ENCLOSURE 3

2014 DECOMMISSIONING COST ANALYSIS FOR THE MONTICELLO NUCLEAR GENERATING PLANT

173 pages follow

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DECOMMISSIONING COST ANALYSIS

for the

MONTICELLO

NUCLEAR GENERATING PLANT

prepared for

Xcel Energy Services, Inc.

prepared by

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No.	Date	Item Revised	Reason for Revision
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EXECUTIVE SUMMARY

This report presents estimates of the cost to promptly decommission the Monticello Nuclear Generating Plant (Monticello) following cessation of plant operations and the operation and eventual decommissioning of the on-site Independent Spent Fuel Storage Installation (ISFSI). The prompt decommissioning, or DECON method, as described below, was selected as it is the most cost-effective of the alternatives (in current dollars) to achieve the objectives of decommissioning. The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2011,[1] updated to reflect current assumptions pertaining to the disposition of nuclear power plants and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The current estimates are designed to provide Xcel Energy with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear unit. The analysis 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. It may also not reflect the actual plan to decommission Monticello; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

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

The Monticello site currently consists of a single operating boiling water reactor and an ISFSI. The currently projected cost to decommission the station assuming all spent nuclear fuel is removed by 2066 (Scenario 1) is estimated at $1.114 billion. Costs are reported in 2014 dollars and include monies anticipated to be spent for radiological remediation and operating license termination, spent fuel management, and site restoration activities. The costs to decommission Monticello for the

1 "Decommissioning Cost Analysis for the Monticello Nuclear Generating Plant," Document No. X01-1617-004 Rev. 1, TLG Services, Inc., December 2011

scenarios evaluated are tabulated at the end of this section. Three additional estimates are provided for extended spent fuel storage scenarios (Scenarios 2, 3, and 4). The estimates are based on numerous fundamental assumptions, including regulatory requirements, low-level radioactive waste disposal practices, high-level radioactive waste management options, site restoration requirements, and project contingencies. The estimates incorporate a minimum cooling period for the spent fuel that resides in the storage pool when operations cease. Any residual fuel remaining in the pool after the cooling period is relocated to the ISFSI to await transfer to a DOE facility. The estimates also include the dismantling of site structures and non-essential facilities and the limited restoration of the site.

The cost estimates assume that the shutdown date of the nuclear unit is scheduled and pre-planned (i.e., there is no delay in transitioning the plant and workforce from operations or in obtaining regulatory relief from operating requirements, etc.). The estimates include the continued operation of the fuel handling area of the reactor building as a wet fuel storage facility for approximately 15 years after operations cease. During this time period, it is assumed that the spent fuel residing in the pool will be transferred to an independent spent fuel storage installation (ISFSI) located on the site. The ISFSI will remain operational until the spent fuel is transferred to an appropriate disposal facility. [2]

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

Alternatives and Regulations

The ultimate objective of the decommissioning process is to reduce the inventory of contaminated and activated material so that the license(s) can be terminated. The Nuclear Regulatory Commission (NRC or Commission) provided general decommissioning requirements in its rule adopted on June 27, 1988.[3] In this rule, the NRC set forth technical and 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

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2 Projected expenditures for spent fuel management identified in the cost analyses do not consider credit for DOE's payment of damages to Xcel Energy for DOE's failure to perform under the terms of the disposal contract between DOE and Xcel Energy.

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

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."[4]
>
> 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."[5] Decommissioning is required 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."[6] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years, although longer time periods will be considered when necessary to protect public health and safety.
>
> The 60-year restriction has limited the practicality for the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. In 1997, the Commission directed its staff to re-evaluate this alternative and identify the technical requirements and regulatory actions that would be necessary for entombment to become a viable option. The resulting evaluation provided several recommendations; however, rulemaking has been deferred pending the completion of additional research studies, for example, on engineered barriers.

In 1996, the NRC published revisions to its general requirements for decommissioning nuclear power plants to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process.[7] The

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4 Ibid. Page FR24022, Column 3

5 Ibid.

6 Ibid. Page FR24023, Column 2

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

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 that are acceptable to the NRC staff for implementing the requirements of the 1996 revised rule that relate to the initial activities and the major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and sequence 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.[8]

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site.[9] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details, including the ISFSI decommissioning estimate, are included in this analysis.

Decommissioning Scenarios

The following scenarios were evaluated and are intended to bound the liability associated with the removal of spent fuel from the site. The current operating license expires in 2030. In all four scenarios, decommissioning activities commence shortly after the cessation of plant operations. The spent fuel in the plant's spent fuel storage pool is transferred to the ISFSI within the first fifteen years. The equipment, structures, and portions of the plant containing radioactive contaminants are removed or decontaminated to a level that permits the facility to be released for unrestricted use. Non-essential structures are then demolished. Spent fuel storage operations continue at the ISFSI until the transfer of the fuel to the DOE is completed (2066 in Scenario 1, 2090 in Scenario 2, 2130 in Scenario 3, and 2230 in Scenario 4).

1996

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

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

Scenario	1st Spent Fuel Canister Replacement	1st Spent Fuel Assembly Removed from Monticello	Last Spent Fuel Assembly Removed from Monticello
1	n/a	2043	2066
2	n/a	2077	2090
3	2058	2117	2130
4	2058	2217	2230

For Scenario 2, although it provides a total fuel storage period of 60 years following plant shutdown. Xcel Energy directed TLG Services to not include the cost of transferring the spent fuel in dry storage to new canisters at 50 years after plant shutdown. The assumption to not transfer spent fuel at 50 years following plant shutdown in Scenario 2 was premised on the likelihood that the life of the canisters could be successfully managed for an additional 10 years.

In Scenarios 3 and 4, the DSCs are assumed to be replaced after fifty years of use. Since the reactor building spent fuel storage pool and fuel handling facilities are removed by the year 2048, a dry fuel transfer facility is assumed to be constructed on site to perform the transfers from the old to the new DSCs. For Scenario 3, only one such transfer is needed over the time frame assumed. For Scenario 4, the spent fuel will be transferred three times following initial placement in the ISFSI.

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines[10] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference describes a unit cost factor method for estimating decommissioning activity costs. The unit cost factors used in this analysis incorporate site-specific costs and the latest available information about worker productivity in decommissioning.

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

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

Contingency

Consistent with cost estimating practice, contingencies are applied to the decontamination and dismantling costs developed as "specific provision for unforeseeable elements of cost within the defined project scope, particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."[11] 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 or duration of the decommissioning program and dry fuel storage period.

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

Low-Level Radioactive Waste Disposal

The contaminated and neutron-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,[12] and its Amendments of 1985,[13] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. It was expected that groups of states would combine together to jointly deal with their radioactive wastes; these organizations are referred to as waste disposal compacts.

Few approved facilities for the disposal of LLW are currently available. Construction of the newest facility, in Texas, is now complete and the facility was declared operational by the operator, Waste Control Specialists (WCS), in November 2011. The facility will be able to accept limited quantities of non-

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

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

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

Compact waste; however, at this time the cost for non-Compact generators is being negotiated on an individual basis.

All options and services currently available to Xcel Energy for disposition of the various waste streams produced by the decommissioning process were considered. The majority of the low-level radioactive waste designated for direct disposal (Class A [14]) can be sent to Energy*Solutions*' facility in Clive, Utah. For the purpose of this analysis, Xcel Energy's "Utilities Service Alliance" agreement with Energy*Solutions* for offsite processing and disposal is used as the basis for estimating the cost for disposition of the majority of the radioactive waste (Class A). 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.

The Texas facility is licensed to receive the higher activity waste forms (Classes B and C). As such, for this analysis, disposal costs for the Class B and C waste were based upon the preliminary and indicative information on the cost for such from WCS.

The dismantling of the components residing closest to the reactor core generates radioactive waste that may be considered unsuitable for shallow-land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste, or greater than Class C (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. However, to date, the federal government has not identified a cost for disposing of GTCC or a schedule for acceptance.

For purposes of this analysis, the GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner as high-level waste and at a cost equivalent to that envisioned for the spent fuel. The GTCC is packaged in the same canisters used for spent fuel and either stored on site or shipped directly to a disposal facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

A significant portion of the waste material generated during decommissioning may only be potentially contaminated by radioactive materials. This waste can be

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

analyzed on site or shipped off site to licensed facilities for further analysis, processing and/or 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 for Monticello reflect the savings from radioactive waste recovery/volume reduction. Material removed during decommissioning that is less than the site release criteria will be designated for conventional disposal or reuse / recovery.

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[15] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The NWPA provided that DOE would enter into contracts with utilities in which DOE would promise to take the utilities' spent fuel and high-level radioactive waste and utilities would pay the cost of the disposition services for that material. NWPA, along with the individual contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. By January 1998, the DOE had failed to accept any spent fuel or high level waste, as required by the NWPA and utility contracts. Delays continue and, as a result, generators have initiated legal action against the DOE in an attempt to obtain compensation for DOE's partial breach of contract. To date no spent fuel has been accepted from commercial generating sites for disposal.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor.[16] Xcel Energy's current spent fuel

15 "Nuclear Waste Policy Act of 1982 and Amendments," DOE's Office of Civilian Radioactive Management, 1982

16 In 2008, the DOE issued a report to Congress in which it concluded that it did not have authority, under present law, to accept spent nuclear fuel for interim storage from decommissioned commercial nuclear power reactor sites. However, the Blue Ribbon Commission, in its final report, noted that: "[A]ccepting spent fuel according to the OFF [Oldest Fuel First] priority ranking instead of giving priority to shutdown reactor sites could greatly reduce the cost savings that could be achieved through consolidated storage if priority could be given to accepting spent fuel from

management plan for the Monticello spent fuel assumed in this estimate is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Monticello fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year,[17] the removal of spent fuel from the site is completed in 2066 under Scenario 1. Different DOE acceptance schedules result in different completion dates.

Today, the country is at an impasse on high-level waste disposal. The administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[18]

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

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"[19]
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[20]

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

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shutdown reactor sites before accepting fuel from still-operating plants. …. The magnitude of the cost savings that could be achieved by giving priority to shutdown sites appears to be large enough (i.e., in the billions of dollars) to warrant DOE exercising its right under the Standard Contract to move this fuel first."

17 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

18 Ibid.

19 "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/, p. 32, January 2012

20 Ibid., p.27

moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[21] This document states:

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

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."[22]

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit recently issued a writ of mandamus (in August 2013) [23] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review. That review is now underway. The current schedule calls for completion and publication of the safety evaluation report by January 2015. The adjudicatory hearing, which must be completed before a licensing decision can be made, remains suspended.

In addition, the state of Minnesota directed the Public Utilities Commission, "when considering approval of a plan for the accrual of funds for the decommissioning of nuclear facilities" …to "include an evaluation of the costs, if any, arising from storage of used nuclear fuel that may be incurred by the state of Minnesota, and any tribal

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

22 Ibid., p.2

23 United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, August 2013
http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB18/$file/11-1271-1451347.pdf

community, county, city, or township where used nuclear fuel is located following the cessation of operations at a nuclear plant."[24]

The state of Minnesota statute also prescribed the parameters to be used in evaluating spent fuel management costs. "To assist the commission in making the determination … the filing shall provide cost estimates, including ratepayer impacts, assuming used nuclear fuel will be stored in the state for 60 years, 100 years, and 200 years following the cessation of operation of the nuclear plant." [25]

Xcel Energy's current spent fuel management plan for the Monticello spent fuel is based in general upon:

1) Fuel transferred from the pool to the ISFSI within 15 years of shutdown;
2) Exchange of Monticello and Prairie Island spent fuel acceptance rights to best manage the overall cost of spent fuel storage for both plants;
3) Fuel will be shipped in the existing NUHOMS DSCs (Scenarios 1 and 2); canisters that are unloaded in the spent fuel transfer operation (Scenarios 3 and 4) are assumed to be mildly neutron activated and therefore must be disposed of as radioactive waste, and
4) Availability of a DOE interim or permanent storage repository by 2025 (Scenario 1), 2049 (Scenario 2), 2089 (Scenario 3), or 2189 (Scenario 4). First shipment of fuel from the Monticello site occurs two years after DOE initial availability.

The NRC requires that licensees establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the Secretary of Energy, pursuant to 10 CFR Part 50.54(bb).[26] This requirement is prepared for through inclusion of certain cost elements in the decommissioning estimates, for example, associated with the isolation and continued operation of the spent fuel pool and the ISFSI.

The spent fuel pool is expected to contain freshly discharged assemblies (from the most recent refueling cycles) as well as the final reactor core at shutdown. Over the

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24 Minnesota Statute 216B.1614, "Nuclear Power Plant Decommissioning and Storage of Used Nuclear Fuel"

25 Ibid.

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

following fifteen years, the assemblies are packaged into DSCs for transfer to the ISFSI for interim storage. It is assumed that this period provides the necessary cooling for the final core to meet the storage requirements for decay heat.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[27]), has been constructed to support continued plant operations. The facility is assumed to be expanded to support decommissioning. This will allow decommissioning activities to proceed within the reactor building.

The DOE has a contractual obligation to accept Monticello' fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim. However, including the cost of storing spent fuel in this study is appropriate to ensure the availability of sufficient decommissioning funds at the end of the station's life if the DOE has not met its obligation.

Site Restoration

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

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

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

Summary

The cost to promptly decommission the Monticello station assumes the removal of all contaminated and activated plant components and structural materials such that Xcel Energy may then have unrestricted use of the site (exclusive of the ISFSI) with no further requirements for an operating license. Low-level radioactive waste, other than GTCC waste, is sent to a commercial processor for treatment/conditioning or a controlled disposal facility.

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

The cost elements in the estimates are assigned to one of three subcategories: NRC License Termination, Spent Fuel Management, and Site Restoration. The subcategory "NRC License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR Part 50.75). The cost reported for this subcategory is generally sufficient to terminate the unit operating license, recognizing that there may be some additional cost impact from spent fuel management.

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

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

It should be noted that the costs assigned to these subcategories are allocations. Delegation of cost elements is for the purposes of comparison (e.g., with NRC financial guidelines) or to permit specific financial treatment (e.g., ARO determinations). In reality, there can be considerable interaction between the activities in the three subcategories. For example, an owner may decide to remove non-contaminated structures early in the project to improve access to highly contaminated facilities or plant components. In these instances, the non-contaminated removal costs could be

reassigned from Site Restoration to an NRC License Termination support activity. However, in general, the allocations represent a reasonable accounting of those costs that can be expected to be incurred for the specific subcomponents of the total estimated program cost, if executed as described.

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

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

SCENARIO 1
COST SUMMARY
MONTICELLO NUCLEAR GENERATING PLANT
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Costs
Decontamination	19,887
Removal	95,673
Packaging	29,423
Transportation	11,606
Waste Disposal	85,832
Off-site Waste Processing	28,802
Program Management [1]	334,224
Railroad Track Maintenance	4,580
Spent Fuel Management (direct costs)[2]	225,000
Insurance and Regulatory Fees	32,367
Energy	30,702
Characterization and Licensing Surveys	22,669
Property Taxes	47,042
Miscellaneous Equipment	7,414
Spent Fuel Pool Isolation	12,434
Security	125,973
Total [3]	**1,113,628**

Cost Element	Costs
License Termination	697,451
Spent Fuel Management	375,071
Site Restoration	41,106
Total [3]	**1,113,628**

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

SCENARIO 2
COST SUMMARY
MONTICELLO NUCLEAR GENERATING PLANT
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Costs
Decontamination	19,887
Removal	95,673
Packaging	29,423
Transportation	11,606
Waste Disposal	85,832
Off-site Waste Processing	28,802
Program Management [1]	368,279
Railroad Track Maintenance	4,283
Spent Fuel Management (direct costs)[2]	296,659
Insurance and Regulatory Fees	46,934
Energy	30,702
Characterization and Licensing Surveys	22,669
Property Taxes	62,507
Miscellaneous Equipment	7,414
Spent Fuel Pool Isolation	12,434
Security	184,812
Total [3]	**1,307,915**

Cost Element	Costs
License Termination	697,450
Spent Fuel Management	569,359
Site Restoration	41,106
Total [3]	**1,307,915**

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

SCENARIO 3
COST SUMMARY
MONTICELLO NUCLEAR GENERATING PLANT
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Costs
Decontamination	19,922
Removal	96,055
Packaging	29,428
Transportation	12,286
Waste Disposal	96,158
Off-site Waste Processing	28,802
Program Management [1]	496,803
Railroad Track Maintenance	4,283
Spent Fuel Management (direct costs)[2]	756,819
Insurance and Regulatory Fees	71,203
Energy	30,702
Characterization and Licensing Surveys	22,669
Property Taxes	156,616
Miscellaneous Equipment	7,414
Spent Fuel Pool Isolation	12,434
Security	282,841
Total [3]	**2,124,434**

Cost Element	Costs
License Termination	697,778
Spent Fuel Management	1,385,171
Site Restoration	41,485
Total [3]	**2,124,434**

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

SCENARIO 4
COST SUMMARY
MONTICELLO NUCLEAR GENERATING PLANT
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Costs
Decontamination	19,922
Removal	96,055
Packaging	29,428
Transportation	13,840
Waste Disposal	119,801
Off-site Waste Processing	28,802
Program Management [1]	1,096,781
Railroad Track Maintenance	4,283
Spent Fuel Management (direct costs)[2]	1,846,162
Insurance and Regulatory Fees	131,882
Energy	30,702
Characterization and Licensing Surveys	22,669
Property Taxes	156,617
Miscellaneous Equipment	7,414
Spent Fuel Pool Isolation	12,434
Security	527,940
Total [3]	**4,114,730**

Cost Element	Costs
License Termination	697,778
Spent Fuel Management	3,405,467
Site Restoration	41,485
Total [3]	**4,114,730**

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

1. INTRODUCTION

This report presents estimates of the cost to promptly decommission the Monticello Nuclear Generating Plant (Monticello) following cessation of plant operations and the operation and eventual decommissioning of the on-site Independent Spent Fuel Storage Installation (ISFSI). The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2011,[1]* updated to reflect current assumptions pertaining to the disposition of the nuclear station and relevant industry experience in undertaking such projects. The current estimates are designed to provide Xcel Energy with sufficient information to assess its 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. It may also not reflect the actual plan to decommission Monticello; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the costs to decommission the Monticello station, to provide a sequence or schedule for the associated activities, and to develop waste stream projections from the decontamination and dismantling activities.

The operating license was originally issued for the plant on September 8th, 1970, and was valid for a period of 40 years. In early 2005, Nuclear Management Company (as agent for Xcel Energy), submitted an application for a renewed license (i.e., 20 year extension). The application was approved by the NRC in November 2006. Therefore, for the purposes of this study, the final shutdown date (license expiration) for Monticello is September 8th, 2030, assuming a 60-year operating life (the current operating license's expiration date).

1.2 SITE DESCRIPTION

Monticello is located on the Mississippi River within the city limits of Monticello, in Wright County, Minnesota. The plant is located approximately 30 miles northwest of the Minneapolis-St. Paul area.

* References provided in Section 7 of the document

The Nuclear Steam Supply System (NSSS) consists of a single cycle, forced circulation, low power density boiling water reactor. The reactor recirculation system is comprised of the reactor vessel; the two loop reactor recirculation system with its pumps, pipes, and valves; the main steam piping up to the main steam isolation valves; and the reactor auxiliary systems piping. The system is housed within a "containment system," consisting of a steel light bulb-shaped drywell, a steel doughnut-shaped pressure suppression chamber, and interconnecting vent pipes. This system provides the first containment barrier surrounding the reactor vessel and reactor primary system. The reactor building provides secondary containment and is designed as a controlled leakage structure.

The saturated steam leaving the reactor vessel flows through the four main steam lines to the main turbine located in the turbine building. After passing through the main turbine, low-pressure steam is condensed, the non-condensable gases are removed, and the condensate is demineralized before being returned to the reactor vessel through the reactor feedwater system heaters. The turbine-generator system converts the thermodynamic energy of the steam into electrical energy. The unit's turbine-generator consists of one single-flow, high-pressure, and two double-flow, low-pressure turbines driving a direct-coupled generator at 1800 rpm. Heat rejected in the main condenser is removed by the circulating water system.

The circulating water system has been designed for open cycle once-through cooling towers, closed cycle with cooling towers, or for variations of these modes, i.e., partial recirculation. The system for open cycle operation consists of an intake structure with two half-capacity circulating water pumps, piping river water through the condenser to a discharge structure where the water enters a 1000-foot long canal that returns the water to the river downstream from the intake. Two induced-draft cooling towers are used during the open and closed cycle operations. Cooled effluent returns by gravity to the intake structure from the cooling tower basins.

1.3 REGULATORY GUIDANCE

The Nuclear Regulatory Commission (NRC or Commission) provided initial decommissioning requirements in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988.[2] This rule set forth financial criteria for decommissioning licensed nuclear power facilities. The regulation addressed decommissioning planning needs, timing, funding methods, and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely

manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors,"[3] which provided additional guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the content and form of the financial assurance mechanisms indicated in the rule.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB. The DECON alternative assumes that any contaminated or activated portion of the plant's systems, structures and facilities are removed or decontaminated to levels that permit the site to be released for unrestricted use shortly after the cessation of plant operations; while the SAFSTOR and ENTOMB alternatives defer the process.

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

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with rulemaking permitting the controlled release of a site,[4] the NRC did evaluate this alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some, if not most reactors. However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. The NRC had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments.[5] At this time, however, the NRC's staff has recommended that rulemaking be deferred, based upon several factors including that no licensee has committed to pursuing the entombment option, the unresolved issues associated with the disposition of greater-than-Class C material (GTCC), and the NRC's current priorities, at least until after the

additional research studies are complete. The Commission concurred with the staff's recommendation.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants.[6] When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the facility's operating licensed life. Since that time, several licensees permanently and prematurely ceased operations. Exemptions from certain operating requirements were required once the reactor was defueled to facilitate the decommissioning. Each case was handled individually, without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning.

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

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

1.3.1 High Level Waste

Congress passed the "Nuclear Waste Policy Act"[8] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The NWPA provided that DOE would enter into contracts with utilities in which DOE would promise to take the utilities' spent fuel and high level waste, and utilities would pay the cost of the disposition services for that material. NWPA, along with the individual disposal contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. By January 1998, the DOE had failed to accept spent nuclear fuel 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 partial breach of contract. To date no spent fuel has been accepted from commercial generating sites for disposal.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Xcel Energy's current spent fuel management plan for the Monticello spent fuel assumed in this estimate is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Monticello fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year,[9] the removal of spent fuel from the site is completed in 2066 (Scenario 1). Different DOE acceptance schedules result in different completion dates.

Today, the country is at an impasse on high-level waste disposal. The administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[10]

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

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."[11]

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[12] This document states:

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

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

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit in August 2013 issued a writ of mandamus[13] ordering NRC to comply with federal law and restart its review of DOE's Yucca Mountain repository license application to the extent of previously appropriated funding for the review. That review is now underway. The current schedule calls for completion

and publication of the safety evaluation report by January 2015. The adjudicatory hearing, which must be completed before a licensing decision can be made, remains suspended.

In addition, the state of Minnesota directed the Public Utilities Commission, "when considering approval of a plan for the accrual of funds for the decommissioning of nuclear facilities" …to "include an evaluation of the costs, if any, arising from storage of used nuclear fuel that may be incurred by the state of Minnesota, and any tribal community, county, city, or township where used nuclear fuel is located following the cessation of operations at a nuclear plant."[14]

The state of Minnesota statute also prescribed the parameters to be used in evaluating spent fuel management costs. "To assist the commission in making the determination … the filing shall provide cost estimates, including ratepayer impacts, assuming used nuclear fuel will be stored in the state for 60 years, 100 years, and 200 years following the cessation of operation of the nuclear plant."

Xcel Energy's current spent fuel management plan for the Monticello spent fuel is based in general upon:

1) Fuel transferred from the pool to the ISFSI within 15 years of shutdown;
2) Exchange of Monticello and Prairie Island spent fuel acceptance rights to best manage the overall cost of spent fuel storage for both plants;
3) Fuel will be shipped in the existing NUHOMS DSCs (Scenarios 1 and 2); canisters that are unloaded in the spent fuel transfer operation (Scenarios 3 and 4) are assumed to be mildly neutron activated and therefore must be disposed of as radioactive waste, and
4) Availability of a DOE interim or permanent storage repository by 2025 (Scenario 1), 2049 (Scenario 2), 2089 (Scenario 3), or 2189 (Scenario 4). First shipment of fuel from the Monticello site occurs two years after DOE initial availability.

The NRC requires that licensees establish a program to manage and provide funding for the management of all irradiated fuel at the reactor site until title of the fuel is transferred to the Secretary of Energy, pursuant to 10 CFR Part 50.54(bb).[15] This requirement is prepared for

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

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

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[16]), has been constructed to support continued plant operations. The facility is assumed to be expanded to support decommissioning. This will allow decommissioning activities to proceed within the auxiliary building.

The DOE has a contractual obligation to accept Monticello's fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim. However, at this time, including the cost of storing spent fuel in this study is appropriate, and ensures the availability of sufficient decommissioning funds if the DOE has not met its obligation.

1.3.2 Low-Level Radioactive Waste

The contaminated and neutron-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,[17] and its Amendments of 1985,[18] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. It was expected that groups of states would combine together to jointly deal with their radioactive wastes; these organizations are referred to as waste disposal compacts.

Few approved facilities for the disposal of LLW are currently available. Construction of the newest facility, in Texas, is now complete and the facility was declared operational by the operator, Waste Control Specialists (WCS), in November 2011. The facility will be able to accept limited

quantities of non-Compact waste; however, at this time the cost for non-Compact generators is being negotiated on an individual basis.

All options and services currently available to Xcel Energy for disposition of the various waste streams produced by the decommissioning process were considered. The majority of the low-level radioactive waste designated for direct disposal (Class A[19]) can be sent to Energy*Solutions*' facility in Clive, Utah. For the purpose of this analysis, Xcel Energy's "Utilities Service Alliance" agreement with Energy*Solutions* for offsite processing and disposal is used as the basis for estimating the disposal cost for the majority of the radioactive waste (i.e., Class A). 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.

The Texas facility is licensed to receive the higher activity waste forms (Classes B and C). As such, for this analysis, disposal costs for the Class B and C waste were based upon the preliminary and indicative information on the cost for such from WCS.

The dismantling of the components residing closest to the reactor core generates radioactive waste that may be considered unsuitable for shallow-land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. However, to date, the federal government has not identified a cost for disposing of GTCC or a schedule for acceptance.

For purposes of this analysis, the GTCC radioactive waste is assumed to be packaged and disposed of in a similar manner as the spent fuel and at a cost equivalent to that envisioned for the spent fuel. The GTCC is packaged in the same canisters used for spent fuel and either stored on site or shipped directly to a disposal facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

A significant portion of the waste material generated during decommissioning may only be potentially contaminated by radioactive

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

Material removed during decommissioning that is less than the site release criteria will be designated for conventional disposal or reuse / recovery.

1.3.3 Radiological Criteria for License Termination

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

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund).[21] An additional and separate limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water.[22]

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)[23] 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.

FIGURE 1.1
MONTICELLO NUCLEAR GENERATING PLANT
GENERAL PLAN

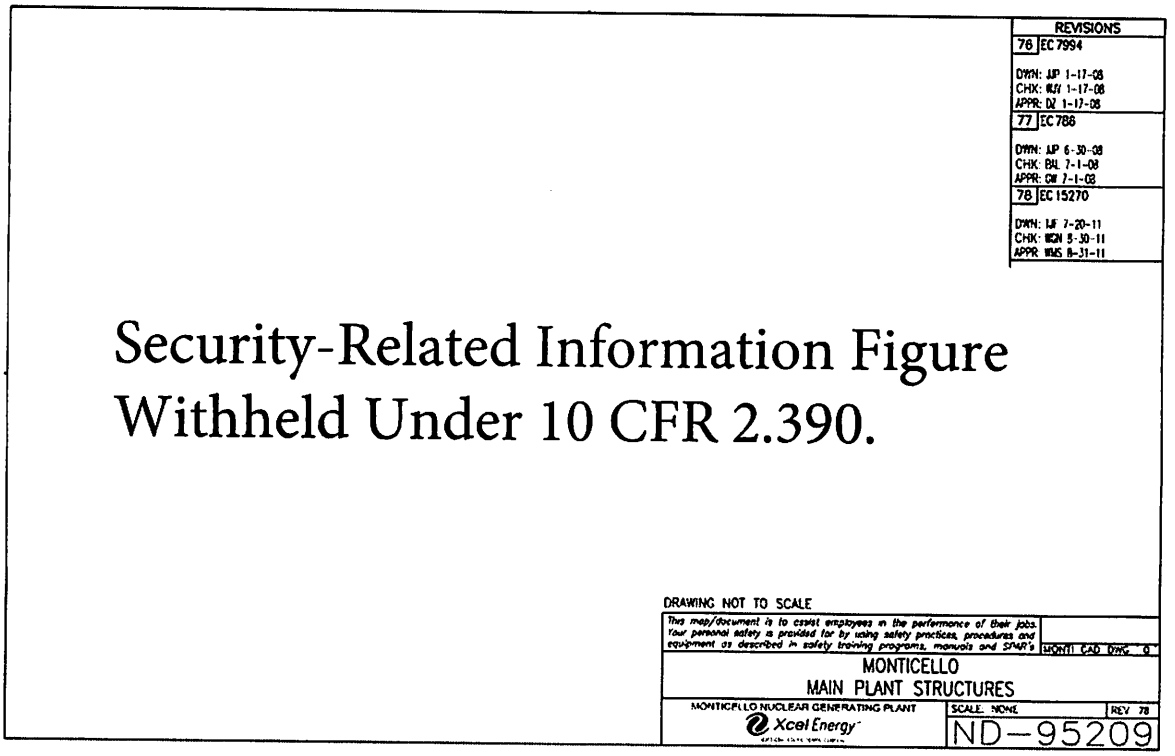
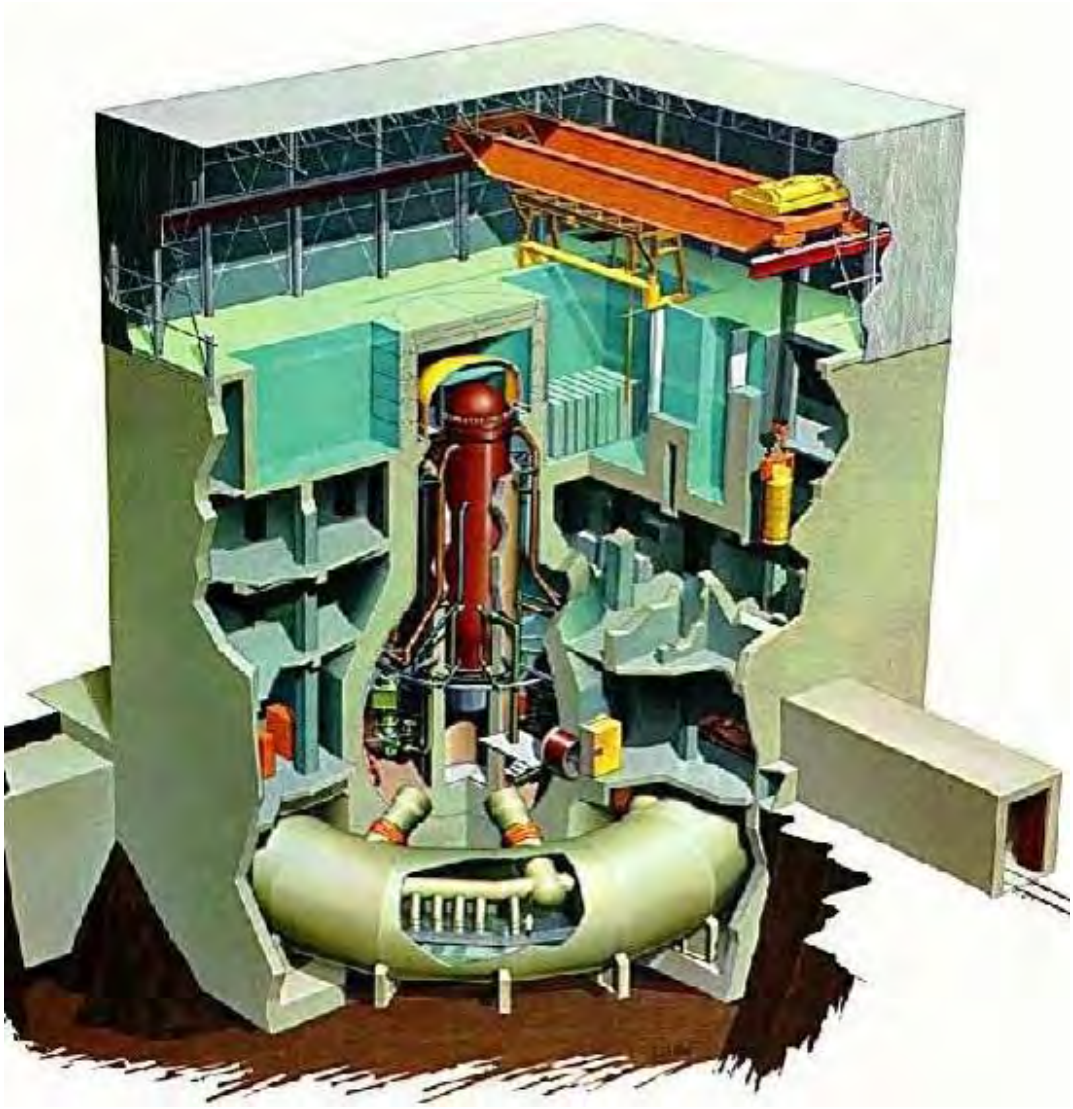


FIGURE 1.2
MONTICELLO NUCLEAR GENERATING PLANT
AERIAL VIEW

FIGURE 1.3
MONTICELLO NUCLEAR GENERATING PLANT
REACTOR BUILDING SECTION



2. DECOMMISSIONING ALTERNATIVE DESCRIPTION

Detailed cost estimates were developed to promptly decommission the Monticello station, (i.e., the DECON decommissioning alternative). The DECON alternative, as defined by the NRC, is "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."

The following scenarios were evaluated and are intended to bound the liability associated with the removal of spent fuel from the site. The current operating license expires in 2030. In all four scenarios, decommissioning activities commence shortly after the cessation of plant operations. The spent fuel in the plant's spent fuel storage pool is transferred to the ISFSI within the first fifteen years. The equipment, structures, and portions of the plant containing radioactive contaminants are removed or decontaminated to a level that permits the facility to be released for unrestricted use. Non-essential structures are then demolished. Spent fuel storage operations continue at the site (at the ISFSI) until the transfer of the fuel to the DOE is completed (2066 in Scenario 1, 2090 in Scenario 2, 2130 in Scenario 3, and 2230 in Scenario 4).

Scenario	1st Spent Fuel Canister Replacement	1st Spent Fuel Assembly Removed from Monticello	Last Spent Fuel Assembly Removed from Monticello
1	n/a	2043	2066
2	n/a	2077	2090
3	2058	2117	2130
4	2058	2217	2230

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

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

the permanent cessation of operations and the removal of fuel from the reactor vessel. The licensee is then prohibited from reactor operation.

The second phase encompasses activities during the storage period or during major decommissioning activities, or a combination of the two. The third phase pertains to the activities involved in license termination. The decommissioning estimates developed for Monticello 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 rate of expenditure.

2.1 PERIOD 1 - PREPARATIONS

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

2.1.1 Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR § Part 50.59 procedure (10 CFR §50.59 establishes the conditions under which licensees may make changes to the facility or procedures and conduct test or experiments, i.e., without prior NRC approval). Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing GTCC, as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, steam generators, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the

following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

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

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

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

2.1.2 Site Preparations

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

- Characterize the site and surrounding environs. This includes radiation surveys and sampling of the work areas, major components (including the reactor vessel and its internals), internal piping, and sacrificial shield.
- Isolate the spent fuel storage pool and fuel handling systems, such that decommissioning operations can commence on the balance of the plant. Decommissioning operations are scheduled around the fuel

handling area to optimize the overall project schedule. The fuel is transferred from the pool once it decays to the point that it meets the heat load criteria of the storage/transport containers. Consequently, it is assumed that the fuel pool will remain operational for approximately fifteen years following the cessation of plant operations while the residual inventory is transferred to the ISFSI.

- Specify the transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Develop procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.
- Perform chemical decontamination of the NSSS to reduce radiation levels in support of removal operations.

2.2 PERIOD 2 - DECOMMISSIONING OPERATIONS

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

- Construct temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfigure and modify site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Modifications may be required to the containment structure to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the building to support the segmentation of the reactor vessel internals and component extraction.
- Design and fabricate temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.

- Procure (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontaminate components and piping systems as required to control (minimize) worker exposure.
- Remove piping and components no longer essential to support decommissioning operations.
- 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 upper core grid.
- 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 a modified fuel storage canister for geologic disposal.
- Disassembly and segmentation of the remaining reactor internals, including the jet pump assemblies, fuel support castings, and core plate assembly.
- Draining and decontamination of the reactor well and the permanent sealing of the spent fuel transfer gate. Install a shielded platform for segmentation of the reactor vessel. Cutting operations are performed in air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Sections are transferred to the dryer-separator pool for packaging and interim storage.
- Disconnection of the control rod drives and instrumentation tubes from reactor vessel lower head. The lower reactor head and vessel supporting structure 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 and the internal contaminants are stabilized, e.g., with grout. Steel shielding will be added, as necessary, to those external areas of the package to meet transportation limits and regulations.

- Segment the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the dryer-separator pool or the spent fuel pool.
- Demolition of the sacrificial shield activated concrete by controlled demolition.
- Expansion of the ISFSI and transfer of the spent fuel from the storage pool to the ISFSI pad for interim storage. Spent fuel storage operations continue throughout the active decommissioning period. Fuel transfer to DOE is expected to be completed by the end of the year 2066 (Scenario 1).

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

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from dryer/separator pool and reactor well, disposing of the activated and contaminated sections as radioactive waste. Removal of any remaining activated/ contaminated concrete.
- Surveys of the decontaminated areas of the containment structure.
- Remediation and removal of the contaminated equipment and material from the radwaste and turbine buildings and any other contaminated facility. Radiation and contamination controls are utilized until residual levels indicate that the structures and equipment can be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and

components (both clean and contaminated) located within these buildings. This activity facilitates surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

- Remove the remaining components, equipment, and plant services in support of the area release survey(s).
- Route material removed during 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 for general disposal). Contaminated material is characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)."[24] 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 the requested change to the operating license (that would release the property, exclusive of the ISFSI, for unrestricted use).

The NRC will amend the operating license if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the property (exclusive of the ISFSI) is suitable for release.

2.3 PERIOD 3 - SITE RESTORATION

Following completion of decommissioning operations, site restoration activities will begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits may result in substantial damage to many of the structures. Although performed in a controlled, safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade

power block structures including the reactor 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 is necessary for those facilities and plant areas where historical records, when available, indicate the potential for radionuclides having been present in the soil, where system failures have been recorded, or where it is required to confirm that subsurface process and drain lines were not breached over the operating life of the station.

