	435	3,335	3,335	-	-	-	-	-	-	-	-	-	-
3a.1.14	Design water clean-up system	-	-	-	-	-	-	175	26	201	201	-	-	-	-	-	-	-	-	-	1,400
3a.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,200	330	2,530	2,530	-	-	-	-	-	-	-	-	-	-
3a.1.16	Procure casks/liners & containers	-	-	-	-	-	-	154	23	177	177	-	-	-	-	-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	14,786	2,218	17,003	16,434	-	569	-	-	-	-	-	-	-	77,559
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	517	52	569	569	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	999	100	1,099	1,099	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	382	-	-	-	-	-	96	478	478	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	460	-	-	-	-	-	69	529	529	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	11	2	-	30	-	9	52	52	-	-	-	514	-	-	-	10,287	17	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	2,781	417	3,198	3,198	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	362	36	399	399	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Costs	-	-	-	-	-	-	316	47	363	363	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	3,161	474	3,635	3,635	-	-	-	-	-	-	-	-	-	65,179
3a.4.10	Utility Staff Cost	-	-	-	-	-	-	20,817	3,123	23,939	23,939	-	-	-	-	-	-	-	-	-	258,629
3a.4	Subtotal Period 3a Period-Dependent Costs	-	842	11	2	-	30	28,952	4,422	34,259	34,259	-	-	-	514	-	-	-	10,287	17	323,807
3a.0	TOTAL PERIOD 3a COST	-	842	11	2	-	30	43,738	6,640	51,262	50,693	-	569	-	514	-	-	-	10,287	17	401,366
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	591	89	680	612	-	68	-	-	-	-	-	-	-	4,733
3b.1.1.2	Reactor internals	-	-	-	-	-	-	500	75	574	574	-	-	-	-	-	-	-	-	-	4,000
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	169	25	194	48	-	145	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD housings & NIs	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5	Incore instrumentation	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	Removal primary containment	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	453	68	521	521	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	150	22	172	86	-	86	-	-	-	-	-	-	-	1,200
3b.1.1.9	Sacrificial shield	-	-	-	-	-	-	150	22	172	172	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	125	19	144	72	-	72	-	-	-	-	-	-	-	1,000
3b.1.1.11	Main Turbine	-	-	-	-	-	-	260	39	299	299	-	-	-	-	-	-	-	-	-	2,080
3b.1.1.12	Main Condensers	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	2,088
3b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.14	Radwaste building	-	-	-	-	-	-	341	51	392	353	-	39	-	-	-	-	-	-	-	2,730
3b.1.1.15	Reactor building	-	-	-	-	-	-	341	51	392	353	-	39	-	-	-	-	-	-	-	2,730
3b.1.1	Total	-	-	-	-	-	-	4,089	613	4,702	4,252	-	450	-	-	-	-	-	-	-	32,741
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	4,089	613	4,702	4,252	-	450	-	-	-	-	-	-	-	32,741

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b Additional Costs																					
3b.2.1	Site Characterization	-	-	-	-	-	-	6,608	1,982	8,591	8,591	-	-	-	-	-	-	-	-	30,500	10,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	6,608	1,982	8,591	8,591	-	-	-	-	-	-	-	-	30,500	10,852
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	841	-	-	-	-	-	-	126	968	968	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,100	-	-	-	-	-	165	1,265	1,265	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	841	1,100	-	-	-	-	1,030	446	3,417	3,417	-	-	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	26	-	-	-	-	-	-	6	32	32	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	259	26	285	285	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	501	50	551	551	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	211	-	-	-	-	-	53	264	264	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	231	-	-	-	-	-	35	265	265	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	1	-	17	-	5	29	29	-	-	-	292	-	-	-	5,834	10	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	1,394	209	1,603	1,603	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	182	18	200	200	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Costs	-	-	-	-	-	-	158	24	182	182	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	1,585	238	1,822	1,822	-	-	-	-	-	-	-	-	-	32,679