It is not currently anticipated that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process is deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public 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.

Non-contaminated concrete rubble produced by demolition activities is processed to remove reinforcing steel and miscellaneous embedments. The processed material is then used on site to backfill foundation voids. Excess non-contaminated materials are trucked to an off-site area for disposal as construction debris at no cost or credit to the decommissioning program.

2.4 ISFSI OPERATIONS AND DECOMMISSIONING

The ISFSI will continue to operate under the general license provisions of 10 CFR §72 following the amendment of the §50 operating license to release the adjacent (power block) property. Assuming the DOE begins to remove fuel from the Monticello site in 2043, the process is not expected to be completed until 2066 (Scenario 1). Any delay in the transfer process, for example, due to a delay in the scheduled opening of the geologic repository, a slower acceptance rate, or a combination of both, can result in a longer on-site residence time for the fuel discharge from the reactor, as well as additional caretaking expenses.

Scenarios 2, 3 and 4 address an extended delay. Scenarios 3 and 4 also reflect an assumption that the spent fuel DSCs will need to be replaced every fifty years.

The assumed design for the ISFSI is based upon the use of a multi-purpose dry shielded storage canister and a horizontal storage module for pad storage.

In Scenarios 3 and 4, once the spent fuel has been removed from the original DSCs by Xcel Energy in the DSC replacement operation, the now-empty DSCs will be disposed of as low-level waste.

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

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

3. COST ESTIMATE

The cost estimates prepared for decommissioning the Monticello station consider the unique features of the plant, including the nuclear steam supply system, electric power generating systems, support services, plant structures, 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 COST ESTIMATE

The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2011, updated to reflect current assumptions pertaining to the disposition of nuclear power plants and relevant industry experience in undertaking such projects. This information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluations were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

The methodology used to develop the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[25] and the DOE "Decommissioning Handbook."[26] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) are developed using local labor rates. The activity-dependent costs are estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures rely upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means. [27]

The unit factor method provides a demonstrable basis for establishing a reliable cost estimate. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, ensures that essential elements have not been omitted. Appendix A presents the

detailed development of a typical unit factor. Appendix B provides the values contained within one set of factors developed for this analysis.

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

Work Difficulty Factors

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

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

- Access Factor 10% to 20%
- Respiratory Protection Factor 10% to 50%
- Radiation/ALARA Factor 10% to 37%
- Protective Clothing Factor 0% to 30%
- Work Break Factor 8.33%

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

Scheduling Program Durations

The unit factors, adjusted by the WDFs as described above, are applied against the inventory of materials to be removed in the radiological controlled areas. The resulting labor-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities is based upon productivity information available from the "Building Construction Cost Data" publication. Dismantling of the fuel handing systems and decontamination of the spent fuel pool is also dependent upon the timetable for the transfer of the spent fuel assemblies from the pool to the ISFSI.

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

3.3 FINANCIAL COMPONENTS OF THE COST MODEL

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

3.3.1 Contingency

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

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American

Association of Cost Engineers "Project and Cost Engineers' Handbook"[28] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, contingency is included. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for a contingency percentage 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.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a successful completion of the intended tasks and, potentially, subsequent related activities. For this study, TLG examined the major activity-related problems (decontamination, segmentation, equipment handling, packaging, transport, and waste disposal) that necessitate a contingency. Individual activity contingencies ranged from 0% to 75%, depending on the degree of difficulty judged to be appropriate from TLG's actual decommissioning experience. The contingency values used in this study are consistent with those developed in the AIF/NESP-036 study and are as follows:

- Decontamination 50%
- Contaminated Component Removal 25%
- Contaminated Component Packaging 10%
- Contaminated Component Transport 15%
- Low-Level Radioactive Waste Disposal 25%
- Low-Level Radioactive Waste Processing 15%

- Reactor Segmentation 75%
- Nuclear Steam Supply System Component Removal 25%
- Reactor Waste Packaging 25%
- Reactor Waste Transport 25%
- Reactor Vessel Component Disposal 50%
- Greater Than Class C Disposal 15%

- Non-Radioactive Component Removal 15%
- Heavy Equipment and Tooling 15%

• Supplies	25%
• Engineering	15%
• Energy	15%
• Insurance, Property Taxes and Fees	10%
• Staffing	15%
• Characterization and Termination Surveys	30%
• Construction	15%
• Spent Fuel Capital Costs (Canisters and Overpacks)	15%
• Spent Fuel Transfer Costs	15%
• Operations and Maintenance Expenses	15%
• ISFSI Decommissioning	25%

The contingency values are applied to the appropriate components of the estimate on a line item basis. The composite contingency values for the four scenarios are reported at the end of each detailed estimate as provided in Appendices C through F.

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 estimates, 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, for example, affecting worker health and safety, site release criteria, waste transportation, and disposal.
- Policy decisions altering national commitments (e.g., in the ability to accommodate certain waste forms for disposition), or in the timetable for such, for example, the start and rate of acceptance of spent fuel by the DOE.
- Pricing changes for basic inputs such as labor, energy, materials, and disposal. Items subject to widespread price competition (such as materials) may not show significant variation; however, others such as waste disposal could exhibit large pricing uncertainties, particularly in markets where limited access to services is available.

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

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 the spent fuel generated from plant operations is not reflected within the estimates to decommission the Monticello station. Ultimate disposition of the spent fuel is within the province of the DOE's

Waste Management System, as defined by the Nuclear Waste Policy Act (the disposal cost is financed by a 1 mill/kWhr surcharge paid into the DOE's waste fund during operations). However, the NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy. This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimates, as described below.

Spent Fuel Management Model

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. The DOE contracts provide mechanisms for altering the oldest fuel first allocation scheme, including emergency deliveries, exchanges of allocations amongst utilities and the option of providing priority acceptance from permanently shut down nuclear reactors. Because it is unclear how these mechanisms may operate once DOE begins accepting spent fuel from commercial reactors, this study assumes that DOE will accept spent fuel in an oldest fuel first order. The timing for removal of spent fuel from the site is based upon the DOE's most recently published annual acceptance rates of 400 MTU/year for year 1, 3,800 MTU total for years 2 through 4 and 3,000 MTU/year for year 5 and beyond.[29]

Xcel Energy's current spent fuel management plan for the Monticello spent fuel is based in general upon:

1) Fuel transferred from the pool to the ISFSI within 15 years of shutdown;

2) Exchange of Monticello and Monticello spent fuel acceptance rights to best manage the overall cost of spent fuel storage for both plants;

3) Fuel will be shipped in the existing NUHOMs DSCs (Scenarios 1 and 2); DSCs that are unloaded in the spent fuel transfer operation (Scenarios 3 and 4) are assumed to be mildly neutron activated and therefore must be disposed of as radioactive waste, and

4) Availability of a DOE interim or permanent storage repository by 2025 (Scenario 1), 2049 (Scenario 2), 2089 (Scenario 3), or 2189 (Scenario 4). First shipment of fuel from the Monticello site occurs two years after DOE initial availability.

ISFSI

This analysis assumes that the existing ISFSI is modified at the cessation of plant operations to accommodate the fuel present in the storage pool at shutdown.

Operation and maintenance costs for the spent fuel pool and ISFSI are included within the estimates and address the costs for staffing the facility, as well as security, insurance, and licensing fees. The estimates also include the costs to purchase, load, and transfer the NUHOMs DSCs from the pool to the ISFSI. Costs are also provided for the final disposition of the ISFSI once the transfer of the DSCs from the ISFSI to the DOE is complete.

Storage Canister Design

The design and capacity of the ISFSI is based upon the Transnuclear NUHOMS system (with a 61-fuel assembly capacity). The system consists of a multi-purpose (storage and transport) dry shielded storage canister (DSC) and a horizontal storage module (HSM).

Canister Loading and Transfer

The estimates include an average cost of $1,377,000 for the labor to load/transport the spent fuel from the pool to the ISFSI pad. For estimating purposes an allowance of $292,500 is used for the cost to transfer each fuel canister from the ISFSI to the DOE.

Operations and Maintenance

An annual cost (excluding labor) of approximately $792,000 and $96,000 are used for operation and maintenance of the spent fuel pool and the ISFSI, respectively.

At shutdown, the spent fuel pool is expected to contain freshly discharged assemblies (from the most recent refueling cycles). Over the next fifteen years the assemblies are packaged into DSCs for transfer to the ISFSI for transfer to the DOE. It is assumed that the fifteen years

provides the necessary cooling period for the final core to meet the decay heat requirements for dry storage. Once the pool is emptied, the spent fuel storage and handling facilities are available for decommissioning.

Replacement of DSCs during ISFSI fuel storage period

Scenarios 1 and 2 do not assume any replacement of the spent fuel storage DSCs (recasking).

Two of the cost estimates, Scenarios 3 and 4, include costs to recask the spent fuel, based upon an assumption that the DSC has a limited lifetime of approximately 50 years.

Scenario 3, which is 100 years (nominally) in length, considers a single repackaging effort for each DSC in the ISFSI.

Scenario 4, which is a (nominal) 200 year scenario, assumes that when any DSC in the ISFSI reaches the 50 years of storage milestone, the DSC is replaced. In Scenario 4, the fuel will be recasked three times following final shutdown of Monticello.

Since the reactor building, spent fuel storage pool, and fuel handling facilities are removed by the year 2048, a dry fuel transfer facility is assumed to be constructed on site to perform the transfers from the old to the new DSCs. Scenarios 3 and 4 include the cost to construct such a transfer facility, as well as additional staffing positions for support of the dry transfer activities, and additional NRC oversight associated with the transfer operations. The decommissioning of this transfer facility is also included in Scenarios 3 and 4.

ISFSI Decommissioning

In accordance with 10 CFR §72.30, licensees must have a proposed decommissioning plan for the ISFSI site and facilities that includes a cost estimate to implement. The plan should contain sufficient information on the proposed practices and procedures for the decontamination of the ISFSI and for the disposal of residual radioactive materials after all spent fuel, high-level radioactive waste, and reactor-related GTCC waste have been removed.

Seven HSMs 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. This allowance is equivalent to the number

of HSMs required to accommodate the final core off load from Monticello. The cost of the disposition of this material is included in the estimate.

The ISFSI pad is not expected to be contaminated and will be demolished accordingly after a confirmation survey. For Scenarios 3 and 4, the dry fuel transfer facility constructed to support the spent fuel transfer operation has a small allowance for decontamination, and will be demolished after a confirmation survey.

The cost estimate for decommissioning the ISFSI reflects: 1) the cost of an independent contractor performing the decommissioning activities; 2) an adequate contingency factor; and 3) the cost of meeting the criteria for unrestricted use. The cost summary for decommissioning the ISFSI is presented in Appendix G. The demolition of the ISFSI for all four scenarios is reflected within the estimates which is included in the Site Restoration costs.

GTCC

The dismantling of the reactor internals is expected to generate radioactive waste considered unsuitable for shallow land disposal (i.e., GTCC waste). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the Federal Government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. To date, the Federal Government has not identified a cost for disposal of GTCC or a schedule for acceptance. As such, the estimates to decommission the Monticello station include an allowance for the disposition of GTCC material.

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

3.4.2 Reactor Vessel and Internal Components

The reactor pressure vessel and internal components are segmented for disposal in shielded, reusable transportation casks. Segmentation is performed underwater 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 well. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology.

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal (i.e., GTCC). Although the material is not classified as high-level waste, federal regulations under the LLRW Policy Amendments Act specifies the GTCC LLWR is designated a federal responsibility under Section 3(b)(1)(D). However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements. As such, for purposes of this study, the GTCC has been packaged and disposed of in the same manner as high-level waste, at a cost equivalent to that envisioned for the spent fuel. This is consistent with the concept that the generator of GTCC waste will bear all reasonable costs of disposing of such wastes. [30]

Intact disposal of reactor vessel shells has been successfully demonstrated at several of the sites that have been decommissioned. Access to navigable waterways has allowed these large packages to be transported to the Barnwell disposal site with minimal overland travel. Intact disposal of the reactor vessel and internal components can provide savings in cost and worker exposure by eliminating the complex segmentation requirements, isolation of the GTCC material, and transport/storage of the resulting waste packages. Portland General Electric (PGE) was able to dispose of the Trojan reactor as an intact package (including the internals). However, its location on the Columbia River simplified the transportation analysis since:

- the reactor package could be secured to the transport vehicle for the entire journey, i.e., the package was not lifted during transport,

- there were no man-made or natural terrain features between the plant site and the disposal location that could produce a large drop, and
- transport speeds were very low, limited by the overland transport vehicle and the river barge.

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

It is not known whether this option will be available when the Monticello station ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. As such, the estimates assume segmentation of the reactor vessel, as a bounding condition. With lower levels of activation, the vessel shell can be packaged more efficiently than the curie-limited internal components. This will allow the use of more conventional waste packages rather than shielded casks for transport.

3.4.3 Primary System Large 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.[31] The contaminated material will be packaged in Industrial Packages (IP-1, IP-2, or IP-3, as defined in subpart 173.411) for transport unless demonstrated to qualify as their own shipping containers. The reactor vessel and internal components are expected to be transported in accordance with Part 71, in Type B containers. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

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

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

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

Transportation costs for Class A material requiring controlled disposal are based upon the mileage to the Energy*Solutions* facility in Clive, Utah. Class B and C wastes use the mileage to the Waste Control Specialists (WCS) facility in Andrews County, Texas. Transportation

costs for off-site waste processing are based upon the mileage to Oak Ridge, Tennessee. Truck transport costs are estimated using published tariffs from Tri-State Motor Transit.[32]

3.4.6 Low-Level Radioactive Waste Disposal

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

The mass of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in the detailed Appendices C, D, E and F, and summarized in Tables 5.1, 5.2 and 5.3. The quantified waste summaries shown in these tables are consistent with 10 CFR Part 61 classifications. Commercially available steel containers are presumed to be used for the disposal of piping, small components, and concrete. Larger components can serve as their own containers, with proper closure of all openings, access ways, and penetrations. The volumes are calculated based on the exterior package dimensions for containerized material or a specific calculation for components serving as their own waste containers.

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

Disposal fees are based upon estimated charges, with surcharges added for the highly activated components, such as those generated in the segmentation of the reactor vessel. The cost to dispose of the lowest level and majority of the material generated from the decontamination and dismantling activities is based upon Xcel Energy's current cost for disposal at Energy*Solutions* facility in Clive, Utah. Disposal costs for the

higher activity waste (Class B and C) were based upon indicative information from WCS for the Andrews County facility.

3.4.7 Site Conditions Following Decommissioning

The NRC will amend or terminate the site license(s) if it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process typically ends at this point. Building codes and environmental regulations will dictate the next step in the decommissioning process, as well as the owner's own future plans for the site.

There are varying degrees to which the Monticello site can be restored following the decommissioning of the nuclear unit. The estimates presented herein include the dismantling of the major structures to just below ground level, backfilling and the collapsing of below grade voids, and general regarding such that the site upon which the power block and supplemental structures are located is transformed into a "grassy plain." Xcel Energy has identified certain structures and site features that are candidates for reuse by a potential follow-on generating plant at the Monticello site. These structures are excluded from the scope of the estimates for decommissioning or site restoration.

Only existing site structures are considered in the dismantling cost. The electrical switchyard remains after Monticello is decommissioned in support of the regional transmission and distribution system. Structures are removed to a nominal depth of three feet below grade. The voids are backfilled with clean debris and capped with soil. The site is then re-graded to conform to the adjacent landscape. Vegetation is established to inhibit erosion. These "non-radiological costs" are included in the total cost of decommissioning.

Costs are included for the demolition of shoreline structures. Costs are not included for general restoration of the riverbank or restoration of the circulation water canals.

Bulk excavation of soil and material in the immediate vicinity of the reactor building is included to remove various duct banks, catch basins, and underground utilities that may exist.

Concrete rubble generated from demolition activities is processed and made available as clean fill for the power block foundations. Additional clean fill is brought on site to backfill below grade voids as needed. 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 Monticello.

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

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

Utility labor costs were provided by Xcel Energy. Average costs were provided by department or work group and included payroll overheads. Decommissioning Operations Contractor (DOC) labor costs were based

on utility labor costs with modified markups to account for employee benefits, DOC overhead and profit.

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

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

A profile of the staffing level for Scenario 1 decommissioning, including contractors and craft, is provided in Figure 3.1. Utility staffing levels will gradually decrease after completing the removal of physical systems at the station.

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

3.5.3 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.

Activation levels in the vessel and internal components are modeled using NUREG/CR-3474.[33] Estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the Monticello components, projected operating life(s), and different periods of decay. Additional short-lived isotopes were derived from NUREG/CR-0130 [34] and NUREG/CR-0672 [35] and benchmarked to the long-lived values from CR-3474.

The disposal cost for the control blades removed from the vessel with the final core load is included within the estimates. Control blade residence time in the reactor is assumed to be controlled such that the blades do not become GTCC material. Disposition of any blades stored in the pools from operations is considered an operating expense and therefore not accounted for in the estimates.

Activation of the reactor building is confined to the area around the sacrificial shield.

3.5.4 General

Transition Activities

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

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale.
- Process operating waste inventories. The estimates do not address the disposition of any legacy wastes and the disposal of operating wastes during this initial period is not considered a decommissioning expense.

Scrap and Salvage

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

not attempt to quantify the value that an owner may realize based upon those efforts.

It is assumed, for purposes of this analysis, that any value received from the sale of scrap generated in the dismantling process would be more than offset by the on-site processing costs. The dismantling techniques assumed in the decommissioning 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. An allowance has been included for the survey and release of all metallic material released from the site.

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

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

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance provided in SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning."[36] The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

Xcel Energy Corporate Overhead

Corporate overhead charges for site support activities are not included in these estimates.

Site Non-Labor Overhead

These estimates include costs for site non-labor overhead charges. These costs include telephones, copy machines, computers, IT infrastructure, office supplies, janitorial supplies, training expenses, etc. Xcel Energy provided a two-part cost to address these costs. A variable charge of $7,014 per person per year of the Xcel Energy staff is included throughout the estimate. A fixed annual overhead charge is also included, starting at $2,435 thousand at the time of unit shut down and decreasing to approximately $503 thousand.

Energy

For estimating purposes, the plant is assumed to be de-energized, with the exception of those facilities associated with spent fuel storage (temporary power is run throughout the plant, as needed). Replacement power costs are used to calculate the cost of energy consumed during decommissioning for tooling, lighting, ventilation, and essential services.

Taxes

Xcel Energy provided the basis for the structures and land taxes included within the estimates, including the reduction of these taxes over time.

NRC Fees

These estimates include charges from the NRC to support the Monticello decommissioning program. Charges are included for the yearly license held by Xcel Energy for the Part 50 license, as well as engineering support charges by the NRC to review activities at the site. The Part 50 license fee for a reactor in a decommissioning or possession-only status and which has spent fuel onsite is $224 thousand per year. Once the reactor has been decommissioned, the site Part 72 license continues at the same fee until final removal of the spent fuel. The hourly rate for NRC review is $279.00. The level of effort of NRC participation is commensurate with the decommissioning alternative and schedule; for example Scenario 2 has an estimated NRC support requirement of

approximately 13,300 hours from shutdown until termination of the ISFSI license.

Emergency Planning Fees

These estimates include costs for emergency planning support activities. There are three separate civil emergency planning organizations assumed to be supporting Xcel Energy during the decommissioning program. The Federal Emergency Management Agency (FEMA) yearly fees are estimated at $553,000 for the site from shutdown until approximately 18 months after each unit's shutdown, after which the FEMA fees are assumed to be eliminated.

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

Schedules of expenditures are provided in Tables 3.1 through 3.4. The tables delineate the costs by year of expenditures as well as cost contributor (e.g., labor, equipment & materials, energy, radioactive waste disposal, and other costs).

The cost elements in Table 3.1 (Scenario 1) are also assigned to one of three subcategories: "License Termination," "Spent Fuel Management," and "Site Restoration." The subcategory "License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). In situations where the long-term management of spent fuel is not an issue, the cost reported for this subcategory is generally sufficient to terminate the unit's operating license, recognizing that there may be some additional cost impact from spent fuel management. Table 3.1a lists the License Termination subcategory schedule of expenditures.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel from the pool to an appropriate disposal facility or to the ISFSI for interim storage, and the transfer of the spent fuel canisters from the ISFSI. Costs are also included for the operations of the pool and the management of the ISFSI until such time that the transfer of all fuel from this facility to an off-site location (e.g., geologic repository) is

complete. Table 3.1b lists the Spent Fuel Management subcategory schedule of expenditures.

"Site Restoration" is used to capture costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination. This includes structures never exposed to radioactive materials, as well as those facilities that have been decontaminated to appropriate levels. Structures are removed to a depth of three feet and backfilled to conform to local grade. Table 3.1c lists the Site Restoration subcategory schedule of expenditures.

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

Table 3.2 presents Scenario 2 (60 years without cask replacement). Table 3.3 presents Scenario 3 (100 years with cask replacement). Table 3.4 presents Scenario 4 (200 years with cask replacement). The tables delineate the cost contributors by year of expenditures as well as cost contributor (e.g., labor, materials, and waste disposal).

Decommissioning costs are reported in 2014 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure (or projected lifetime of the plant). The schedules are based upon the detailed activity costs reported in Appendices C through F, along with the timelines presented in Section 4.

TABLE 3.1
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	18,974	10,063	1,279	19	3,286	33,621
2031	62,013	27,009	5,339	1,241	18,173	113,776
2032	61,346	28,117	4,661	41,885	19,052	155,061
2033	55,908	23,767	3,456	29,792	12,841	125,764
2034	51,600	16,619	3,045	8,577	10,266	90,107
2035	43,414	19,813	2,445	6,285	9,312	81,270
2036	11,723	255	814	41	6,733	19,566
2037	11,691	254	812	41	6,714	19,512
2038	11,691	254	812	41	6,714	19,512
2039	11,691	254	812	41	6,714	19,512
2040	11,723	255	814	41	6,733	19,566
2041	11,691	254	812	41	6,714	19,512
2042	11,691	254	812	41	6,714	19,512
2043	11,860	759	812	41	6,714	20,185
2044	11,723	255	814	41	6,733	19,566
2045	28,226	28,482	1,068	6,395	7,324	71,494
2046	36,039	10,333	1,168	8,884	5,347	61,772
2047	21,046	7,385	484	9	2,318	31,241
2048	17,433	8,168	376	0	2,215	28,191
2049	3,909	0	0	0	2,186	6,095
2050	4,329	1,261	0	0	2,186	7,776
2051	3,909	0	0	0	2,186	6,095
2052	4,424	1,514	0	0	2,192	8,129
2053	4,329	1,261	0	0	2,186	7,776
2054	3,909	0	0	0	2,186	6,095
2055	4,329	1,261	0	0	2,186	7,776
2056	4,340	1,261	0	0	2,192	7,793
2057	3,909	0	0	0	2,186	6,095
2058	4,413	1,514	0	0	2,186	8,113
2059	3,909	0	0	0	2,186	6,095
2060	4,340	1,261	0	0	2,192	7,793
2061	3,909	0	0	0	2,186	6,095
2062	4,329	1,261	0	0	2,186	7,776

TABLE 3.1 (continued)
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	3,909	0	0	0	2,186	6,095
2064	4,340	1,261	0	0	2,192	7,793
2065	3,909	0	0	0	2,186	6,095
2066	4,073	2,333	0	28	9,984	16,418
2067	1,515	839	68	3,379	3,186	8,986
Total	577,519	197,579	30,702	106,859	200,969	1,113,628

Note: Columns may not add due to rounding

TABLE 3.1a
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF LICENSE TERMINATION EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	15,660	581	1,279	19	1,883	19,421
2031	54,552	6,394	5,339	1,241	13,721	81,247
2032	61,182	28,098	4,661	41,885	14,855	150,681
2033	54,179	18,598	3,456	29,792	8,855	114,880
2034	48,111	6,162	3,045	8,577	6,421	72,315
2035	37,050	4,576	2,445	6,285	5,468	55,823
2036	6,933	255	814	41	2,877	10,920
2037	6,914	254	812	41	2,869	10,891
2038	6,914	254	812	41	2,869	10,891
2039	6,914	254	812	41	2,869	10,891
2040	6,933	255	814	41	2,877	10,920
2041	6,914	254	812	41	2,869	10,891
2042	6,914	254	812	41	2,869	10,891
2043	6,914	254	812	41	2,869	10,891
2044	6,933	255	814	41	2,877	10,920
2045	16,184	2,174	1,068	6,395	3,766	29,586
2046	33,800	3,614	1,168	8,884	3,801	51,268
2047	6,197	284	156	9	443	7,089
2048	109	0	0	0	0	109
2049-65	0	0	0	0	0	0
2066	6	1,829	0	28	7,799	9,663
2067	777	98	0	3,379	3,009	7,264
Total	390,094	74,699	29,930	106,859	95,869	697,451

Note: Columns may not add due to rounding

TABLE 3.1b
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	3,161	9,483	0	0	1,403	14,046
2031	6,872	20,615	0	0	4,453	31,939
2032	0	0	0	0	3,969	3,969
2033	1,719	5,157	0	0	3,845	10,721
2034	3,486	10,457	0	0	3,845	17,788
2035	6,362	15,237	0	0	3,845	25,443
2036	4,790	0	0	0	3,855	8,645
2037	4,777	0	0	0	3,845	8,622
2038	4,777	0	0	0	3,845	8,622
2039	4,777	0	0	0	3,845	8,622
2040	4,790	0	0	0	3,855	8,645
2041	4,777	0	0	0	3,845	8,622
2042	4,777	0	0	0	3,845	8,622
2043	4,945	505	0	0	3,845	9,294
2044	4,790	0	0	0	3,855	8,645
2045	12,041	26,308	0	0	3,558	41,908
2046	2,240	6,719	0	0	1,546	10,504
2047	3,183	1,515	0	0	1,718	6,416
2048	3,958	1,768	0	0	2,034	7,761
2049	3,909	0	0	0	2,186	6,095
2050	4,329	1,261	0	0	2,186	7,776
2051	3,909	0	0	0	2,186	6,095
2052	4,424	1,514	0	0	2,192	8,129
2053	4,329	1,261	0	0	2,186	7,776
2054	3,909	0	0	0	2,186	6,095
2055	4,329	1,261	0	0	2,186	7,776
2056	4,340	1,261	0	0	2,192	7,793
2057	3,909	0	0	0	2,186	6,095
2058	4,413	1,514	0	0	2,186	8,113
2059	3,909	0	0	0	2,186	6,095
2060	4,340	1,261	0	0	2,192	7,793
2061	3,909	0	0	0	2,186	6,095
2062	4,329	1,261	0	0	2,186	7,776
2063	3,909	0	0	0	2,186	6,095

TABLE 3.1b (continued)
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	4,340	1,261	0	0	2,192	7,793
2065	3,909	0	0	0	2,186	6,095
2066	4,066	505	0	0	2,184	6,755
Total	160,732	110,124	0	0	104,215	375,071

Note: Columns may not add due to rounding

TABLE 3.1c
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF SITE RESTORATION EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	153	0	0	0	0	153
2031	589	0	0	0	0	589
2032	164	19	0	0	228	412
2033	10	12	0	0	142	163
2034	4	0	0	0	0	4
2035	3	0	0	0	0	3
2036-46						
2047	11,665	5,585	328	0	158	17,737
2048	13,366	6,400	376	0	181	20,322
2049-66						
2067	738	740	68	0	176	1,723
Total	26,693	12,757	772	0	884	41,106

Note: Columns may not add due to rounding

TABLE 3.2
SCENARIO 2
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	18,104	7,454	1,279	19	3,286	30,142
2031	60,127	21,351	5,339	1,241	18,173	106,232
2032	61,361	28,164	4,661	41,885	19,052	155,123
2033	56,046	24,180	3,456	29,792	12,841	126,315
2034	51,864	17,410	3,045	8,577	10,266	91,162
2035	43,611	20,404	2,445	6,285	9,312	82,058
2036	11,739	301	814	41	6,733	19,627
2037	11,707	300	812	41	6,714	19,574
2038	11,707	300	812	41	6,714	19,574
2039	11,707	300	812	41	6,714	19,574
2040	11,739	301	814	41	6,733	19,627
2041	11,707	300	812	41	6,714	19,574
2042	11,707	300	812	41	6,714	19,574
2043	11,707	300	812	41	6,714	19,574
2044	11,739	301	814	41	6,733	19,627
2045	27,752	27,062	1,068	6,395	7,324	69,600
2046	35,679	9,251	1,168	8,884	5,347	60,329
2047	20,353	6,708	484	9	2,786	30,339
2048	16,672	7,495	376	0	2,738	27,282
2049	3,924	46	0	0	2,019	5,989
2050	6,097	6,564	0	0	2,019	14,680
2051	7,284	10,127	0	0	2,019	19,431
2052	5,316	4,189	0	0	2,025	11,529
2053	6,889	8,939	0	0	2,019	17,847
2054	8,076	12,502	0	0	2,019	22,597
2055	3,909	0	0	0	2,019	5,928
2056	3,920	0	0	0	2,025	5,944
2057	3,909	0	0	0	2,019	5,928
2058	3,909	0	0	0	2,019	5,928
2059	3,909	0	0	0	2,019	5,928
2060	3,920	0	0	0	2,025	5,944
2061	3,909	0	0	0	2,019	5,928
2062	3,909	0	0	0	2,019	5,928

TABLE 3.2 (continued)
SCENARIO 2
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	3,909	0	0	0	2,019	5,928
2064	3,920	0	0	0	2,025	5,944
2065	3,909	0	0	0	2,019	5,928
2066	3,909	0	0	0	2,019	5,928
2067	3,909	0	0	0	2,019	5,928
2068	3,920	0	0	0	2,025	5,944
2069	3,909	0	0	0	2,019	5,928
2070	3,909	0	0	0	2,019	5,928
2071	3,909	0	0	0	2,019	5,928
2072	3,920	0	0	0	2,025	5,944
2073	3,909	0	0	0	2,019	5,928
2074	3,909	0	0	0	2,019	5,928
2075	3,909	0	0	0	2,019	5,928
2076	3,920	0	0	0	2,025	5,944
2077	4,077	505	0	0	2,285	6,866
2078	4,413	1,514	0	0	2,286	8,212
2079	4,329	1,261	0	0	2,286	7,876
2080	4,340	1,261	0	0	2,292	7,893
2081	4,329	1,261	0	0	2,286	7,876
2082	4,413	1,514	0	0	2,286	8,212
2083	4,329	1,261	0	0	2,286	7,876
2084	4,340	1,261	0	0	2,292	7,893
2085	4,329	1,261	0	0	2,286	7,876
2086	4,413	1,514	0	0	2,286	8,212
2087	4,329	1,261	0	0	2,286	7,876
2088	4,954	3,103	0	0	2,292	10,348
2089	4,329	1,261	0	0	2,286	7,876
2090	4,077	2,332	0	0	10,060	16,469
2091	1,533	840	68	3,407	3,217	9,064
Total	683,207	235,961	30,702	106,859	251,187	1,307,915

Note: Columns may not add due to rounding

TABLE 3.3
SCENARIO 3
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	18,104	7,454	1,279	19	3,286	30,142
2031	60,127	21,351	5,339	1,241	18,173	106,232
2032	61,361	28,164	4,661	41,885	19,052	155,123
2033	56,046	24,180	3,456	29,792	12,841	126,315
2034	51,864	17,410	3,045	8,577	10,266	91,162
2035	43,611	20,404	2,445	6,285	9,312	82,058
2036	11,739	301	814	41	6,733	19,627
2037	11,707	300	812	41	6,714	19,574
2038	11,707	300	812	41	6,714	19,574
2039	11,707	300	812	41	6,714	19,574
2040	11,739	301	814	41	6,733	19,627
2041	11,707	300	812	41	6,714	19,574
2042	11,707	300	812	41	6,714	19,574
2043	11,707	300	812	41	6,714	19,574
2044	11,739	301	814	41	6,733	19,627
2045	27,752	27,062	1,068	6,395	7,324	69,600
2046	35,679	9,251	1,168	8,884	5,347	60,329
2047	20,375	6,775	484	9	2,786	30,429
2048	16,728	7,427	376	0	2,815	27,345
2049	4,939	46	0	0	3,016	8,001
2050	6,320	4,189	0	0	3,016	13,524
2051	6,320	4,189	0	0	3,016	13,524
2052	6,333	4,189	0	0	3,024	13,546
2053	6,320	4,189	0	0	3,016	13,524
2054	6,320	4,189	0	0	3,016	13,524
2055	6,320	4,189	0	0	3,016	13,524
2056	9,683	14,239	0	0	3,024	26,947
2057	6,320	4,189	0	0	3,016	13,524
2058	13,602	26,037	0	1,557	3,016	44,212
2059	6,320	4,189	0	0	3,016	13,524
2060	6,333	4,189	0	0	3,024	13,546
2061	6,320	4,189	0	0	3,016	13,524
2062	6,320	4,189	0	0	3,016	13,524

TABLE 3.3 (continued)
SCENARIO 3
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	13,602	26,037	0	1,557	3,016	44,212
2064	6,333	4,189	0	0	3,024	13,546
2065	6,320	4,189	0	0	3,016	13,524
2066	13,602	26,037	0	1,557	3,016	44,212
2067	6,320	4,189	0	0	3,016	13,524
2068	6,333	4,189	0	0	3,024	13,546
2069	6,320	4,189	0	0	3,016	13,524
2070	6,320	4,189	0	0	3,016	13,524
2071	6,320	4,189	0	0	3,016	13,524
2072	6,333	4,189	0	0	3,024	13,546
2073	6,320	4,189	0	0	3,016	13,524
2074	6,320	4,189	0	0	3,016	13,524
2075	6,320	4,189	0	0	3,016	13,524
2076	6,333	4,189	0	0	3,024	13,546
2077	6,320	4,189	0	0	3,016	13,524
2078	6,320	4,189	0	0	3,016	13,524
2079	6,320	4,189	0	0	3,016	13,524
2080	13,616	26,037	0	1,557	3,024	44,234
2081	6,320	4,189	0	0	3,016	13,524
2082	6,320	4,189	0	0	3,016	13,524
2083	6,320	4,189	0	0	3,016	13,524
2084	6,333	4,189	0	0	3,024	13,546
2085	15,787	32,591	0	2,024	3,016	53,418
2086	6,320	4,189	0	0	3,016	13,524
2087	6,320	4,189	0	0	3,016	13,524
2088	6,947	6,030	0	0	3,024	16,001
2089	6,320	4,189	0	0	3,016	13,524
2090	6,320	4,189	0	0	3,016	13,524
2091	8,299	10,127	0	0	3,016	21,442
2092	6,333	4,189	0	0	3,024	13,546
2093	7,903	8,939	0	0	3,016	19,858
2094	9,091	12,502	0	0	3,016	24,609
2095	15,119	30,587	0	2,034	3,016	50,756

TABLE 3.3 (continued)
SCENARIO 3
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2096	4,937	0	0	0	3,024	7,961
2097	4,923	0	0	0	3,016	7,939
2098	4,923	0	0	0	3,016	7,939
2099	4,923	0	0	0	3,016	7,939
2100	4,923	0	0	0	3,016	7,939
2101	4,923	0	0	0	3,016	7,939
2102	4,923	0	0	0	3,016	7,939
2103	4,923	0	0	0	3,016	7,939
2104	4,937	0	0	0	3,024	7,961
2105	4,923	0	0	0	3,016	7,939
2106	4,923	0	0	0	3,016	7,939
2107	4,923	0	0	0	3,016	7,939
2108	4,937	0	0	0	3,024	7,961
2109	4,923	0	0	0	3,016	7,939
2110	4,923	0	0	0	3,016	7,939
2111	4,923	0	0	0	3,016	7,939
2112	4,937	0	0	0	3,024	7,961
2113	4,923	0	0	0	3,016	7,939
2114	4,923	0	0	0	3,016	7,939
2115	4,923	0	0	0	3,016	7,939
2116	4,937	0	0	0	3,024	7,961
2117	4,077	505	0	0	2,286	6,867
2118	4,413	1,514	0	0	2,286	8,212
2119	4,329	1,261	0	0	2,286	7,876
2120	4,340	1,261	0	0	2,292	7,893
2121	4,329	1,261	0	0	2,286	7,876
2122	4,413	1,514	0	0	2,286	8,212
2123	4,329	1,261	0	0	2,286	7,876
2124	4,340	1,261	0	0	2,292	7,893
2125	4,329	1,261	0	0	2,286	7,876
2126	4,413	1,514	0	0	2,286	8,212
2127	4,329	1,261	0	0	2,286	7,876
2128	4,954	3,103	0	0	2,292	10,348

TABLE 3.3 (continued)
SCENARIO 3
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2129	4,329	1,261	0	0	2,286	7,876
2130	4,077	2,332	0	0	10,060	16,469
2131	1,823	960	68	3,447	3,456	9,753
Total	1,016,876	559,535	30,702	117,186	400,136	2,124,434

Note: Columns may not add due to rounding

TABLE 3.4
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2030	18,104	7,454	1,279	19	3,286	30,142
2031	60,127	21,351	5,339	1,241	18,173	106,232
2032	61,361	28,164	4,661	41,885	19,052	155,123
2033	56,046	24,180	3,456	29,792	12,841	126,315
2034	51,864	17,410	3,045	8,577	10,266	91,162
2035	43,611	20,404	2,445	6,285	9,312	82,058
2036	11,739	301	814	41	6,733	19,627
2037	11,707	300	812	41	6,714	19,574
2038	11,707	300	812	41	6,714	19,574
2039	11,707	300	812	41	6,714	19,574
2040	11,739	301	814	41	6,733	19,627
2041	11,707	300	812	41	6,714	19,574
2042	11,707	300	812	41	6,714	19,574
2043	11,707	300	812	41	6,714	19,574
2044	11,739	301	814	41	6,733	19,627
2045	27,752	27,062	1,068	6,395	7,324	69,600
2046	35,679	9,251	1,168	8,884	5,347	60,329
2047	20,375	6,775	484	9	2,786	30,429
2048	16,888	7,427	376	0	2,739	27,431
2049	7,034	46	0	0	2,032	9,112
2050	8,415	4,189	0	0	2,032	14,636
2051	8,415	4,189	0	0	2,032	14,636
2052	8,434	4,189	0	0	2,038	14,661
2053	8,415	4,189	0	0	2,032	14,636
2054	8,415	4,189	0	0	2,032	14,636
2055	8,415	4,189	0	0	2,032	14,636
2056	11,784	14,239	0	0	2,038	28,062
2057	8,415	4,189	0	0	2,032	14,636
2058	15,698	26,037	0	1,555	2,032	45,322
2059	8,415	4,189	0	0	2,032	14,636
2060	8,434	4,189	0	0	2,038	14,661
2061	8,415	4,189	0	0	2,032	14,636
2062	8,415	4,189	0	0	2,032	14,636

TABLE 3.4 (continued)
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	15,698	26,037	0	1,555	2,032	45,322
2064	8,434	4,189	0	0	2,038	14,661
2065	8,415	4,189	0	0	2,032	14,636
2066	15,698	26,037	0	1,555	2,032	45,322
2067	8,415	4,189	0	0	2,032	14,636
2068	8,434	4,189	0	0	2,038	14,661
2069	8,415	4,189	0	0	2,032	14,636
2070	8,415	4,189	0	0	2,032	14,636
2071	8,415	4,189	0	0	2,032	14,636
2072	8,434	4,189	0	0	2,038	14,661
2073	8,415	4,189	0	0	2,032	14,636
2074	8,415	4,189	0	0	2,032	14,636
2075	8,415	4,189	0	0	2,032	14,636
2076	8,434	4,189	0	0	2,038	14,661
2077	8,415	4,189	0	0	2,032	14,636
2078	8,415	4,189	0	0	2,032	14,636
2079	8,415	4,189	0	0	2,032	14,636
2080	15,717	26,037	0	1,555	2,038	45,347
2081	8,415	4,189	0	0	2,032	14,636
2082	8,415	4,189	0	0	2,032	14,636
2083	8,415	4,189	0	0	2,032	14,636
2084	8,434	4,189	0	0	2,038	14,661
2085	17,883	32,591	0	2,022	2,032	54,528
2086	8,415	4,189	0	0	2,032	14,636
2087	8,415	4,189	0	0	2,032	14,636
2088	9,048	6,030	0	0	2,038	17,116
2089	8,415	4,189	0	0	2,032	14,636
2090	8,415	4,189	0	0	2,032	14,636
2091	8,415	4,189	0	0	2,032	14,636
2092	8,434	4,189	0	0	2,038	14,661
2093	8,415	4,189	0	0	2,032	14,636
2094	8,415	4,189	0	0	2,032	14,636
2095	18,611	34,776	0	2,032	2,032	57,451

TABLE 3.4 (continued)
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2096	8,434	4,189	0	0	2,038	14,661
2097	8,415	4,189	0	0	2,032	14,636
2098	8,415	4,189	0	0	2,032	14,636
2099	8,415	4,189	0	0	2,032	14,636
2100	8,415	4,189	0	0	2,032	14,636
2101	8,415	4,189	0	0	2,032	14,636
2102	8,415	4,189	0	0	2,032	14,636
2103	8,415	4,189	0	0	2,032	14,636
2104	8,434	4,189	0	0	2,038	14,661
2105	8,415	4,189	0	0	2,032	14,636
2106	8,415	4,189	0	0	2,032	14,636
2107	8,415	4,189	0	0	2,032	14,636
2108	15,717	26,037	0	1,555	2,038	45,347
2109	8,415	4,189	0	0	2,032	14,636
2110	8,415	4,189	0	0	2,032	14,636
2111	8,415	4,189	0	0	2,032	14,636
2112	8,434	4,189	0	0	2,038	14,661
2113	15,698	26,037	0	1,555	2,032	45,322
2114	8,415	4,189	0	0	2,032	14,636
2115	8,415	4,189	0	0	2,032	14,636
2116	15,717	26,037	0	1,555	2,038	45,347
2117	8,415	4,189	0	0	2,032	14,636
2118	8,415	4,189	0	0	2,032	14,636
2119	8,415	4,189	0	0	2,032	14,636
2120	8,434	4,189	0	0	2,038	14,661
2121	8,415	4,189	0	0	2,032	14,636
2122	8,415	4,189	0	0	2,032	14,636
2123	8,415	4,189	0	0	2,032	14,636
2124	8,434	4,189	0	0	2,038	14,661
2125	8,415	4,189	0	0	2,032	14,636
2126	8,415	4,189	0	0	2,032	14,636
2127	8,415	4,189	0	0	2,032	14,636
2128	9,048	6,030	0	0	2,038	17,116

TABLE 3.4 (continued)
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2129	8,415	4,189	0	0	2,032	14,636
2130	15,698	26,037	0	1,555	2,032	45,322
2131	8,415	4,189	0	0	2,032	14,636
2132	8,434	4,189	0	0	2,038	14,661
2133	8,415	4,189	0	0	2,032	14,636
2134	8,415	4,189	0	0	2,032	14,636
2135	17,883	32,591	0	2,022	2,032	54,528
2136	8,434	4,189	0	0	2,038	14,661
2137	8,415	4,189	0	0	2,032	14,636
2138	8,415	4,189	0	0	2,032	14,636
2139	8,415	4,189	0	0	2,032	14,636
2140	8,434	4,189	0	0	2,038	14,661
2141	8,415	4,189	0	0	2,032	14,636
2142	8,415	4,189	0	0	2,032	14,636
2143	8,415	4,189	0	0	2,032	14,636
2144	8,434	4,189	0	0	2,038	14,661
2145	18,611	34,776	0	2,032	2,032	57,451
2146	8,415	4,189	0	0	2,032	14,636
2147	8,415	4,189	0	0	2,032	14,636
2148	8,434	4,189	0	0	2,038	14,661
2149	8,415	4,189	0	0	2,032	14,636
2150	8,415	4,189	0	0	2,032	14,636
2151	8,415	4,189	0	0	2,032	14,636
2152	8,434	4,189	0	0	2,038	14,661
2153	8,415	4,189	0	0	2,032	14,636
2154	8,415	4,189	0	0	2,032	14,636
2155	8,415	4,189	0	0	2,032	14,636
2156	8,434	4,189	0	0	2,038	14,661
2157	8,415	4,189	0	0	2,032	14,636
2158	15,698	26,037	0	1,555	2,032	45,322
2159	8,415	4,189	0	0	2,032	14,636
2160	8,434	4,189	0	0	2,038	14,661
2161	8,415	4,189	0	0	2,032	14,636

TABLE 3.4 (continued)
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2162	8,415	4,189	0	0	2,032	14,636
2163	15,698	26,037	0	1,555	2,032	45,322
2164	8,434	4,189	0	0	2,038	14,661
2165	8,415	4,189	0	0	2,032	14,636
2166	15,698	26,037	0	1,555	2,032	45,322
2167	8,415	4,189	0	0	2,032	14,636
2168	9,048	6,030	0	0	2,038	17,116
2169	8,415	4,189	0	0	2,032	14,636
2170	8,415	4,189	0	0	2,032	14,636
2171	8,415	4,189	0	0	2,032	14,636
2172	8,434	4,189	0	0	2,038	14,661
2173	8,415	4,189	0	0	2,032	14,636
2174	8,415	4,189	0	0	2,032	14,636
2175	8,415	4,189	0	0	2,032	14,636
2176	8,434	4,189	0	0	2,038	14,661
2177	8,415	4,189	0	0	2,032	14,636
2178	8,415	4,189	0	0	2,032	14,636
2179	8,415	4,189	0	0	2,032	14,636
2180	15,717	26,037	0	1,555	2,038	45,347
2181	8,415	4,189	0	0	2,032	14,636
2182	8,415	4,189	0	0	2,032	14,636
2183	8,415	4,189	0	0	2,032	14,636
2184	8,434	4,189	0	0	2,038	14,661
2185	17,883	32,591	0	2,022	2,032	54,528
2186	8,415	4,189	0	0	2,032	14,636
2187	8,415	4,189	0	0	2,032	14,636
2188	8,434	4,189	0	0	2,038	14,661
2189	8,415	4,189	0	0	2,032	14,636
2190	9,207	6,564	0	0	2,032	17,803
2191	10,394	10,127	0	0	2,032	22,554
2192	8,434	4,189	0	0	2,038	14,661
2193	9,999	8,939	0	0	2,032	20,970
2194	11,186	12,502	0	0	2,032	25,721

TABLE 3.4 (continued)
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

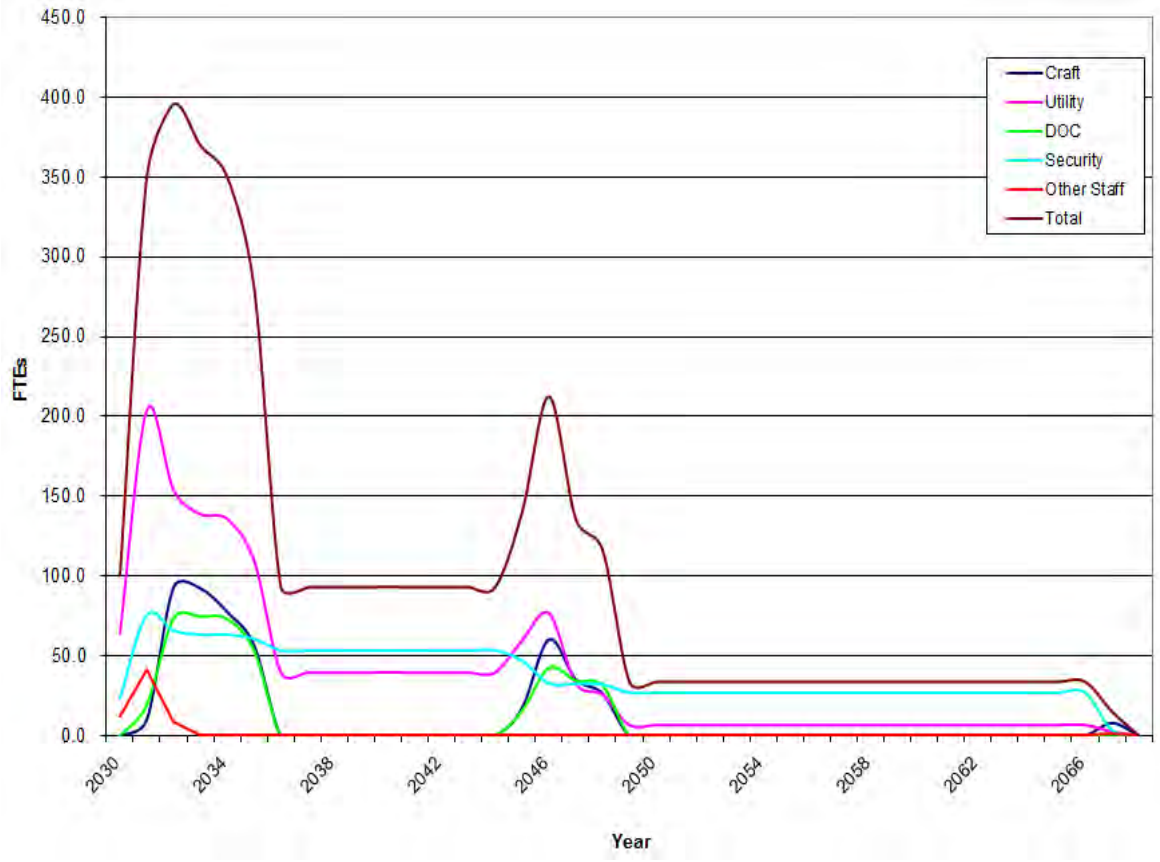
Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2195	17,215	30,587	0	2,032	2,032	51,866
2196	7,038	0	0	0	2,038	9,076
2197	7,019	0	0	0	2,032	9,051
2198	7,019	0	0	0	2,032	9,051
2199	7,019	0	0	0	2,032	9,051
2200	7,019	0	0	0	2,032	9,051
2201	7,019	0	0	0	2,032	9,051
2202	7,019	0	0	0	2,032	9,051
2203	7,019	0	0	0	2,032	9,051
2204	7,038	0	0	0	2,038	9,076
2205	7,019	0	0	0	2,032	9,051
2206	7,019	0	0	0	2,032	9,051
2207	7,019	0	0	0	2,032	9,051
2208	14,934	23,689	0	1,555	2,038	42,217
2209	7,019	0	0	0	2,032	9,051
2210	7,019	0	0	0	2,032	9,051
2211	7,019	0	0	0	2,032	9,051
2212	7,038	0	0	0	2,038	9,076
2213	14,301	21,848	0	1,555	2,032	39,737
2214	7,019	0	0	0	2,032	9,051
2215	7,019	0	0	0	2,032	9,051
2216	7,038	0	0	0	2,038	9,076
2217	4,077	505	0	0	2,286	6,867
2218	4,413	1,514	0	0	2,286	8,212
2219	4,329	1,261	0	0	2,286	7,876
2220	4,340	1,261	0	0	2,292	7,893
2221	4,329	1,261	0	0	2,286	7,876
2222	4,413	1,514	0	0	2,286	8,212
2223	4,329	1,261	0	0	2,286	7,876
2224	4,340	1,261	0	0	2,292	7,893
2225	4,329	1,261	0	0	2,286	7,876
2226	4,413	1,514	0	0	2,286	8,212
2227	4,329	1,261	0	0	2,286	7,876

TABLE 3.4 (continued)
SCENARIO 4
MONTICELLO NUCLEAR GENERATING PLANT
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2014 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2228	4,340	1,261	0	0	2,292	7,893
2229	4,329	1,261	0	0	2,286	7,876
2230	4,077	2,332	0	0	10,060	16,469
2231	1,823	960	68	3,447	3,455	9,753
Total	2,115,755	1,320,942	30,702	140,829	536,503	4,144,731

Note: Columns may not add due to rounding

FIGURE 3.1
SCENARIO 1
MONTICELLO NUCLEAR GENERATING PLANT
MANPOWER LEVELS



4. SCHEDULE ESTIMATE

The schedule for the decommissioning scenario considered in this study follows the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints. In addition, the scheduling has been revised to reflect the spent fuel management plan described in Section 3.5.1.

A schedule or sequence of activities for the DECON alternative (without the post-decommissioning ISFSI operating period) is presented in Figure 4.1. The scheduling sequence assumes that fuel is removed from the spent fuel pool approximately fifteen years following the permanent cessation of plant operations. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost table, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project Professional 2010" computer software.[37]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

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

- The fuel handling area of the reactor building is isolated until such time that all spent fuel has been discharged from the spent fuel pool to the ISFSI. Decontamination and dismantling of the storage pool is initiated once the transfer of spent fuel is complete.
- All work (except vessel and internals removal) is performed during an 8-hour workday, 5 days per week, with no overtime. There are eleven paid holidays per year.
- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.
- Multiple crews work parallel activities to the maximum extent possible, consistent with optimum efficiency, adequate access for cutting, removal and laydown space, and with the stringent safety measures necessary during demolition of heavy components and structures.

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

4.2 PROJECT SCHEDULE

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

Project timelines are provided in Figures 4.2 through 4.4, with milestone dates based on the anticipated shutdown date. The fuel pool is emptied approximately fifteen years after shutdown, while ISFSI operations continue until all spent fuel has been transferred to an appropriate disposal facility.

FIGURE 4.1
ACTIVITY SCHEDULE

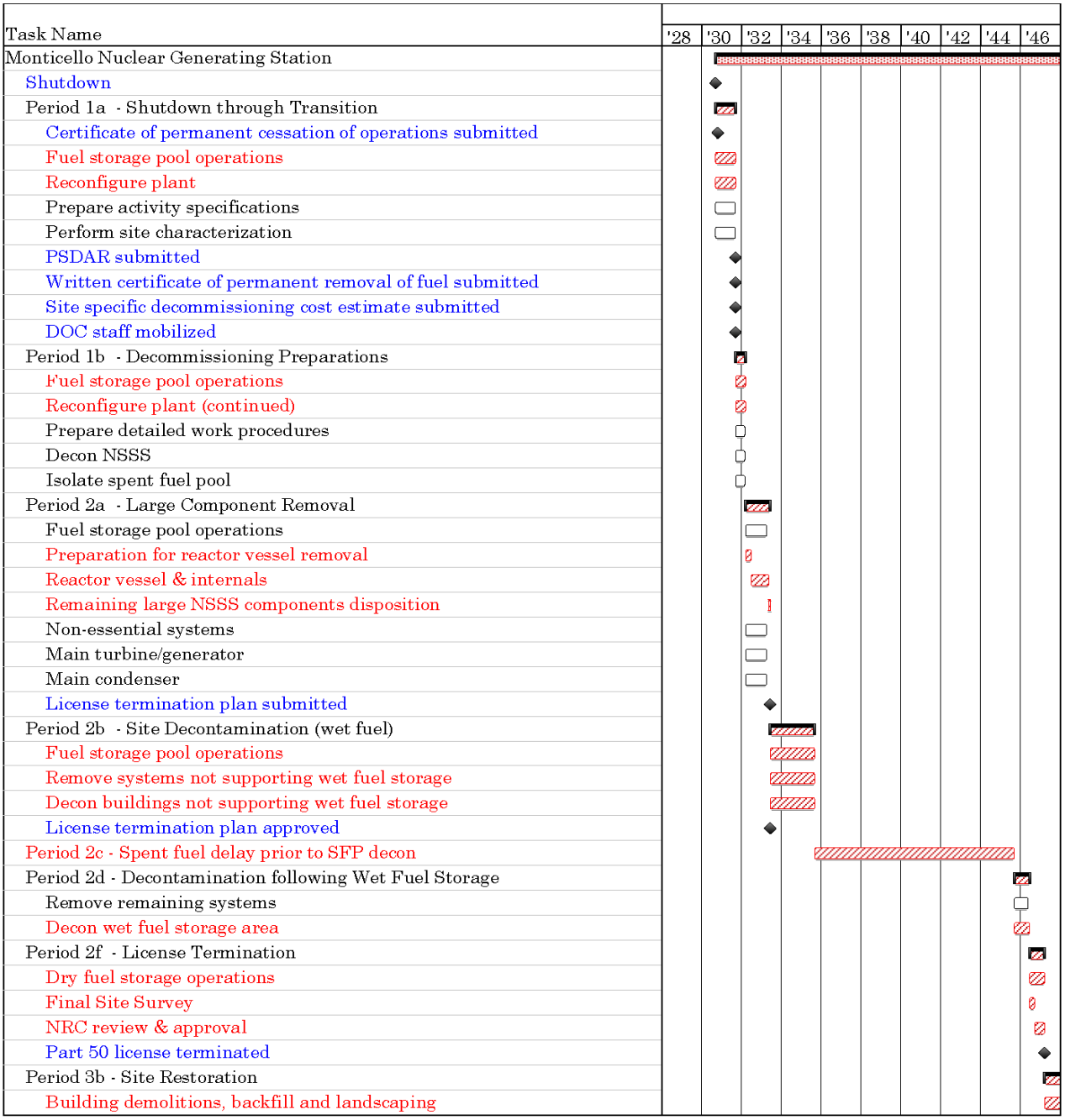


FIGURE 4.1
ACTIVITY SCHEDULE
(continued)

LEGEND

1. Red scheduling bars indicate critical path activities
2. Blue scheduling bars associated with major decommissioning periods, e.g., Period 1a, indicate overall duration of that period
3. Diamond symbols indicate major milestones
4. In the chart header, the "Y1", "Y4", et. al. refers to the years of the decommissioning project. Therefore, "Y1" is the year of shutdown, or 2030.

FIGURE 4.2
SCENARIO 1 DECOMMISSIONING TIMELINE
(not to scale)

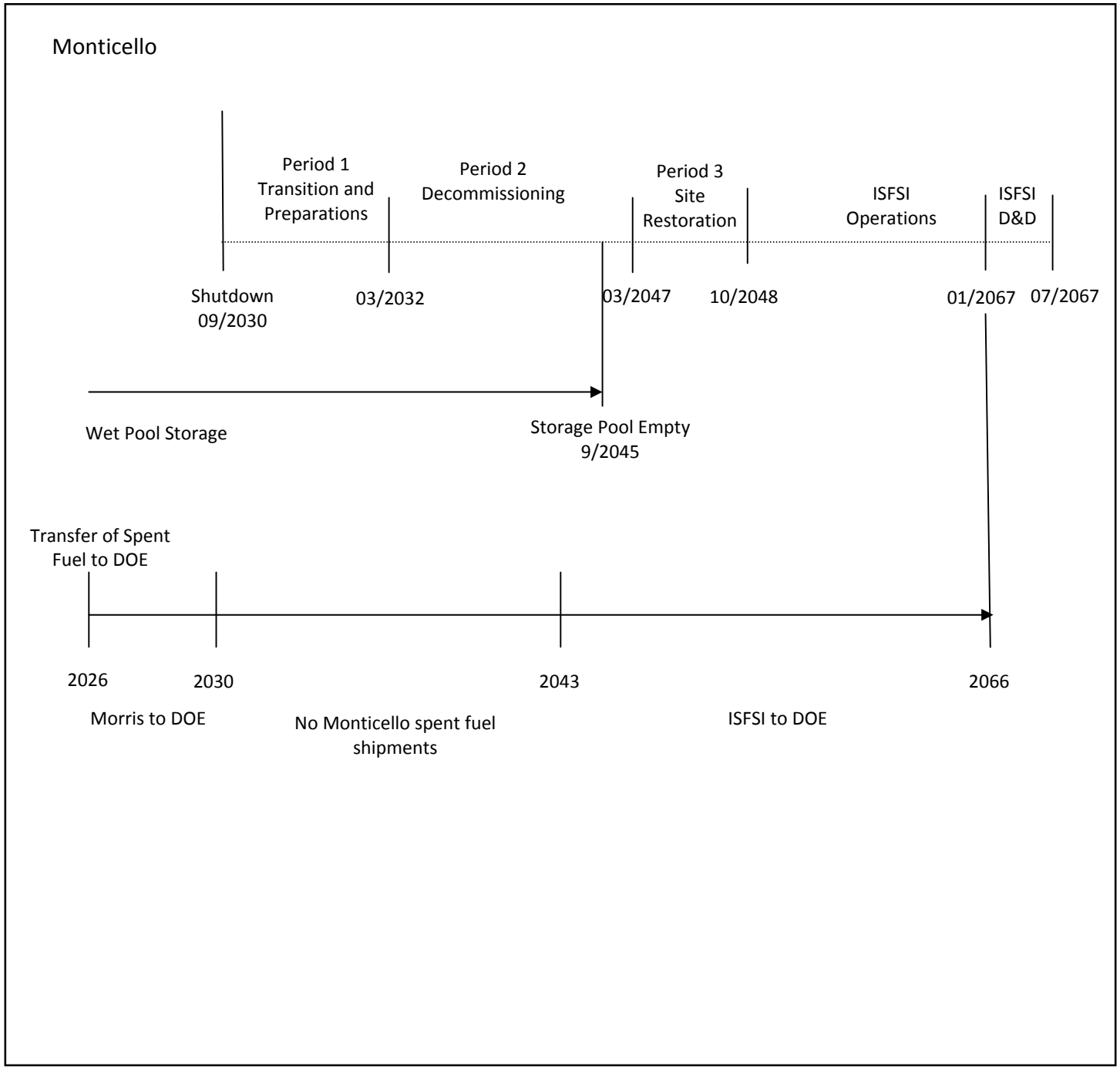


FIGURE 4.3
SCENARIO 2 DECOMMISSIONING TIMELINE
(not to scale)

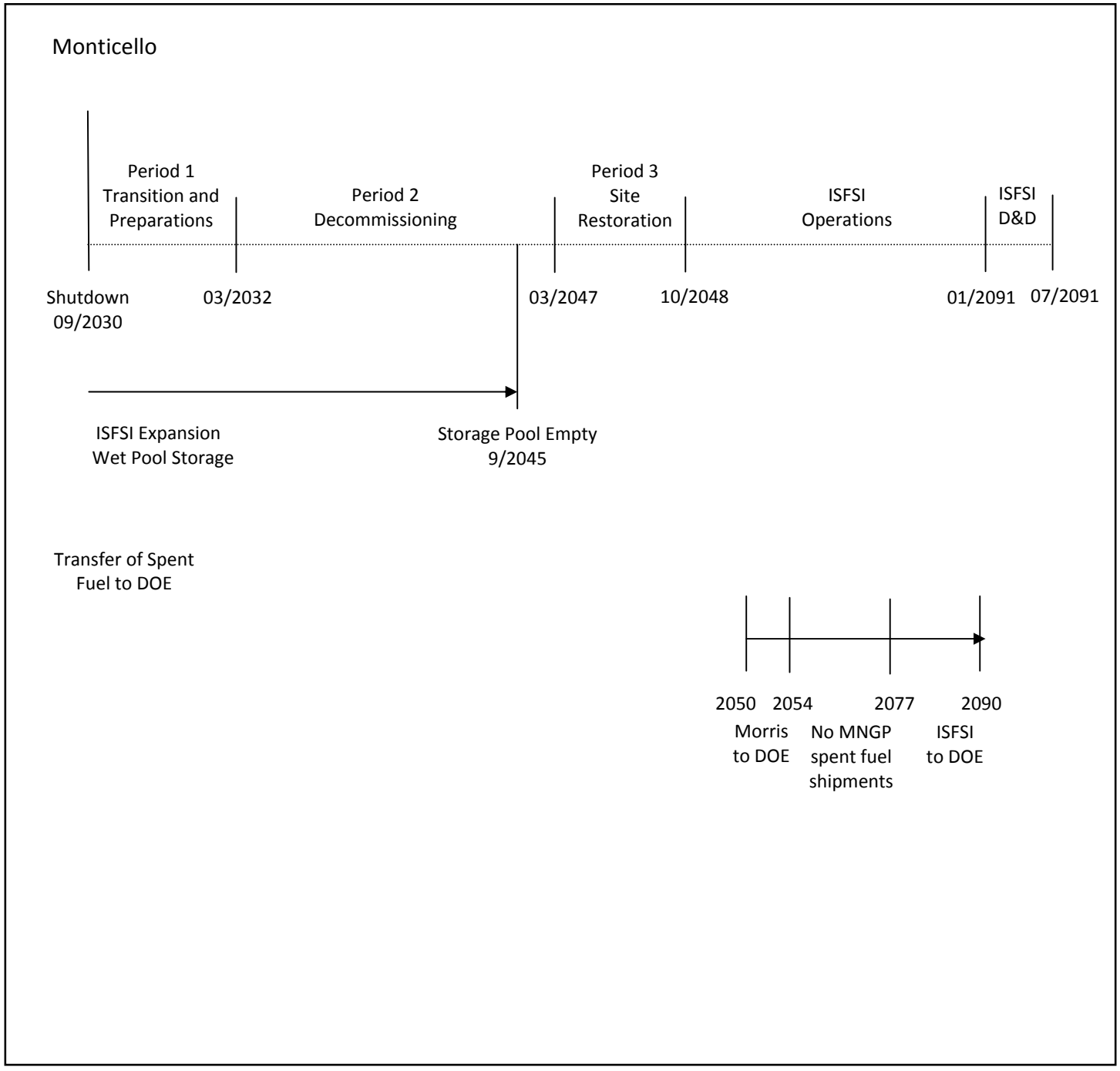


FIGURE 4.4
SCENARIO 3 DECOMMISSIONING TIMELINE
(not to scale)

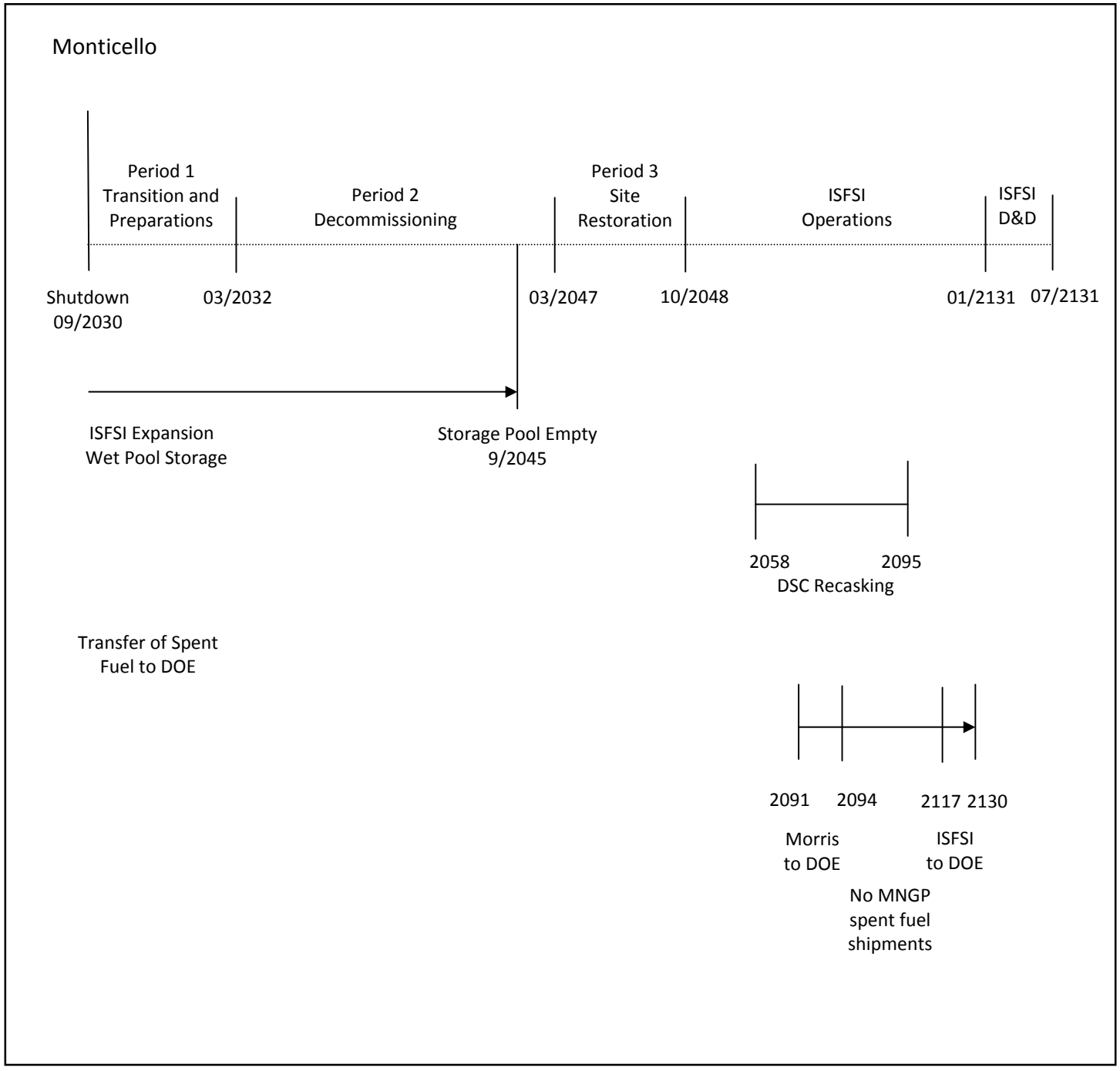
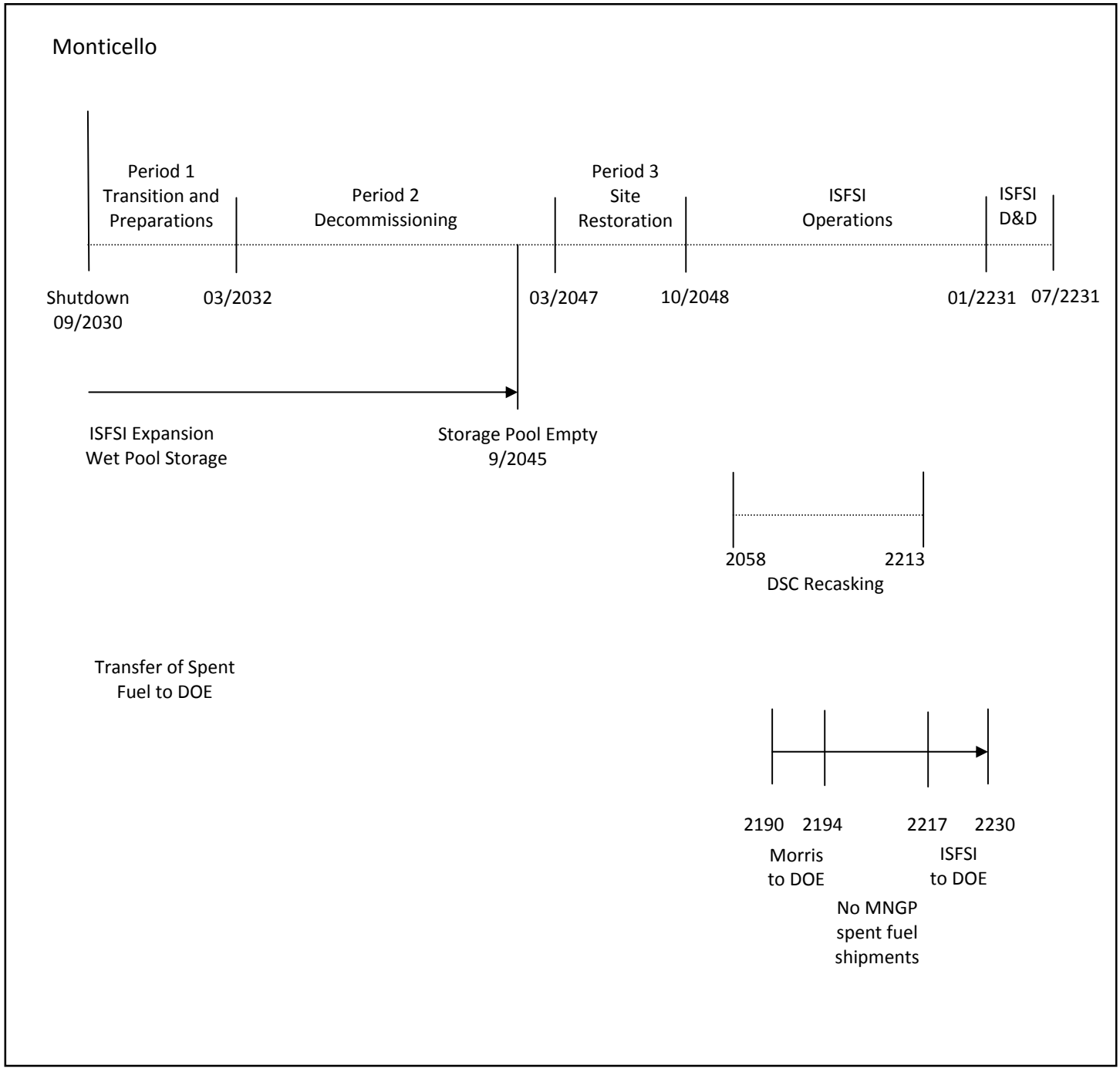


FIGURE 4.5
SCENARIO 4 DECOMMISSIONING TIMELINE
(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license. This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,[38] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations delineates the production, utilization, and disposal of radioactive materials and processes. In particular, Part 71 defines radioactive material as it pertains to transportation and Part 61 specifies its disposition.

Most of the materials being transported for controlled burial are categorized as Low Specific Activity (LSA) or Surface Contaminated Object (SCO) materials containing Type A quantities, as defined in 49 CFR Parts 173-178. Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3, as defined in 10 CFR §173.411). For this study, commercially available steel containers are presumed to be used for the disposal of piping, small components, and concrete. Larger components can serve as their own containers, with proper closure of all openings, access ways, and penetrations.

The destinations for the various waste streams from decommissioning are identified in Figures 5.1 and 5.2. The volumes of radioactive waste generated during the various decommissioning activities are shown on a line-item basis in Appendices C through F, and summarized in Tables 5.1, 5.2 and 5.3. The quantified waste volume summaries shown in these tables are consistent with Part 61 classifications. The volumes are calculated based on the exterior dimensions for containerized material and on the displaced volume of components serving as their own waste containers.

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

No process system containing/handling radioactive substances at shutdown is presumed to meet material release criteria by decay alone (i.e., systems radioactive at shutdown will still be radioactive over the time period during which the decommissioning is accomplished, due to the presence of long-lived radionuclides).

While the dose rates decrease with time, radionuclides such as ^{137}Cs will still control the disposition requirements.

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

For purposes of constructing the estimates, the cost for disposal at the Energy*Solutions* facility was used. Separate rates were used for containerized waste and large components, including the steam generators and reactor coolant pump motors. Demolition debris including miscellaneous steel, scaffolding, and concrete was disposed of at a bulk rate. The decommissioning waste stream also included resins and dry active waste.

The recently completed facility in Andrews County was declared operational by the operator, Waste Control Specialists (WCS), in November 2011. The facility will be able to accept limited quantities of non-Compact waste; however, at this time the cost for non-Compact generators is being negotiated on an individual basis. The Texas facility is licensed to receive the higher activity waste forms (Classes B and C). As such, for this analysis, disposal costs for the Class B and C waste were based upon the preliminary and indicative information on the cost for such from WCS.

A small quantity of material will be generated during the Monticello decommissioning that is not considered suitable for near-surface disposal, and is assumed to be disposed of in a geologic repository, in a manner similar to that envisioned for spent fuel disposal. This material, known as Greater-Than-Class-C or GTCC material, is estimated to require seven spent fuel storage canisters (or the equivalent) to dispose of the most radioactive portions of the two reactor vessel internals. The volume and weight reported in Tables 5.1, 5.2 and 5.3 represent the packaged weight and volume of the spent fuel storage canisters.