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	5,195	779	5,974	5,974	-	-	-	-	-	-	-	-	-	58,560
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	10,437	1,566	12,002	12,002	-	-	-	-	-	-	-	-	-	129,669
3b.4	Subtotal Period 3b Period-Dependent Costs	26	442	6	1	-	17	19,710	3,008	23,211	23,211	-	-	-	292	-	-	-	5,834	10	220,907
3b.0	TOTAL PERIOD 3b COST	867	1,542	6	1	-	17	31,437	6,050	39,920	39,470	-	450	-	292	-	-	-	5,834	30,510	264,500
PERIOD 3 TOTALS		867	2,384	17	3	-	47	75,174	12,690	91,182	90,163	-	1,019	-	806	-	-	-	16,121	30,526	665,866
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Recirculation System Piping & Valves	13	49	11	8	18	39	-	33	171	171	-	-	265	280	-	-	-	61,461	1,078	-
4a.1.1.2	Recirculation Pumps & Motors	13	44	14	31	85	140	-	71	398	398	-	-	1,487	1,237	-	-	-	251,240	1,145	-
4a.1.1.3	CRDMs & NIs Removal	51	191	535	107	-	161	-	183	1,229	1,229	-	-	-	6,985	-	-	-	131,119	4,212	-
4a.1.1.4	Reactor Vessel Internals	90	3,403	5,115	1,026	-	6,417	278	7,383	23,712	23,712	-	-	-	1,388	751	1,038	-	339,285	30,367	1,347
4a.1.1.5	Vessel & Internals GTCC Disposal	-	-	-	-	-	7,415	-	1,112	8,527	8,527	-	-	-	-	-	-	1,785	351,100	-	-
4a.1.1.6	Reactor Vessel	-	7,182	2,269	551	-	3,859	278	8,063	22,201	22,201	-	-	-	15,059	-	-	-	1,531,890	30,367	1,347
4a.1.1	Totals	167	10,869	7,944	1,722	103	18,031	556	16,845	56,238	56,238	-	-	1,752	24,949	751	1,038	1,785	2,666,095	67,169	2,693
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	381	323	63	439	-	-	203	1,408	1,408	-	-	15,719	-	-	-	-	707,358	6,934	-
4a.1.3	Main Condensers	-	1,199	1,114	217	1,512	-	-	670	4,712	4,712	-	-	54,200	-	-	-	-	2,439,000	22,050	-
Cascading Costs from Clean Building Demolition																					
4a.1.4.1	Reactor Building	-	1,021	-	-	-	-	-	153	1,174	1,174	-	-	-	-	-	-	-	-	11,450	-
4a.1.4.2	Auxiliary Building	-	245	-	-	-	-	-	37	281	281	-	-	-	-	-	-	-	-	2,582	-
4a.1.4.3	Radwaste Building	-	579	-	-	-	-	-	87	666	666	-	-	-	-	-	-	-	-	6,493	-
4a.1.4.4	Turbine Building	-	577	-	-	-	-	-	87	664	664	-	-	-	-	-	-	-	-	6,771	-
4a.1.4.5	Fuel Building	-	268	-	-	-	-	-	40	309	309	-	-	-	-	-	-	-	-	2,912	-
4a.1.4	Totals	-	2,690	-	-	-	-	-	404	3,094	3,094	-	-	-	-	-	-	-	-	30,209	-
Disposal of Plant Systems																					
4a.1.5.1	Acid Feed & Handling	-	35	1	2	12	-	-	11	60	60	-	-	493	-	-	-	-	20,012	573	-
4a.1.5.2	Auxiliary Steam	-	652	12	27	192	-	-	197	1,080	1,080	-	-	7,613	-	-	-	-	309,178	10,682	-
4a.1.5.3	Breathing Air	-	44	-	-	-	-	-	7	51	-	-	51	-	-	-	-	-	-	877	-
4a.1.5.4	CO2 & Generator Purge	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	373	-
4a.1.5.5	Caustic Handling	-	18	0	1	5	-	-	5	29	29	-	-	186	-	-	-	-	7,571	285	-
4a.1.5.6	Chem Radwaste Reprocessing & Disposal	-	459	50	40	85	141	-	174	950	950	-	-	3,392	2,056	-	-	-	252,395	7,957	-
4a.1.5.7	Chilled Water - RCA	-	1,395	24	58	407	-	-	421	2,305	2,305	-	-	16,163	-	-	-	-	656,386	22,847	-
4a.1.5.8	Chilled Water Non-RCA	-	202	-	-	-	-	-	30	232	-	-	232	-	-	-	-	-	-	3,958	-
4a.1.5.9	Chlorination	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	988	-

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
4a.1.5.10	Circulating Water - RCA	-	207	14	34	237	-	-	94	585	585	-	-	9,402	-	-	-	-	381,817	3,590	-
4a.1.5.11	Circulating Water Non-RCA	-	57	-	-	-	-	-	8	65	-	-	65	-	-	-	-	-	-	1,093	-
4a.1.5.12	Cntnmnt Aux & Fuel Bldg Equip Drains	-	114	7	6	9	21	-	37	193	193	-	-	344	306	-	-	-	31,322	1,890	-