FIGURE 5.1
RADIOACTIVE WASTE DISPOSITION

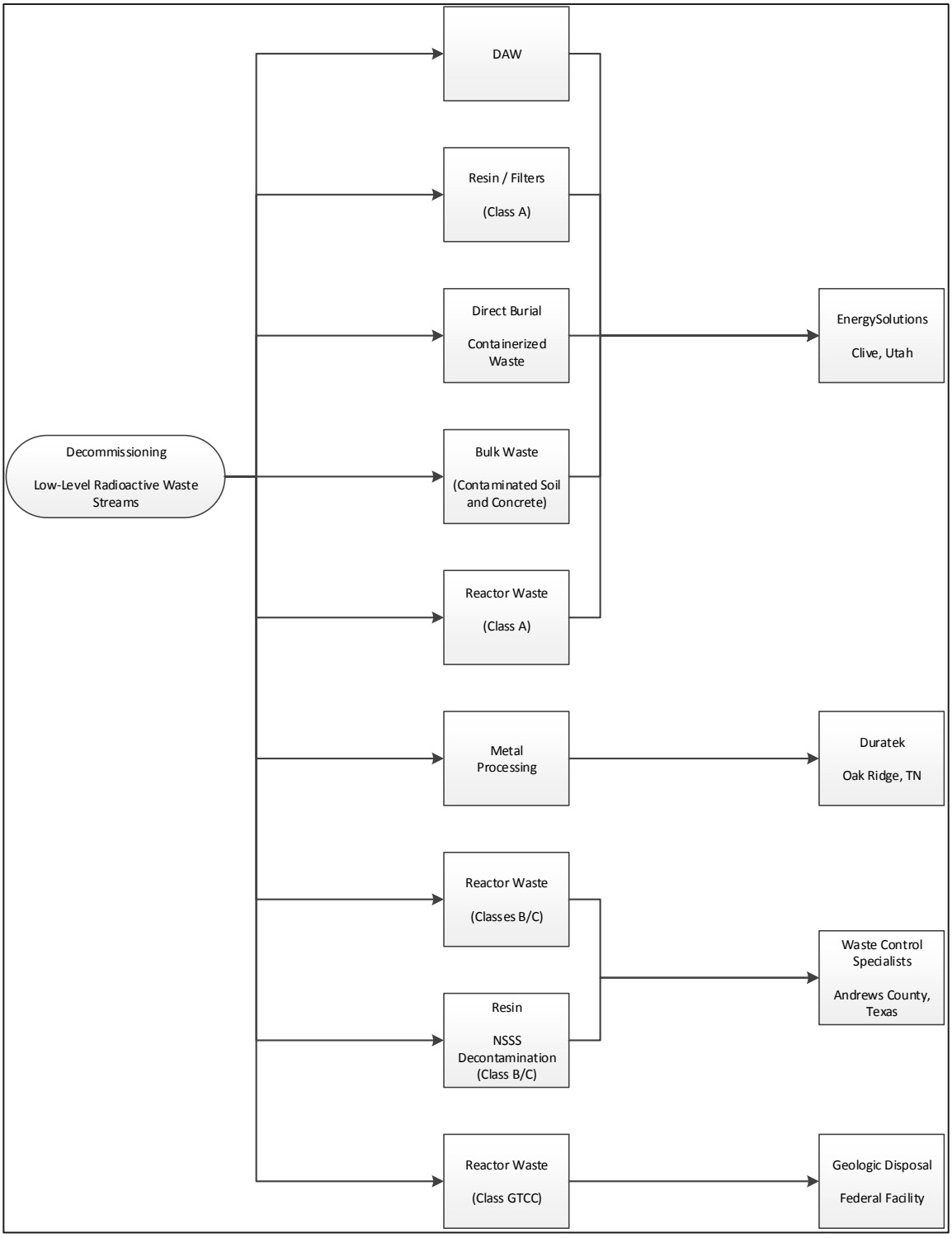


FIGURE 5.2
DECOMMISSIONING WASTE DESTINATIONS
RADIOLOGICAL

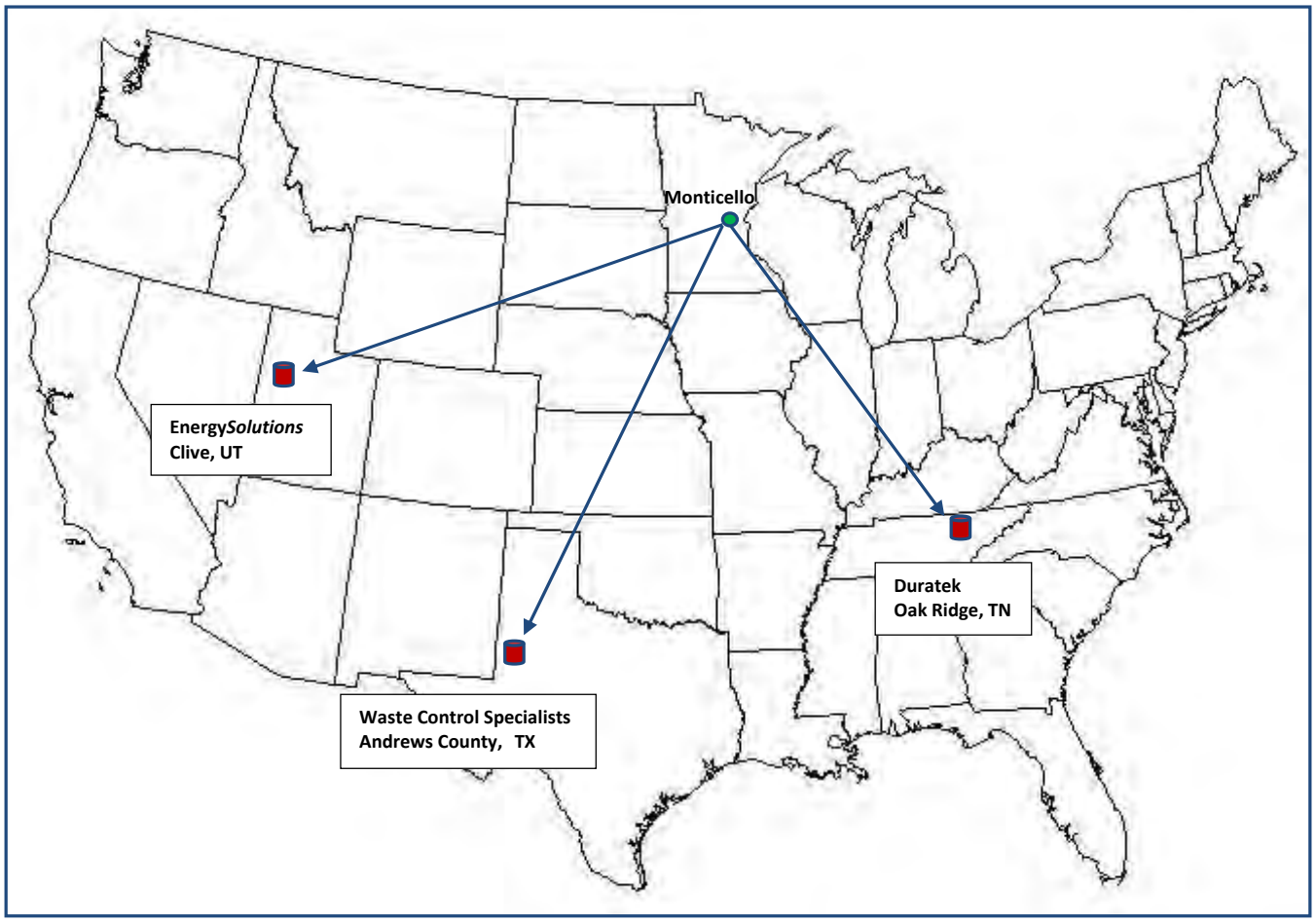


TABLE 5.1
SCENARIOS 1 AND 2
DECOMMISSIONING WASTE SUMMARY

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions* Containerized	A	107,967	7,447,925
	Energy*Solutions* Bulk	A	54,800	3,518,709
	WCS	B	1,711	185,173
	WCS	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,785	346,570
Total [2]				
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,695	12,157,230
Scrap Metal				30,998,000

[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
SCENARIO 3
DECOMMISSIONING WASTE SUMMARY

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions* Containerized	A	134,591	10,110,370
	Energy*Solutions* Bulk	A	54,989	3,535,341
	WCS	B	1,711	185,173
	WCS	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,785	346,570
Total [2]				
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,695	12,157,230
Scrap Metal				30,998,000

[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
SCENARIO 4
DECOMMISSIONING WASTE SUMMARY

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions* Containerized	A	195,900	16,241,250
	Energy*Solutions* Bulk	A	54,989	3,535,341
	WCS	B	1,711	185,173
	WCS	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,785	346,570
Total [2]				
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,695	12,157,230
Scrap Metal				30,998,000

[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 Monticello relied upon the site-specific, technical information provided by Xcel Energy. While not an engineering study, the estimates provide the owner with sufficient information to assess their financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The cost projected to promptly decommission the Monticello nuclear station is estimated to be $1.114 billion (Scenario 1). The estimates are based on numerous fundamental assumptions, including regulatory requirements, low-level radioactive waste disposal practices, high-level waste management considerations, and project contingencies.

The primary cost contributors, identified in Tables 6.1 through 6.4, are either labor-related or associated with the management and disposition of the radioactive waste. Program management is the largest single contributor to the overall cost. The magnitude of the expense is a function of both the size of the organization required to manage the decommissioning, as well as the duration of the program. It is assumed, for purposes of this analysis, that Xcel Energy will oversee the decommissioning program, using a DOC to manage the decommissioning labor force and the associated subcontractors. The size and composition of the management organization varies with the decommissioning phase and associated site activities. However, once the operating license is amended or terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel.

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

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

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

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

The reported cost for transport includes the tariffs and surcharges associated with moving large components and/or overweight shielded casks overland, as well as the general expense (i.e., 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 plant.

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
SCENARIO 1
COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	19,887	1.8
Removal	95,673	8.6
Packaging	29,423	2.6
Transportation	11,606	1.0
Waste Disposal	85,832	7.7
Off-site Waste Processing	28,802	2.6
Program Management [1]	334,224	30.0
Railroad Track Maintenance	4,580	0.4
Spent Fuel Management (direct costs)[2]	225,000	20.2
Insurance and Regulatory Fees	32,367	2.9
Energy	30,702	2.8
Characterization and Licensing Surveys	22,669	2.0
Property Taxes	47,042	4.2
Miscellaneous Equipment	7,414	0.7
Spent Fuel Pool Isolation	12,434	1.1
Security	125,973	11.3
Total [3]	**1,113,628**	**100.0**

Cost Element	Total	Percentage
License Termination	697,451	62.6
Spent Fuel Management	375,071	33.7
Site Restoration	41,106	3.7
Total [3]	**1,113,628**	**100.0**

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

TABLE 6.2
SCENARIO 2
COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	19,887	1.5
Removal	95,673	7.3
Packaging	29,423	2.3
Transportation	11,606	0.9
Waste Disposal	85,832	6.6
Off-site Waste Processing	28,802	2.2
Program Management [1]	368,279	28.2
Railroad Track Maintenance	4,283	0.3
Spent Fuel Management (direct costs)[2]	296,659	22.7
Insurance and Regulatory Fees	46,934	3.6
Energy	30,702	2.4
Characterization and Licensing Surveys	22,669	1.7
Property Taxes	62,507	4.8
Miscellaneous Equipment	7,414	0.6
Spent Fuel Pool Isolation	12,434	1.0
Security	184,812	14.1
Total [3]	**1,307,915**	**100.0**

Cost Element	Total	Percentage
License Termination	697,450	53.3
Spent Fuel Management	569,359	43.5
Site Restoration	41,106	3.1
Total [3]	**1,307,915**	**100.0**

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

TABLE 6.3
SCENARIO 3
COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	19,922	0.9
Removal	96,055	4.5
Packaging	29,428	1.4
Transportation	12,286	0.6
Waste Disposal	96,158	4.5
Off-site Waste Processing	28,802	1.4
Program Management [1]	496,803	23.4
Railroad Track Maintenance	4,283	0.2
Spent Fuel Management (direct costs)[2]	756,819	35.6
Insurance and Regulatory Fees	71,203	3.4
Energy	30,702	1.5
Characterization and Licensing Surveys	22,669	1.1
Property Taxes	156,616	7.4
Miscellaneous Equipment	7,414	0.4
Spent Fuel Pool Isolation	12,434	0.6
Security	282,841	13.3
Total [3]	**2,124,434**	**100.0**

Cost Element	Total	Percentage
License Termination	697,778	32.9
Spent Fuel Management	1,385,171	65.2
Site Restoration	41,485	2.0
Total [3]	**2,124,434**	**100.0**

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

TABLE 6.4
SCENARIO 4
COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2014 dollars)

Cost Element	Total	Percentage
Decontamination	19,922	0.5
Removal	96,055	2.3
Packaging	29,428	0.7
Transportation	13,840	0.3
Waste Disposal	119,801	2.9
Off-site Waste Processing	28,802	0.7
Program Management [1]	1,096,781	26.5
Railroad Track Maintenance	4,283	0.1
Spent Fuel Management (direct costs)[2]	1,846,162	44.5
Insurance and Regulatory Fees	131,882	3.2
Energy	30,702	0.7
Characterization and Licensing Surveys	22,669	0.6
Property Taxes	156,617	3.8
Miscellaneous Equipment	7,414	0.2
Spent Fuel Pool Isolation	12,434	0.3
Security	527,940	12.7
Total [3]	**4,144,730**	**100.0**

Cost Element	Total	Percentage
License Termination	697,778	16.8
Spent Fuel Management	3,405,467	82.2
Site Restoration	41,485	1.0
Total [3]	**4,144,730**	**100.0**

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

7. REFERENCES

1. "Decommissioning Cost Analysis for the Monticello Nuclear Generating Plant," TLG Services Document No. X01-1617-004, Rev. 1, December 2011

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

3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," Rev. 2, October 2011

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

5. U.S. Code of Federal Regulations, Title 10, Parts 20 and 50, "Entombment Options for Power Reactors," Advanced Notice of Proposed Rulemaking, Federal Register Volume 66 (p 52551), Number 200, October 16, 2001

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

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

8. "Nuclear Waste Policy Act of 1982," 42 U.S. Code 10101, et seq. http://pbadupws.nrc.gov/docs/ML1327/ML13274A489.pdf#page=419

9. "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, 2004

10. Charter of the Blue Ribbon Commission on America's Nuclear Future, "Objectives and Scope of Activities," http://www.brc.gov/index.php?q=page/charter

11. "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/, p. 32, January 2012

7. REFERENCES
(continued)

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

13. United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, Et Al., August 2013, http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB18/$file/11-1271-1451347.pdf

14. Minnesota Statute 216B.1614, "Nuclear Power Plant Decommissioning and Storage of Used Nuclear Fuel"

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 72.40 Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites.".

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

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

19. U.S. Code of Federal Regulations, Title 10, Part 61.55, "Licensing Requirements for Land Disposal of Radioactive Waste"

20. 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

21. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," EPA Memorandum OSWER No. 9200.4-18, August 22, 1997

22. 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"

7. REFERENCES
(continued)

23. "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

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

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

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

27. "Building Construction Cost Data 2014," Robert Snow Means Company, Inc., Kingston, Massachusetts

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

29. Civilian Radioactive Waste Management System Waste Acceptance System Requirements Document, Revision 5" ICN01 (DOE/RW-0351) effective March 10, 2008

30. "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

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

32. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-427719 Rules Tariff, March 2004 as amended; Radioactive Materials Tariff.

33. 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

7. REFERENCES
(continued)

34. 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

35. 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

36. SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning," June 2000.

37. "Microsoft Project Professional 2010," Microsoft Corporation, Redmond, WA.

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

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

APPENDIX A
UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

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

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

Total duration = 11.217 hours

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate ($/hr)	Cost
Laborers	3.00	11.217	$50.24	$1,690.63
Craftsmen	2.00	11.217	$62.77	$1,408.18
Foreman	1.00	11.217	$68.02	$762.98
General Foreman	0.25	11.217	$70.14	$196.69
Fire Watch	0.05	11.217	$50.24	$28.18
Health Physics Technician	1.00	11.217	$48.84	$547.84
Total labor cost				$4,634.50

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
Gas torch consumables 1 @ $18.60/hour x 1 hour [1]	$18.60
Tarpaulin, oil resistant, fire retardant 50 @ $0.26 square foot [2]	$13.00
Polypropylene sorbent rolls 50 @ $0.59/square foot [3]	$29.50
Subtotal cost of equipment and materials	$61.10
Overhead & sales tax on equipment and materials @ 16.88 %	$10.31
Total costs, equipment & material	$71.41

TOTAL COST: Removal of contaminated heat exchanger <3000 pounds:	$4,705.91
Total labor cost:	$4,634.50
Total equipment/material costs:	$71.41
Total craft labor man-hours required per unit:	81.88

APPENDIX A
(continued)

5. NOTES AND REFERENCES

Work difficulty factors were developed in conjunction with the Atomic Industrial Forum (AIF) (now Nuclear Energy Institute) program to standardize nuclear decommissioning cost estimates and are delineated in Volume 1, Chapter 5 of the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

References for equipment & consumables costs:

1. R.S. Means (2014) Division 01 54 33, Section 40-6360, page 698
2. R.S. Means (2014) Division 01 56, Section 13.60-0600, page 23
3. www.mcmaster.com online catalog, McMaster Carr Spill Control (7193T88)

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

APPENDIX B

UNIT COST FACTOR LISTING

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean instrument and sampling tubing, $/linear foot	0.55
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	5.88
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	8.37
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	16.14
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	31.23
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	40.65
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	59.80
Removal of clean pipe >36 inches diameter, $/linear foot	71.03
Removal of clean valve >2 to 4 inches	107.99
Removal of clean valve >4 to 8 inches	161.41
Removal of clean valve >8 to 14 inches	312.32
Removal of clean valve >14 to 20 inches	406.54
Removal of clean valve >20 to 36 inches	598.01
Removal of clean valve >36 inches	710.35
Removal of clean pipe hanger for small bore piping	37.53
Removal of clean pipe hanger for large bore piping	133.14
Removal of clean pump, <300 pound	273.29
Removal of clean pump, 300-1000 pound	751.65
Removal of clean pump, 1000-10,000 pound	2,973.12
Removal of clean pump, >10,000 pound	5,753.64
Removal of clean pump motor, 300-1000 pound	313.69
Removal of clean pump motor, 1000-10,000 pound	1,234.55
Removal of clean pump motor, >10,000 pound	2,777.73
Removal of clean heat exchanger <3000 pound	1,600.36
Removal of clean heat exchanger >3000 pound	4,033.71
Removal of clean feedwater heater/deaerator	11,343.60
Removal of clean moisture separator/reheater	23,284.41
Removal of clean tank, <300 gallons	351.41
Removal of clean tank, 300-3000 gallon	1,106.14
Removal of clean tank, >3000 gallons, $/square foot surface area	9.24

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean electrical equipment, <300 pound	147.73
Removal of clean electrical equipment, 300-1000 pound	510.72
Removal of clean electrical equipment, 1000-10,000 pound	1,021.43
Removal of clean electrical equipment, >10,000 pound	2,430.28
Removal of clean electrical transformer < 30 tons	1,687.80
Removal of clean electrical transformer > 30 tons	4,860.57
Removal of clean standby diesel generator, <100 kW	1,723.94
Removal of clean standby diesel generator, 100 kW to 1 MW	3,847.96
Removal of clean standby diesel generator, >1 MW	7,966.04
Removal of clean electrical cable tray, $/linear foot	13.92
Removal of clean electrical conduit, $/linear foot	6.08
Removal of clean mechanical equipment, <300 pound	147.73
Removal of clean mechanical equipment, 300-1000 pound	510.72
Removal of clean mechanical equipment, 1000-10,000 pound	1,021.43
Removal of clean mechanical equipment, >10,000 pound	2,430.28
Removal of clean HVAC equipment, <300 pound	178.63
Removal of clean HVAC equipment, 300-1000 pound	613.67
Removal of clean HVAC equipment, 1000-10,000 pound	1,223.03
Removal of clean HVAC equipment, >10,000 pound	2,430.28
Removal of clean HVAC ductwork, $/pound	0.58
Removal of contaminated instrument and sampling tubing, $/linear foot	1.65
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	22.89
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	39.68
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	62.06
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	122.92
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	147.89
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	204.98
Removal of contaminated pipe >36 inches diameter, $/linear foot	242.39
Removal of contaminated valve >2 to 4 inches	476.96
Removal of contaminated valve >4 to 8 inches	571.17

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated valve >8 to 14 inches	1,179.51
Removal of contaminated valve >14 to 20 inches	1,500.93
Removal of contaminated valve >20 to 36 inches	2,000.14
Removal of contaminated valve >36 inches	2,374.21
Removal of contaminated pipe hanger for small bore piping	154.89
Removal of contaminated pipe hanger for large bore piping	509.98
Removal of contaminated pump, <300 pound	1,019.54
Removal of contaminated pump, 300-1000 pound	2,360.34
Removal of contaminated pump, 1000-10,000 pound	7,785.90
Removal of contaminated pump, >10,000 pound	18,968.04
Removal of contaminated pump motor, 300-1000 pound	999.21
Removal of contaminated pump motor, 1000-10,000 pound	3,162.79
Removal of contaminated pump motor, >10,000 pound	7,100.84
Removal of contaminated heat exchanger <3000 pound	4,705.91
Removal of contaminated heat exchanger >3000 pound	13,634.02
Removal of contaminated tank, <300 gallons	1,693.11
Removal of contaminated tank, >300 gallons, $/square foot	33.18
Removal of contaminated electrical equipment, <300 pound	789.28
Removal of contaminated electrical equipment, 300-1000 pound	1,914.94
Removal of contaminated electrical equipment, 1000-10,000 pound	3,687.25
Removal of contaminated electrical equipment, >10,000 pound	7,240.23
Removal of contaminated electrical cable tray, $/linear foot	38.24
Removal of contaminated electrical conduit, $/linear foot	17.99
Removal of contaminated mechanical equipment, <300 pound	878.49
Removal of contaminated mechanical equipment, 300-1000 pound	2,116.31
Removal of contaminated mechanical equipment, 1000-10,000 pound	4,068.41
Removal of contaminated mechanical equipment, >10,000 pound	7,240.23
Removal of contaminated HVAC equipment, <300 pound	878.49
Removal of contaminated HVAC equipment, 300-1000 pound	2,116.31
Removal of contaminated HVAC equipment, 1000-10,000 pound	4,068.41

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated HVAC equipment, >10,000 pound	7,240.23
Removal of contaminated HVAC ductwork, $/pound	2.31
Removal/plasma arc cut of contaminated thin metal components, $/linear in.	4.24
Additional decontamination of surface by washing, $/square foot	8.89
Additional decontamination of surfaces by hydrolasing, $/square foot	37.56
Decontamination rig hook up and flush, $/ 250 foot length	7,437.80
Chemical flush of components/systems, $/gallon	18.97
Removal of clean standard reinforced concrete, $/cubic yard	155.03
Removal of grade slab concrete, $/cubic yard	206.68
Removal of clean concrete floors, $/cubic yard	407.04
Removal of sections of clean concrete floors, $/cubic yard	1,206.39
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	262.89
Removal of contaminated heavily rein concrete w/#9 rebar, $/cubic yard	2,348.88
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	332.38
Removal of contaminated heavily rein concrete w/#18 rebar, $/cubic yard	3,108.79
Removal heavily rein concrete w/#18 rebar & steel embedments, $/cubic yard	501.85
Removal of below-grade suspended floors, $/cubic yard	407.04
Removal of clean monolithic concrete structures, $/cubic yard	1,009.67
Removal of contaminated monolithic concrete structures, $/cubic yard	2,343.50
Removal of clean foundation concrete, $/cubic yard	794.25
Removal of contaminated foundation concrete, $/cubic yard	2,183.64
Explosive demolition of bulk concrete, $/cubic yard	34.42
Removal of clean hollow masonry block wall, $/cubic yard	112.26
Removal of contaminated hollow masonry block wall, $/cubic yard	358.37
Removal of clean solid masonry block wall, $/cubic yard	112.26
Removal of contaminated solid masonry block wall, $/cubic yard	358.37
Backfill of below-grade voids, $/cubic yard	33.46
Removal of subterranean tunnels/voids, $/linear foot	128.32
Placement of concrete for below-grade voids, $/cubic yard	128.07
Excavation of clean material, $/cubic yard	3.40

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Excavation of contaminated material, $/cubic yard	44.72
Removal of clean concrete rubble (tipping fee included), $/cubic yard	26.11
Removal of contaminated concrete rubble, $/cubic yard	29.13
Removal of building by volume, $/cubic foot	0.34
Removal of clean building metal siding, $/square foot	1.49
Removal of contaminated building metal siding, $/square foot	4.81
Removal of standard asphalt roofing, $/square foot	2.58
Removal of transite panels, $/square foot	2.36
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	13.58
Scabbling contaminated concrete floors, $/square foot	8.53
Scabbling contaminated concrete walls, $/square foot	22.67
Scabbling contaminated ceilings, $/square foot	77.93
Scabbling structural steel, $/square foot	6.77
Removal of clean overhead crane/monorail < 10 ton capacity	710.31
Removal of contaminated overhead crane/monorail < 10 ton capacity	1,951.99
Removal of clean overhead crane/monorail >10-50 ton capacity	1,704.75
Removal of contaminated overhead crane/monorail >10-50 ton capacity	4,683.99
Removal of polar crane > 50 ton capacity	7,134.45
Removal of gantry crane > 50 ton capacity	30,378.56
Removal of structural steel, $/pound	0.22
Removal of clean steel floor grating, $/square foot	5.14
Removal of contaminated steel floor grating, $/square foot	14.56
Removal of clean free standing steel liner, $/square foot	13.85
Removal of contaminated free standing steel liner, $/square foot	38.81
Removal of clean concrete-anchored steel liner, $/square foot	6.92
Removal of contaminated concrete-anchored steel liner, $/square foot	45.25
Placement of scaffolding in clean areas, $/square foot	15.95
Placement of scaffolding in contaminated areas, $/square foot	26.91
Landscaping with topsoil, $/acre	24,693.56
Cost of CPC B-88 LSA box & preparation for use	2,048.71

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Cost of CPC B-25 LSA box & preparation for use	1,874.78
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,530.04
Cost of CPC B-144 LSA box & preparation for use	10,411.07
Cost of LSA drum & preparation for use	208.82
Cost of cask liner for CNSI 8 120A cask (resins)	12,290.34
Cost of cask liner for CNSI 8 120A cask (filters)	8,872.45
Decontamination of surfaces with vacuuming, $/square foot	0.90

APPENDIX C

DETAILED COST ANALYSIS

SCENARIO 1

DECON DECOMMISSIONING COST ESTIMATE

WITH DOE PICKUP OF INDUSTRY SPENT FUEL STARTING IN 2025

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	851	128	979	979	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	352	53	405	405	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	568	85	653	653	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	465	70	535	535	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	559	84	642	578	-	64	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	473	71	544	490	-	54	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	806	121	927	927	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	738	111	849	849	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	182	27	209	104	-	104	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	182	27	209	209	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	354	53	407	204	-	204	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	102	15	118	59	-	59	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,846	727	5,573	5,087	-	486	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	272	41	313	313	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	159	24	183	183	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	140	21	161	161	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,224	2,134	16,358	15,873	-	486	-	-	-	-	-	-	-	78,609
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	34,895	5,234	40,130	-	40,130	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	34,895	5,234	40,130	-	40,130	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,418	142	1,560	1,560	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,718	272	2,990	2,990	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	490	-	-	-	-	-	123	613	613	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	528	-	-	-	-	-	79	608	608	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	48	-	14	79	79	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	3,530	530	4,060	4,060	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,181	118	1,299	1,299	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,121	312	3,433	-	3,433	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,434	365	2,799	2,799	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	95	14	110	-	110	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	107	16	123	123	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	5,349	802	6,151	6,151	-	-	-	-	-	-	-	-	-	157,471
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	22,165	3,325	25,489	25,489	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	4	-	48	42,909	6,230	50,222	45,769	4,453	-	-	610	-	-	-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	4	-	48	92,028	13,598	106,710	61,642	44,582	486	-	610	-	-	-	12,190	20	659,480

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	537	81	618	556	-	62	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	454	68	522	522	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	153	23	176	44	-	132	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	412	62	474	474	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	136	20	157	78	-	78	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	136	20	157	157	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	114	17	131	65	-	65	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	236	35	272	272	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,831	575	4,405	3,996	-	409	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	262	-	-	-	-	-	-	131	393	393	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	262	-	-	-	-	-	3,831	705	4,798	4,389	-	409	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	5,244	1,573	6,818	6,818	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.3	Mixed & RCRA Waste	-	-	26	19	12	-	-	7	65	65	-	-	43	-	-	-	-	5,253	163	-
1b.2	Subtotal Period 1b Additional Costs	-	-	26	19	12	-	16,057	3,202	19,317	19,317	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	881	-	-	-	-	-	-	132	1,013	1,013	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	37	-	24	60	-	104	-	56	280	280	-	-	-	233	-	-	-	13,986	45	-
1b.3.4	Process decommissioning chemical flush waste	1	-	23	82	-	1,385	-	361	1,852	1,852	-	-	-	-	231	-	-	24,599	43	-
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	Subtotal Period 1b Collateral Costs	2,418	1,102	47	142	-	1,489	1,708	1,195	8,101	8,101	-	-	-	233	231	-	-	38,585	89	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	711	71	782	782	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,339	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	276	-	-	-	-	-	69	345	345	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	265	-	-	-	-	-	40	305	305	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	3,540	531	4,071	4,071	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,565	156	1,721	-	1,721	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,220	183	1,403	1,403	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	53	8	62	62	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	2,682	402	3,084	3,084	-	-	-	-	-	-	-	-	-	78,951
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	4,755	713	5,468	5,468	-	-	-	-	-	-	-	-	-	63,789
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	11,170	1,675	12,845	12,845	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	27	541	7	3	-	28	27,824	4,099	32,530	30,297	2,232	-	-	358	-	-	-	7,159	12	356,066
1b.0	TOTAL PERIOD 1b COST	2,707	1,643	80	164	12	1,517	49,419	9,203	64,745	62,103	2,232	409	43	591	231	-	-	50,997	31,830	400,659
PERIOD 1 TOTALS		2,707	2,661	93	168	12	1,565	141,448	22,801	171,455	123,745	46,815	894	43	1,201	231	-	-	63,188	31,850	1,060,139

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	92	78	17	22	-	407	-	172	789	789	-	-	-	858	-	-	-	98,047	2,888	-
2a.1.1.2	Recirculation Pumps & Motors	33	52	15	37	21	423	-	146	727	727	-	-	96	945	-	-	-	112,200	1,563	-
2a.1.1.3	CRDMs & NIs Removal	162	857	400	98	-	887	-	572	2,976	2,976	-	-	-	3,741	-	-	-	213,700	17,768	-
2a.1.1.4	Reactor Vessel Internals	193	3,392	15,478	2,739	-	19,466	309	16,974	58,552	58,552	-	-	-	1,252	1,481	1,010	-	312,338	27,675	1,239
2a.1.1.5	Reactor Vessel	94	7,234	2,229	976	-	3,459	309	8,050	22,352	22,352	-	-	-	10,736	-	-	-	1,089,965	27,675	1,239
2a.1.1	Totals	574	11,614	18,139	3,873	21	24,642	619	25,914	85,396	85,396	-	-	96	17,532	1,481	1,010	-	1,826,250	77,569	2,478
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	326	1,455	390	3,137	352	-	844	6,504	6,504	-	-	25,377	1,413	-	-	-	1,616,032	5,557	-
2a.1.3	Main Condensers	-	1,109	379	140	1,613	199	-	628	4,067	4,067	-	-	17,396	727	-	-	-	830,822	18,831	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor Building	-	611	-	-	-	-	-	92	703	703	-	-	-	-	-	-	-	-	6,238	-
2a.1.4.2	Radwaste	-	53	-	-	-	-	-	8	61	61	-	-	-	-	-	-	-	-	569	-
2a.1.4.3	Turbine	-	157	-	-	-	-	-	24	180	180	-	-	-	-	-	-	-	-	1,884	-
2a.1.4	Totals	-	821	-	-	-	-	-	123	944	944	-	-	-	-	-	-	-	-	8,691	-
Disposal of Plant Systems																					
2a.1.5.1	Automatic Press Relief	-	98	6	8	67	57	-	51	287	287	-	-	803	206	-	-	-	46,236	1,656	-
2a.1.5.2	Chemistry Sampling	-	23	1	2	13	10	-	11	59	59	-	-	156	37	-	-	-	8,774	400	-
2a.1.5.3	Chemistry Sampling - Insulated	-	1	0	0	-	0	-	0	2	2	-	-	-	1	-	-	-	73	28	-
2a.1.5.4	Circulating Water - RCA	-	172	10	44	557	-	-	134	917	917	-	-	6,656	-	-	-	-	270,307	2,860	-
2a.1.5.5	Combustible Gas Control - Insul - RCA	-	24	0	1	18	-	-	9	53	53	-	-	212	-	-	-	-	8,617	378	-
2a.1.5.6	Combustible Gas Control - RCA	-	15	0	2	24	-	-	8	49	49	-	-	285	-	-	-	-	11,577	245	-
2a.1.5.7	Condensate & Feedwater	-	818	178	244	1,669	2,008	-	1,011	5,929	5,929	-	-	19,947	7,319	-	-	-	1,293,969	14,196	-
2a.1.5.8	Condensate & Feedwater - Insulated	-	408	33	46	349	331	-	247	1,414	1,414	-	-	4,176	1,207	-	-	-	249,413	6,964	-
2a.1.5.9	Condensate Demin	-	451	28	37	280	274	-	232	1,303	1,303	-	-	3,346	1,000	-	-	-	201,994	7,618	-
2a.1.5.10	Condensate Storage	-	604	29	60	597	216	-	306	1,811	1,811	-	-	7,131	795	-	-	-	341,719	10,345	-
2a.1.5.11	Control Rod Drive	-	2	0	0	2	1	-	1	7	7	-	-	19	4	-	-	-	1,015	41	-
2a.1.5.12	Control Rod Drive Hydraulic	-	344	15	20	139	154	-	150	822	822	-	-	1,658	562	-	-	-	104,537	5,898	-
2a.1.5.13	Core Spray	-	66	18	37	367	143	-	115	745	745	-	-	4,384	521	-	-	-	212,510	1,163	-
2a.1.5.14	Core Spray - Insulated	-	120	7	9	68	72	-	60	338	338	-	-	818	264	-	-	-	50,680	2,033	-
2a.1.5.15	Demin Water - Insulated - RCA	-	12	0	1	7	-	-	4	24	24	-	-	85	-	-	-	-	3,445	181	-
2a.1.5.16	Demin Water - RCA	-	34	0	2	21	-	-	12	69	69	-	-	253	-	-	-	-	10,278	508	-
2a.1.5.17	Diesel Oil - RCA	-	2	0	0	2	-	-	1	4	4	-	-	23	-	-	-	-	931	25	-
2a.1.5.18	Drywell Atmosphere Cooling - RCA	-	31	1	4	46	-	-	15	97	97	-	-	548	-	-	-	-	22,244	550	-
2a.1.5.19	EDG Emerg Service Water - Insul - RCA	-	0	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	84	4	-
2a.1.5.20	Electrical - Clean	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	182	-
2a.1.5.21	Emergency Service Water - Insul - RCA	-	18	0	1	11	-	-	6	37	37	-	-	137	-	-	-	-	5,544	281	-
2a.1.5.22	Emergency Service Water - RCA	-	1	0	0	1	-	-	1	3	3	-	-	13	-	-	-	-	512	22	-
2a.1.5.23	GEZIP - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2a.1.5.24	Generator Physical Design - RCA	-	4	0	0	3	-	-	1	8	8	-	-	31	-	-	-	-	1,250	67	-
2a.1.5.25	H2-O2 Control Analyzing	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.26	H2-O2 Control Analyzing - Insulated	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.27	High Pressure Coolant Injection	-	56	6	10	81	57	-	42	252	252	-	-	972	209	-	-	-	53,266	966	-
2a.1.5.28	High Pressure Coolant Injection - Insula	-	182	13	18	134	132	-	103	582	582	-	-	1,598	481	-	-	-	96,733	3,079	-
2a.1.5.29	Hydrogen Cooling	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	118	-
2a.1.5.30	Hydrogen Cooling - RCA	-	6	0	0	3	-	-	2	11	11	-	-	39	-	-	-	-	1,600	79	-
2a.1.5.31	Hydrogen Seal Oil - RCA	-	14	0	1	16	-	-	6	38	38	-	-	189	-	-	-	-	7,669	212	-
2a.1.5.32	Hydrogen Water Chemistry - RCA	-	20	0	1	12	-	-	7	40	40	-	-	140	-	-	-	-	5,672	304	-
2a.1.5.33	Instrument & Service Air - RCA	-	185	3	12	148	-	-	71	418	418	-	-	1,768	-	-	-	-	71,810	2,733	-
2a.1.5.34	Main Condenser	-	162	11	15	112	113	-	89	502	502	-	-	1,333	411	-	-	-	81,311	2,746	-
2a.1.5.35	Main Steam	-	206	16	23	180	163	-	124	712	712	-	-	2,148	594	-	-	-	126,485	3,512	-
2a.1.5.36	Main Turbine	-	839	203	263	1,653	2,383	-	1,113	6,454	6,454	-	-	19,760	8,687	-	-	-	1,376,578	14,733	-
2a.1.5.37	Main Turbine - Insulated	-	178	17	27	212	183	-	128	745	745	-	-	2,530	667	-	-	-	146,839	3,069	-
2a.1.5.38	Miscellaneous	-	35	0	2	25	-	-	13	76	76	-	-	302	-	-	-	-	12,283	622	-
2a.1.5.39	Off Gas Recombiner	-	157	18	24	150	210	-	120	678	678	-	-	1,795	764	-	-	-	123,437	2,708	-
2a.1.5.40	Off Gas Recombiner - Insulated	-	320	18	20	114	195	-	151	818	818	-	-	1,366	709	-	-	-	102,395	5,385	-
2a.1.5.41	Post Accident Sampling	-	21	1	1	4	9	-	8	44	44	-	-	53	33	-	-	-	4,355	345	-
2a.1.5.42	Post Accident Sampling - Insulated	-	14	1	1	1	10	-	6	34	34	-	-	17	37	-	-	-	3,143	212	-
2a.1.5.43	RHR Service Water - Insulated - RCA	-	69	2	10	124	-	-	37	242	242	-	-	1,485	-	-	-	-	60,293	1,125	-
2a.1.5.44	RHR Service Water - RCA	-	3	0	0	3	-	-	1	8	8	-	-	35	-	-	-	-	1,410	57	-
2a.1.5.45	Reactor Feedwater Pump Seal	-	46	2	3	16	26	-	21	115	115	-	-	193	96	-	-	-	14,222	773	-
2a.1.5.46	Residual Heat Removal	320	209	162	134	536	1,653	-	742	3,755	3,755	-	-	6,406	6,012	-	-	-	658,423	4,135	-