4a.1.5.13	Cntnmnt Aux & Fuel Bldg Floor Drains	-	179	9	8	29	19	-	56	300	300	-	-	1,157	278	-	-	-	62,722	3,022	-
4a.1.5.14	Component Cooling Water Non-RCA	-	137	-	-	-	-	-	21	158	-	-	158	-	-	-	-	-	-	2,681	-
4a.1.5.15	Condensate	-	1,064	155	166	580	416	-	497	2,879	2,879	-	-	23,020	5,962	-	-	-	1,272,859	18,802	-
4a.1.5.16	Condensate Booster	-	963	337	317	762	1,036	-	695	4,109	4,109	-	-	30,263	14,866	-	-	-	2,071,290	17,575	-
4a.1.5.17	Condensate Polishing	-	837	53	48	169	126	-	277	1,502	1,502	-	-	6,320	1,812	-	-	-	359,429	14,284	-
4a.1.5.18	Condenser Vacuum	-	227	15	36	255	-	-	102	636	636	-	-	10,118	-	-	-	-	410,897	3,912	-
4a.1.5.19	Containment Combustible Gas	-	90	2	4	27	-	-	27	150	150	-	-	1,079	-	-	-	-	43,821	1,537	-
4a.1.5.20	Cycled Condensate	-	755	43	42	152	103	-	248	1,343	1,343	-	-	6,039	1,481	-	-	-	328,957	12,882	-
4a.1.5.21	Drywell Cooling	-	572	10	25	176	-	-	174	958	958	-	-	6,996	-	-	-	-	284,127	9,171	-
4a.1.5.22	Drywell Purge	-	162	5	13	92	-	-	57	330	330	-	-	3,669	-	-	-	-	149,002	2,830	-
4a.1.5.23	ECCS Equipment Cooling	-	79	2	5	32	-	-	25	142	142	-	-	1,252	-	-	-	-	50,856	1,311	-
4a.1.5.24	Extraction Steam	-	565	64	65	210	176	-	233	1,313	1,313	-	-	8,333	2,526	-	-	-	481,604	9,893	-
4a.1.5.25	Feedwater	-	598	127	126	368	367	-	328	1,913	1,913	-	-	14,601	5,262	-	-	-	891,180	10,721	-
4a.1.5.26	Feedwater Heater Drains Turbine Cycle	-	1,474	125	130	443	330	-	550	3,052	3,052	-	-	17,605	4,731	-	-	-	983,039	25,639	-
4a.1.5.27	Feedwater Heater Misc.	-	246	17	14	32	46	-	82	436	436	-	-	1,264	661	-	-	-	88,853	4,161	-
4a.1.5.28	Filtered Water	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	90	-
4a.1.5.29	Generator Hydrogen Seal Oil	-	35	0	1	6	-	-	10	53	53	-	-	253	-	-	-	-	10,263	550	-
4a.1.5.30	Generator Stator Cooling	-	20	0	1	5	-	-	6	32	32	-	-	208	-	-	-	-	8,443	343	-
4a.1.5.31	High Pressure Core Spray	-	294	32	36	133	83	-	123	701	701	-	-	5,277	1,194	-	-	-	281,966	5,172	-
4a.1.5.32	Hydrogen	-	32	0	1	4	-	-	9	47	47	-	-	178	-	-	-	-	7,225	490	-
4a.1.5.33	Laundry Equip & Flr Drains RW Reprocess	-	242	12	15	69	24	-	80	442	442	-	-	2,760	350	-	-	-	131,644	4,191	-
4a.1.5.34	Leak Detection	-	46	0	0	2	-	-	12	61	61	-	-	87	-	-	-	-	3,522	839	-
4a.1.5.35	Local Instrument Panels	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	119	-
4a.1.5.36	Low Pressure Core Spray	-	113	16	18	73	39	-	53	314	314	-	-	2,917	559	-	-	-	159,192	1,987	-
4a.1.5.37	Machine Shop Equipment	-	13	0	1	6	-	-	4	23	23	-	-	225	-	-	-	-	9,119	216	-
4a.1.5.38	Machine Shop Ventilation	-	250	4	10	71	-	-	75	410	410	-	-	2,806	-	-	-	-	113,939	3,670	-
4a.1.5.39	Main Steam	-	1,006	89	85	264	233	-	371	2,048	2,048	-	-	10,489	3,342	-	-	-	615,663	17,380	-
4a.1.5.40	Main Steam Isolation Valve	-	28	2	1	1	4	-	9	45	45	-	-	49	62	-	-	-	5,527	460	-
4a.1.5.41	Make-up Demineralizer - RCA	-	255	4	9	62	-	-	75	405	405	-	-	2,474	-	-	-	-	100,485	4,066	-
4a.1.5.42	Make-up Demineralizer Non-RCA	-	234	-	-	-	-	-	35	269	-	-	269	-	-	-	-	-	-	4,440	-
4a.1.5.43	Makeup Condensate Storage	-	322	22	15	27	56	-	103	545	545	-	-	1,056	805	-	-	-	88,679	5,325	-
4a.1.5.44	Misc. Building Drains	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	372	-
4a.1.5.45	Miscellaneous Ventilation	-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	688	-
4a.1.5.46	Nuclear Boiler	-	19	1	1	1	3	-	6	30	30	-	-	35	36	-	-	-	3,464	338	-
4a.1.5.47	Oil Transfer	-	115	4	9	61	-	-	40	229	229	-	-	2,442	-	-	-	-	99,182	1,945	-
4a.1.5.48	Reactor Core Isolation Cooling	-	252	14	15	63	30	-	84	458	458	-	-	2,511	438	-	-	-	126,640	4,379	-
4a.1.5.49	Refrigeration Piping	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	435	-
4a.1.5.50	Sanitary	-	169	-	-	-	-	-	25	195	-	-	195	-	-	-	-	-	-	3,202	-
4a.1.5.51	Screen House & MU Pump House Ventilation	-	36	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	751	-
4a.1.5.52	Standby Liquid Control	-	35	1	2	11	-	-	11	58	58	-	-	417	-	-	-	-	16,953	569	-
4a.1.5.53	Switchgear Heat Removal	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	426	-
4a.1.5.54	Turbine Building Closed Cooling Water	-	204	3	8	54	-	-	60	329	329	-	-	2,149	-	-	-	-	87,291	3,298	-
4a.1.5.55	Turbine Electrohydraulic Control	-	11	0	0	2	-	-	3	17	17	-	-	84	-	-	-	-	3,425	189	-
4a.1.5.56	Turbine Gen Misc Drains & Vents	-	69	0	1	9	-	-	19	98	98	-	-	339	-	-	-	-	13,772	1,122	-
4a.1.5.57	Turbine Gland Seal Steam	-	396	19	48	337	-	-	159	960	960	-	-	13,399	-	-	-	-	544,147	6,883	-
4a.1.5.58	Turbine Oil	-	58	2	5	31	-	-	20	115	115	-	-	1,251	-	-	-	-	50,795	1,024	-
4a.1.5.59	Turbine-Gen Aux & Misc Devices	-	260	30	77	536	-	-	160	1,063	1,063	-	-	21,282	-	-	-	-	864,279	4,767	-
4a.1.5	Totals	-	15,826	1,329	1,525	6,093	3,255	-	5,940	33,968	32,749	-	1,218	241,997	46,726	-	-	-	12,473,930	273,260	-
4a.1.6	Scaffolding in support of decommissioning	-	3,360	68	16	83	22	-	867	4,417	4,417	-	-	2,969	314	-	-	-	151,389	63,809	-
4a.1	Subtotal Period 4a Activity Costs	167	34,326	10,778	3,542	8,230	21,308	556	24,929	103,836	102,617	-	1,218	316,637	71,989	751	1,038	1,785	18,437,770	463,430	2,693
Period 4a Additional Costs																					
4a.2.1	Disposal of Stored Turbine Rotors	-	27	246	103	822	-	-	170	1,368	1,368	-	-	29,464	-	-	-	-	1,325,880	469	-
4a.2	Subtotal Period 4a Additional Costs	-	27	246	103	822	-	-	170	1,368	1,368	-	-	29,464	-	-	-	-	1,325,880	469	-
Period 4a Collateral Costs																					
4a.3.1	Process decommissioning water waste	5	-	6	23	-	27	-	13	74	74	-	-	-	81	-	-	-	4,885	16	-
4a.3.3	Small tool allowance	-	445	-	-	-	-	-	67	512	461	-	51	-	-	-	-	-	-	-	-

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
4a.3	Subtotal Period 4a Collateral Costs	5	445	6	23	-	27	-	80	586	535	-	51	-	81	-	-	-	4,885	16	-
Period 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	74	-	-	-	-	-	-	18	92	92	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	742	74	816	816	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	1,435	143	1,578	1,420	-	158	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	2,499	-	-	-	-	-	625	3,124	3,124	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,669	-	-	-	-	-	400	3,070	3,070	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	162	31	-	461	-	136	791	791	-	-	-	7,899	-	-	-	157,982	258	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	3,792	569	4,361	4,361	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	838	84	922	922	-	-	-	-	-	-	-	-	-	-
4a.4.9	Site O&M Costs	-	-	-	-	-	-	453	68	521	521	-	-	-	-	-	-	-	-	-	-
4a.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	566	85	651	651	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	4,538	681	5,218	5,218	-	-	-	-	-	-	-	-	-	93,571
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	17,994	2,699	20,693	20,693	-	-	-	-	-	-	-	-	-	206,606
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	30,161	4,524	34,685	34,685	-	-	-	-	-	-	-	-	-	374,286
4a.4	Subtotal Period 4a Period-Dependent Costs	74	5,168	162	31	-	461	60,518	10,107	76,522	76,364	-	158	-	7,899	-	-	-	157,982	258	674,463
4a.0	TOTAL PERIOD 4a COST	246	39,966	11,192	3,699	9,052	21,796	61,075	35,286	182,312	180,884	-	1,427	346,101	79,969	751	1,038	1,785	19,926,520	464,173	677,156
PERIOD 4b - Site Decontamination																					
Period 4b Direct Decommissioning Activities																					
4b.1.1	Remove spent fuel racks	839	78	181	218	-	1,086	-	761	3,163	3,163	-	-	-	15,584	-	-	-	882,760	1,537	-
Disposal of Plant Systems																					
4b.1.2.1	Component Cooling Water - RCA	-	244	4	9	61	-	-	72	389	389	-	-	2,412	-	-	-	-	97,965	3,955	-
4b.1.2.2	Containment Monitoring	-	64	0	1	5	-	-	17	87	87	-	-	187	-	-	-	-	7,595	1,149	-