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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			
Disposal of Plant Systems (continued)																					
2a.1.5.47	Residual Heat Removal - Insulated	542	461	61	62	282	716	-	623	2,746	2,746	-	-	3,367	2,607	-	-	-	309,163	10,340	-
2a.1.5.48	Rx Core Isolation Cooling	-	40	2	3	22	21	-	19	107	107	-	-	259	76	-	-	-	15,537	691	-
2a.1.5.49	Rx Core Isolation Cooling - Insulated	-	89	5	5	24	54	-	41	218	218	-	-	288	198	-	-	-	24,804	1,479	-
2a.1.5.50	Rx Recirculation	47	48	5	3	4	52	-	50	210	210	-	-	43	190	-	-	-	14,353	1,580	-
2a.1.5.51	Snubbers	-	141	2	4	32	25	-	47	251	251	-	-	377	90	-	-	-	21,240	2,548	-
2a.1.5.52	Standby Liquid Control - Insul - RCA	-	3	0	0	2	-	-	1	6	6	-	-	22	-	-	-	-	904	48	-
2a.1.5.53	Standby Liquid Control - RCA	-	22	0	2	21	-	-	9	53	53	-	-	245	-	-	-	-	9,969	341	-
2a.1.5.54	Stator Cooling - RCA	-	6	0	1	11	-	-	3	21	21	-	-	126	-	-	-	-	5,135	98	-
2a.1.5.55	Traversing Incore Probe	0	3	0	0	0	2	-	1	6	6	-	-	1	5	-	-	-	390	51	-
2a.1.5	Totals	909	6,814	882	1,164	8,170	9,278	-	5,964	33,181	33,161	-	20	97,654	33,808	-	-	-	6,201,492	119,943	-
2a.1.6	Scaffolding in support of decommissioning	-	1,911	24	9	95	25	-	502	2,566	2,566	-	-	1,030	91	-	-	-	52,344	22,564	-
2a.1	Subtotal Period 2a Activity Costs	1,483	22,596	20,878	5,575	13,035	34,496	619	33,975	132,658	132,638	-	20	141,552	53,571	1,481	1,010	-	10,526,940	253,155	2,478
Period 2a Additional Costs																					
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	84	-	55	139	-	239	-	128	645	645	-	-	-	538	-	-	-	32,290	105	-
2a.3.2	Process decommissioning chemical flush waste	5	-	206	746	-	1,652	-	548	3,157	3,157	-	-	-	2,093	-	-	-	223,008	392	-
2a.3.3	Small tool allowance	-	270	-	-	-	-	-	41	311	280	-	31	-	-	-	-	-	-	-	-
2a.3.4	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	89	270	261	884	-	1,892	-	717	4,113	4,082	-	31	-	2,631	-	-	-	255,298	497	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	71	-	-	-	-	-	-	18	89	89	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	777	78	854	854	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	3,365	336	3,701	3,331	-	370	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,940	-	-	-	-	-	485	2,425	2,425	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,687	-	-	-	-	-	403	3,090	3,090	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	112	39	-	424	-	123	699	699	-	-	-	5,394	-	-	-	107,886	176	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	4,438	666	5,103	5,103	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	829	83	911	911	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,399	340	3,739	-	3,739	-	-	-	-	-	-	-	-	-
2a.4.10	Fixed Overhead	-	-	-	-	-	-	2,459	369	2,827	2,827	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,047	157	1,204	-	1,204	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	126	19	145	-	145	-	-	-	-	-	-	-	-	-
2a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	6,002	900	6,902	6,902	-	-	-	-	-	-	-	-	-	174,570
2a.4.15	DOC Staff Cost	-	-	-	-	-	-	15,225	2,284	17,509	17,509	-	-	-	-	-	-	-	-	-	209,760
2a.4.16	Utility Staff Cost	-	-	-	-	-	-	21,262	3,189	24,451	24,451	-	-	-	-	-	-	-	-	-	390,540
2a.4	Subtotal Period 2a Period-Dependent Costs	71	4,627	112	39	-	424	59,068	9,471	73,813	68,355	5,088	370	-	5,394	-	-	-	107,886	176	774,870
2a.0	TOTAL PERIOD 2a COST	1,643	27,494	21,252	6,499	13,035	36,812	61,030	44,566	212,330	206,821	5,088	421	141,552	61,596	1,481	1,010	-	10,890,130	281,333	777,348
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	ALARA/Radiological	-	15	0	0	3	3	-	5	27	27	-	-	35	10	-	-	-	2,083	277	-
2b.1.1.2	Alternate N2 - RCA	-	13	0	1	8	-	-	5	27	27	-	-	93	-	-	-	-	3,765	185	-
2b.1.1.3	Decontamination Projects	-	1	0	0	0	0	-	0	2	2	-	-	2	0	-	-	-	130	17	-
2b.1.1.4	Electrical - Contaminated	-	366	5	17	200	25	-	131	744	744	-	-	2,389	90	-	-	-	102,957	6,325	-
2b.1.1.5	Electrical - Decontaminated	-	2,195	36	156	1,953	-	-	869	5,208	5,208	-	-	23,344	-	-	-	-	948,013	37,107	-
2b.1.1.6	Fire - RCA	-	84	1	4	51	-	-	29	169	169	-	-	614	-	-	-	-	24,917	1,324	-
2b.1.1.7	HVAC Ductwork	-	263	6	19	223	28	-	110	649	649	-	-	2,665	100	-	-	-	114,856	4,111	-
2b.1.1.8	HVAC/Chilled Water - RCA	-	267	4	18	230	-	-	104	624	624	-	-	2,752	-	-	-	-	111,779	3,985	-
2b.1.1.9	Heating & Ventilation	-	401	14	44	503	62	-	199	1,224	1,224	-	-	6,018	227	-	-	-	259,372	7,101	-
2b.1.1.10	Heating Boiler - Insulated - RCA	-	2	0	0	2	-	-	1	5	5	-	-	26	-	-	-	-	1,058	35	-
2b.1.1.11	Liquid Radwaste	494	571	44	46	257	468	-	557	2,437	2,437	-	-	3,073	1,728	-	-	-	237,560	17,194	-
2b.1.1.12	Makeup Demin - RCA	-	86	2	10	123	-	-	42	263	263	-	-	1,471	-	-	-	-	59,747	1,412	-
2b.1.1.13	Non-Essential Diesel Generator - RCA	-	23	2	9	119	-	-	25	179	179	-	-	1,424	-	-	-	-	57,832	395	-
2b.1.1.14	Off Gas Holdup	-	283	19	28	230	172	-	155	888	888	-	-	2,755	630	-	-	-	153,412	4,769	-
2b.1.1.15	Primary Containment	-	378	40	64	519	413	-	289	1,703	1,703	-	-	6,201	1,506	-	-	-	351,391	6,454	-
2b.1.1.16	Process Radiation Monitors	-	38	2	2	12	14	-	15	83	83	-	-	142	52	-	-	-	9,195	649	-

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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)																					
2b.1.1.17	Rx Bldg Closed Clng Water - Insul - RCA	-	93	2	7	82	-	-	37	220	220	-	-	977	-	-	-	-	39,675	1,484	-
2b.1.1.18	Rx Bldg Closed Clng Water - RCA	-	152	11	47	593	-	-	135	938	938	-	-	7,093	-	-	-	-	288,031	2,489	-
2b.1.1.19	Rx Component Handling Equip	23	117	18	20	97	228	-	117	621	621	-	-	1,158	829	-	-	-	101,862	2,462	-
2b.1.1.20	Rx Pressure Vessel	23	39	5	4	6	63	-	39	181	181	-	-	75	230	-	-	-	18,281	1,051	-
2b.1.1.21	Rx Water Cleanup	145	220	18	12	11	202	-	184	793	793	-	-	130	737	-	-	-	54,051	5,736	-
2b.1.1.22	Secondary Containment	-	103	7	11	85	70	-	58	334	334	-	-	1,017	255	-	-	-	58,151	1,763	-
2b.1.1.23	Service & Seal Water - Insulated - RCA	-	99	2	8	99	-	-	41	249	249	-	-	1,180	-	-	-	-	47,917	1,565	-
2b.1.1.24	Service & Seal Water - RCA	-	131	3	12	151	-	-	58	355	355	-	-	1,809	-	-	-	-	73,453	2,016	-
2b.1.1.25	Service Air Blower - RCA	-	13	0	1	17	-	-	6	38	38	-	-	206	-	-	-	-	8,364	206	-
2b.1.1.26	Solid Radwaste	285	409	34	37	200	375	-	378	1,718	1,718	-	-	2,387	1,380	-	-	-	187,377	10,820	-
2b.1.1.27	Structures & Buildings	-	64	2	4	30	23	-	27	151	151	-	-	357	85	-	-	-	20,152	1,128	-
2b.1.1.28	Wells & Domestic Water	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	144	-
2b.1.1.29	Wells & Domestic Water - RCA	-	43	1	2	29	-	-	15	90	90	-	-	342	-	-	-	-	13,874	633	-
2b.1.1	Totals	971	6,479	280	584	5,834	2,147	-	3,632	19,926	19,917	-	9	69,735	7,859	-	-	-	3,349,255	122,835	-
2b.1.2	Scaffolding in support of decommissioning	-	2,389	29	11	119	31	-	628	3,208	3,208	-	-	1,287	114	-	-	-	65,430	28,205	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	4,343	2,430	138	368	4,022	978	-	3,696	15,975	15,975	-	-	48,077	4,667	-	-	-	2,318,995	112,507	-
2b.1.3.2	Admin	91	5	0	2	-	13	-	50	161	161	-	-	-	79	-	-	-	6,840	1,599	-
2b.1.3.3	HPCI Room	24	24	0	2	10	12	-	23	96	96	-	-	118	70	-	-	-	10,760	789	-
2b.1.3.4	Hot Shop	14	4	0	1	-	9	-	11	39	39	-	-	-	56	-	-	-	4,860	286	-
2b.1.3.5	LLRW Storage & Shipping	49	21	1	5	3	39	-	41	159	159	-	-	31	237	-	-	-	21,708	1,126	-
2b.1.3.6	Offgas Stack	315	228	5	16	112	70	-	252	998	998	-	-	1,343	388	-	-	-	87,082	8,859	-
2b.1.3.7	Offgas Storage & Compressor	35	15	0	4	2	29	-	29	114	114	-	-	25	173	-	-	-	15,948	785	-
2b.1.3.8	Radwaste	103	53	2	12	14	83	-	90	357	357	-	-	172	501	-	-	-	49,943	2,501	-
2b.1.3.9	Radwaste Material Storage Warehouse	54	21	1	6	-	45	-	45	171	171	-	-	-	270	-	-	-	23,400	1,196	-
2b.1.3.10	Recombiner	23	21	1	4	17	21	-	25	111	111	-	-	199	121	-	-	-	18,405	695	-
2b.1.3.11	Turbine	601	304	10	72	107	489	-	526	2,109	2,109	-	-	1,283	2,912	-	-	-	303,150	14,432	-
2b.1.3.12	Turbine Building Addition	50	18	1	5	-	39	-	40	153	153	-	-	-	236	-	-	-	20,478	1,086	-
2b.1.3	Totals	5,701	3,143	159	498	4,287	1,828	-	4,827	20,443	20,443	-	-	51,247	9,710	-	-	-	2,881,569	145,859	-
2b.1	Subtotal Period 2b Activity Costs	6,673	12,012	467	1,093	10,240	4,006	-	9,087	43,578	43,568	-	9	122,269	17,682	-	-	-	6,296,255	296,899	-
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,259	678	2,936	2,936	-	-	-	-	-	-	-	-	46,242	-
2b.2.2	Operational Equipment	-	-	17	66	603	-	-	102	788	788	-	-	11,710	-	-	-	-	292,750	32	-
2b.2	Subtotal Period 2b Additional Costs	-	-	17	66	603	-	2,259	780	3,724	3,724	-	-	11,710	-	-	-	-	292,750	46,274	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	172	-	115	291	-	501	-	266	1,345	1,345	-	-	-	1,127	-	-	-	67,647	220	-
2b.3.2	Process decommissioning chemical flush waste	1	-	41	147	-	326	-	108	623	623	-	-	-	413	-	-	-	43,978	77	-
2b.3.3	Small tool allowance	-	286	-	-	-	-	-	43	329	329	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	26,973	4,046	31,019	-	31,019	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	173	286	156	438	-	827	26,973	4,463	33,316	2,297	31,019	-	-	1,540	-	-	-	111,625	297	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,063	-	-	-	-	-	-	266	1,328	1,328	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,306	131	1,437	1,437	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	5,191	519	5,710	5,710	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,659	-	-	-	-	-	665	3,324	3,324	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,472	-	-	-	-	-	671	5,143	5,143	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	121	42	-	456	-	132	752	752	-	-	-	5,805	-	-	-	116,095	189	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	5,890	883	6,773	6,773	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,393	139	1,532	1,532	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	5,714	571	6,285	-	6,285	-	-	-	-	-	-	-	-	-
2b.4.10	Fixed Overhead	-	-	-	-	-	-	4,133	620	4,753	4,753	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,760	264	2,024	-	2,024	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	446	67	513	513	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	212	32	244	-	244	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	10,090	1,514	11,604	11,604	-	-	-	-	-	-	-	-	-	293,480
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	24,752	3,713	28,465	28,465	-	-	-	-	-	-	-	-	-	338,720
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	34,504	5,176	39,680	39,680	-	-	-	-	-	-	-	-	-	628,720
2b.4	Subtotal Period 2b Period-Dependent Costs	1,063	7,131	121	42	-	456	95,629	15,398	119,840	111,287	8,553	-	-	5,805	-	-	-	116,095	189	1,260,920
2b.0	TOTAL PERIOD 2b COST	7,908	19,430	762	1,639	10,843	5,289	124,860	29,727	200,458	160,877	39,572	9	133,979	25,027	-	-	-	6,816,725	343,660	1,260,920

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2c - Spent fuel delay prior to SFP decon																					
Period 2c Direct Decommissioning Activities																					
Period 2c Collateral Costs																					
2c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	34,726	5,209	39,935	-	39,935	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	-	-	-	-	-	-	34,726	5,209	39,935	-	39,935	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	5,848	585	6,432	6,432	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	15,696	1,570	17,265	17,265	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	1,958	-	-	-	-	-	490	2,448	2,448	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	86	30	-	323	-	94	532	532	-	-	-	4,110	-	-	-	82,199	134	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	7,033	1,055	8,088	8,088	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	2,883	288	3,171	3,171	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	25,586	2,559	28,145	-	28,145	-	-	-	-	-	-	-	-	-
2c.4.8	Fixed Overhead	-	-	-	-	-	-	18,508	2,776	21,285	21,285	-	-	-	-	-	-	-	-	-	-
2c.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	7,880	1,182	9,062	-	9,062	-	-	-	-	-	-	-	-	-
2c.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	399	60	459	459	-	-	-	-	-	-	-	-	-	-
2c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	951	143	1,094	-	1,094	-	-	-	-	-	-	-	-	-
2c.4.12	Railroad Track Maintenance	-	-	-	-	-	-	1,063	159	1,222	1,222	-	-	-	-	-	-	-	-	-	-
2c.4.13	Security Staff Cost	-	-	-	-	-	-	38,571	5,786	44,356	22,178	22,178	-	-	-	-	-	-	-	-	1,106,383
2c.4.14	Utility Staff Cost	-	-	-	-	-	-	44,188	6,628	50,817	25,408	25,408	-	-	-	-	-	-	-	-	820,697
2c.4	Subtotal Period 2c Period-Dependent Costs	-	1,958	86	30	-	323	168,606	23,374	194,376	108,489	85,887	-	-	4,110	-	-	-	82,199	134	1,927,080
2c.0	TOTAL PERIOD 2c COST	-	1,958	86	30	-	323	203,332	28,583	234,311	108,489	125,822	-	-	4,110	-	-	-	82,199	134	1,927,080
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	557	49	108	116	-	2,099	-	844	3,772	3,772	-	-	-	7,653	-	-	-	505,842	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	38	1	2	20	2	-	14	77	77	-	-	240	9	-	-	-	10,357	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	242	4	16	206	-	-	94	562	562	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	9	0	0	5	-	-	3	18	18	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	210	354	33	28	99	368	-	308	1,399	1,399	-	-	1,179	1,341	-	-	-	136,502	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	23	34	3	2	6	32	-	30	129	129	-	-	67	117	-	-	-	10,447	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	29	1	2	25	3	-	12	72	72	-	-	296	11	-	-	-	12,762	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	27	0	1	19	-	-	10	57	57	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	24	0	2	22	-	-	10	58	58	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	233	760	42	55	409	405	-	482	2,386	2,386	-	-	4,894	1,479	-	-	-	296,447	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.3	Totals	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.4	Scaffolding in support of decommissioning	-	478	6	2	24	6	-	126	642	642	-	-	257	23	-	-	-	13,086	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,581	3,511	245	815	598	10,527	-	4,536	21,813	21,813	-	-	7,120	52,182	-	-	-	3,492,399	67,557	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,104	331	1,435	1,435	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	765	229	994	994	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	1,868	561	2,429	2,429	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	26	-	21	52	-	90	-	45	235	235	-	-	-	204	-	-	-	12,210	40	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	89	-	197	-	65	376	376	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	74	-	-	-	-	-	11	86	86	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	137	62	556	145	-	143	1,043	1,043	-	-	6,000	529	-	-	-	304,968	88	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	12,335	1,850	14,186	-	14,186	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	26	74	182	203	556	432	12,335	2,115	15,925	1,739	14,186	-	6,000	982	-	-	-	343,731	174	-

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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	169	-	-	-	-	-	-	42	212	212	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	442	44	487	487	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	686	69	755	755	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	714	-	-	-	-	-	178	892	892	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,515	-	-	-	-	-	227	1,742	1,742	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	42	15	-	160	-	46	263	263	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	1,064	160	1,223	1,223	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	401	40	441	441	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	194	2,129	-	2,129	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	1,917	288	2,205	2,205	-	-	-	-	-	-	-	-	-	52,250
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	5,802	870	6,672	6,672	-	-	-	-	-	-	-	-	-	78,571
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	8,686	1,303	9,989	9,989	-	-	-	-	-	-	-	-	-	150,071
2d.4	Subtotal Period 2d Period-Dependent Costs	169	2,229	42	15	-	160	22,788	3,739	29,142	26,931	2,211	-	-	2,030	-	-	-	40,600	66	280,893
2d.0	TOTAL PERIOD 2d COST	1,777	5,814	469	1,033	1,154	11,118	36,992	10,951	69,309	52,912	16,397	-	13,120	55,194	-	-	-	3,876,730	83,458	293,373
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license									a											
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	822	123	946	-	946	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	2,530	379	2,909	1,964	946	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	415	42	457	457	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	624	62	686	686	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	568	-	-	-	-	-	142	710	710	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	532	80	612	612	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	455	46	501	501	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	241	24	265	-	265	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	1,880	282	2,162	2,162	-	-	-	-	-	-	-	-	-	51,071
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	4,394	659	5,053	5,053	-	-	-	-	-	-	-	-	-	57,357
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	4,918	738	5,656	5,656	-	-	-	-	-	-	-	-	-	80,929
2f.4	Subtotal Period 2f Period-Dependent Costs	-	568	7	3	-	28	15,011	2,315	17,932	17,584	348	-	-	355	-	-	-	7,097	12	189,357
2f.0	TOTAL PERIOD 2f COST	-	568	7	3	-	28	23,640	4,524	28,770	27,477	1,294	-	-	355	-	-	-	7,097	96,208	195,597
PERIOD 2 TOTALS		11,328	55,263	22,575	9,203	25,033	53,570	449,855	118,351	745,178	556,575	188,173	431	288,652	146,282	1,481	1,010	-	21,672,880	804,794	4,454,318

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	3,541	-	-	-	-	-	531	4,073	-	-	4,073	-	-	-	-	-	-	36,752	-
3b.1.1.2	Condensate Tanks Foundation	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	219	-
3b.1.1.3	Discharge Retention Basin	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	110	-
3b.1.1.4	HPCI Room	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	401	-
3b.1.1.5	Hot Shop	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	298	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	21	-
3b.1.1.7	LLRW Storage & Shipping	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	1,794	-
3b.1.1.8	MSIV	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	59	-
3b.1.1.9	Offgas Stack	-	232	-	-	-	-	-	35	267	-	-	267	-	-	-	-	-	-	2,668	-
3b.1.1.10	Offgas Storage & Compressor	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	963	-
3b.1.1.11	Radwaste	-	482	-	-	-	-	-	72	554	-	-	554	-	-	-	-	-	-	5,196	-
3b.1.1.12	Recombiner	-	258	-	-	-	-	-	39	297	-	-	297	-	-	-	-	-	-	2,490	-
3b.1.1.13	Security Barrier	-	362	-	-	-	-	-	54	416	-	-	416	-	-	-	-	-	-	4,083	-
3b.1.1.14	Tank Farm	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	121	-
3b.1.1.15	Turbine	-	1,514	-	-	-	-	-	227	1,741	-	-	1,741	-	-	-	-	-	-	18,764	-
3b.1.1.16	Turbine Building Addition	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	971	-
3b.1.1.17	Turbine Pedestal	-	415	-	-	-	-	-	62	478	-	-	478	-	-	-	-	-	-	3,762	-
3b.1.1	Totals	-	7,207	-	-	-	-	-	1,081	8,288	-	-	8,288	-	-	-	-	-	-	78,674	-
Site Closeout Activities																					
3b.1.2	BackFill Site	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	542	-
3b.1.3	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	177	27	204	204	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,374	-	-	-	-	177	1,283	9,833	204	-	9,630	-	-	-	-	-	-	81,057	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	292	-	-	-	-	9	45	347	-	-	347	-	-	-	-	-	-	1,387	-
3b.2.2	Excavation of Underground Services	-	1,402	-	-	-	-	705	316	2,424	-	-	2,424	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure cofferdam	-	285	-	-	-	-	-	43	328	-	-	328	-	-	-	-	-	-	2,540	-
3b.2	Subtotal Period 3b Additional Costs	-	1,980	-	-	-	-	715	404	3,099	-	-	3,099	-	-	-	-	-	-	17,402	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	91	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	3,320	498	3,817	-	3,817	-	-	-	-	-	-	-	-	-
3b.3.3	Railroad Track Maintenance SR	-	-	-	-	-	-	185	28	213	-	-	213	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	91	-	-	-	-	3,504	539	4,135	-	3,817	317	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	956	96	1,052	-	1,052	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,159	116	1,274	(0)	1,160	115	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	4,953	-	-	-	-	-	743	5,696	-	-	5,696	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	612	92	704	-	-	704	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	440	44	484	-	484	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	555	55	610	-	610	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	166	25	190	-	190	-	-	-	-	-	-	-	-	-
3b.4.8	Fixed Overhead SR	-	-	-	-	-	-	873	131	1,004	-	-	1,004	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	4,327	649	4,976	0	4,229	746	-	-	-	-	-	-	-	117,557
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	9,599	1,440	11,039	-	-	11,039	-	-	-	-	-	-	-	122,983
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,284	943	7,226	0	1,518	5,709	-	-	-	-	-	-	-	98,567
3b.4	Subtotal Period 3b Period-Dependent Costs	-	4,953	-	-	-	-	24,970	4,333	34,256	0	9,243	25,013	-	-	-	-	-	-	-	339,107
3b.0	TOTAL PERIOD 3b COST	-	15,397	-	-	-	-	29,366	6,559	51,323	204	13,061	38,059	-	-	-	-	-	-	98,459	340,667
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	14,609	2,191	16,800	-	16,800	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	14,609	2,191	16,800	-	16,800	-	-	-	-	-	-	-	-	-

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	9,947	995	10,942	-	10,942	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	11,630	1,163	12,793	-	12,793	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,577	458	5,035	-	5,035	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	5,774	577	6,351	-	6,351	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	9,082	1,362	10,444	-	10,444	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,723	258	1,981	-	1,981	-	-	-	-	-	-	-	-	-
3c.4.8	Railroad Track Maintenance	-	-	-	-	-	-	2,031	305	2,336	-	2,336	-	-	-	-	-	-	-	-	-
3c.4.9	Security Staff Cost	-	-	-	-	-	-	38,431	5,765	44,196	-	44,196	-	-	-	-	-	-	-	-	1,016,126
3c.4.10	Utility Staff Cost	-	-	-	-	-	-	13,817	2,073	15,890	-	15,890	-	-	-	-	-	-	-	-	254,031
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	97,013	12,956	109,969	-	109,969	-	-	-	-	-	-	-	-	1,270,157
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	111,622	15,147	126,768	-	126,768	-	-	-	-	-	-	-	-	1,270,157
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1.1	Totals	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
Period 3d Collateral Costs																					
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	23	2	25	-	25	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	26	3	29	-	29	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	15	1	16	-	16	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	13	1	14	-	14	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	21	3	24	-	24	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	4	1	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	4	1	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	88	13	101	-	101	-	-	-	-	-	-	-	-	2,314
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	31	5	36	-	36	-	-	-	-	-	-	-	-	579
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	225	30	255	-	255	-	-	-	-	-	-	-	-	2,893
3d.0	TOTAL PERIOD 3d COST	-	-	1,462	-	-	6,760	225	1,410	9,857	9,602	255	-	-	-	-	-	1,785	346,570	-	2,893
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	-	194	3	357	-	2,726	1,784	1,266	6,330	6,330	-	-	-	15,284	-	-	-	1,652,734	10,381	1,872
3e.2	Subtotal Period 3e Additional Costs	-	194	3	357	-	2,726	1,784	1,266	6,330	6,330	-	-	-	15,284	-	-	-	1,652,734	10,381	1,872
Period 3e Collateral Costs																					
3e.3	Subtotal Period 3e Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	84	21	104	104	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	203	51	253	253	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	167	42	209	209	-	-	-	-	-	-	-	-	-	-
3e.4.5	Security Staff Cost	-	-	-	-	-	-	130	32	162	162	-	-	-	-	-	-	-	-	-	5,013
3e.4.6	Utility Staff Cost	-	-	-	-	-	-	213	53	266	266	-	-	-	-	-	-	-	-	-	3,803
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	796	199	994	994	-	-	-	-	-	-	-	-	-	8,816
3e.0	TOTAL PERIOD 3e COST	-	194	3	357	-	2,726	2,580	1,465	7,324	7,324	-	-	-	15,284	-	-	-	1,652,734	10,381	10,688

Table C
Monticello Nuclear Generating Plant
DECON 2025 DOE Fuel Pickup Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	938	-	-	-	-	55	149	1,143	-	-	1,143	-	-	-	-	-	-	5,641	160
3f.2	Subtotal Period 3f Additional Costs	-	938	-	-	-	-	55	149	1,143	-	-	1,143	-	-	-	-	-	-	5,641	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	102	10	112	-	-	112	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	106	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	59	9	68	-	-	68	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	84	13	97	-	-	97	-	-	-	-	-	-	-	-
3f.4.6	Security Staff Cost	-	-	-	-	-	-	65	10	75	-	-	75	-	-	-	-	-	-	-	2,527
3f.4.7	Utility Staff Cost	-	-	-	-	-	-	84	13	96	-	-	96	-	-	-	-	-	-	-	1,569
3f.4	Subtotal Period 3f Period-Dependent Costs	-	106	-	-	-	-	394	70	570	-	-	570	-	-	-	-	-	-	-	4,096
3f.0	TOTAL PERIOD 3f COST	-	1,053	-	-	-	-	450	220	1,723	-	-	1,723	-	-	-	-	-	-	5,641	4,256
PERIOD 3 TOTALS		-	16,644	1,465	357	-	9,486	144,243	24,801	196,995	17,130	140,084	39,781	-	15,284	-	-	1,785	1,999,304	114,480	1,628,660
TOTAL COST TO DECOMMISSION		**14,035**	**74,568**	**24,134**	**9,729**	**25,045**	**64,621**	**735,545**	**165,952**	**1,113,628**	**697,451**	**375,071**	**41,106**	**288,695**	**162,767**	**1,711**	**1,010**	**1,785**	**23,735,370**	**951,124**	**7,143,117**

TOTAL COST TO DECOMMISSION WITH 17.51% CONTINGENCY:	**$1,113,628**	**thousands of 2014 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 62.63% OR:	**$697,451**	**thousands of 2014 dollars**
SPENT FUEL MANAGEMENT COST IS 33.68% OR:	**$375,071**	**thousands of 2014 dollars**
NON-NUCLEAR DEMOLITION COST IS 3.69% OR:	**$41,106**	**thousands of 2014 dollars**
TOTAL RADWASTE VOLUME BURIED (EXCLUDING GTCC):	**165,488**	**Cubic Feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**1,785**	**Cubic Feet**
TOTAL SCRAP METAL REMOVED:	**15,499**	**Tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**951,124**	**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

SCENARIO 2

DECON DECOMMISSIONING COST ESTIMATE

WITH 60 YEARS OF SPENT FUEL STORAGE

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	851	128	979	979	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	352	53	405	405	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	568	85	653	653	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	465	70	535	535	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	559	84	642	578	-	64	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	473	71	544	490	-	54	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	806	121	927	927	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	738	111	849	849	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	182	27	209	104	-	104	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	182	27	209	209	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	354	53	407	204	-	204	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	102	15	118	59	-	59	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,846	727	5,573	5,087	-	486	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	272	41	313	313	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	159	24	183	183	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	140	21	161	161	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,224	2,134	16,358	15,873	-	486	-	-	-	-	-	-	-	78,609
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	25,293	3,794	29,087	-	29,087	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	25,293	3,794	29,087	-	29,087	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,418	142	1,560	1,560	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,718	272	2,990	2,990	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	490	-	-	-	-	-	123	613	613	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	528	-	-	-	-	-	79	608	608	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	48	-	14	79	79	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	3,530	530	4,060	4,060	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,181	118	1,299	1,299	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,121	312	3,433	-	3,433	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,434	365	2,799	2,799	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	95	14	110	-	110	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	107	16	123	123	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	5,349	802	6,151	6,151	-	-	-	-	-	-	-	-	-	157,471
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	22,165	3,325	25,489	25,489	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	4	-	48	42,909	6,230	50,222	45,769	4,453	-	-	610	-	-	-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	4	-	48	82,426	12,158	95,667	61,642	33,540	486	-	610	-	-	-	12,190	20	659,480

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	537	81	618	556	-	62	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	454	68	522	522	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	153	23	176	44	-	132	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	412	62	474	474	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	136	20	157	78	-	78	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	136	20	157	157	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	114	17	131	65	-	65	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	236	35	272	272	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,831	575	4,405	3,996	-	409	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	262	-	-	-	-	-	-	131	393	393	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	262	-	-	-	-	-	3,831	705	4,798	4,389	-	409	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	5,244	1,573	6,818	6,818	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.3	Mixed & RCRA Waste	-	-	26	19	12	-	-	7	65	65	-	-	43	-	-	-	-	5,253	163	-
1b.2	Subtotal Period 1b Additional Costs	-	-	26	19	12	-	16,057	3,202	19,317	19,317	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	881	-	-	-	-	-	-	132	1,013	1,013	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	37	-	24	60	-	104	-	56	280	280	-	-	-	233	-	-	-	13,986	45	-
1b.3.4	Process decommissioning chemical flush waste	1	-	23	82	-	1,385	-	361	1,852	1,852	-	-	-	-	231	-	-	24,599	43	-
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	-	-	-	-	-	-	27	4	31	-	31	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,418	1,102	47	142	-	1,489	1,734	1,199	8,131	8,101	31	-	-	233	231	-	-	38,585	89	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	711	71	782	782	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,339	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	276	-	-	-	-	-	69	345	345	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	265	-	-	-	-	-	40	305	305	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	3,540	531	4,071	4,071	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,565	156	1,721	-	1,721	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,220	183	1,403	1,403	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	53	8	62	62	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	2,682	402	3,084	3,084	-	-	-	-	-	-	-	-	-	78,951
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	4,755	713	5,468	5,468	-	-	-	-	-	-	-	-	-	63,789
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	11,170	1,675	12,845	12,845	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	27	541	7	3	-	28	27,824	4,099	32,530	30,297	2,232	-	-	358	-	-	-	7,159	12	356,066
1b.0	TOTAL PERIOD 1b COST	2,707	1,643	80	164	12	1,517	49,446	9,207	64,776	62,103	2,263	409	43	591	231	-	-	50,997	31,830	400,659
PERIOD 1 TOTALS		2,707	2,661	93	168	12	1,565	131,872	21,364	160,443	123,745	35,803	894	43	1,201	231	-	-	63,188	31,850	1,060,139

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	92	78	17	22	-	407	-	172	789	789	-	-	-	858	-	-	-	98,047	2,888	-
2a.1.1.2	Recirculation Pumps & Motors	33	52	15	37	21	423	-	146	727	727	-	-	96	945	-	-	-	112,200	1,563	-
2a.1.1.3	CRDMs & NIs Removal	162	857	400	98	-	887	-	572	2,976	2,976	-	-	-	3,741	-	-	-	213,700	17,768	-
2a.1.1.4	Reactor Vessel Internals	193	3,392	15,478	2,739	-	19,466	309	16,974	58,552	58,552	-	-	-	1,252	1,481	1,010	-	312,338	27,675	1,239
2a.1.1.5	Reactor Vessel	94	7,234	2,229	976	-	3,459	309	8,050	22,352	22,352	-	-	-	10,736	-	-	-	1,089,965	27,675	1,239
2a.1.1	Totals	574	11,614	18,139	3,873	21	24,642	619	25,914	85,396	85,396	-	-	96	17,532	1,481	1,010	-	1,826,250	77,569	2,478
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	326	1,455	390	3,137	352	-	844	6,504	6,504	-	-	25,377	1,413	-	-	-	1,616,032	5,557	-
2a.1.3	Main Condensers	-	1,109	379	140	1,613	199	-	628	4,067	4,067	-	-	17,396	727	-	-	-	830,822	18,831	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor Building	-	611	-	-	-	-	-	92	703	703	-	-	-	-	-	-	-	-	6,238	-
2a.1.4.2	Radwaste	-	53	-	-	-	-	-	8	61	61	-	-	-	-	-	-	-	-	569	-
2a.1.4.3	Turbine	-	157	-	-	-	-	-	24	180	180	-	-	-	-	-	-	-	-	1,884	-
2a.1.4	Totals	-	821	-	-	-	-	-	123	944	944	-	-	-	-	-	-	-	-	8,691	-
Disposal of Plant Systems																					
2a.1.5.1	Automatic Press Relief	-	98	6	8	67	57	-	51	287	287	-	-	803	206	-	-	-	46,236	1,656	-
2a.1.5.2	Chemistry Sampling	-	23	1	2	13	10	-	11	59	59	-	-	156	37	-	-	-	8,774	400	-
2a.1.5.3	Chemistry Sampling - Insulated	-	1	0	0	-	0	-	0	2	2	-	-	-	1	-	-	-	73	28	-
2a.1.5.4	Circulating Water - RCA	-	172	10	44	557	-	-	134	917	917	-	-	6,656	-	-	-	-	270,307	2,860	-
2a.1.5.5	Combustible Gas Control - Insul - RCA	-	24	0	1	18	-	-	9	53	53	-	-	212	-	-	-	-	8,617	378	-
2a.1.5.6	Combustible Gas Control - RCA	-	15	0	2	24	-	-	8	49	49	-	-	285	-	-	-	-	11,577	245	-
2a.1.5.7	Condensate & Feedwater	-	818	178	244	1,669	2,008	-	1,011	5,929	5,929	-	-	19,947	7,319	-	-	-	1,293,969	14,196	-
2a.1.5.8	Condensate & Feedwater - Insulated	-	408	33	46	349	331	-	247	1,414	1,414	-	-	4,176	1,207	-	-	-	249,413	6,964	-
2a.1.5.9	Condensate Demin	-	451	28	37	280	274	-	232	1,303	1,303	-	-	3,346	1,000	-	-	-	201,994	7,618	-
2a.1.5.10	Condensate Storage	-	604	29	60	597	216	-	306	1,811	1,811	-	-	7,131	795	-	-	-	341,719	10,345	-
2a.1.5.11	Control Rod Drive	-	2	0	0	2	1	-	1	7	7	-	-	19	4	-	-	-	1,015	41	-
2a.1.5.12	Control Rod Drive Hydraulic	-	344	15	20	139	154	-	150	822	822	-	-	1,658	562	-	-	-	104,537	5,898	-
2a.1.5.13	Core Spray	-	66	18	37	367	143	-	115	745	745	-	-	4,384	521	-	-	-	212,510	1,163	-
2a.1.5.14	Core Spray - Insulated	-	120	7	9	68	72	-	60	338	338	-	-	818	264	-	-	-	50,680	2,033	-
2a.1.5.15	Demin Water - Insulated - RCA	-	12	0	1	7	-	-	4	24	24	-	-	85	-	-	-	-	3,445	181	-
2a.1.5.16	Demin Water - RCA	-	34	0	2	21	-	-	12	69	69	-	-	253	-	-	-	-	10,278	508	-
2a.1.5.17	Diesel Oil - RCA	-	2	0	0	2	-	-	1	4	4	-	-	23	-	-	-	-	931	25	-
2a.1.5.18	Drywell Atmosphere Cooling - RCA	-	31	1	4	46	-	-	15	97	97	-	-	548	-	-	-	-	22,244	550	-
2a.1.5.19	EDG Emerg Service Water - Insul - RCA	-	0	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	84	4	-
2a.1.5.20	Electrical - Clean	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	182	-
2a.1.5.21	Emergency Service Water - Insul - RCA	-	18	0	1	11	-	-	6	37	37	-	-	137	-	-	-	-	5,544	281	-
2a.1.5.22	Emergency Service Water - RCA	-	1	0	0	1	-	-	1	3	3	-	-	13	-	-	-	-	512	22	-
2a.1.5.23	GEZIP - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2a.1.5.24	Generator Physical Design - RCA	-	4	0	0	3	-	-	1	8	8	-	-	31	-	-	-	-	1,250	67	-
2a.1.5.25	H2-O2 Control Analyzing	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.26	H2-O2 Control Analyzing - Insulated	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.27	High Pressure Coolant Injection	-	56	6	10	81	57	-	42	252	252	-	-	972	209	-	-	-	53,266	966	-
2a.1.5.28	High Pressure Coolant Injection - Insula	-	182	13	18	134	132	-	103	582	582	-	-	1,598	481	-	-	-	96,733	3,079	-
2a.1.5.29	Hydrogen Cooling	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	118	-
2a.1.5.30	Hydrogen Cooling - RCA	-	6	0	0	3	-	-	2	11	11	-	-	39	-	-	-	-	1,600	79	-
2a.1.5.31	Hydrogen Seal Oil - RCA	-	14	0	1	16	-	-	6	38	38	-	-	189	-	-	-	-	7,669	212	-
2a.1.5.32	Hydrogen Water Chemistry - RCA	-	20	0	1	12	-	-	7	40	40	-	-	140	-	-	-	-	5,672	304	-
2a.1.5.33	Instrument & Service Air - RCA	-	185	3	12	148	-	-	71	418	418	-	-	1,768	-	-	-	-	71,810	2,733	-
2a.1.5.34	Main Condenser	-	162	11	15	112	113	-	89	502	502	-	-	1,333	411	-	-	-	81,311	2,746	-
2a.1.5.35	Main Steam	-	206	16	23	180	163	-	124	712	712	-	-	2,148	594	-	-	-	126,485	3,512	-
2a.1.5.36	Main Turbine	-	839	203	263	1,653	2,383	-	1,113	6,454	6,454	-	-	19,760	8,687	-	-	-	1,376,578	14,733	-
2a.1.5.37	Main Turbine - Insulated	-	178	17	27	212	183	-	128	745	745	-	-	2,530	667	-	-	-	146,839	3,069	-
2a.1.5.38	Miscellaneous	-	35	0	2	25	-	-	13	76	76	-	-	302	-	-	-	-	12,283	622	-
2a.1.5.39	Off Gas Recombiner	-	157	18	24	150	210	-	120	678	678	-	-	1,795	764	-	-	-	123,437	2,708	-
2a.1.5.40	Off Gas Recombiner - Insulated	-	320	18	20	114	195	-	151	818	818	-	-	1,366	709	-	-	-	102,395	5,385	-
2a.1.5.41	Post Accident Sampling	-	21	1	1	4	9	-	8	44	44	-	-	53	33	-	-	-	4,355	345	-
2a.1.5.42	Post Accident Sampling - Insulated	-	14	1	1	1	10	-	6	34	34	-	-	17	37	-	-	-	3,143	212	-
2a.1.5.43	RHR Service Water - Insulated - RCA	-	69	2	10	124	-	-	37	242	242	-	-	1,485	-	-	-	-	60,293	1,125	-
2a.1.5.44	RHR Service Water - RCA	-	3	0	0	3	-	-	1	8	8	-	-	35	-	-	-	-	1,410	57	-
2a.1.5.45	Reactor Feedwater Pump Seal	-	46	2	3	16	26	-	21	115	115	-	-	193	96	-	-	-	14,222	773	-
2a.1.5.46	Residual Heat Removal	320	209	162	134	536	1,653	-	742	3,755	3,755	-	-	6,406	6,012	-	-	-	658,423	4,135	-