4b.1.2.3	Control Rod Drive	-	474	26	21	53	66	-	149	790	790	-	-	2,113	951	-	-	-	139,851	8,125	-
4b.1.2.4	Diesel Fuel Oil	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	1,276	-
4b.1.2.5	Diesel General	-	59	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	1,150	-
4b.1.2.6	Diesel-Generator Room Ventilation	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,848	-
4b.1.2.7	Drains-Laundry to Radwaste	-	20	1	1	2	3	-	6	32	32	-	-	67	39	-	-	-	4,925	334	-
4b.1.2.8	Electrical - Clean Non-RCA	-	1,735	-	-	-	-	-	260	1,995	-	-	1,995	-	-	-	-	-	-	33,545	-
4b.1.2.9	Electrical - Clean RCA	-	7,621	113	270	1,884	-	-	2,240	12,127	12,127	-	-	74,814	-	-	-	-	3,038,244	126,569	-
4b.1.2.10	Electrical - Contaminated	-	1,121	12	30	209	-	-	317	1,689	1,689	-	-	8,281	-	-	-	-	336,300	19,039	-
4b.1.2.11	Equip Drain Radwaste Reprocessing	-	1,370	74	72	254	178	-	443	2,391	2,391	-	-	10,072	2,566	-	-	-	553,918	23,392	-
4b.1.2.12	Fire Protection - RCA	-	806	14	33	229	-	-	242	1,323	1,323	-	-	9,085	-	-	-	-	368,934	13,156	-
4b.1.2.13	Fire Protection Non-RCA	-	182	-	-	-	-	-	27	210	-	-	210	-	-	-	-	-	-	3,585	-
4b.1.2.14	Floor Drain Radwaste Reprocessing	-	842	63	60	193	160	-	295	1,613	1,613	-	-	7,671	2,306	-	-	-	441,819	14,444	-
4b.1.2.15	Fuel Handling & Transfer	-	27	2	2	7	6	-	10	55	55	-	-	263	92	-	-	-	15,903	483	-
4b.1.2.16	Fuel Pool Cooling & Cleanup	-	1,078	93	89	287	238	-	395	2,180	2,180	-	-	11,395	3,413	-	-	-	656,370	18,444	-
4b.1.2.17	Fuel Support	-	106	12	13	42	33	-	44	248	248	-	-	1,649	472	-	-	-	93,750	1,905	-
4b.1.2.18	HVAC - Auxiliary Building	-	33	1	2	15	-	-	11	63	63	-	-	612	-	-	-	-	24,859	592	-
4b.1.2.19	HVAC - Containment Building	-	835	19	47	331	-	-	267	1,500	1,500	-	-	13,152	-	-	-	-	534,096	12,947	-
4b.1.2.20	HVAC - Control Room	-	282	-	-	-	-	-	42	324	-	-	324	-	-	-	-	-	-	5,842	-
4b.1.2.21	HVAC - Fuel Building	-	355	6	14	101	-	-	107	582	582	-	-	3,994	-	-	-	-	162,195	5,172	-
4b.1.2.22	HVAC - Laboratory	-	569	9	23	161	-	-	171	933	933	-	-	6,394	-	-	-	-	259,676	8,426	-
4b.1.2.23	HVAC - Off Gas Building	-	151	3	7	48	-	-	46	254	254	-	-	1,887	-	-	-	-	76,626	2,458	-
4b.1.2.24	HVAC - Radwaste Building	-	809	14	36	253	-	-	247	1,359	1,359	-	-	10,046	-	-	-	-	407,957	12,025	-
4b.1.2.25	HVAC - Service Building	-	65	-	-	-	-	-	10	74	-	-	74	-	-	-	-	-	-	1,265	-
4b.1.2.26	HVAC - Turbine Building	-	665	11	28	197	-	-	201	1,103	1,103	-	-	7,840	-	-	-	-	318,387	9,720	-
4b.1.2.27	Hoists Cranes & Elevators	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	123	-
4b.1.2.28	Instrument Air - RCA	-	556	4	10	72	-	-	152	795	795	-	-	2,875	-	-	-	-	116,761	8,528	-
4b.1.2.29	Instrument Air Non-RCA	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	429	-
4b.1.2.30	Off Gas	-	214	3	8	55	-	-	63	344	344	-	-	2,203	-	-	-	-	89,451	3,589	-
4b.1.2.31	Plant Service Water - RCA	-	238	5	11	78	-	-	73	405	405	-	-	3,090	-	-	-	-	125,493	3,884	-
4b.1.2.32	Plant Service Water Non RCA	-	184	-	-	-	-	-	28	212	-	-	212	-	-	-	-	-	-	3,643	-
4b.1.2.33	Potable Water	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	238	-
4b.1.2.34	Process Radiation Monitoring	-	125	1	2	14	-	-	34	176	176	-	-	554	-	-	-	-	22,497	2,046	-
4b.1.2.35	Process Sampling	-	630	3	8	58	-	-	168	867	867	-	-	2,290	-	-	-	-	93,002	10,271	-
4b.1.2.36	Reactor Recirculation	-	61	6	5	7	19	-	22	120	120	-	-	276	272	-	-	-	26,618	1,046	-
4b.1.2.37	Reactor Water Clean-up	-	352	30	25	45	90	-	124	666	666	-	-	1,784	1,297	-	-	-	145,974	5,978	-
4b.1.2.38	Residual Heat Removal	-	636	79	82	294	198	-	273	1,562	1,562	-	-	11,692	2,842	-	-	-	636,067	11,114	-

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2012 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Disposal of Plant Systems (continued)																					
4b.1.2.39	Screen Wash	-	7	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	146	-
4b.1.2.40	Service Air - RCA	-	325	4	9	64	-	-	93	496	496	-	-	2,553	-	-	-	-	103,666	5,156	-