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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)																					
2a.1.5.47	Residual Heat Removal - Insulated	542	461	61	62	282	716	-	623	2,746	2,746	-	-	3,367	2,607	-	-	-	309,163	10,340	-
2a.1.5.48	Rx Core Isolation Cooling	-	40	2	3	22	21	-	19	107	107	-	-	259	76	-	-	-	15,537	691	-
2a.1.5.49	Rx Core Isolation Cooling - Insulated	-	89	5	5	24	54	-	41	218	218	-	-	288	198	-	-	-	24,804	1,479	-
2a.1.5.50	Rx Recirculation	47	48	5	3	4	52	-	50	210	210	-	-	43	190	-	-	-	14,353	1,580	-
2a.1.5.51	Snubbers	-	141	2	4	32	25	-	47	251	251	-	-	377	90	-	-	-	21,240	2,548	-
2a.1.5.52	Standby Liquid Control - Insul - RCA	-	3	0	0	2	-	-	1	6	6	-	-	22	-	-	-	-	904	48	-
2a.1.5.53	Standby Liquid Control - RCA	-	22	0	2	21	-	-	9	53	53	-	-	245	-	-	-	-	9,969	341	-
2a.1.5.54	Stator Cooling - RCA	-	6	0	1	11	-	-	3	21	21	-	-	126	-	-	-	-	5,135	98	-
2a.1.5.55	Traversing Incore Probe	0	3	0	0	0	2	-	1	6	6	-	-	1	5	-	-	-	390	51	-
2a.1.5	Totals	909	6,814	882	1,164	8,170	9,278	-	5,964	33,181	33,161	-	20	97,654	33,808	-	-	-	6,201,492	119,943	-
2a.1.6	Scaffolding in support of decommissioning	-	1,911	24	9	95	25	-	502	2,566	2,566	-	-	1,030	91	-	-	-	52,344	22,564	-
2a.1	Subtotal Period 2a Activity Costs	1,483	22,596	20,878	5,575	13,035	34,496	619	33,975	132,658	132,638	-	20	141,552	53,571	1,481	1,010	-	10,526,940	253,155	2,478
Period 2a Additional Costs																					
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	84	-	55	139	-	239	-	128	645	645	-	-	-	538	-	-	-	32,290	105	-
2a.3.2	Process decommissioning chemical flush waste	5	-	206	746	-	1,652	-	548	3,157	3,157	-	-	-	2,093	-	-	-	223,008	392	-
2a.3.3	Small tool allowance	-	270	-	-	-	-	-	41	311	280	-	31	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	71	11	81	-	81	-	-	-	-	-	-	-	-	-
2a.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	89	270	261	884	-	1,892	71	727	4,194	4,082	81	31	-	2,631	-	-	-	255,298	497	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	71	-	-	-	-	-	-	18	89	89	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	777	78	854	854	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	3,365	336	3,701	3,331	-	370	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,940	-	-	-	-	-	485	2,425	2,425	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,687	-	-	-	-	-	403	3,090	3,090	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	112	39	-	424	-	123	699	699	-	-	-	5,394	-	-	-	107,886	176	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	4,438	666	5,103	5,103	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	829	83	911	911	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,399	340	3,739	-	3,739	-	-	-	-	-	-	-	-	-
2a.4.10	Fixed Overhead	-	-	-	-	-	-	2,459	369	2,827	2,827	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,047	157	1,204	-	1,204	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	126	19	145	-	145	-	-	-	-	-	-	-	-	-
2a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	6,002	900	6,902	6,902	-	-	-	-	-	-	-	-	-	174,570
2a.4.15	DOC Staff Cost	-	-	-	-	-	-	15,225	2,284	17,509	17,509	-	-	-	-	-	-	-	-	-	209,760
2a.4.16	Utility Staff Cost	-	-	-	-	-	-	21,262	3,189	24,451	24,451	-	-	-	-	-	-	-	-	-	390,540
2a.4	Subtotal Period 2a Period-Dependent Costs	71	4,627	112	39	-	424	59,068	9,471	73,813	68,355	5,088	370	-	5,394	-	-	-	107,886	176	774,870
2a.0	TOTAL PERIOD 2a COST	1,643	27,494	21,252	6,499	13,035	36,812	61,101	44,576	212,411	206,821	5,169	421	141,552	61,596	1,481	1,010	-	10,890,130	281,333	777,348
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	ALARA/Radiological	-	15	0	0	3	3	-	5	27	27	-	-	35	10	-	-	-	2,083	277	-
2b.1.1.2	Alternate N2 - RCA	-	13	0	1	8	-	-	5	27	27	-	-	93	-	-	-	-	3,765	185	-
2b.1.1.3	Decontamination Projects	-	1	0	0	0	0	-	0	2	2	-	-	2	0	-	-	-	130	17	-
2b.1.1.4	Electrical - Contaminated	-	366	5	17	200	25	-	131	744	744	-	-	2,389	90	-	-	-	102,957	6,325	-
2b.1.1.5	Electrical - Decontaminated	-	2,195	36	156	1,953	-	-	869	5,208	5,208	-	-	23,344	-	-	-	-	948,013	37,107	-
2b.1.1.6	Fire - RCA	-	84	1	4	51	-	-	29	169	169	-	-	614	-	-	-	-	24,917	1,324	-
2b.1.1.7	HVAC Ductwork	-	263	6	19	223	28	-	110	649	649	-	-	2,665	100	-	-	-	114,856	4,111	-
2b.1.1.8	HVAC/Chilled Water - RCA	-	267	4	18	230	-	-	104	624	624	-	-	2,752	-	-	-	-	111,779	3,985	-
2b.1.1.9	Heating & Ventilation	-	401	14	44	503	62	-	199	1,224	1,224	-	-	6,018	227	-	-	-	259,372	7,101	-
2b.1.1.10	Heating Boiler - Insulated - RCA	-	2	0	0	2	-	-	1	5	5	-	-	26	-	-	-	-	1,058	35	-
2b.1.1.11	Liquid Radwaste	494	571	44	46	257	468	-	557	2,437	2,437	-	-	3,073	1,728	-	-	-	237,560	17,194	-
2b.1.1.12	Makeup Demin - RCA	-	86	2	10	123	-	-	42	263	263	-	-	1,471	-	-	-	-	59,747	1,412	-
2b.1.1.13	Non-Essential Diesel Generator - RCA	-	23	2	9	119	-	-	25	179	179	-	-	1,424	-	-	-	-	57,832	395	-
2b.1.1.14	Off Gas Holdup	-	283	19	28	230	172	-	155	888	888	-	-	2,755	630	-	-	-	153,412	4,769	-
2b.1.1.15	Primary Containment	-	378	40	64	519	413	-	289	1,703	1,703	-	-	6,201	1,506	-	-	-	351,391	6,454	-

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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)																					
2b.1.1.16	Process Radiation Monitors	-	38	2	2	12	14	-	15	83	83	-	-	142	52	-	-	-	9,195	649	-
2b.1.1.17	Rx Bldg Closed Clng Water - Insul - RCA	-	93	2	7	82	-	-	37	220	220	-	-	977	-	-	-	-	39,675	1,484	-
2b.1.1.18	Rx Bldg Closed Clng Water - RCA	-	152	11	47	593	-	-	135	938	938	-	-	7,093	-	-	-	-	288,031	2,489	-
2b.1.1.19	Rx Component Handling Equip	23	117	18	20	97	228	-	117	621	621	-	-	1,158	829	-	-	-	101,862	2,462	-
2b.1.1.20	Rx Pressure Vessel	23	39	5	4	6	63	-	39	181	181	-	-	75	230	-	-	-	18,281	1,051	-
2b.1.1.21	Rx Water Cleanup	145	220	18	12	11	202	-	184	793	793	-	-	130	737	-	-	-	54,051	5,736	-
2b.1.1.22	Secondary Containment	-	103	7	11	85	70	-	58	334	334	-	-	1,017	255	-	-	-	58,151	1,763	-
2b.1.1.23	Service & Seal Water - Insulated - RCA	-	99	2	8	99	-	-	41	249	249	-	-	1,180	-	-	-	-	47,917	1,565	-
2b.1.1.24	Service & Seal Water - RCA	-	131	3	12	151	-	-	58	355	355	-	-	1,809	-	-	-	-	73,453	2,016	-
2b.1.1.25	Service Air Blower - RCA	-	13	0	1	17	-	-	6	38	38	-	-	206	-	-	-	-	8,364	206	-
2b.1.1.26	Solid Radwaste	285	409	34	37	200	375	-	378	1,718	1,718	-	-	2,387	1,380	-	-	-	187,377	10,820	-
2b.1.1.27	Structures & Buildings	-	64	2	4	30	23	-	27	151	151	-	-	357	85	-	-	-	20,152	1,128	-
2b.1.1.28	Wells & Domestic Water	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	144	-
2b.1.1.29	Wells & Domestic Water - RCA	-	43	1	2	29	-	-	15	90	90	-	-	342	-	-	-	-	13,874	633	-
2b.1.1	Totals	971	6,479	280	584	5,834	2,147	-	3,632	19,926	19,917	-	9	69,735	7,859	-	-	-	3,349,255	122,835	-
2b.1.2	Scaffolding in support of decommissioning	-	2,389	29	11	119	31	-	628	3,208	3,208	-	-	1,287	114	-	-	-	65,430	28,205	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	4,343	2,430	138	368	4,022	978	-	3,696	15,975	15,975	-	-	48,077	4,667	-	-	-	2,318,995	112,507	-
2b.1.3.2	Admin	91	5	0	2	-	13	-	50	161	161	-	-	-	79	-	-	-	6,840	1,599	-
2b.1.3.3	HPCI Room	24	24	0	2	10	12	-	23	96	96	-	-	118	70	-	-	-	10,760	789	-
2b.1.3.4	Hot Shop	14	4	0	1	-	9	-	11	39	39	-	-	-	56	-	-	-	4,860	286	-
2b.1.3.5	LLRW Storage & Shipping	49	21	1	5	3	39	-	41	159	159	-	-	31	237	-	-	-	21,708	1,126	-
2b.1.3.6	Offgas Stack	315	228	5	16	112	70	-	252	998	998	-	-	1,343	388	-	-	-	87,082	8,859	-
2b.1.3.7	Offgas Storage & Compressor	35	15	0	4	2	29	-	29	114	114	-	-	25	173	-	-	-	15,948	785	-
2b.1.3.8	Radwaste	103	53	2	12	14	83	-	90	357	357	-	-	172	501	-	-	-	49,943	2,501	-
2b.1.3.9	Radwaste Material Storage Warehouse	54	21	1	6	-	45	-	45	171	171	-	-	-	270	-	-	-	23,400	1,196	-
2b.1.3.10	Recombiner	23	21	1	4	17	21	-	25	111	111	-	-	199	121	-	-	-	18,405	695	-
2b.1.3.11	Turbine	601	304	10	72	107	489	-	526	2,109	2,109	-	-	1,283	2,912	-	-	-	303,150	14,432	-
2b.1.3.12	Turbine Building Addition	50	18	1	5	-	39	-	40	153	153	-	-	-	236	-	-	-	20,478	1,086	-
2b.1.3	Totals	5,701	3,143	159	498	4,287	1,828	-	4,827	20,443	20,443	-	-	51,247	9,710	-	-	-	2,881,569	145,859	-
2b.1	Subtotal Period 2b Activity Costs	6,673	12,012	467	1,093	10,240	4,006	-	9,087	43,578	43,568	-	9	122,269	17,682	-	-	-	6,296,255	296,899	-
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,259	678	2,936	2,936	-	-	-	-	-	-	-	-	46,242	-
2b.2.2	Operational Equipment	-	-	17	66	603	-		102	788	788	-	-	11,710	-	-	-	-	292,750	32	-
2b.2	Subtotal Period 2b Additional Costs	-	-	17	66	603	-	2,259	780	3,724	3,724	-	-	11,710	-	-	-	-	292,750	46,274	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	172	-	115	291	-	501	-	266	1,345	1,345	-	-	-	1,127	-	-	-	67,647	220	-
2b.3.2	Process decommissioning chemical flush waste	1	-	41	147	-	326	-	108	623	623	-	-	-	413	-	-	-	43,978	77	-
2b.3.3	Small tool allowance	-	286	-	-	-	-	-	43	329	329	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	29,013	4,352	33,365	-	33,365	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	173	286	156	438	-	827	29,013	4,769	35,662	2,297	33,365	-	-	1,540	-	-	-	111,625	297	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,063	-	-	-	-	-	-	266	1,328	1,328	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,306	131	1,437	1,437	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	5,191	519	5,710	5,710	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,659	-	-	-	-	-	665	3,324	3,324	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,472	-	-	-	-	-	671	5,143	5,143	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	121	42	-	456	-	132	752	752	-	-	-	5,805	-	-	-	116,095	189	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	5,890	883	6,773	6,773	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,393	139	1,532	1,532	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	5,714	571	6,285	-	6,285	-	-	-	-	-	-	-	-	-
2b.4.10	Fixed Overhead	-	-	-	-	-	-	4,133	620	4,753	4,753	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,760	264	2,024	-	2,024	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	446	67	513	513	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	212	32	244	-	244	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	10,090	1,514	11,604	11,604	-	-	-	-	-	-	-	-	-	293,480
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	24,752	3,713	28,465	28,465	-	-	-	-	-	-	-	-	-	338,720
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	34,504	5,176	39,680	39,680	-	-	-	-	-	-	-	-	-	628,720
2b.4	Subtotal Period 2b Period-Dependent Costs	1,063	7,131	121	42	-	456	95,629	15,398	119,840	111,287	8,553	-	-	5,805	-	-	-	116,095	189	1,260,920
2b.0	TOTAL PERIOD 2b COST	7,908	19,430	762	1,639	10,843	5,289	126,900	30,033	202,804	160,877	41,918	9	133,979	25,027	-	-	-	6,816,725	343,660	1,260,920

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2c - Spent fuel delay prior to SFP decon																					
Period 2c Direct Decommissioning Activities																					
Period 2c Collateral Costs																					
2c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	33,471	5,021	38,492	-	38,492	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	-	-	-	-	-	-	33,471	5,021	38,492	-	38,492	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	5,848	585	6,432	6,432	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	15,696	1,570	17,265	17,265	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	1,958	-	-	-	-	-	490	2,448	2,448	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	86	30	-	323	-	94	532	532	-	-	-	4,110	-	-	-	82,199	134	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	7,033	1,055	8,088	8,088	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	2,883	288	3,171	3,171	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	25,586	2,559	28,145	-	28,145	-	-	-	-	-	-	-	-	-
2c.4.8	Fixed Overhead	-	-	-	-	-	-	18,508	2,776	21,285	21,285	-	-	-	-	-	-	-	-	-	-
2c.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	7,880	1,182	9,062	-	9,062	-	-	-	-	-	-	-	-	-
2c.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	399	60	459	459	-	-	-	-	-	-	-	-	-	-
2c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	951	143	1,094	-	1,094	-	-	-	-	-	-	-	-	-
2c.4.12	Railroad Track Maintenance	-	-	-	-	-	-	1,063	159	1,222	1,222	-	-	-	-	-	-	-	-	-	-
2c.4.13	Security Staff Cost	-	-	-	-	-	-	38,571	5,786	44,356	22,178	22,178	-	-	-	-	-	-	-	-	1,106,383
2c.4.14	Utility Staff Cost	-	-	-	-	-	-	44,188	6,628	50,817	25,408	25,408	-	-	-	-	-	-	-	-	820,697
2c.4	Subtotal Period 2c Period-Dependent Costs	-	1,958	86	30	-	323	168,606	23,374	194,376	108,489	85,887	-	-	4,110	-	-	-	82,199	134	1,927,080
2c.0	TOTAL PERIOD 2c COST	-	1,958	86	30	-	323	202,077	28,394	232,868	108,489	124,380	-	-	4,110	-	-	-	82,199	134	1,927,080
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	557	49	108	116	-	2,099	-	844	3,772	3,772	-	-	-	7,653	-	-	-	505,842	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	38	1	2	20	2	-	14	77	77	-	-	240	9	-	-	-	10,357	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	242	4	16	206	-	-	94	562	562	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	9	0	0	5	-	-	3	18	18	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	210	354	33	28	99	368	-	308	1,399	1,399	-	-	1,179	1,341	-	-	-	136,502	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	23	34	3	2	6	32	-	30	129	129	-	-	67	117	-	-	-	10,447	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	29	1	2	25	3	-	12	72	72	-	-	296	11	-	-	-	12,762	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	27	0	1	19	-	-	10	57	57	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	24	0	2	22	-	-	10	58	58	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	233	760	42	55	409	405	-	482	2,386	2,386	-	-	4,894	1,479	-	-	-	296,447	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.3	Totals	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.4	Scaffolding in support of decommissioning	-	478	6	2	24	6	-	126	642	642	-	-	257	23	-	-	-	13,086	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,581	3,511	245	815	598	10,527	-	4,536	21,813	21,813	-	-	7,120	52,182	-	-	-	3,492,399	67,557	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,104	331	1,435	1,435	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	765	229	994	994	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	1,868	561	2,429	2,429	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	26	-	21	52	-	90	-	45	235	235	-	-	-	204	-	-	-	12,210	40	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	89	-	197	-	65	376	376	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	74	-	-	-	-	-	11	86	86	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	137	62	556	145	-	143	1,043	1,043	-	-	6,000	529	-	-	-	304,968	88	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,181	1,677	12,859	-	12,859	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	26	74	182	203	556	432	11,181	1,942	14,598	1,739	12,859	-	6,000	982	-	-	-	343,731	174	-

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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	169	-	-	-	-	-	-	42	212	212	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	442	44	487	487	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	686	69	755	755	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	714	-	-	-	-	-	178	892	892	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,515	-	-	-	-	-	227	1,742	1,742	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	42	15	-	160	-	46	263	263	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	1,064	160	1,223	1,223	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	401	40	441	441	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	194	2,129	-	2,129	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	1,917	288	2,205	2,205	-	-	-	-	-	-	-	-	-	52,250
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	5,802	870	6,672	6,672	-	-	-	-	-	-	-	-	-	78,571
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	8,686	1,303	9,989	9,989	-	-	-	-	-	-	-	-	-	150,071
2d.4	Subtotal Period 2d Period-Dependent Costs	169	2,229	42	15	-	160	22,788	3,739	29,142	26,931	2,211	-	-	2,030	-	-	-	40,600	66	280,893
2d.0	TOTAL PERIOD 2d COST	1,777	5,814	469	1,033	1,154	11,118	35,838	10,778	67,982	52,912	15,070	-	13,120	55,194	-	-	-	3,876,730	83,458	293,373
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license									a											
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	40	6	46	-	46	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,748	262	2,010	1,964	46	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	415	42	457	457	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	624	62	686	686	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	568	-	-	-	-	-	142	710	710	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	532	80	612	612	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	455	46	501	501	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	241	24	265	-	265	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	1,880	282	2,162	2,162	-	-	-	-	-	-	-	-	-	51,071
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	4,394	659	5,053	5,053	-	-	-	-	-	-	-	-	-	57,357
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	4,918	738	5,656	5,656	-	-	-	-	-	-	-	-	-	80,929
2f.4	Subtotal Period 2f Period-Dependent Costs	-	568	7	3	-	28	15,011	2,315	17,932	17,584	348	-	-	355	-	-	-	7,097	12	189,357
2f.0	TOTAL PERIOD 2f COST	-	568	7	3	-	28	22,858	4,407	27,871	27,477	394	-	-	355	-	-	-	7,097	96,208	195,597
PERIOD 2 TOTALS		11,328	55,263	22,575	9,203	25,033	53,570	448,775	118,189	743,936	556,575	186,931	431	288,652	146,282	1,481	1,010	-	21,672,880	804,794	4,454,318

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	3,541	-	-	-	-	-	531	4,073	-	-	4,073	-	-	-	-	-	-	36,752	-
3b.1.1.2	Condensate Tanks Foundation	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	219	-
3b.1.1.3	Discharge Retention Basin	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	110	-
3b.1.1.4	HPCI Room	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	401	-
3b.1.1.5	Hot Shop	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	298	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	21	-
3b.1.1.7	LLRW Storage & Shipping	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	1,794	-
3b.1.1.8	MSIV	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	59	-
3b.1.1.9	Offgas Stack	-	232	-	-	-	-	-	35	267	-	-	267	-	-	-	-	-	-	2,668	-
3b.1.1.10	Offgas Storage & Compressor	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	963	-
3b.1.1.11	Radwaste	-	482	-	-	-	-	-	72	554	-	-	554	-	-	-	-	-	-	5,196	-
3b.1.1.12	Recombiner	-	258	-	-	-	-	-	39	297	-	-	297	-	-	-	-	-	-	2,490	-
3b.1.1.13	Security Barrier	-	362	-	-	-	-	-	54	416	-	-	416	-	-	-	-	-	-	4,083	-
3b.1.1.14	Tank Farm	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	121	-
3b.1.1.15	Turbine	-	1,514	-	-	-	-	-	227	1,741	-	-	1,741	-	-	-	-	-	-	18,764	-
3b.1.1.16	Turbine Building Addition	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	971	-
3b.1.1.17	Turbine Pedestal	-	415	-	-	-	-	-	62	478	-	-	478	-	-	-	-	-	-	3,762	-
3b.1.1	Totals	-	7,207	-	-	-	-	-	1,081	8,288	-	-	8,288	-	-	-	-	-	-	78,674	-
Site Closeout Activities																					
3b.1.2	BackFill Site	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	542	-
3b.1.3	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	177	27	204	204	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,374	-	-	-	-	177	1,283	9,833	204	-	9,630	-	-	-	-	-	-	81,057	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	292	-	-	-	-	9	45	347	-	-	347	-	-	-	-	-	-	1,387	-
3b.2.2	Excavation of Underground Services	-	1,402	-	-	-	-	705	316	2,424	-	-	2,424	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure cofferdam	-	285	-	-	-	-	-	43	328	-	-	328	-	-	-	-	-	-	2,540	-
3b.2	Subtotal Period 3b Additional Costs	-	1,980	-	-	-	-	715	404	3,099	-	-	3,099	-	-	-	-	-	-	17,402	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	91	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,062	309	2,372	-	2,372	-	-	-	-	-	-	-	-	-
3b.3.3	Railroad Track Maintenance SR	-	-	-	-	-	-	185	28	213	-	-	213	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	91	-	-	-	-	2,247	351	2,689	-	2,372	317	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	956	96	1,052	-	1,052	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,159	116	1,274	(0)	1,160	115	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	4,953	-	-	-	-	-	743	5,696	-	-	5,696	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	612	92	704	-	-	704	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	440	44	484	-	484	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	555	55	610	-	610	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	166	25	190	-	190	-	-	-	-	-	-	-	-	-
3b.4.8	Fixed Overhead SR	-	-	-	-	-	-	873	131	1,004	-	-	1,004	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	4,327	649	4,976	0	4,229	746	-	-	-	-	-	-	-	117,557
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	9,599	1,440	11,039	-	-	11,039	-	-	-	-	-	-	-	122,983
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,284	943	7,226	0	1,518	5,709	-	-	-	-	-	-	-	98,567
3b.4	Subtotal Period 3b Period-Dependent Costs	-	4,953	-	-	-	-	24,970	4,333	34,256	0	9,243	25,013	-	-	-	-	-	-	-	339,107
3b.0	TOTAL PERIOD 3b COST	-	15,397	-	-	-	-	28,109	6,371	49,877	204	11,615	38,059	-	-	-	-	-	-	98,459	340,667
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	49,292	7,394	56,686	-	56,686	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	49,292	7,394	56,686	-	56,686	-	-	-	-	-	-	-	-	-

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	15,490	1,549	17,039	-	17,039	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	17,160	1,716	18,876	-	18,876	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	7,128	713	7,841	-	7,841	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	8,992	899	9,891	-	9,891	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	14,143	2,121	16,264	-	16,264	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	2,683	402	3,085	-	3,085	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	59,847	8,977	68,824	-	68,824	-	-	-	-	-	-	-	-	1,582,354
3c.4.9	Utility Staff Cost	-	-	-	-	-	-	21,517	3,228	24,745	-	24,745	-	-	-	-	-	-	-	-	395,589
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	146,959	19,605	166,564	-	166,564	-	-	-	-	-	-	-	-	1,977,943
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	196,251	26,999	223,250	-	223,250	-	-	-	-	-	-	-	-	1,977,943
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1.1	Totals	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	21,729	3,259	24,988	-	24,988	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	21,729	3,259	24,988	-	24,988	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	7,722	772	8,494	-	8,494	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	8,556	856	9,411	-	9,411	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	5,089	509	5,597	-	5,597	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	4,483	448	4,931	-	4,931	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	7,051	1,058	8,108	-	8,108	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,338	201	1,538	-	1,538	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,777	267	2,044	-	2,044	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	29,836	4,475	34,311	-	34,311	-	-	-	-	-	-	-	-	788,863
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	10,727	1,609	12,336	-	12,336	-	-	-	-	-	-	-	-	197,216
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	76,577	10,194	86,772	-	86,772	-	-	-	-	-	-	-	-	986,079
3d.0	TOTAL PERIOD 3d COST	-	-	1,462	-	-	6,760	98,306	14,833	121,362	9,602	111,760	-	-	-	-	-	1,785	346,570	-	986,079
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	-	194	3	357	-	2,726	1,784	1,266	6,330	6,330	-	-	-	15,284	-	-	-	1,652,734	10,381	1,872
3e.2	Subtotal Period 3e Additional Costs	-	194	3	357	-	2,726	1,784	1,266	6,330	6,330	-	-	-	15,284	-	-	-	1,652,734	10,381	1,872
Period 3e Collateral Costs																					
3e.3	Subtotal Period 3e Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	84	21	104	104	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	203	51	253	253	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	167	42	209	209	-	-	-	-	-	-	-	-	-	-
3e.4.5	Security Staff Cost	-	-	-	-	-	-	130	32	162	162	-	-	-	-	-	-	-	-	-	5,013
3e.4.6	Utility Staff Cost	-	-	-	-	-	-	213	53	266	266	-	-	-	-	-	-	-	-	-	3,803
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	795	199	994	994	-	-	-	-	-	-	-	-	-	8,816
3e.0	TOTAL PERIOD 3e COST	-	194	3	357	-	2,726	2,579	1,465	7,324	7,324	-	-	-	15,284	-	-	-	1,652,734	10,381	10,688

Table D
Monticello Nuclear Generating Plant
DECON 60 YR of Fuel Storage Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	938	-	-	-	-	55	149	1,143	-	-	1,143	-	-	-	-	-	-	5,641	160
3f.2	Subtotal Period 3f Additional Costs	-	938	-	-	-	-	55	149	1,143	-	-	1,143	-	-	-	-	-	-	5,641	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	102	10	112	-	-	112	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	106	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	59	9	68	-	-	68	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	84	13	97	-	-	97	-	-	-	-	-	-	-	-
3f.4.6	Security Staff Cost	-	-	-	-	-	-	65	10	75	-	-	75	-	-	-	-	-	-	-	2,527
3f.4.7	Utility Staff Cost	-	-	-	-	-	-	84	13	96	-	-	96	-	-	-	-	-	-	-	1,569
3f.4	Subtotal Period 3f Period-Dependent Costs	-	106	-	-	-	-	394	70	570	-	-	570	-	-	-	-	-	-	-	4,096
3f.0	TOTAL PERIOD 3f COST	-	1,053	-	-	-	-	450	220	1,723	-	-	1,723	-	-	-	-	-	-	5,641	4,256
PERIOD 3 TOTALS		-	16,644	1,465	357	-	9,486	325,696	49,888	403,536	17,130	346,625	39,781	-	15,284	-	-	1,785	1,999,304	114,480	3,319,632
TOTAL COST TO DECOMMISSION		**14,035**	**74,568**	**24,134**	**9,729**	**25,045**	**64,621**	**906,343**	**189,441**	**1,307,916**	**697,451**	**569,359**	**41,106**	**288,695**	**162,767**	**1,711**	**1,010**	**1,785**	**23,735,370**	**951,124**	**8,834,088**

TOTAL COST TO DECOMMISSION WITH 16.94% CONTINGENCY:	**$1,307,916**	**thousands of 2014 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 53.33% OR:	**$697,451**	**thousands of 2014 dollars**
SPENT FUEL MANAGEMENT COST IS 43.53% OR:	**$569,359**	**thousands of 2014 dollars**
NON-NUCLEAR DEMOLITION COST IS 3.14% OR:	**$41,106**	**thousands of 2014 dollars**
TOTAL RADWASTE VOLUME BURIED (EXCLUDING GTCC):	**165,488**	**Cubic Feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED	**1,785**	**Cubic Feet**
TOTAL SCRAP METAL REMOVED:	**15,499**	**Tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**951,124**	**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

SCENARIO 3

DECON DECOMMISSIONING COST ESTIMATE

WITH 100 YEARS OF SPENT FUEL STORAGE

AND PERIODIC DSC REPLACEMENT

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	851	128	979	979	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	352	53	405	405	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	568	85	653	653	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	465	70	535	535	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	559	84	642	578	-	64	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	473	71	544	490	-	54	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	806	121	927	927	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	738	111	849	849	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	182	27	209	104	-	104	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	182	27	209	209	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	354	53	407	204	-	204	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	102	15	118	59	-	59	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,846	727	5,573	5,087	-	486	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	272	41	313	313	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	159	24	183	183	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	140	21	161	161	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,224	2,134	16,358	15,873	-	486	-	-	-	-	-	-	-	78,609
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	25,293	3,794	29,087	-	29,087	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	25,293	3,794	29,087	-	29,087	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,418	142	1,560	1,560	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,718	272	2,990	2,990	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	490	-	-	-	-	-	123	613	613	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	528	-	-	-	-	-	79	608	608	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	48	-	14	79	79	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	3,530	530	4,060	4,060	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,181	118	1,299	1,299	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,121	312	3,433	-	3,433	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,434	365	2,799	2,799	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	95	14	110	-	110	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	107	16	123	123	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	5,349	802	6,151	6,151	-	-	-	-	-	-	-	-	-	157,471
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	22,165	3,325	25,489	25,489	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	4	-	48	42,909	6,230	50,222	45,769	4,453	-	-	610	-	-	-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	4	-	48	82,426	12,158	95,667	61,642	33,540	486	-	610	-	-	-	12,190	20	659,480

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	537	81	618	556	-	62	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	454	68	522	522	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	153	23	176	44	-	132	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	412	62	474	474	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	136	20	157	78	-	78	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	136	20	157	157	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	114	17	131	65	-	65	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	236	35	272	272	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,831	575	4,405	3,996	-	409	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	262	-	-	-	-	-	-	131	393	393	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	262	-	-	-	-	-	3,831	705	4,798	4,389	-	409	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	5,244	1,573	6,818	6,818	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.3	Mixed & RCRA Waste	-	-	26	19	12	-	-	7	65	65	-	-	43	-	-	-	-	5,253	163	-
1b.2	Subtotal Period 1b Additional Costs	-	-	26	19	12	-	16,057	3,202	19,317	19,317	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	881	-	-	-	-	-	-	132	1,013	1,013	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	37	-	24	60	-	104	-	56	280	280	-	-	-	233	-	-	-	13,986	45	-
1b.3.4	Process decommissioning chemical flush waste	1	-	23	82	-	1,385	-	361	1,852	1,852	-	-	-	-	231	-	-	24,599	43	-
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	-	-	-	-	-	-	27	4	31	-	31	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,418	1,102	47	142	-	1,489	1,734	1,199	8,131	8,101	31	-	-	233	231	-	-	38,585	89	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	711	71	782	782	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,339	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	276	-	-	-	-	-	69	345	345	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	265	-	-	-	-	-	40	305	305	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	3,540	531	4,071	4,071	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,565	156	1,721	-	1,721	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,220	183	1,403	1,403	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	53	8	62	62	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	2,682	402	3,084	3,084	-	-	-	-	-	-	-	-	-	78,951
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	4,755	713	5,468	5,468	-	-	-	-	-	-	-	-	-	63,789
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	11,170	1,675	12,845	12,845	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	27	541	7	3	-	28	27,824	4,099	32,530	30,297	2,232	-	-	358	-	-	-	7,159	12	356,066
1b.0	TOTAL PERIOD 1b COST	2,707	1,643	80	164	12	1,517	49,446	9,207	64,776	62,103	2,263	409	43	591	231	-	-	50,997	31,830	400,659
PERIOD 1 TOTALS		2,707	2,661	93	168	12	1,565	131,872	21,364	160,443	123,745	35,803	894	43	1,201	231	-	-	63,188	31,850	1,060,139

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	92	78	17	22	-	407	-	172	789	789	-	-	-	858	-	-	-	98,047	2,888	-
2a.1.1.2	Recirculation Pumps & Motors	33	52	15	37	21	423	-	146	727	727	-	-	96	945	-	-	-	112,200	1,563	-
2a.1.1.3	CRDMs & NIs Removal	162	857	400	98	-	887	-	572	2,976	2,976	-	-	-	3,741	-	-	-	213,700	17,768	-
2a.1.1.4	Reactor Vessel Internals	193	3,392	15,478	2,739	-	19,466	309	16,974	58,552	58,552	-	-	-	1,252	1,481	1,010	-	312,338	27,675	1,239
2a.1.1.5	Reactor Vessel	94	7,234	2,229	976	-	3,459	309	8,050	22,352	22,352	-	-	-	10,736	-	-	-	1,089,965	27,675	1,239
2a.1.1	Totals	574	11,614	18,139	3,873	21	24,642	619	25,914	85,396	85,396	-	-	96	17,532	1,481	1,010	-	1,826,250	77,569	2,478
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	326	1,455	390	3,137	352	-	844	6,504	6,504	-	-	25,377	1,413	-	-	-	1,616,032	5,557	-
2a.1.3	Main Condensers	-	1,109	379	140	1,613	199	-	628	4,067	4,067	-	-	17,396	727	-	-	-	830,822	18,831	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor Building	-	611	-	-	-	-	-	92	703	703	-	-	-	-	-	-	-	-	6,238	-
2a.1.4.2	Radwaste	-	53	-	-	-	-	-	8	61	61	-	-	-	-	-	-	-	-	569	-
2a.1.4.3	Turbine	-	157	-	-	-	-	-	24	180	180	-	-	-	-	-	-	-	-	1,884	-
2a.1.4	Totals	-	821	-	-	-	-	-	123	944	944	-	-	-	-	-	-	-	-	8,691	-
Disposal of Plant Systems																					
2a.1.5.1	Automatic Press Relief	-	98	6	8	67	57	-	51	287	287	-	-	803	206	-	-	-	46,236	1,656	-
2a.1.5.2	Chemistry Sampling	-	23	1	2	13	10	-	11	59	59	-	-	156	37	-	-	-	8,774	400	-
2a.1.5.3	Chemistry Sampling - Insulated	-	1	0	0	-	0	-	0	2	2	-	-	-	1	-	-	-	73	28	-
2a.1.5.4	Circulating Water - RCA	-	172	10	44	557	-	-	134	917	917	-	-	6,656	-	-	-	-	270,307	2,860	-
2a.1.5.5	Combustible Gas Control - Insul - RCA	-	24	0	1	18	-	-	9	53	53	-	-	212	-	-	-	-	8,617	378	-
2a.1.5.6	Combustible Gas Control - RCA	-	15	0	2	24	-	-	8	49	49	-	-	285	-	-	-	-	11,577	245	-
2a.1.5.7	Condensate & Feedwater	-	818	178	244	1,669	2,008	-	1,011	5,929	5,929	-	-	19,947	7,319	-	-	-	1,293,969	14,196	-
2a.1.5.8	Condensate & Feedwater - Insulated	-	408	33	46	349	331	-	247	1,414	1,414	-	-	4,176	1,207	-	-	-	249,413	6,964	-
2a.1.5.9	Condensate Demin	-	451	28	37	280	274	-	232	1,303	1,303	-	-	3,346	1,000	-	-	-	201,994	7,618	-
2a.1.5.10	Condensate Storage	-	604	29	60	597	216	-	306	1,811	1,811	-	-	7,131	795	-	-	-	341,719	10,345	-
2a.1.5.11	Control Rod Drive	-	2	0	0	2	1	-	1	7	7	-	-	19	4	-	-	-	1,015	41	-
2a.1.5.12	Control Rod Drive Hydraulic	-	344	15	20	139	154	-	150	822	822	-	-	1,658	562	-	-	-	104,537	5,898	-
2a.1.5.13	Core Spray	-	66	18	37	367	143	-	115	745	745	-	-	4,384	521	-	-	-	212,510	1,163	-
2a.1.5.14	Core Spray - Insulated	-	120	7	9	68	72	-	60	338	338	-	-	818	264	-	-	-	50,680	2,033	-
2a.1.5.15	Demin Water - Insulated - RCA	-	12	0	1	7	-	-	4	24	24	-	-	85	-	-	-	-	3,445	181	-
2a.1.5.16	Demin Water - RCA	-	34	0	2	21	-	-	12	69	69	-	-	253	-	-	-	-	10,278	508	-
2a.1.5.17	Diesel Oil - RCA	-	2	0	0	2	-	-	1	4	4	-	-	23	-	-	-	-	931	25	-
2a.1.5.18	Drywell Atmosphere Cooling - RCA	-	31	1	4	46	-	-	15	97	97	-	-	548	-	-	-	-	22,244	550	-
2a.1.5.19	EDG Emerg Service Water - Insul - RCA	-	0	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	84	4	-
2a.1.5.20	Electrical - Clean	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	182	-
2a.1.5.21	Emergency Service Water - Insul - RCA	-	18	0	1	11	-	-	6	37	37	-	-	137	-	-	-	-	5,544	281	-
2a.1.5.22	Emergency Service Water - RCA	-	1	0	0	1	-	-	1	3	3	-	-	13	-	-	-	-	512	22	-
2a.1.5.23	GEZIP - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2a.1.5.24	Generator Physical Design - RCA	-	4	0	0	3	-	-	1	8	8	-	-	31	-	-	-	-	1,250	67	-
2a.1.5.25	H2-O2 Control Analyzing	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.26	H2-O2 Control Analyzing - Insulated	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.27	High Pressure Coolant Injection	-	56	6	10	81	57	-	42	252	252	-	-	972	209	-	-	-	53,266	966	-
2a.1.5.28	High Pressure Coolant Injection - Insula	-	182	13	18	134	132	-	103	582	582	-	-	1,598	481	-	-	-	96,733	3,079	-
2a.1.5.29	Hydrogen Cooling	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	118	-
2a.1.5.30	Hydrogen Cooling - RCA	-	6	0	0	3	-	-	2	11	11	-	-	39	-	-	-	-	1,600	79	-
2a.1.5.31	Hydrogen Seal Oil - RCA	-	14	0	1	16	-	-	6	38	38	-	-	189	-	-	-	-	7,669	212	-
2a.1.5.32	Hydrogen Water Chemistry - RCA	-	20	0	1	12	-	-	7	40	40	-	-	140	-	-	-	-	5,672	304	-
2a.1.5.33	Instrument & Service Air - RCA	-	185	3	12	148	-	-	71	418	418	-	-	1,768	-	-	-	-	71,810	2,733	-
2a.1.5.34	Main Condenser	-	162	11	15	112	113	-	89	502	502	-	-	1,333	411	-	-	-	81,311	2,746	-
2a.1.5.35	Main Steam	-	206	16	23	180	163	-	124	712	712	-	-	2,148	594	-	-	-	126,485	3,512	-
2a.1.5.36	Main Turbine	-	839	203	263	1,653	2,383	-	1,113	6,454	6,454	-	-	19,760	8,687	-	-	-	1,376,578	14,733	-
2a.1.5.37	Main Turbine - Insulated	-	178	17	27	212	183	-	128	745	745	-	-	2,530	667	-	-	-	146,839	3,069	-
2a.1.5.38	Miscellaneous	-	35	0	2	25	-	-	13	76	76	-	-	302	-	-	-	-	12,283	622	-
2a.1.5.39	Off Gas Recombiner	-	157	18	24	150	210	-	120	678	678	-	-	1,795	764	-	-	-	123,437	2,708	-
2a.1.5.40	Off Gas Recombiner - Insulated	-	320	18	20	114	195	-	151	818	818	-	-	1,366	709	-	-	-	102,395	5,385	-
2a.1.5.41	Post Accident Sampling	-	21	1	1	4	9	-	8	44	44	-	-	53	33	-	-	-	4,355	345	-
2a.1.5.42	Post Accident Sampling - Insulated	-	14	1	1	1	10	-	6	34	34	-	-	17	37	-	-	-	3,143	212	-
2a.1.5.43	RHR Service Water - Insulated - RCA	-	69	2	10	124	-	-	37	242	242	-	-	1,485	-	-	-	-	60,293	1,125	-
2a.1.5.44	RHR Service Water - RCA	-	3	0	0	3	-	-	1	8	8	-	-	35	-	-	-	-	1,410	57	-
2a.1.5.45	Reactor Feedwater Pump Seal	-	46	2	3	16	26	-	21	115	115	-	-	193	96	-	-	-	14,222	773	-
2a.1.5.46	Residual Heat Removal	320	209	162	134	536	1,653	-	742	3,755	3,755	-	-	6,406	6,012	-	-	-	658,423	4,135	-

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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)																					
2a.1.5.47	Residual Heat Removal - Insulated	542	461	61	62	282	716	-	623	2,746	2,746	-	-	3,367	2,607	-	-	-	309,163	10,340	-
2a.1.5.48	Rx Core Isolation Cooling	-	40	2	3	22	21	-	19	107	107	-	-	259	76	-	-	-	15,537	691	-
2a.1.5.49	Rx Core Isolation Cooling - Insulated	-	89	5	5	24	54	-	41	218	218	-	-	288	198	-	-	-	24,804	1,479	-
2a.1.5.50	Rx Recirculation	47	48	5	3	4	52	-	50	210	210	-	-	43	190	-	-	-	14,353	1,580	-
2a.1.5.51	Snubbers	-	141	2	4	32	25	-	47	251	251	-	-	377	90	-	-	-	21,240	2,548	-
2a.1.5.52	Standby Liquid Control - Insul - RCA	-	3	0	0	2	-	-	1	6	6	-	-	22	-	-	-	-	904	48	-
2a.1.5.53	Standby Liquid Control - RCA	-	22	0	2	21	-	-	9	53	53	-	-	245	-	-	-	-	9,969	341	-
2a.1.5.54	Stator Cooling - RCA	-	6	0	1	11	-	-	3	21	21	-	-	126	-	-	-	-	5,135	98	-
2a.1.5.55	Traversing Incore Probe	0	3	0	0	0	2	-	1	6	6	-	-	1	5	-	-	-	390	51	-
2a.1.5	Totals	909	6,814	882	1,164	8,170	9,278	-	5,964	33,181	33,161	-	20	97,654	33,808	-	-	-	6,201,492	119,943	-
2a.1.6	Scaffolding in support of decommissioning	-	1,911	24	9	95	25	-	502	2,566	2,566	-	-	1,030	91	-	-	-	52,344	22,564	-
2a.1	Subtotal Period 2a Activity Costs	1,483	22,596	20,878	5,575	13,035	34,496	619	33,975	132,658	132,638	-	20	141,552	53,571	1,481	1,010	-	10,526,940	253,155	2,478
Period 2a Additional Costs																					
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	84	-	55	139	-	239	-	128	645	645	-	-	-	538	-	-	-	32,290	105	-
2a.3.2	Process decommissioning chemical flush waste	5	-	206	746	-	1,652	-	548	3,157	3,157	-	-	-	2,093	-	-	-	223,008	392	-
2a.3.3	Small tool allowance	-	270	-	-	-	-	-	41	311	280	-	31	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	71	11	81	-	81	-	-	-	-	-	-	-	-	-
2a.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	89	270	261	884	-	1,892	71	727	4,194	4,082	81	31	-	2,631	-	-	-	255,298	497	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	71	-	-	-	-	-	-	18	89	89	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	777	78	854	854	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	3,365	336	3,701	3,331	-	370	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,940	-	-	-	-	-	485	2,425	2,425	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,687	-	-	-	-	-	403	3,090	3,090	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	112	39	-	424	-	123	699	699	-	-	-	5,394	-	-	-	107,886	176	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	4,438	666	5,103	5,103	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	829	83	911	911	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,399	340	3,739	-	3,739	-	-	-	-	-	-	-	-	-
2a.4.10	Fixed Overhead	-	-	-	-	-	-	2,459	369	2,827	2,827	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,047	157	1,204	-	1,204	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	126	19	145	-	145	-	-	-	-	-	-	-	-	-
2a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	6,002	900	6,902	6,902	-	-	-	-	-	-	-	-	-	174,570
2a.4.15	DOC Staff Cost	-	-	-	-	-	-	15,225	2,284	17,509	17,509	-	-	-	-	-	-	-	-	-	209,760
2a.4.16	Utility Staff Cost	-	-	-	-	-	-	21,262	3,189	24,451	24,451	-	-	-	-	-	-	-	-	-	390,540
2a.4	Subtotal Period 2a Period-Dependent Costs	71	4,627	112	39	-	424	59,068	9,471	73,813	68,355	5,088	370	-	5,394	-	-	-	107,886	176	774,870
2a.0	TOTAL PERIOD 2a COST	1,643	27,494	21,252	6,499	13,035	36,812	61,101	44,576	212,411	206,821	5,169	421	141,552	61,596	1,481	1,010	-	10,890,130	281,333	777,348
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	ALARA/Radiological	-	15	0	0	3	3	-	5	27	27	-	-	35	10	-	-	-	2,083	277	-
2b.1.1.2	Alternate N2 - RCA	-	13	0	1	8	-	-	5	27	27	-	-	93	-	-	-	-	3,765	185	-
2b.1.1.3	Decontamination Projects	-	1	0	0	0	0	-	0	2	2	-	-	2	0	-	-	-	130	17	-
2b.1.1.4	Electrical - Contaminated	-	366	5	17	200	25	-	131	744	744	-	-	2,389	90	-	-	-	102,957	6,325	-
2b.1.1.5	Electrical - Decontaminated	-	2,195	36	156	1,953	-	-	869	5,208	5,208	-	-	23,344	-	-	-	-	948,013	37,107	-
2b.1.1.6	Fire - RCA	-	84	1	4	51	-	-	29	169	169	-	-	614	-	-	-	-	24,917	1,324	-
2b.1.1.7	HVAC Ductwork	-	263	6	19	223	28	-	110	649	649	-	-	2,665	100	-	-	-	114,856	4,111	-
2b.1.1.8	HVAC/Chilled Water - RCA	-	267	4	18	230	-	-	104	624	624	-	-	2,752	-	-	-	-	111,779	3,985	-
2b.1.1.9	Heating & Ventilation	-	401	14	44	503	62	-	199	1,224	1,224	-	-	6,018	227	-	-	-	259,372	7,101	-
2b.1.1.10	Heating Boiler - Insulated - RCA	-	2	0	0	2	-	-	1	5	5	-	-	26	-	-	-	-	1,058	35	-
2b.1.1.11	Liquid Radwaste	494	571	44	46	257	468	-	557	2,437	2,437	-	-	3,073	1,728	-	-	-	237,560	17,194	-
2b.1.1.12	Makeup Demin - RCA	-	86	2	10	123	-	-	42	263	263	-	-	1,471	-	-	-	-	59,747	1,412	-
2b.1.1.13	Non-Essential Diesel Generator - RCA	-	23	2	9	119	-	-	25	179	179	-	-	1,424	-	-	-	-	57,832	395	-
2b.1.1.14	Off Gas Holdup	-	283	19	28	230	172	-	155	888	888	-	-	2,755	630	-	-	-	153,412	4,769	-
2b.1.1.15	Primary Containment	-	378	40	64	519	413	-	289	1,703	1,703	-	-	6,201	1,506	-	-	-	351,391	6,454	-

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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)																					
2b.1.1.16	Process Radiation Monitors	-	38	2	2	12	14	-	15	83	83	-	-	142	52	-	-	-	9,195	649	-
2b.1.1.17	Rx Bldg Closed Clng Water - Insul - RCA	-	93	2	7	82	-	-	37	220	220	-	-	977	-	-	-	-	39,675	1,484	-
2b.1.1.18	Rx Bldg Closed Clng Water - RCA	-	152	11	47	593	-	-	135	938	938	-	-	7,093	-	-	-	-	288,031	2,489	-
2b.1.1.19	Rx Component Handling Equip	23	117	18	20	97	228	-	117	621	621	-	-	1,158	829	-	-	-	101,862	2,462	-
2b.1.1.20	Rx Pressure Vessel	23	39	5	4	6	63	-	39	181	181	-	-	75	230	-	-	-	18,281	1,051	-
2b.1.1.21	Rx Water Cleanup	145	220	18	12	11	202	-	184	793	793	-	-	130	737	-	-	-	54,051	5,736	-
2b.1.1.22	Secondary Containment	-	103	7	11	85	70	-	58	334	334	-	-	1,017	255	-	-	-	58,151	1,763	-
2b.1.1.23	Service & Seal Water - Insulated - RCA	-	99	2	8	99	-	-	41	249	249	-	-	1,180	-	-	-	-	47,917	1,565	-
2b.1.1.24	Service & Seal Water - RCA	-	131	3	12	151	-	-	58	355	355	-	-	1,809	-	-	-	-	73,453	2,016	-
2b.1.1.25	Service Air Blower - RCA	-	13	0	1	17	-	-	6	38	38	-	-	206	-	-	-	-	8,364	206	-
2b.1.1.26	Solid Radwaste	285	409	34	37	200	375	-	378	1,718	1,718	-	-	2,387	1,380	-	-	-	187,377	10,820	-
2b.1.1.27	Structures & Buildings	-	64	2	4	30	23	-	27	151	151	-	-	357	85	-	-	-	20,152	1,128	-
2b.1.1.28	Wells & Domestic Water	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	144	-
2b.1.1.29	Wells & Domestic Water - RCA	-	43	1	2	29	-	-	15	90	90	-	-	342	-	-	-	-	13,874	633	-
2b.1.1	Totals	971	6,479	280	584	5,834	2,147	-	3,632	19,926	19,917	-	9	69,735	7,859	-	-	-	3,349,255	122,835	-
2b.1.2	Scaffolding in support of decommissioning	-	2,389	29	11	119	31	-	628	3,208	3,208	-	-	1,287	114	-	-	-	65,430	28,205	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	4,343	2,430	138	368	4,022	978	-	3,696	15,975	15,975	-	-	48,077	4,667	-	-	-	2,318,995	112,507	-
2b.1.3.2	Admin	91	5	0	2	-	13	-	50	161	161	-	-	-	79	-	-	-	6,840	1,599	-
2b.1.3.3	HPCI Room	24	24	0	2	10	12	-	23	96	96	-	-	118	70	-	-	-	10,760	789	-
2b.1.3.4	Hot Shop	14	4	0	1	-	9	-	11	39	39	-	-	-	56	-	-	-	4,860	286	-
2b.1.3.5	LLRW Storage & Shipping	49	21	1	5	3	39	-	41	159	159	-	-	31	237	-	-	-	21,708	1,126	-
2b.1.3.6	Offgas Stack	315	228	5	16	112	70	-	252	998	998	-	-	1,343	388	-	-	-	87,082	8,859	-
2b.1.3.7	Offgas Storage & Compressor	35	15	0	4	2	29	-	29	114	114	-	-	25	173	-	-	-	15,948	785	-
2b.1.3.8	Radwaste	103	53	2	12	14	83	-	90	357	357	-	-	172	501	-	-	-	49,943	2,501	-
2b.1.3.9	Radwaste Material Storage Warehouse	54	21	1	6	-	45	-	45	171	171	-	-	-	270	-	-	-	23,400	1,196	-
2b.1.3.10	Recombiner	23	21	1	4	17	21	-	25	111	111	-	-	199	121	-	-	-	18,405	695	-
2b.1.3.11	Turbine	601	304	10	72	107	489	-	526	2,109	2,109	-	-	1,283	2,912	-	-	-	303,150	14,432	-
2b.1.3.12	Turbine Building Addition	50	18	1	5	-	39	-	40	153	153	-	-	-	236	-	-	-	20,478	1,086	-
2b.1.3	Totals	5,701	3,143	159	498	4,287	1,828	-	4,827	20,443	20,443	-	-	51,247	9,710	-	-	-	2,881,569	145,859	-
2b.1	Subtotal Period 2b Activity Costs	6,673	12,012	467	1,093	10,240	4,006	-	9,087	43,578	43,568	-	9	122,269	17,682	-	-	-	6,296,255	296,899	-
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,259	678	2,936	2,936	-	-	-	-	-	-	-	-	46,242	-
2b.2.2	Operational Equipment	-	-	17	66	603	-	-	102	788	788	-	-	11,710	-	-	-	-	292,750	32	-
2b.2	Subtotal Period 2b Additional Costs	-	-	17	66	603	-	2,259	780	3,724	3,724	-	-	11,710	-	-	-	-	292,750	46,274	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	172	-	115	291	-	501	-	266	1,345	1,345	-	-	-	1,127	-	-	-	67,647	220	-
2b.3.2	Process decommissioning chemical flush waste	1	-	41	147	-	326	-	108	623	623	-	-	-	413	-	-	-	43,978	77	-
2b.3.3	Small tool allowance	-	286	-	-	-	-	-	43	329	329	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	29,013	4,352	33,365	-	33,365	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	173	286	156	438	-	827	29,013	4,769	35,662	2,297	33,365	-	-	1,540	-	-	-	111,625	297	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,063	-	-	-	-	-	-	266	1,328	1,328	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,306	131	1,437	1,437	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	5,191	519	5,710	5,710	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,659	-	-	-	-	-	665	3,324	3,324	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,472	-	-	-	-	-	671	5,143	5,143	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	121	42	-	456	-	132	752	752	-	-	-	5,805	-	-	-	116,095	189	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	5,890	883	6,773	6,773	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,393	139	1,532	1,532	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	5,714	571	6,285	-	6,285	-	-	-	-	-	-	-	-	-
2b.4.10	Fixed Overhead	-	-	-	-	-	-	4,133	620	4,753	4,753	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,760	264	2,024	-	2,024	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	446	67	513	513	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	212	32	244	-	244	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	10,090	1,514	11,604	11,604	-	-	-	-	-	-	-	-	-	293,480
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	24,752	3,713	28,465	28,465	-	-	-	-	-	-	-	-	-	338,720
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	34,504	5,176	39,680	39,680	-	-	-	-	-	-	-	-	-	628,720
2b.4	Subtotal Period 2b Period-Dependent Costs	1,063	7,131	121	42	-	456	95,629	15,398	119,840	111,287	8,553	-	-	5,805	-	-	-	116,095	189	1,260,920
2b.0	TOTAL PERIOD 2b COST	7,908	19,430	762	1,639	10,843	5,289	126,900	30,033	202,804	160,877	41,918	9	133,979	25,027	-	-	-	6,816,725	343,660	1,260,920

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2c - Spent fuel delay prior to SFP decon																					
Period 2c Direct Decommissioning Activities																					
Period 2c Collateral Costs																					
2c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	33,471	5,021	38,492	-	38,492	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	-	-	-	-	-	-	33,471	5,021	38,492	-	38,492	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	5,848	585	6,432	6,432	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	15,696	1,570	17,265	17,265	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	1,958	-	-	-	-	-	490	2,448	2,448	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	86	30	-	323	-	94	532	532	-	-	-	4,110	-	-	-	82,199	134	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	7,033	1,055	8,088	8,088	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	2,883	288	3,171	3,171	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	25,586	2,559	28,145	-	28,145	-	-	-	-	-	-	-	-	-
2c.4.8	Fixed Overhead	-	-	-	-	-	-	18,508	2,776	21,285	21,285	-	-	-	-	-	-	-	-	-	-
2c.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	7,880	1,182	9,062	-	9,062	-	-	-	-	-	-	-	-	-
2c.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	399	60	459	459	-	-	-	-	-	-	-	-	-	-
2c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	951	143	1,094	-	1,094	-	-	-	-	-	-	-	-	-
2c.4.12	Railroad Track Maintenance	-	-	-	-	-	-	1,063	159	1,222	1,222	-	-	-	-	-	-	-	-	-	-
2c.4.13	Security Staff Cost	-	-	-	-	-	-	38,571	5,786	44,356	22,178	22,178	-	-	-	-	-	-	-	-	1,106,383
2c.4.14	Utility Staff Cost	-	-	-	-	-	-	44,188	6,628	50,817	25,408	25,408	-	-	-	-	-	-	-	-	820,697
2c.4	Subtotal Period 2c Period-Dependent Costs	-	1,958	86	30	-	323	168,606	23,374	194,376	108,489	85,887	-	-	4,110	-	-	-	82,199	134	1,927,080
2c.0	TOTAL PERIOD 2c COST	-	1,958	86	30	-	323	202,077	28,394	232,868	108,489	124,380	-	-	4,110	-	-	-	82,199	134	1,927,080
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	557	49	108	116	-	2,099	-	844	3,772	3,772	-	-	-	7,653	-	-	-	505,842	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	38	1	2	20	2	-	14	77	77	-	-	240	9	-	-	-	10,357	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	242	4	16	206	-	-	94	562	562	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	9	0	0	5	-	-	3	18	18	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	210	354	33	28	99	368	-	308	1,399	1,399	-	-	1,179	1,341	-	-	-	136,502	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	23	34	3	2	6	32	-	30	129	129	-	-	67	117	-	-	-	10,447	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	29	1	2	25	3	-	12	72	72	-	-	296	11	-	-	-	12,762	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	27	0	1	19	-	-	10	57	57	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	24	0	2	22	-	-	10	58	58	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	233	760	42	55	409	405	-	482	2,386	2,386	-	-	4,894	1,479	-	-	-	296,447	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.3	Totals	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.4	Scaffolding in support of decommissioning	-	478	6	2	24	6	-	126	642	642	-	-	257	23	-	-	-	13,086	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,581	3,511	245	815	598	10,527	-	4,536	21,813	21,813	-	-	7,120	52,182	-	-	-	3,492,399	67,557	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,104	331	1,435	1,435	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	765	229	994	994	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	1,868	561	2,429	2,429	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	26	-	21	52	-	90	-	45	235	235	-	-	-	204	-	-	-	12,210	40	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	89	-	197	-	65	376	376	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	74	-	-	-	-	-	11	86	86	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	137	62	556	145	-	143	1,043	1,043	-	-	6,000	529	-	-	-	304,968	88	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,181	1,677	12,859	-	12,859	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	26	74	182	203	556	432	11,181	1,942	14,598	1,739	12,859	-	6,000	982	-	-	-	343,731	174	-

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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 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	169	-	-	-	-	-	-	42	212	212	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	442	44	487	487	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	686	69	755	755	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	714	-	-	-	-	-	178	892	892	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,515	-	-	-	-	-	227	1,742	1,742	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	42	15	-	160	-	46	263	263	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	1,064	160	1,223	1,223	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	401	40	441	441	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	194	2,129	-	2,129	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	1,917	288	2,205	2,205	-	-	-	-	-	-	-	-	-	52,250
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	5,802	870	6,672	6,672	-	-	-	-	-	-	-	-	-	78,571
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	8,686	1,303	9,989	9,989	-	-	-	-	-	-	-	-	-	150,071
2d.4	Subtotal Period 2d Period-Dependent Costs	169	2,229	42	15	-	160	22,788	3,739	29,142	26,931	2,211	-	-	2,030	-	-	-	40,600	66	280,893
2d.0	TOTAL PERIOD 2d COST	1,777	5,814	469	1,033	1,154	11,118	35,838	10,778	67,982	52,912	15,070	-	13,120	55,194	-	-	-	3,876,730	83,458	293,373
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license									a											
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	40	6	46	-	46	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,748	262	2,010	1,964	46	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	415	42	457	457	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	624	62	686	686	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	568	-	-	-	-	-	142	710	710	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	532	80	612	612	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	455	46	501	501	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	241	24	265	-	265	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	1,880	282	2,162	2,162	-	-	-	-	-	-	-	-	-	51,071
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	4,394	659	5,053	5,053	-	-	-	-	-	-	-	-	-	57,357
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	4,918	738	5,656	5,656	-	-	-	-	-	-	-	-	-	80,929
2f.4	Subtotal Period 2f Period-Dependent Costs	-	568	7	3	-	28	15,011	2,315	17,932	17,584	348	-	-	355	-	-	-	7,097	12	189,357
2f.0	TOTAL PERIOD 2f COST	-	568	7	3	-	28	22,858	4,407	27,871	27,477	394	-	-	355	-	-	-	7,097	96,208	195,597
PERIOD 2 TOTALS		11,328	55,263	22,575	9,203	25,033	53,570	448,775	118,189	743,936	556,575	186,931	431	288,652	146,282	1,481	1,010	-	21,672,880	804,794	4,454,318

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	3,541	-	-	-	-	-	531	4,073	-	-	4,073	-	-	-	-	-	-	36,752	-
3b.1.1.2	Condensate Tanks Foundation	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	219	-
3b.1.1.3	Discharge Retention Basin	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	110	-
3b.1.1.4	HPCI Room	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	401	-
3b.1.1.5	Hot Shop	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	298	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	21	-
3b.1.1.7	LLRW Storage & Shipping	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	1,794	-
3b.1.1.8	MSIV	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	59	-
3b.1.1.9	Offgas Stack	-	232	-	-	-	-	-	35	267	-	-	267	-	-	-	-	-	-	2,668	-
3b.1.1.10	Offgas Storage & Compressor	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	963	-
3b.1.1.11	Radwaste	-	482	-	-	-	-	-	72	554	-	-	554	-	-	-	-	-	-	5,196	-
3b.1.1.12	Recombiner	-	258	-	-	-	-	-	39	297	-	-	297	-	-	-	-	-	-	2,490	-
3b.1.1.13	Security Barrier	-	362	-	-	-	-	-	54	416	-	-	416	-	-	-	-	-	-	4,083	-
3b.1.1.14	Tank Farm	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	121	-
3b.1.1.15	Turbine	-	1,514	-	-	-	-	-	227	1,741	-	-	1,741	-	-	-	-	-	-	18,764	-
3b.1.1.16	Turbine Building Addition	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	971	-
3b.1.1.17	Turbine Pedestal	-	415	-	-	-	-	-	62	478	-	-	478	-	-	-	-	-	-	3,762	-
3b.1.1	Totals	-	7,207	-	-	-	-	-	1,081	8,288	-	-	8,288	-	-	-	-	-	-	78,674	-
Site Closeout Activities																					
3b.1.2	BackFill Site	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	542	-
3b.1.3	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	177	27	204	204	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,374	-	-	-	-	177	1,283	9,833	204	-	9,630	-	-	-	-	-	-	81,057	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	292	-	-	-	-	9	45	347	-	-	347	-	-	-	-	-	-	1,387	-
3b.2.2	Excavation of Underground Services	-	1,402	-	-	-	-	705	316	2,424	-	-	2,424	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure cofferdam	-	285	-	-	-	-	-	43	328	-	-	328	-	-	-	-	-	-	2,540	-
3b.2	Subtotal Period 3b Additional Costs	-	1,980	-	-	-	-	715	404	3,099	-	-	3,099	-	-	-	-	-	-	17,402	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	91	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,231	335	2,566	-	2,566	-	-	-	-	-	-	-	-	-
3b.3.3	Railroad Track Maintenance SR	-	-	-	-	-	-	185	28	213	-	-	213	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	91	-	-	-	-	2,416	376	2,883	-	2,566	317	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	956	96	1,052	-	1,052	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,159	116	1,274	(0)	1,160	115	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	4,953	-	-	-	-	-	743	5,696	-	-	5,696	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	612	92	704	-	-	704	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	440	44	484	-	484	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	555	55	610	-	610	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	166	25	190	-	190	-	-	-	-	-	-	-	-	-
3b.4.8	Fixed Overhead SR	-	-	-	-	-	-	873	131	1,004	-	-	1,004	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	4,327	649	4,976	0	4,229	746	-	-	-	-	-	-	-	117,557
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	9,599	1,440	11,039	-	-	11,039	-	-	-	-	-	-	-	122,983
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,284	943	7,226	0	1,518	5,709	-	-	-	-	-	-	-	98,567
3b.4	Subtotal Period 3b Period-Dependent Costs	-	4,953	-	-	-	-	24,970	4,333	34,256	0	9,243	25,013	-	-	-	-	-	-	-	339,107
3b.0	TOTAL PERIOD 3b COST	-	15,397	-	-	-	-	28,278	6,396	50,071	204	11,809	38,059	-	-	-	-	-	-	98,459	340,667
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Additional Costs																					
3c.2.1	ISFSI Disposition of Original MPC Canisters	-	-	-	614	-	8,229	-	2,119	10,962	-	10,962	-	-	26,624	-	-	-	2,662,443	-	-
3c.2	Subtotal Period 3c Additional Costs	-	-	-	614	-	8,229	-	2,119	10,962	-	10,962	-	-	26,624	-	-	-	2,662,443	-	-

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	424,141	63,621	487,762	-	487,762	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	424,141	63,621	487,762	-	487,762	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	37,552	3,755	41,308	-	41,308	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	102,714	10,271	112,985	-	112,985	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	17,281	1,728	19,009	-	19,009	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	21,799	2,180	23,979	-	23,979	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	34,286	5,143	39,429	-	39,429	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	6,504	976	7,480	-	7,480	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	145,090	21,763	166,853	-	166,853	-	-	-	-	-	-	-	-	3,836,160
3c.4.9	DOC Staff Cost	-	-	-	-	-	-	13,601	2,040	15,641	-	15,641	-	-	-	-	-	-	-	-	142,080
3c.4.10	Utility Staff Cost	-	-	-	-	-	-	98,660	14,799	113,459	-	113,459	-	-	-	-	-	-	-	-	1,882,560
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	477,487	62,656	540,142	-	540,142	-	-	-	-	-	-	-	-	5,860,800
3c.0	TOTAL PERIOD 3c COST	-	-	-	614	-	8,229	901,628	128,396	1,038,867	-	1,038,867	-	-	26,624	-	-	-	2,662,443	-	5,860,800
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1.1	Totals	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	21,730	3,260	24,990	-	24,990	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	21,730	3,260	24,990	-	24,990	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	7,722	772	8,494	-	8,494	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	8,556	856	9,411	-	9,411	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	5,089	509	5,597	-	5,597	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	4,483	448	4,931	-	4,931	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	7,051	1,058	8,108	-	8,108	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,338	201	1,538	-	1,538	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,777	267	2,044	-	2,044	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	29,836	4,475	34,311	-	34,311	-	-	-	-	-	-	-	-	788,863
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	10,727	1,609	12,336	-	12,336	-	-	-	-	-	-	-	-	197,216
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	76,577	10,194	86,772	-	86,772	-	-	-	-	-	-	-	-	986,079
3d.0	TOTAL PERIOD 3d COST	-	-	1,462	-	-	6,760	98,308	14,833	121,363	9,602	111,761	-	-	-	-	-	1,785	346,570	-	986,079
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	28	196	7	361	-	2,758	1,977	1,332	6,658	6,658	-	-	-	15,473	-	-	-	1,669,366	12,625	1,872
3e.2	Subtotal Period 3e Additional Costs	28	196	7	361	-	2,758	1,977	1,332	6,658	6,658	-	-	-	15,473	-	-	-	1,669,366	12,625	1,872
Period 3e Collateral Costs																					
3e.3	Subtotal Period 3e Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	84	21	104	104	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	203	51	253	253	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	167	42	209	209	-	-	-	-	-	-	-	-	-	-
3e.4.5	Security Staff Cost	-	-	-	-	-	-	130	32	162	162	-	-	-	-	-	-	-	-	-	5,013
3e.4.6	Utility Staff Cost	-	-	-	-	-	-	213	53	266	266	-	-	-	-	-	-	-	-	-	3,803
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	795	199	994	994	-	-	-	-	-	-	-	-	-	8,816
3e.0	TOTAL PERIOD 3e COST	28	196	7	361	-	2,758	2,772	1,530	7,652	7,652	-	-	-	15,473	-	-	-	1,669,366	12,625	10,688

Table E
Monticello Nuclear Generating Plant
DECON 100 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,263	-	-	-	-	55	198	1,516	-	-	1,516	-	-	-	-	-	-	8,959	160
3f.2	Subtotal Period 3f Additional Costs	-	1,263	-	-	-	-	55	198	1,516	-	-	1,516	-	-	-	-	-	-	8,959	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	102	10	112	-	-	112	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	106	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	59	9	68	-	-	68	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	84	13	97	-	-	97	-	-	-	-	-	-	-	-
3f.4.6	Security Staff Cost	-	-	-	-	-	-	65	10	75	-	-	75	-	-	-	-	-	-	-	2,527
3f.4.7	Utility Staff Cost	-	-	-	-	-	-	84	13	96	-	-	96	-	-	-	-	-	-	-	1,569
3f.4	Subtotal Period 3f Period-Dependent Costs	-	106	-	-	-	-	394	70	570	-	-	570	-	-	-	-	-	-	-	4,096
3f.0	TOTAL PERIOD 3f COST	-	1,382	-	-	-	-	450	270	2,101	-	-	2,101	-	-	-	-	-	-	8,959	4,256
PERIOD 3 TOTALS		28	16,975	1,470	975	-	17,747	1,031,436	151,425	1,220,055	17,458	1,162,437	40,160	-	42,097	-	-	1,785	4,678,379	120,043	7,202,489
TOTAL COST TO DECOMMISSION		14,063	74,899	24,138	10,347	25,045	72,882	1,612,082	290,978	2,124,434	697,778	1,385,171	41,485	288,695	189,580	1,711	1,010	1,785	26,414,440	956,686	12,716,950

TOTAL COST TO DECOMMISSION WITH 15.87% CONTINGENCY:	**$2,124,434**	**thousands of 2014 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 32.85% OR:	**$697,778**	**thousands of 2014 dollars**
SPENT FUEL MANAGEMENT COST IS 65.2% OR:	**$1,385,171**	**thousands of 2014 dollars**
NON-NUCLEAR DEMOLITION COST IS 1.95% OR:	**$41,485**	**thousands of 2014 dollars**
TOTAL RADWASTE VOLUME BURIED (EXCLUDING GTCC):	**192,301**	**Cubic Feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**1,785**	**Cubic Feet**
TOTAL SCRAP METAL REMOVED:	**15,499**	**Tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**956,686**	**Man-hours**

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

APPENDIX F

DETAILED COST ANALYSIS

SCENARIO 4

DECON DECOMMISSIONING COST ESTIMATE

WITH 200 YEARS OF SPENT FUEL STORAGE

AND PERIODIC DSC REPLACEMENT

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	851	128	979	979	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	352	53	405	405	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	568	85	653	653	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	465	70	535	535	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	559	84	642	578	-	64	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	473	71	544	490	-	54	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	806	121	927	927	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	738	111	849	849	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	182	27	209	104	-	104	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	182	27	209	209	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	354	53	407	204	-	204	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	522	78	601	601	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	102	15	118	59	-	59	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,846	727	5,573	5,087	-	486	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	272	41	313	313	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,000	450	3,450	3,450	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	159	24	183	183	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	140	21	161	161	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	14,224	2,134	16,358	15,873	-	486	-	-	-	-	-	-	-	78,609
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	25,293	3,794	29,087	-	29,087	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	25,293	3,794	29,087	-	29,087	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,418	142	1,560	1,560	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,718	272	2,990	2,990	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	490	-	-	-	-	-	123	613	613	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	528	-	-	-	-	-	79	608	608	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	48	-	14	79	79	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	3,530	530	4,060	4,060	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,181	118	1,299	1,299	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,121	312	3,433	-	3,433	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,434	365	2,799	2,799	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	791	119	910	-	910	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	95	14	110	-	110	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	107	16	123	123	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	5,349	802	6,151	6,151	-	-	-	-	-	-	-	-	-	157,471
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	22,165	3,325	25,489	25,489	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,018	13	4	-	48	42,909	6,230	50,222	45,769	4,453	-	-	610	-	-	-	12,190	20	580,871
1a.0	TOTAL PERIOD 1a COST	-	1,018	13	4	-	48	82,426	12,158	95,667	61,642	33,540	486	-	610	-	-	-	12,190	20	659,480

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	537	81	618	556	-	62	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	454	68	522	522	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	153	23	176	44	-	132	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	114	17	131	131	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	412	62	474	474	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	136	20	157	78	-	78	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	136	20	157	157	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	114	17	131	65	-	65	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	236	35	272	272	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	227	34	261	261	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	310	46	356	321	-	36	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,831	575	4,405	3,996	-	409	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	262	-	-	-	-	-	-	131	393	393	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	262	-	-	-	-	-	3,831	705	4,798	4,389	-	409	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	10,813	1,622	12,434	12,434	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	5,244	1,573	6,818	6,818	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.3	Mixed & RCRA Waste	-	-	26	19	12	-	-	7	65	65	-	-	43	-	-	-	-	5,253	163	-
1b.2	Subtotal Period 1b Additional Costs	-	-	26	19	12	-	16,057	3,202	19,317	19,317	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	881	-	-	-	-	-	-	132	1,013	1,013	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	37	-	24	60	-	104	-	56	280	280	-	-	-	233	-	-	-	13,986	45	-
1b.3.4	Process decommissioning chemical flush waste	1	-	23	82	-	1,385	-	361	1,852	1,852	-	-	-	-	231	-	-	24,599	43	-
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	-	-	-	-	-	-	27	4	31	-	31	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,418	1,102	47	142	-	1,489	1,734	1,199	8,131	8,101	31	-	-	233	231	-	-	38,585	89	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	27	-	-	-	-	-	-	7	34	34	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	711	71	782	782	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,339	134	1,472	1,472	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	276	-	-	-	-	-	69	345	345	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	265	-	-	-	-	-	40	305	305	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	3,540	531	4,071	4,071	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	346	35	381	381	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,565	156	1,721	-	1,721	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,220	183	1,403	1,403	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	397	59	456	-	456	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	48	7	55	-	55	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	53	8	62	62	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	2,682	402	3,084	3,084	-	-	-	-	-	-	-	-	-	78,951
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	4,755	713	5,468	5,468	-	-	-	-	-	-	-	-	-	63,789
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	11,170	1,675	12,845	12,845	-	-	-	-	-	-	-	-	-	213,326
1b.4	Subtotal Period 1b Period-Dependent Costs	27	541	7	3	-	28	27,824	4,099	32,530	30,297	2,232	-	-	358	-	-	-	7,159	12	356,066
1b.0	TOTAL PERIOD 1b COST	2,707	1,643	80	164	12	1,517	49,446	9,207	64,776	62,103	2,263	409	43	591	231	-	-	50,997	31,830	400,659
PERIOD 1 TOTALS		2,707	2,661	93	168	12	1,565	131,872	21,364	160,443	123,745	35,803	894	43	1,201	231	-	-	63,188	31,850	1,060,139