4b.1.2.41	Service Air Non-RCA	-	17	-	-	-	-	-	3	19	-	-	19	-	-	-	-	-	-	329	-
4b.1.2.42	Shutdown Service Water - RCA	-	125	2	5	38	-	-	38	209	209	-	-	1,505	-	-	-	-	61,135	2,025	-
4b.1.2.43	Shutdown Service Water Non-RCA	-	119	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	2,328	-
4b.1.2.44	Solid Radwaste Reprocessing & Disposal	-	678	36	36	128	85	-	219	1,182	1,182	-	-	5,098	1,230	-	-	-	276,501	11,573	-
4b.1.2.45	Standby Gas Treatment	-	77	1	2	15	-	-	22	117	117	-	-	593	-	-	-	-	24,083	1,286	-
4b.1.2.46	Suppression Pool Cleanup & Transfer	-	132	10	9	28	25	-	46	250	250	-	-	1,103	362	-	-	-	65,367	2,264	-
4b.1.2.47	Suppression Pool Make-up	-	58	8	9	28	23	-	26	152	152	-	-	1,123	328	-	-	-	64,195	1,024	-
4b.1.2.48	Turb OG RW Cntrl & DG Bldg Equip Drains	-	258	15	11	20	40	-	81	425	425	-	-	808	566	-	-	-	64,966	4,267	-
4b.1.2.49	Turb OG RW Cntrl & DG Bldg Floor Drains	-	379	19	19	76	41	-	121	656	656	-	-	3,033	588	-	-	-	156,372	6,470	-
4b.1.2	Totals	-	24,881	703	1,008	5,351	1,207	-	7,262	40,412	37,139	-	3,273	212,512	17,323	-	-	-	9,611,517	418,603	-
4b.1.3	Scaffolding in support of decommissioning	-	5,040	102	24	124	33	-	1,301	6,625	6,625	-	-	4,453	471	-	-	-	227,083	95,713	-
Decontamination of Site Buildings																					
4b.1.4.1	Reactor Building	2,941	3,625	678	606	195	1,908	-	3,042	12,995	12,995	-	-	7,734	30,787	-	-	-	2,526,021	112,915	-
4b.1.4.2	Auxiliary Building	349	131	22	27	29	55	-	232	847	847	-	-	1,171	1,016	-	-	-	134,188	7,998	-
4b.1.4.3	Control Building	404	76	21	25	1	57	-	241	825	825	-	-	56	1,039	-	-	-	93,487	7,976	-
4b.1.4.4	Diesel Generator Building	117	19	6	7	-	15	-	69	234	234	-	-	-	284	-	-	-	24,996	2,274	-
4b.1.4.5	Radwaste Building	1,367	328	79	94	27	206	-	843	2,945	2,945	-	-	1,067	3,787	-	-	-	373,574	28,194	-
4b.1.4.6	Turbine Building	1,222	390	75	90	69	189	-	787	2,822	2,822	-	-	2,735	3,450	-	-	-	408,701	26,841	-
4b.1.4.7	Fuel Building	863	746	28	34	65	62	-	651	2,449	2,449	-	-	2,574	1,117	-	-	-	198,195	27,895	-
4b.1.4	Totals	7,264	5,316	909	883	386	2,492	-	5,865	23,116	23,116	-	-	15,337	41,480	-	-	-	3,759,162	214,093	-
4b.1	Subtotal Period 4b Activity Costs	8,103	35,316	1,896	2,133	5,861	4,818	-	15,189	73,316	70,043	-	3,273	232,302	74,857	-	-	-	14,480,520	729,946	-
Period 4b Additional Costs																					
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	954	286	1,240	1,240	-	-	-	-	-	-	-	-	-	6,240
4b.2.2	ISFSI License Termination	-	42	8	35	-	202	1,431	282	2,000	-	2,000	-	-	1,953	-	-	-	163,052	3,623	2,560
4b.2	Subtotal Period 4b Additional Costs	-	42	8	35	-	202	2,385	568	3,241	1,240	2,000	-	-	1,953	-	-	-	163,052	3,623	8,800
Period 4b Collateral Costs																					
4b.3.1	Process decommissioning water waste	16	-	18	73	-	87	-	42	235	235	-	-	-	258	-	-	-	15,481	50	-
4b.3.3	Small tool allowance	-	684	-	-	-	-	-	103	786	786	-	-	-	-	-	-	-	-	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	138	38	167	44	-	56	444	444	-	-	6,000	635	-	-	-	305,961	88	-
4b.3	Subtotal Period 4b Collateral Costs	16	684	156	111	167	131	-	200	1,465	1,465	-	-	6,000	893	-	-	-	321,442	138	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	2,312	-	-	-	-	-	-	578	2,889	2,889	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,231	123	1,354	1,354	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	2,379	238	2,617	2,617	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	3,985	-	-	-	-	-	996	4,981	4,981	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	4,380	-	-	-	-	-	657	5,037	5,037	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	236	45	-	670	-	198	1,149	1,149	-	-	-	11,473	-	-	-	229,464	374	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	4,965	745	5,710	5,710	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,390	139	1,529	1,529	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Costs	-	-	-	-	-	-	751	113	864	864	-	-	-	-	-	-	-	-	-	-
4b.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	939	141	1,080	1,080	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	7,525	1,129	8,654	8,654	-	-	-	-	-	-	-	-	-	155,179
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	29,085	4,363	33,447	33,447	-	-	-	-	-	-	-	-	-	332,703
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	47,308	7,096	54,405	54,405	-	-	-	-	-	-	-	-	-	585,954
4b.4	Subtotal Period 4b Period-Dependent Costs	2,312	8,365	236	45	-	670	95,573	16,515	123,715	123,715	-	-	-	11,473	-	-	-	229,464	374	1,073,836
4b.0	TOTAL PERIOD 4b COST	10,430	44,407	2,295	2,324	6,029	5,821	97,958	32,472	201,736	196,463	2,000	3,273	238,302	89,176	-	-	-	15,194,480	734,082	1,082,636
PERIOD 4f - License Termination																					
Period 4f Direct Decommissioning Activities																					
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	175	52	227	227	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license									a											
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	175	52	227	227	-	-	-	-	-	-	-	-	-	-

Table E
Clinton Power Station
SAFSTOR Decommissioning Cost Estimate
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 4f Additional Costs																					
4f.2.1	License Termination Survey	-	-	-	-	-	-	13,733	4,120	17,852	17,852	-	-	-	-	-	-	-	-	223,573	3,120
4f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	13,733	4,120	17,852	17,852	-	-	-	-	-	-	-	-	223,573	3,120
Period 4f Collateral Costs																					
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,030	154	1,184	1,184	-	-	-	-	-	-	-	-	-	-
Period 4f Period-Dependent Costs																					
4f.4.1	Insurance	-	-	-	-	-	-	385	39	424	424	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	-	-	-	-	-	745	74	819	819	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies	-	817	-	-	-	-	-	204	1,021	1,021	-	-	-	-	-	-	-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	1	-	20	-	6	35	35	-	-	-	347	-	-	-	6,948	11	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	414	62	477	477	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees	-	-	-	-	-	-	436	44	479	479	-	-	-	-	-	-	-	-	-	-
4f.4.7	Site O&M Costs	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
4f.4.8	Security Staff Cost	-	-	-	-	-	-	963	144	1,107	1,107	-	-	-	-	-	-	-	-	-	18,651
4f.4.9	DOC Staff Cost	-	-	-	-	-	-	5,194	779	5,974	5,974	-	-	-	-	-	-	-	-	-	56,731
4f.4.10	Utility Staff Cost	-	-	-	-	-	-	6,722	1,008	7,731	7,731	-	-	-	-	-	-	-	-	-	73,829
4f.4	Subtotal Period 4f Period-Dependent Costs	-	817	7	1	-	20	15,095	2,396	18,337	18,337	-	-	-	347	-	-	-	6,948	11	149,211
4f.0	TOTAL PERIOD 4f COST	-	817	7	1	-	20	30,032	6,723	37,600	37,600	-	-	-	347	-	-	-	6,948	223,585	152,331
PERIOD 4 TOTALS		10,676	85,189	13,494	6,025	15,081	27,638	189,064	74,481	421,648	414,947	2,000	4,700	584,403	169,493	751	1,038	1,785	35,127,950	1,421,840	1,912,123
PERIOD 5b - Site Restoration																					
Period 5b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
5b.1.1.1	Reactor Building	-	5,791	-	-	-	-	-	869	6,659	-	-	6,659	-	-	-	-	-	-	65,001	-
5b.1.1.2	Auxiliary Building	-	2,202	-	-	-	-	-	330	2,533	-	-	2,533	-	-	-	-	-	-	23,242	-
5b.1.1.3	Circulating Water Screenhouse	-	3,609	-	-	-	-	-	541	4,150	-	-	4,150	-	-	-	-	-	-	38,418	-
5b.1.1.4	Control Building	-	5,265	-	-	-	-	-	790	6,054	-	-	6,054	-	-	-	-	-	-	56,578	-
5b.1.1.5	Diesel Generator Building	-	1,858	-	-	-	-	-	279	2,136	-	-	2,136	-	-	-	-	-	-	20,234	-
5b.1.1.6	Make-Up Water Pump House	-	380	-	-	-	-	-	57	437	-	-	437	-	-	-	-	-	-	5,100	-
5b.1.1.7	Miscellaneous Site Work	-	1,785	-	-	-	-	-	268	2,053	-	-	2,053	-	-	-	-	-	-	21,227	-
5b.1.1.8	Miscellaneous Structures	-	2,782	-	-	-	-	-	417	3,199	-	-	3,199	-	-	-	-	-	-	44,561	-