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	92	78	17	22	-	407	-	172	789	789	-	-	-	858	-	-	-	98,047	2,888	-
2a.1.1.2	Recirculation Pumps & Motors	33	52	15	37	21	423	-	146	727	727	-	-	96	945	-	-	-	112,200	1,563	-
2a.1.1.3	CRDMs & NIs Removal	162	857	400	98	-	887	-	572	2,976	2,976	-	-	-	3,741	-	-	-	213,700	17,768	-
2a.1.1.4	Reactor Vessel Internals	193	3,392	15,478	2,739	-	19,466	309	16,974	58,552	58,552	-	-	-	1,252	1,481	1,010	-	312,338	27,675	1,239
2a.1.1.5	Reactor Vessel	94	7,234	2,229	976	-	3,459	309	8,050	22,352	22,352	-	-	-	10,736	-	-	-	1,089,965	27,675	1,239
2a.1.1	Totals	574	11,614	18,139	3,873	21	24,642	619	25,914	85,396	85,396	-	-	96	17,532	1,481	1,010	-	1,826,250	77,569	2,478
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	326	1,455	390	3,137	352	-	844	6,504	6,504	-	-	25,377	1,413	-	-	-	1,616,032	5,557	-
2a.1.3	Main Condensers	-	1,109	379	140	1,613	199	-	628	4,067	4,067	-	-	17,396	727	-	-	-	830,822	18,831	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor Building	-	611	-	-	-	-	-	92	703	703	-	-	-	-	-	-	-	-	6,238	-
2a.1.4.2	Radwaste	-	53	-	-	-	-	-	8	61	61	-	-	-	-	-	-	-	-	569	-
2a.1.4.3	Turbine	-	157	-	-	-	-	-	24	180	180	-	-	-	-	-	-	-	-	1,884	-
2a.1.4	Totals	-	821	-	-	-	-	-	123	944	944	-	-	-	-	-	-	-	-	8,691	-
Disposal of Plant Systems																					
2a.1.5.1	Automatic Press Relief	-	98	6	8	67	57	-	51	287	287	-	-	803	206	-	-	-	46,236	1,656	-
2a.1.5.2	Chemistry Sampling	-	23	1	2	13	10	-	11	59	59	-	-	156	37	-	-	-	8,774	400	-
2a.1.5.3	Chemistry Sampling - Insulated	-	1	0	0	-	0	-	0	2	2	-	-	-	1	-	-	-	73	28	-
2a.1.5.4	Circulating Water - RCA	-	172	10	44	557	-	-	134	917	917	-	-	6,656	-	-	-	-	270,307	2,860	-
2a.1.5.5	Combustible Gas Control - Insul - RCA	-	24	0	1	18	-	-	9	53	53	-	-	212	-	-	-	-	8,617	378	-
2a.1.5.6	Combustible Gas Control - RCA	-	15	0	2	24	-	-	8	49	49	-	-	285	-	-	-	-	11,577	245	-
2a.1.5.7	Condensate & Feedwater	-	818	178	244	1,669	2,008	-	1,011	5,929	5,929	-	-	19,947	7,319	-	-	-	1,293,969	14,196	-
2a.1.5.8	Condensate & Feedwater - Insulated	-	408	33	46	349	331	-	247	1,414	1,414	-	-	4,176	1,207	-	-	-	249,413	6,964	-
2a.1.5.9	Condensate Demin	-	451	28	37	280	274	-	232	1,303	1,303	-	-	3,346	1,000	-	-	-	201,994	7,618	-
2a.1.5.10	Condensate Storage	-	604	29	60	597	216	-	306	1,811	1,811	-	-	7,131	795	-	-	-	341,719	10,345	-
2a.1.5.11	Control Rod Drive	-	2	0	0	2	1	-	1	7	7	-	-	19	4	-	-	-	1,015	41	-
2a.1.5.12	Control Rod Drive Hydraulic	-	344	15	20	139	154	-	150	822	822	-	-	1,658	562	-	-	-	104,537	5,898	-
2a.1.5.13	Core Spray	-	66	18	37	367	143	-	115	745	745	-	-	4,384	521	-	-	-	212,510	1,163	-
2a.1.5.14	Core Spray - Insulated	-	120	7	9	68	72	-	60	338	338	-	-	818	264	-	-	-	50,680	2,033	-
2a.1.5.15	Demin Water - Insulated - RCA	-	12	0	1	7	-	-	4	24	24	-	-	85	-	-	-	-	3,445	181	-
2a.1.5.16	Demin Water - RCA	-	34	0	2	21	-	-	12	69	69	-	-	253	-	-	-	-	10,278	508	-
2a.1.5.17	Diesel Oil - RCA	-	2	0	0	2	-	-	1	4	4	-	-	23	-	-	-	-	931	25	-
2a.1.5.18	Drywell Atmosphere Cooling - RCA	-	31	1	4	46	-	-	15	97	97	-	-	548	-	-	-	-	22,244	550	-
2a.1.5.19	EDG Emerg Service Water - Insul - RCA	-	0	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	84	4	-
2a.1.5.20	Electrical - Clean	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	182	-
2a.1.5.21	Emergency Service Water - Insul - RCA	-	18	0	1	11	-	-	6	37	37	-	-	137	-	-	-	-	5,544	281	-
2a.1.5.22	Emergency Service Water - RCA	-	1	0	0	1	-	-	1	3	3	-	-	13	-	-	-	-	512	22	-
2a.1.5.23	GEZIP - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2a.1.5.24	Generator Physical Design - RCA	-	4	0	0	3	-	-	1	8	8	-	-	31	-	-	-	-	1,250	67	-
2a.1.5.25	H2-O2 Control Analyzing	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.26	H2-O2 Control Analyzing - Insulated	-	5	0	0	0	4	-	2	12	12	-	-	6	13	-	-	-	1,089	81	-
2a.1.5.27	High Pressure Coolant Injection	-	56	6	10	81	57	-	42	252	252	-	-	972	209	-	-	-	53,266	966	-
2a.1.5.28	High Pressure Coolant Injection - Insula	-	182	13	18	134	132	-	103	582	582	-	-	1,598	481	-	-	-	96,733	3,079	-
2a.1.5.29	Hydrogen Cooling	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	118	-
2a.1.5.30	Hydrogen Cooling - RCA	-	6	0	0	3	-	-	2	11	11	-	-	39	-	-	-	-	1,600	79	-
2a.1.5.31	Hydrogen Seal Oil - RCA	-	14	0	1	16	-	-	6	38	38	-	-	189	-	-	-	-	7,669	212	-
2a.1.5.32	Hydrogen Water Chemistry - RCA	-	20	0	1	12	-	-	7	40	40	-	-	140	-	-	-	-	5,672	304	-
2a.1.5.33	Instrument & Service Air - RCA	-	185	3	12	148	-	-	71	418	418	-	-	1,768	-	-	-	-	71,810	2,733	-
2a.1.5.34	Main Condenser	-	162	11	15	112	113	-	89	502	502	-	-	1,333	411	-	-	-	81,311	2,746	-
2a.1.5.35	Main Steam	-	206	16	23	180	163	-	124	712	712	-	-	2,148	594	-	-	-	126,485	3,512	-
2a.1.5.36	Main Turbine	-	839	203	263	1,653	2,383	-	1,113	6,454	6,454	-	-	19,760	8,687	-	-	-	1,376,578	14,733	-
2a.1.5.37	Main Turbine - Insulated	-	178	17	27	212	183	-	128	745	745	-	-	2,530	667	-	-	-	146,839	3,069	-
2a.1.5.38	Miscellaneous	-	35	0	2	25	-	-	13	76	76	-	-	302	-	-	-	-	12,283	622	-
2a.1.5.39	Off Gas Recombiner	-	157	18	24	150	210	-	120	678	678	-	-	1,795	764	-	-	-	123,437	2,708	-
2a.1.5.40	Off Gas Recombiner - Insulated	-	320	18	20	114	195	-	151	818	818	-	-	1,366	709	-	-	-	102,395	5,385	-
2a.1.5.41	Post Accident Sampling	-	21	1	1	4	9	-	8	44	44	-	-	53	33	-	-	-	4,355	345	-
2a.1.5.42	Post Accident Sampling - Insulated	-	14	1	1	1	10	-	6	34	34	-	-	17	37	-	-	-	3,143	212	-
2a.1.5.43	RHR Service Water - Insulated - RCA	-	69	2	10	124	-	-	37	242	242	-	-	1,485	-	-	-	-	60,293	1,125	-
2a.1.5.44	RHR Service Water - RCA	-	3	0	0	3	-	-	1	8	8	-	-	35	-	-	-	-	1,410	57	-
2a.1.5.45	Reactor Feedwater Pump Seal	-	46	2	3	16	26	-	21	115	115	-	-	193	96	-	-	-	14,222	773	-
2a.1.5.46	Residual Heat Removal	320	209	162	134	536	1,653	-	742	3,755	3,755	-	-	6,406	6,012	-	-	-	658,423	4,135	-

Table F
Monticello Nuclear Generating Plant
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(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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)																					
2a.1.5.47	Residual Heat Removal - Insulated	542	461	61	62	282	716	-	623	2,746	2,746	-	-	3,367	2,607	-	-	-	309,163	10,340	-
2a.1.5.48	Rx Core Isolation Cooling	-	40	2	3	22	21	-	19	107	107	-	-	259	76	-	-	-	15,537	691	-
2a.1.5.49	Rx Core Isolation Cooling - Insulated	-	89	5	5	24	54	-	41	218	218	-	-	288	198	-	-	-	24,804	1,479	-
2a.1.5.50	Rx Recirculation	47	48	5	3	4	52	-	50	210	210	-	-	43	190	-	-	-	14,353	1,580	-
2a.1.5.51	Snubbers	-	141	2	4	32	25	-	47	251	251	-	-	377	90	-	-	-	21,240	2,548	-
2a.1.5.52	Standby Liquid Control - Insul - RCA	-	3	0	0	2	-	-	1	6	6	-	-	22	-	-	-	-	904	48	-
2a.1.5.53	Standby Liquid Control - RCA	-	22	0	2	21	-	-	9	53	53	-	-	245	-	-	-	-	9,969	341	-
2a.1.5.54	Stator Cooling - RCA	-	6	0	1	11	-	-	3	21	21	-	-	126	-	-	-	-	5,135	98	-
2a.1.5.55	Traversing Incore Probe	0	3	0	0	0	2	-	1	6	6	-	-	1	5	-	-	-	390	51	-
2a.1.5	Totals	909	6,814	882	1,164	8,170	9,278	-	5,964	33,181	33,161	-	20	97,654	33,808	-	-	-	6,201,492	119,943	-
2a.1.6	Scaffolding in support of decommissioning	-	1,911	24	9	95	25	-	502	2,566	2,566	-	-	1,030	91	-	-	-	52,344	22,564	-
2a.1	Subtotal Period 2a Activity Costs	1,483	22,596	20,878	5,575	13,035	34,496	619	33,975	132,658	132,638	-	20	141,552	53,571	1,481	1,010	-	10,526,940	253,155	2,478
Period 2a Additional Costs																					
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,343	403	1,746	1,746	-	-	-	-	-	-	-	-	27,506	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	84	-	55	139	-	239	-	128	645	645	-	-	-	538	-	-	-	32,290	105	-
2a.3.2	Process decommissioning chemical flush waste	5	-	206	746	-	1,652	-	548	3,157	3,157	-	-	-	2,093	-	-	-	223,008	392	-
2a.3.3	Small tool allowance	-	270	-	-	-	-	-	41	311	280	-	31	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	71	11	81	-	81	-	-	-	-	-	-	-	-	-
2a.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	89	270	261	884	-	1,892	71	727	4,194	4,082	81	31	-	2,631	-	-	-	255,298	497	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	71	-	-	-	-	-	-	18	89	89	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	777	78	854	854	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	3,365	336	3,701	3,331	-	370	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	1,940	-	-	-	-	-	485	2,425	2,425	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	2,687	-	-	-	-	-	403	3,090	3,090	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	112	39	-	424	-	123	699	699	-	-	-	5,394	-	-	-	107,886	176	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	4,438	666	5,103	5,103	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	829	83	911	911	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,399	340	3,739	-	3,739	-	-	-	-	-	-	-	-	-
2a.4.10	Fixed Overhead	-	-	-	-	-	-	2,459	369	2,827	2,827	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,047	157	1,204	-	1,204	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	126	19	145	-	145	-	-	-	-	-	-	-	-	-
2a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	6,002	900	6,902	6,902	-	-	-	-	-	-	-	-	-	174,570
2a.4.15	DOC Staff Cost	-	-	-	-	-	-	15,225	2,284	17,509	17,509	-	-	-	-	-	-	-	-	-	209,760
2a.4.16	Utility Staff Cost	-	-	-	-	-	-	21,262	3,189	24,451	24,451	-	-	-	-	-	-	-	-	-	390,540
2a.4	Subtotal Period 2a Period-Dependent Costs	71	4,627	112	39	-	424	59,068	9,471	73,813	68,355	5,088	370	-	5,394	-	-	-	107,886	176	774,870
2a.0	TOTAL PERIOD 2a COST	1,643	27,494	21,252	6,499	13,035	36,812	61,101	44,576	212,411	206,821	5,169	421	141,552	61,596	1,481	1,010	-	10,890,130	281,333	777,348
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	ALARA/Radiological	-	15	0	0	3	3	-	5	27	27	-	-	35	10	-	-	-	2,083	277	-
2b.1.1.2	Alternate N2 - RCA	-	13	0	1	8	-	-	5	27	27	-	-	93	-	-	-	-	3,765	185	-
2b.1.1.3	Decontamination Projects	-	1	0	0	0	0	-	0	2	2	-	-	2	0	-	-	-	130	17	-
2b.1.1.4	Electrical - Contaminated	-	366	5	17	200	25	-	131	744	744	-	-	2,389	90	-	-	-	102,957	6,325	-
2b.1.1.5	Electrical - Decontaminated	-	2,195	36	156	1,953	-	-	869	5,208	5,208	-	-	23,344	-	-	-	-	948,013	37,107	-
2b.1.1.6	Fire - RCA	-	84	1	4	51	-	-	29	169	169	-	-	614	-	-	-	-	24,917	1,324	-
2b.1.1.7	HVAC Ductwork	-	263	6	19	223	28	-	110	649	649	-	-	2,665	100	-	-	-	114,856	4,111	-
2b.1.1.8	HVAC/Chilled Water - RCA	-	267	4	18	230	-	-	104	624	624	-	-	2,752	-	-	-	-	111,779	3,985	-
2b.1.1.9	Heating & Ventilation	-	401	14	44	503	62	-	199	1,224	1,224	-	-	6,018	227	-	-	-	259,372	7,101	-
2b.1.1.10	Heating Boiler - Insulated - RCA	-	2	0	0	2	-	-	1	5	5	-	-	26	-	-	-	-	1,058	35	-
2b.1.1.11	Liquid Radwaste	494	571	44	46	257	468	-	557	2,437	2,437	-	-	3,073	1,728	-	-	-	237,560	17,194	-
2b.1.1.12	Makeup Demin - RCA	-	86	2	10	123	-	-	42	263	263	-	-	1,471	-	-	-	-	59,747	1,412	-
2b.1.1.13	Non-Essential Diesel Generator - RCA	-	23	2	9	119	-	-	25	179	179	-	-	1,424	-	-	-	-	57,832	395	-
2b.1.1.14	Off Gas Holdup	-	283	19	28	230	172	-	155	888	888	-	-	2,755	630	-	-	-	153,412	4,769	-
2b.1.1.15	Primary Containment	-	378	40	64	519	413	-	289	1,703	1,703	-	-	6,201	1,506	-	-	-	351,391	6,454	-

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Disposal of Plant Systems (continued)																					
2b.1.1.16	Process Radiation Monitors	-	38	2	2	12	14	-	15	83	83	-	-	142	52	-	-	-	9,195	649	-
2b.1.1.17	Rx Bldg Closed Clng Water - Insul - RCA	-	93	2	7	82	-	-	37	220	220	-	-	977	-	-	-	-	39,675	1,484	-
2b.1.1.18	Rx Bldg Closed Clng Water - RCA	-	152	11	47	593	-	-	135	938	938	-	-	7,093	-	-	-	-	288,031	2,489	-
2b.1.1.19	Rx Component Handling Equip	23	117	18	20	97	228	-	117	621	621	-	-	1,158	829	-	-	-	101,862	2,462	-
2b.1.1.20	Rx Pressure Vessel	23	39	5	4	6	63	-	39	181	181	-	-	75	230	-	-	-	18,281	1,051	-
2b.1.1.21	Rx Water Cleanup	145	220	18	12	11	202	-	184	793	793	-	-	130	737	-	-	-	54,051	5,736	-
2b.1.1.22	Secondary Containment	-	103	7	11	85	70	-	58	334	334	-	-	1,017	255	-	-	-	58,151	1,763	-
2b.1.1.23	Service & Seal Water - Insulated - RCA	-	99	2	8	99	-	-	41	249	249	-	-	1,180	-	-	-	-	47,917	1,565	-
2b.1.1.24	Service & Seal Water - RCA	-	131	3	12	151	-	-	58	355	355	-	-	1,809	-	-	-	-	73,453	2,016	-
2b.1.1.25	Service Air Blower - RCA	-	13	0	1	17	-	-	6	38	38	-	-	206	-	-	-	-	8,364	206	-
2b.1.1.26	Solid Radwaste	285	409	34	37	200	375	-	378	1,718	1,718	-	-	2,387	1,380	-	-	-	187,377	10,820	-
2b.1.1.27	Structures & Buildings	-	64	2	4	30	23	-	27	151	151	-	-	357	85	-	-	-	20,152	1,128	-
2b.1.1.28	Wells & Domestic Water	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	144	-
2b.1.1.29	Wells & Domestic Water - RCA	-	43	1	2	29	-	-	15	90	90	-	-	342	-	-	-	-	13,874	633	-
2b.1.1	Totals	971	6,479	280	584	5,834	2,147	-	3,632	19,926	19,917	-	9	69,735	7,859	-	-	-	3,349,255	122,835	-
2b.1.2	Scaffolding in support of decommissioning	-	2,389	29	11	119	31	-	628	3,208	3,208	-	-	1,287	114	-	-	-	65,430	28,205	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	4,343	2,430	138	368	4,022	978	-	3,696	15,975	15,975	-	-	48,077	4,667	-	-	-	2,318,995	112,507	-
2b.1.3.2	Admin	91	5	0	2	-	13	-	50	161	161	-	-	-	79	-	-	-	6,840	1,599	-
2b.1.3.3	HPCI Room	24	24	0	2	10	12	-	23	96	96	-	-	118	70	-	-	-	10,760	789	-
2b.1.3.4	Hot Shop	14	4	0	1	-	9	-	11	39	39	-	-	-	56	-	-	-	4,860	286	-
2b.1.3.5	LLRW Storage & Shipping	49	21	1	5	3	39	-	41	159	159	-	-	31	237	-	-	-	21,708	1,126	-
2b.1.3.6	Offgas Stack	315	228	5	16	112	70	-	252	998	998	-	-	1,343	388	-	-	-	87,082	8,859	-
2b.1.3.7	Offgas Storage & Compressor	35	15	0	4	2	29	-	29	114	114	-	-	25	173	-	-	-	15,948	785	-
2b.1.3.8	Radwaste	103	53	2	12	14	83	-	90	357	357	-	-	172	501	-	-	-	49,943	2,501	-
2b.1.3.9	Radwaste Material Storage Warehouse	54	21	1	6	-	45	-	45	171	171	-	-	-	270	-	-	-	23,400	1,196	-
2b.1.3.10	Recombiner	23	21	1	4	17	21	-	25	111	111	-	-	199	121	-	-	-	18,405	695	-
2b.1.3.11	Turbine	601	304	10	72	107	489	-	526	2,109	2,109	-	-	1,283	2,912	-	-	-	303,150	14,432	-
2b.1.3.12	Turbine Building Addition	50	18	1	5	-	39	-	40	153	153	-	-	-	236	-	-	-	20,478	1,086	-
2b.1.3	Totals	5,701	3,143	159	498	4,287	1,828	-	4,827	20,443	20,443	-	-	51,247	9,710	-	-	-	2,881,569	145,859	-
2b.1	Subtotal Period 2b Activity Costs	6,673	12,012	467	1,093	10,240	4,006	-	9,087	43,578	43,568	-	9	122,269	17,682	-	-	-	6,296,255	296,899	-
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,259	678	2,936	2,936	-	-	-	-	-	-	-	-	46,242	-
2b.2.2	Operational Equipment	-	-	17	66	603	-	-	102	788	788	-	-	11,710	-	-	-	-	292,750	32	-
2b.2	Subtotal Period 2b Additional Costs	-	-	17	66	603	-	2,259	780	3,724	3,724	-	-	11,710	-	-	-	-	292,750	46,274	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	172	-	115	291	-	501	-	266	1,345	1,345	-	-	-	1,127	-	-	-	67,647	220	-
2b.3.2	Process decommissioning chemical flush waste	1	-	41	147	-	326	-	108	623	623	-	-	-	413	-	-	-	43,978	77	-
2b.3.3	Small tool allowance	-	286	-	-	-	-	-	43	329	329	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	29,013	4,352	33,365	-	33,365	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	173	286	156	438	-	827	29,013	4,769	35,662	2,297	33,365	-	-	1,540	-	-	-	111,625	297	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,063	-	-	-	-	-	-	266	1,328	1,328	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,306	131	1,437	1,437	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	5,191	519	5,710	5,710	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,659	-	-	-	-	-	665	3,324	3,324	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,472	-	-	-	-	-	671	5,143	5,143	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	121	42	-	456	-	132	752	752	-	-	-	5,805	-	-	-	116,095	189	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	5,890	883	6,773	6,773	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,393	139	1,532	1,532	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	5,714	571	6,285	-	6,285	-	-	-	-	-	-	-	-	-
2b.4.10	Fixed Overhead	-	-	-	-	-	-	4,133	620	4,753	4,753	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,760	264	2,024	-	2,024	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	446	67	513	513	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	212	32	244	-	244	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	237	36	273	273	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	10,090	1,514	11,604	11,604	-	-	-	-	-	-	-	-	-	293,480
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	24,752	3,713	28,465	28,465	-	-	-	-	-	-	-	-	-	338,720
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	34,504	5,176	39,680	39,680	-	-	-	-	-	-	-	-	-	628,720
2b.4	Subtotal Period 2b Period-Dependent Costs	1,063	7,131	121	42	-	456	95,629	15,398	119,840	111,287	8,553	-	-	5,805	-	-	-	116,095	189	1,260,920
2b.0	TOTAL PERIOD 2b COST	7,908	19,430	762	1,639	10,843	5,289	126,900	30,033	202,804	160,877	41,918	9	133,979	25,027	-	-	-	6,816,725	343,660	1,260,920

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 2c - Spent fuel delay prior to SFP decon																					
Period 2c Direct Decommissioning Activities																					
Period 2c Collateral Costs																					
2c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	33,471	5,021	38,492	-	38,492	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	-	-	-	-	-	-	33,471	5,021	38,492	-	38,492	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	5,848	585	6,432	6,432	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	15,696	1,570	17,265	17,265	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	1,958	-	-	-	-	-	490	2,448	2,448	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	86	30	-	323	-	94	532	532	-	-	-	4,110	-	-	-	82,199	134	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	7,033	1,055	8,088	8,088	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	2,883	288	3,171	3,171	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	25,586	2,559	28,145	-	28,145	-	-	-	-	-	-	-	-	-
2c.4.8	Fixed Overhead	-	-	-	-	-	-	18,508	2,776	21,285	21,285	-	-	-	-	-	-	-	-	-	-
2c.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	7,880	1,182	9,062	-	9,062	-	-	-	-	-	-	-	-	-
2c.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	399	60	459	459	-	-	-	-	-	-	-	-	-	-
2c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	951	143	1,094	-	1,094	-	-	-	-	-	-	-	-	-
2c.4.12	Railroad Track Maintenance	-	-	-	-	-	-	1,063	159	1,222	1,222	-	-	-	-	-	-	-	-	-	-
2c.4.13	Security Staff Cost	-	-	-	-	-	-	38,571	5,786	44,356	22,178	22,178	-	-	-	-	-	-	-	-	1,106,383
2c.4.14	Utility Staff Cost	-	-	-	-	-	-	44,188	6,628	50,817	25,408	25,408	-	-	-	-	-	-	-	-	820,697
2c.4	Subtotal Period 2c Period-Dependent Costs	-	1,958	86	30	-	323	168,606	23,374	194,376	108,489	85,887	-	-	4,110	-	-	-	82,199	134	1,927,080
2c.0	TOTAL PERIOD 2c COST	-	1,958	86	30	-	323	202,077	28,394	232,868	108,489	124,380	-	-	4,110	-	-	-	82,199	134	1,927,080
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	557	49	108	116	-	2,099	-	844	3,772	3,772	-	-	-	7,653	-	-	-	505,842	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	14	14	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	38	1	2	20	2	-	14	77	77	-	-	240	9	-	-	-	10,357	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	242	4	16	206	-	-	94	562	562	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	9	0	0	5	-	-	3	18	18	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	210	354	33	28	99	368	-	308	1,399	1,399	-	-	1,179	1,341	-	-	-	136,502	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	23	34	3	2	6	32	-	30	129	129	-	-	67	117	-	-	-	10,447	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	29	1	2	25	3	-	12	72	72	-	-	296	11	-	-	-	12,762	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	27	0	1	19	-	-	10	57	57	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	24	0	2	22	-	-	10	58	58	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	233	760	42	55	409	405	-	482	2,386	2,386	-	-	4,894	1,479	-	-	-	296,447	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.3	Totals	791	2,225	89	642	165	8,016	-	3,086	15,012	15,012	-	-	1,969	43,028	-	-	-	2,677,024	45,625	-
2d.1.4	Scaffolding in support of decommissioning	-	478	6	2	24	6	-	126	642	642	-	-	257	23	-	-	-	13,086	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,581	3,511	245	815	598	10,527	-	4,536	21,813	21,813	-	-	7,120	52,182	-	-	-	3,492,399	67,557	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,104	331	1,435	1,435	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	765	229	994	994	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	1,868	561	2,429	2,429	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	26	-	21	52	-	90	-	45	235	235	-	-	-	204	-	-	-	12,210	40	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	89	-	197	-	65	376	376	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	74	-	-	-	-	-	11	86	86	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	137	62	556	145	-	143	1,043	1,043	-	-	6,000	529	-	-	-	304,968	88	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,181	1,677	12,859	-	12,859	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	26	74	182	203	556	432	11,181	1,942	14,598	1,739	12,859	-	6,000	982	-	-	-	343,731	174	-

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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	169	-	-	-	-	-	-	42	212	212	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	442	44	487	487	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	686	69	755	755	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	714	-	-	-	-	-	178	892	892	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,515	-	-	-	-	-	227	1,742	1,742	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	42	15	-	160	-	46	263	263	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	1,064	160	1,223	1,223	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	401	40	441	441	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	194	2,129	-	2,129	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	302	45	347	347	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	1,917	288	2,205	2,205	-	-	-	-	-	-	-	-	-	52,250
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	5,802	870	6,672	6,672	-	-	-	-	-	-	-	-	-	78,571
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	8,686	1,303	9,989	9,989	-	-	-	-	-	-	-	-	-	150,071
2d.4	Subtotal Period 2d Period-Dependent Costs	169	2,229	42	15	-	160	22,788	3,739	29,142	26,931	2,211	-	-	2,030	-	-	-	40,600	66	280,893
2d.0	TOTAL PERIOD 2d COST	1,777	5,814	469	1,033	1,154	11,118	35,838	10,778	67,982	52,912	15,070	-	13,120	55,194	-	-	-	3,876,730	83,458	293,373
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license									a											
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	163	49	212	212	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	5,936	1,781	7,717	7,717	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,708	256	1,964	1,964	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	40	6	46	-	46	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,748	262	2,010	1,964	46	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	415	42	457	457	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	624	62	686	686	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	568	-	-	-	-	-	142	710	710	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	7	3	-	28	-	8	46	46	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	532	80	612	612	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	455	46	501	501	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	241	24	265	-	265	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,400	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	72	11	83	-	83	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	80	12	92	92	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	1,880	282	2,162	2,162	-	-	-	-	-	-	-	-	-	51,071
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	4,394	659	5,053	5,053	-	-	-	-	-	-	-	-	-	57,357
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	4,918	738	5,656	5,656	-	-	-	-	-	-	-	-	-	80,929
2f.4	Subtotal Period 2f Period-Dependent Costs	-	568	7	3	-	28	15,011	2,315	17,932	17,584	348	-	-	355	-	-	-	7,097	12	189,357
2f.0	TOTAL PERIOD 2f COST	-	568	7	3	-	28	22,858	4,407	27,871	27,477	394	-	-	355	-	-	-	7,097	96,208	195,597
PERIOD 2 TOTALS		11,328	55,263	22,575	9,203	25,033	53,570	448,775	118,189	743,936	556,575	186,931	431	288,652	146,282	1,481	1,010	-	21,672,880	804,794	4,454,318

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	3,541	-	-	-	-	-	531	4,073	-	-	4,073	-	-	-	-	-	-	36,752	-
3b.1.1.2	Condensate Tanks Foundation	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	219	-
3b.1.1.3	Discharge Retention Basin	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	110	-
3b.1.1.4	HPCI Room	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	401	-
3b.1.1.5	Hot Shop	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	298	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	21	-
3b.1.1.7	LLRW Storage & Shipping	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	1,794	-
3b.1.1.8	MSIV	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	59	-
3b.1.1.9	Offgas Stack	-	232	-	-	-	-	-	35	267	-	-	267	-	-	-	-	-	-	2,668	-
3b.1.1.10	Offgas Storage & Compressor	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	963	-
3b.1.1.11	Radwaste	-	482	-	-	-	-	-	72	554	-	-	554	-	-	-	-	-	-	5,196	-
3b.1.1.12	Recombiner	-	258	-	-	-	-	-	39	297	-	-	297	-	-	-	-	-	-	2,490	-
3b.1.1.13	Security Barrier	-	362	-	-	-	-	-	54	416	-	-	416	-	-	-	-	-	-	4,083	-
3b.1.1.14	Tank Farm	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	121	-
3b.1.1.15	Turbine	-	1,514	-	-	-	-	-	227	1,741	-	-	1,741	-	-	-	-	-	-	18,764	-
3b.1.1.16	Turbine Building Addition	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	971	-
3b.1.1.17	Turbine Pedestal	-	415	-	-	-	-	-	62	478	-	-	478	-	-	-	-	-	-	3,762	-
3b.1.1	Totals	-	7,207	-	-	-	-	-	1,081	8,288	-	-	8,288	-	-	-	-	-	-	78,674	-
Site Closeout Activities																					
3b.1.2	BackFill Site	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	542	-
3b.1.3	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	177	27	204	204	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,374	-	-	-	-	177	1,283	9,833	204	-	9,630	-	-	-	-	-	-	81,057	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	292	-	-	-	-	9	45	347	-	-	347	-	-	-	-	-	-	1,387	-
3b.2.2	Excavation of Underground Services	-	1,402	-	-	-	-	705	316	2,424	-	-	2,424	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure cofferdam	-	285	-	-	-	-	-	43	328	-	-	328	-	-	-	-	-	-	2,540	-
3b.2	Subtotal Period 3b Additional Costs	-	1,980	-	-	-	-	715	404	3,099	-	-	3,099	-	-	-	-	-	-	17,402	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	91	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,231	335	2,566	-	2,566	-	-	-	-	-	-	-	-	-
3b.3.3	Railroad Track Maintenance SR	-	-	-	-	-	-	185	28	213	-	-	213	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	91	-	-	-	-	2,416	376	2,883	-	2,566	317	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	956	96	1,052	-	1,052	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,159	116	1,274	(0)	1,160	115	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	4,953	-	-	-	-	-	743	5,696	-	-	5,696	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	612	92	704	-	-	704	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	440	44	484	-	484	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	555	55	610	-	610	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	166	25	190	-	190	-	-	-	-	-	-	-	-	-
3b.4.8	Fixed Overhead SR	-	-	-	-	-	-	873	131	1,004	-	-	1,004	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	4,327	649	4,976	0	4,229	746	-	-	-	-	-	-	-	117,557
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	9,599	1,440	11,039	-	-	11,039	-	-	-	-	-	-	-	122,983
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	6,284	943	7,226	0	1,518	5,709	-	-	-	-	-	-	-	98,567
3b.4	Subtotal Period 3b Period-Dependent Costs	-	4,953	-	-	-	-	24,970	4,333	34,256	0	9,243	25,013	-	-	-	-	-	-	-	339,107
3b.0	TOTAL PERIOD 3b COST	-	15,397	-	-	-	-	28,278	6,396	50,071	204	11,809	38,059	-	-	-	-	-	-	98,459	340,667
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Additional Costs																					
3c.2.1	ISFSI Disposition of Retired MPC Canisters	-	-	-	2,027	-	27,144	-	6,989	36,159	-	36,159	-	-	87,933	-	-	-	8,793,328	-	-
3c.2	Subtotal Period 3c Additional Costs	-	-	-	2,027	-	27,144	-	6,989	36,159	-	36,159	-	-	87,933	-	-	-	8,793,328	-	-

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,309,066	196,360	1,505,426	-	1,505,426	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	1,309,066	196,360	1,505,426	-	1,505,426	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	92,715	9,271	101,986	-	101,986	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	102,714	10,271	112,986	-	112,986	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	42,665	4,267	46,932	-	46,932	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	53,820	5,382	59,202	-	59,202	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	84,651	12,698	97,349	-	97,349	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	16,058	2,409	18,467	-	18,467	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	358,219	53,733	411,952	-	411,952	-	-	-	-	-	-	-	-	9,471,291
3c.4.9	DOC Staff Cost	-	-	-	-	-	-	472,442	70,866	543,308	-	543,308	-	-	-	-	-	-	-	-	6,664,983
3c.4.10	Utility Staff Cost	-	-	-	-	-	-	111,174	16,676	127,850	-	127,850	-	-	-	-	-	-	-	-	2,280,126
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	1,334,459	185,573	1,520,032	-	1,520,032	-	-	-	-	-	-	-	-	18,416,400
3c.0	TOTAL PERIOD 3c COST	-	-	-	2,027	-	27,144	2,643,526	388,922	3,061,618	-	3,061,618	-	-	87,933	-	-	-	8,793,328	-	18,416,400
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1.1	Totals	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,462	-	-	6,760	-	1,380	9,602	9,602	-	-	-	-	-	-	1,785	346,570	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	19,595	2,939	22,535	-	22,535	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	19,595	2,939	22,535	-	22,535	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	7,722	772	8,494	-	8,494	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	8,556	856	9,411	-	9,411	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	5,089	509	5,597	-	5,597	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	4,483	448	4,931	-	4,931	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	7,051	1,058	8,108	-	8,108	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,338	201	1,538	-	1,538	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,777	267	2,044	-	2,044	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	29,836	4,475	34,311	-	34,311	-	-	-	-	-	-	-	-	788,863
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	10,727	1,609	12,336	-	12,336	-	-	-	-	-	-	-	-	197,216
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	76,577	10,194	86,772	-	86,772	-	-	-	-	-	-	-	-	986,079
3d.0	TOTAL PERIOD 3d COST	-	-	1,462	-	-	6,760	96,173	14,513	118,908	9,602	109,306	-	-	-	-	-	1,785	346,570	-	986,079
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	28	196	7	361	-	2,758	1,977	1,332	6,658	6,658	-	-	-	15,473	-	-	-	1,669,366	12,625	1,872
3e.2	Subtotal Period 3e Additional Costs	28	196	7	361	-	2,758	1,977	1,332	6,658	6,658	-	-	-	15,473	-	-	-	1,669,366	12,625	1,872
Period 3e Collateral Costs																					
3e.3	Subtotal Period 3e Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	84	21	104	104	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	202	51	253	253	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	167	42	209	209	-	-	-	-	-	-	-	-	-	-
3e.4.5	Security Staff Cost	-	-	-	-	-	-	130	32	162	162	-	-	-	-	-	-	-	-	-	5,013
3e.4.6	Utility Staff Cost	-	-	-	-	-	-	213	53	266	266	-	-	-	-	-	-	-	-	-	3,803
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	795	199	994	994	-	-	-	-	-	-	-	-	-	8,816
3e.0	TOTAL PERIOD 3e COST	28	196	7	361	-	2,758	2,772	1,530	7,652	7,652	-	-	-	15,473	-	-	-	1,669,366	12,625	10,688

Table F
Monticello Nuclear Generating Plant
DECON 200 YR Fuel Storage with Recasking Decommissioning Cost Estimate
(Thousands of 2014 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	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 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,263	-	-	-	-	55	198	1,516	-	-	1,516	-	-	-	-	-	-	8,959	160
3f.2	Subtotal Period 3f Additional Costs	-	1,263	-	-	-	-	55	198	1,516	-	-	1,516	-	-	-	-	-	-	8,959	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	102	10	112	-	-	112	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	106	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	59	9	68	-	-	68	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	84	13	97	-	-	97	-	-	-	-	-	-	-	-
3f.4.6	Security Staff Cost	-	-	-	-	-	-	65	10	75	-	-	75	-	-	-	-	-	-	-	2,527
3f.4.7	Utility Staff Cost	-	-	-	-	-	-	84	13	96	-	-	96	-	-	-	-	-	-	-	1,569
3f.4	Subtotal Period 3f Period-Dependent Costs	-	106	-	-	-	-	394	70	570	-	-	570	-	-	-	-	-	-	-	4,096
3f.0	TOTAL PERIOD 3f COST	-	1,382	-	-	-	-	450	270	2,101	-	-	2,101	-	-	-	-	-	-	8,959	4,256
PERIOD 3 TOTALS		28	16,975	1,470	2,387	-	36,662	2,771,199	411,631	3,240,351	17,458	3,182,733	40,160	-	103,406	-	-	1,785	10,809,260	120,043	19,758,090
TOTAL COST TO DECOMMISSION		14,063	74,899	24,138	11,759	25,045	91,797	3,351,845	551,184	4,144,730	697,778	3,405,467	41,485	288,695	250,889	1,711	1,010	1,785	32,545,330	956,686	25,272,540

TOTAL COST TO DECOMMISSION WITH 15.34% CONTINGENCY:	**$4,144,730**	**thousands of 2014 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 16.84% OR:	**$697,778**	**thousands of 2014 dollars**
SPENT FUEL MANAGEMENT COST IS 82.16% OR:	**$3,405,467**	**thousands of 2014 dollars**
NON-NUCLEAR DEMOLITION COST IS 1% OR:	**$41,485**	**thousands of 2014 dollars**
TOTAL RADWASTE VOLUME BURIED (EXCLUDING GTCC):	**253,610**	**Cubic Feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**1,785**	**Cubic Feet**
TOTAL SCRAP METAL REMOVED:	**15,499**	**Tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**956,686**	**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 G

DETAILED COST ANALYSIS

ISFSI

Table G-1
Monticello Nuclear Generating Plant
ISFSI Decommissioning Cost Estimate - Scenarios 1 & 2
(thousands of 2014 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	242.8	242.8	-	-	1,096
Decontamination (activated liner and concrete removal)	193.7	3.1	357.4	2,725.7	-	3,279.9	15,284	1,680	
License Termination (radiological surveys)	-	-	-	-	1,157.5	1,157.5	-	8,700	-
Subtotal	193.7	3.1	357.4	2,725.7	1,400.3	4,680.2	15,284	10,381	1,096
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	383.7	383.7	-	-	776
Insurance					83.5	83.5			
Property taxes					202.6	202.6			
Fixed Overheard					166.9	166.9			
Security Staff Cost					129.9	129.9			5,013
Utility Staff Cost					212.6	212.6			3,803
Subtotal	-	-	-	-	1,179.1	1,179.1	-	-	9,592
Total (w/o contingency)	193.7	3.1	357.4	2,725.7	2,579.5	5,859.4	15,284.0	10,380.8	1,096.0
Total (w/25% contingency)	242.1	3.9	446.8	3,407.1	3,224.3	7,324.2			

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

Table G-2
Monticello Nuclear Generating Plant
ISFSI Decommissioning Cost Estimate - Scenarios 3 & 4
(thousands of 2014 dollars)

Activity Description	Decontam-ination Costs	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor										
Planning (characterization, specs and procedures)		-	-	-	-	242.8	242.8	-	-	1,096
Decontamination (activated liner and concrete removal)	28	195.6	7.2	360.7	2,757.7	-	3,349.2	15,473	2,041	
License Termination (radiological surveys)		-	-	-	-	1,350.2	1,350.2	-	10,584	-
Subtotal	28	195.6	7.2	360.7	2,757.7	1,593.0	4,942.2	15,473	12,625	1,096
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	-	383.7	383.7	-	-	776
Insurance						83.5	83.5			
Property taxes						202.6	202.6			
Fixed Overheard						166.9	166.9			
Security Staff Cost						129.9	129.9			5,013
Utility Staff Cost						212.6	212.6			3,803
Subtotal		-	-	-	-	1,179.1	1,179.1	-	-	9,591.7
Total (w/o contingency)	28.0	195.6	7.2	360.7	2,757.7	2,772.1	6,121.3	15,473.0	12,625.0	10,687.7
Total (w/25% contingency)	35.0	244.5	9.0	450.9	3,447.1	3,465.2	7,652.0			

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