5b.1.1.9	Radwaste Building	-	5,212	-	-	-	-	-	782	5,994	-	-	5,994	-	-	-	-	-	-	58,440	-
5b.1.1.10	Service Building	-	402	-	-	-	-	-	60	462	-	-	462	-	-	-	-	-	-	5,585	-
5b.1.1.11	Transformer and Tank Pads	-	173	-	-	-	-	-	26	199	-	-	199	-	-	-	-	-	-	2,463	-
5b.1.1.12	Turbine Building	-	5,324	-	-	-	-	-	799	6,123	-	-	6,123	-	-	-	-	-	-	63,415	-
5b.1.1.13	Turbine Pedestal	-	1,223	-	-	-	-	-	184	1,407	-	-	1,407	-	-	-	-	-	-	12,474	-
5b.1.1.14	Fuel Building	-	2,442	-	-	-	-	-	366	2,808	-	-	2,808	-	-	-	-	-	-	26,720	-
5b.1.1	Totals	-	38,447	-	-	-	-	-	5,767	44,215	-	-	44,215	-	-	-	-	-	-	443,457	-
Site Closeout Activities																					
5b.1.2	BackFill Site	-	109	-	-	-	-	-	16	125	-	-	125	-	-	-	-	-	-	201	-
5b.1.3	Grade & landscape site	-	2,154	-	-	-	-	-	323	2,477	-	-	2,477	-	-	-	-	-	-	4,449	-
5b.1.4	Final report to NRC	-	-	-	-	-	-	195	29	224	224	-	-	-	-	-	-	-	-	-	1,560
5b.1	Subtotal Period 5b Activity Costs	-	40,710	-	-	-	-	195	6,136	47,041	224	-	46,817	-	-	-	-	-	-	448,106	1,560
Period 5b Additional Costs																					
5b.2.1	Concrete Crushing	-	1,515	-	-	-	-	9	229	1,753	-	-	1,753	-	-	-	-	-	-	7,355	-
5b.2.2	Screenhouse Cofferdam	-	1,096	-	-	-	-	-	164	1,260	-	-	1,260	-	-	-	-	-	-	10,159	-
5b.2.3	Discharge Flume & Unit 2 Excavation Backfill	-	5,440	-	-	-	-	-	816	6,256	-	-	6,256	-	-	-	-	-	-	37,059	-
5b.2.4	ISFSI Site Restoration	-	1,440	-	-	-	-	50	224	1,714	-	1,714	-	-	-	-	-	-	-	19,129	160
5b.2	Subtotal Period 5b Additional Costs	-	9,492	-	-	-	-	60	1,433	10,984	-	1,714	9,269	-	-	-	-	-	-	73,702	160
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	465	-	-	-	-	-	70	535	-	-	535	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	465	-	-	-	-	-	70	535	-	-	535	-	-	-	-	-	-	-	-

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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 5b Period-Dependent Costs																					
5b.4.2	Property taxes	-	-	-	-	-	-	2,264	226	2,491	-	2,491	-	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	5,959	-	-	-	-	-	894	6,853	-	-	6,853	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	630	95	725	-	-	725	-	-	-	-	-	-	-	-
5b.4.5	Site O&M Costs	-	-	-	-	-	-	715	107	822	-	-	822	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	2,927	439	3,366	-	-	3,366	-	-	-	-	-	-	-	56,709
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	15,261	2,289	17,551	-	-	17,551	-	-	-	-	-	-	-	160,674
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	8,479	1,272	9,751	-	-	9,751	-	-	-	-	-	-	-	92,151
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,959	-	-	-	-	30,277	5,322	41,558	-	2,491	39,067	-	-	-	-	-	-	-	309,534
5b.0	TOTAL PERIOD 5b COST	-	56,626	-	-	-	-	30,531	12,960	100,117	224	4,205	95,688	-	-	-	-	-	-	521,808	311,254
PERIOD 5 TOTALS		-	56,626	-	-	-	-	30,531	12,960	100,117	224	4,205	95,688	-	-	-	-	-	-	521,808	311,254
TOTAL COST TO DECOMMISSION		**22,924**	**151,412**	**13,856**	**6,800**	**15,081**	**29,035**	**898,673**	**190,790**	**1,328,572**	**949,951**	**277,213**	**101,408**	**584,403**	**181,017**	**751**	**1,038**	**1,785**	**35,463,060**	**2,124,994**	**7,484,351**

TOTAL COST TO DECOMMISSION WITH 16.77% CONTINGENCY:	**$1,328,572**	**thousands of 2012 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 71.5% OR:	**$949,951**	**thousands of 2012 dollars**
SPENT FUEL MANAGEMENT COST IS 20.87% OR:	**$277,213**	**thousands of 2012 dollars**
NON-NUCLEAR DEMOLITION COST IS 7.63% OR:	**$101,408**	**thousands of 2012 dollars**
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	**182,806**	**cubic feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**1,785**	**cubic feet**
TOTAL SCRAP METAL REMOVED:	**75,966**	**tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**2,124,994**	**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